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SHEGAON-444203,Dist.Buldana

(Affiliated to SantGadge Baba Amravati University,Amravati)

(Accredited byNAACwithB+ GradewithCGPA2.65)



Criterion- III

RESEARCH INNOVATIONS AND EXTENSION

3.3.1: Number of research papers published per teacher in the Journals notified on UGC care list during the last five years

Late Reverend Father Shri. Maskuji Biruji Burungale Education Society, Shegaon (R.No. F-422)

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No.:SDMBCS/NAAC/IQAC/AQAR/2021-22/3343 Date:30/12/2022

Self Declaration

This is to declare that,the information,reports,true copies of the Supporting documents, numerical data, and weblinks etc.furnished in this file are verified byIQAC and the head of the institution and found correct.

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INDEX

SN	Content
1	3.3.1: Number of research papers published per teacher in the Journals notified on UGC care list during the last five years
2	3.3.1.1: Number of research papers in the Journals notified on UGC CARE list year wise during the last five years
3	Number of research papers in the Journals notified on UGC CARE list year wise21-22
4	Number of research papers in the Journals notified on UGC CARE list year wise20-21
5	Number of research papers in the Journals notified on UGC CARE list year wise19-20
6	Number of research papers in the Journals notified on UGC CARE list year wise18-19
7	Number of research papers in the Journals notified on UGC CARE list year wise17-18

3.3.1: Number of research papers published per teacher in the Journals notified on UGC care list during the last five years
81

3.3.1.1: Number of research papers in the Journals notified on UGC CARE list year wise during the last five years

R2021-22	20-21	19-20	18-19	17-18
20	24	12	14	11

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STRESS MANAGEMENT OF LIBRARY PROFESSIONAL AT WORK PLACE

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Abstract:

The study deals with the stress management of Library professionals at work place. Librarianship and information work is the profession which provides services to the users. Stress is the changes which our bodies experience as we adjust to our continually changing environment. It has been an integral part of our daily life since prehistoric times and Library & Information science personnel are not exception to this. Thus we cannot avoid stress in our life; rather the best policy is to manage it properly to increase our efficiency. This article attempts to define stress in the light of LIS profession. It describes about the types of stress in libraries and its reasons. Also critically analyses the best ways to manage the stress of LIS professionals in the work place..

Keywords: stress management, work related stress, Library Professional

.INTRODUCTION

Generally stress is the changes, which our bodies experience as one, adjust to the continually The profession itself suffers tension related problems between the professional and para- professionals. The library structure includes librarian as the chief manager of the library having administrative technical and nontechnical staff in hierarchy. Stress is a fact in our daily life. When a person needs help, it means the person feels physically and emotionally disabled. Most people believe that their capacity and capabilities are so little to encounter high level of stress. Today, with progress in all respects, human is facing new challenges in many different fields as if progress in turn creates new problems. Over a century, the nature of working has been changed widely, and still these changes are in progress. Following these changes, number of illnesses has been increased, morality and human aspects are faded and new problems are occurred every day, so that we are facing job stress which called "illness of the century"

Stress Management:

Stress Management means to make changes to our life, if someone is in constant stress situation and the person can prevent stress by practicing self care, relaxation and to manage or response to the stressful situations when its occurs.

Stress management is said to reduce the blood pressure, heart, disease, digestive troubles and many more physical ailments. The experts comment that it helps to improve sleep and mental health.

Sources of Stress in the Library Professionals

Stress can be consequent from three sources such as physical, mental and Work Place. Physical stress can be brought on by overwork, lack of rest and poor diet. Mental stress can be traced to a persons' mental state of mind, which involves expectation, fears, regrets etc. Work Place stress is derived from the interaction with the outer world like interaction with modern technologies, role as a library manager etc. Different events which are responsible for stress factors are as follows, Stress Management for Library and Information Professionals

1) Workplace Stress
2) Technological Stress
3) Organisational to Stress
4) Physical Stress

1) Workplace Stress

Workplace stress is hardly limited to the library profession, if compared with the public sectors like public service oriented occupations like health care units, child care or teaching fields. The librarians deal with the users and management. The librarians face problem of staff i.e. manpower, when the attendant and clerk is shifted from library to the office work. The teachers behave differently with the librarian as they are non vocational teachers and the nature of the work differs. Librarianship is very much hectic when the stock verification if more than twenty thousands of books, every three years have to conduct, otherwise every year in summer vacations with insufficient staff. If found loss, librarians are blamed and punished if the management is not supportive. Librarians also feel stressful when not appreciated for the efforts they have taken, many times the stress is also due to lack of leadership, lack of staff autonomy and an distinct vision of job activities. It is obvious that although there is no single definitive cause and therefore no one solution, the reasons contributing to a stressful environment hold distinctive similarities throughout the public service sector, including librarianship. The stress also occurs in the areas of technology, ser expectations and personal responsibilities but the occupation has its stress levels.

2) Technological Stress

Technical services staff members feel pressure of never seeing "in" basket or self of materials to be processed diminish or of always having to accomplish special projects without reductions in "regular" work expectations. In addition to the sheer quantity of work, library staff members may feel a qualitative overload. They often feel that their job requires knowledge and skills that they do not have, job contains elements that are inappropriate or job is frustratingly fragmented or complex. Reference librarians report feelings of inadequacy regarding their knowledge of information sources and technology, impatience with duties such as dealing with "problem" patrons and maintaining photocopy machines and conflicts between on-desk and off-desk duties. Technical services and support staff feel qualitative overload. It has been also reported that it include interdepartmental conflicts, tensions between professionals and non professionals, competition for status and resources, irritable and negative co-workers, and gossip.

Organisational to Stress

Library staffs face many problems and converts into stress when it working in organisation. Librarian and other subordinates also have stress at workplace dealing with different issues. Libraries as organisations including their policymakers, managers and personnel officers, deal with stress and burnout at workplace. The organizational strategies can be grouped into several categories including: (1) reducing number and intensity of stressors, (2) strengthening the employee's ability to cope with stress effectively and (3) recognizing and assisting those who are not coping effectively and who are at risk of burnout. Goal of such strategies is not only to complete elimination of stress or strain but also rather maintenance of stress at a level with which individuals can cope effectively and productively.

Helping manage workers Stress:

While every library staff member should feel that sources of stress are kept minimum at library workplace, even in libraries where this is successful, there will still be considerable stress at workplace. Effective individual stress management and coping strategies are as important, if not more so, as organizational reduction of stressors. Libraries as organizations can play an important role here, too. In overall terms, this is a matter of helping employees gain knowledge, self-awareness, and skills. Works that contain useful information on helping workers manage stress include Paine (1982), Pines (1981), and Tanner (1983). First step to effective stress management is gaining knowledge of how stress operates in one's life and the role that various types of stressors and coping strategies can play in painful stress or strain. Libraries should help their staff members gain such knowledge through workshops and other means. Using this knowledge, staff members can assess sources and level of stress or strain in their own lives. Personnel officers and managers can be helpful in this regard by making available stress and burnout "check up" or assessment instruments that have proven useful. Especially important is assistance to employees in assessing how realistic are goals they have to imposed on themselves and encouraging them to adopt more realistic goals and expectations of themselves. Development of an effective social support system is especially important for individual stress management and coping. Such a support network can provide self-esteem, feedback and appraisal of situation, information and advice, and assistance in making changes in situation.

Strategies to counter of stress management

- Think positive every time
- Improve yourself
- Make yourself happy first. So keep smiling as it costs nothing but pays much.
- Start work through proper planning and set your goals.
- Start enjoying whatever you do for your living
- Learn to say yes happily in every time .
- Communicate properly and do and daily yoga
- Seek more information about handle that situation.
- Increase your physical exercise to have a greater feeling of well being your daily routine.
- Take a good stretch. Stretching makes muscles relax and.

Suggestions:

- Management and Principal must look into the matter, if librarian faces any problem related to job as stress reduces the output performance of the institution.
- Librarians must adopt the new technology to cope up with the next generation library sources and services.
- Library employees should create stress free work environment and ensure they exercise themselves.
- Mind Meditation and physical activities will help the library professionals to reduce the stress at workplace.

Conclusion: Stress is a part of our working lives and is not likely to decrease in tomorrow's workplace. A difficult economy, downsizing, taking on additional responsibilities without assistance or additional pay, all are taking their toll on physical, mental and emotional well being. College librarians often feel isolated as the only professional in the field serving the college campus. The librarian also face difficulty in coping with new technologies, staff support, insufficient staff or manpower and busy workloads in academic structure in limited time frames. The librarian has to find time to do activities which helps to reduce workplace stress.

References:

1. Bailey, R. D. (1985). *Coping with stress in caring Oxford*, England: Blackwell Scientific Publications.
2. Cherniss, C. (1980). *Staff burnout: Job stress in the human services (Sage studies in com- munity mental health, 2)*. Beverly Hills, CA: Sage.
3. David Wainwright and Michael Calnan (2002). Work Stress: The Making of a Modern Epidemic. Buckingham, U.K.: Open University.
4. Maureen F. Dollard, Anthony H. Winefield, and Helen R. Winefield (2003). Occupational Stress in the Service Professions. London: Taylor &Francis.
5. Ivancevich, J. M. T., Matteson. (1980). Stress and work. Scott, Foresman, Glenview, IL.

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JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

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STRESS MANAGEMENT: CONCEPT AND APPROACHES OF LIBRARY PROFESSIONAL

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Abstract

This article provides an overview of stress and its management. Stress is a common occurrence in modern life. Stress Depending on the person and the situation. Stress management involves techniques such as relaxation exercises, time Management, cognitive intervention and mindfulness based approach. The present article examines and reviews aspects Stress, Stage Stages and Approaches to Stress Management. The authors found that the psychological approach Helps to manage stress in different situations.

Keywords: Stress Management, causes of stress , Management Standards Approach

Introduction

The study deals with the stress management of Library professionals at work place. Librarianship and information work is the profession which provides services to the users. The profession itself suffers tension related problems between the professional and para professionals. The library structure includes librarian as the chief manager of the library having administrative technical and nontechnical staff in hierarchy. The libraries have to serve the information needs of users in time and if the failure occurs it becomes stressful. The British and Danish library research explores to concept of satisfaction and it is related to stress, of content and conditions. The research focuses on the different variables and factors such as stress, freedom in the job, perception of management style and the actual content. It can be concluded that stress may affect proper decision making. There is strongly correlation between the level of satisfaction and the amount of stress.

Stress:

Stress is a general term applied to various psycho logic (mental) and Physiologic (body) pressures or felt by people throughout their lives.

Stress is defined as "a state of psychological and physiological imbalance resulting from the disparity between situational demand and the individual's ability and motivation to meet those needs."

Stress Management:

Stress Management means to make changes to our life, if someone is in constant stress situation and the person can prevent stress by practicing self care, relaxation and to manage or response to the stressful situations when its occurs.

Stress management is said to reduce the blood pressure, heart, disease, digestive troubles and many more physical ailments. The experts comment that it helps to improve sleep and mental health.

Stressors:

Earlier discussion of sources of stress at library professional suggests many areas for reducing stressors. Remedies for reducing stress in organizations have been discussed by several professionals such as Cherniss (1980);. Stressors associated with quantitative and qualitative work overload can be reduced through job redesign.

Managers, working with staff, should try to arrange employee's day so that intense or taxing activities alternate with other activities for variety and relief. Duties that are inappropriate to the employee's role or training (e.g., equipment servicing by reference librarians) should be kept at a minimum. Number of hours worked at intense or exhausting tasks should be carefully limited and jobs should be structured so as to allow workers to take "time outs" when necessary. Opportunities for learning, for using creativity and for innovation should be built into jobs to greatest extent possible. Staff members should be encouraged to take vacations and accrual of unused vacation time should not be treated as an object of pride or status. Stress resulting from competition can be reduced by developing work strategies that are collaborative rather than competitive. Many of stressors that are related to interpersonal relationships, role ambiguity and role of conflict can be addressed through good organizational communication. Library administrators should assess the degree to which all staff members receive clear, timely and full information relevant to their jobs and their contributions to accomplish organizational mission. Identified gaps and deficiencies should be remedied. Policies, goals, rules and expectations should be made as clear and explicit as possible for each staff member.

Causes of stress

Aldwin (2007) maintains that stressors can be physical, social or psychological. Physical stressors are described as those evasive environmental conditions which manifest harmful effects on individuals, e.g. pollutants, noise. Others include building with sealed windows; fumes from printers and photocopiers etc. Poorly ventilated offices and littering work areas also result in physical stress by leading to strain in eye and muscle. Stress has to do with the way people react to conditions, changes and demands of life. Reaction could be mental, physical or even emotional (Lehnert, 2002).

Stress emanates from a wide range of issues. According to Bunge (1989), budget cutbacks and staff shortages have resulted in;

* More work to be done than there is time to do it
* Lack of adequate knowledge of information sources or technology
* Interpersonal relationship, library support staffs feel a lack of recognition, appreciation and respect from other staff, tension between professionals and non professionals, negative co-workers and gossip.
* Lack of effective feedback from supervisors, co-workers and patrons

* Role conflict and role ambiguity.
* Inadequate supervision and management in terms of feeling left out of decisions where one has important expertise.
* Managers who will not risk advocating for their staff.
* Inadequate office space, crowding and lack of privacy in offices.

Environmental factors

Michellan (2012) reported his study on stress and cataloguing paraprofessionals in academic and public libraries in Florida noticed some stresses from library work environment. Wherein observed that environment factors attracted a 40.5% response, while 10.5% respondents averred that they often experience stress from work overload. This reported that 61% of respondents experience stress because they are expected to know so many things while others said their stress emanates from fear of making mistakes.

Organizational

Parent institutions where librarians work also contribute for generating stress. Bamber (2011) maintained that physical working conditions, supports, relationships, change, pay and career prospects are factors that constitute stress to librarians. Employees also undergo stress while trying to meet up with professional assignments, teaching and writing papers for promotion. Interface satisfying the need of users and meeting up with publications gives librarians real time stress.(Ajalla, 2011).

Home-work interface:

Employees have family responsibilities outside library workplace. These include caring for spouses, children and relatives. Home-work interface may pose stress to librarians depending on what is happening at home. Okoukwo (2014) observes that family strain interference with work results in family conflict which in turn results to pressure, tension, anxiety, stress to employee. Perlin (1989) identified juggling parent and work roles as one of the crucial causes of stress. Working women experience a considerable amount of strains for their multiple roles.

Management Standards Approach:

Management standards approach is a risk assessment for work related stress that is designed to assist employers in meeting their legal duties. Management standards approach has modified the normal 5-steps to risk assessment promoted by HSE by the inclusion of a firm definition of the psychosocial (interaction between psychological and social factors) hazards and by defining, in the states to be achieved (STBA), what good practice may look like; Management Standards (Cousins et al. 2004).

Management standard and associated STBA for the psychosocial risk factor of demands is shown below as an example. Management standards for all six psychosocial risk factors share same format.

Management Standard for demands:

The standard is that:

*Employees indicate that they are able to cope with their job demands.

* Systems are in place locally to respond to any individual concerns.

States to be achieved are:

* Organisation provides employees with adequate and achievable demands in relation to agreed hours of work;

* People's skills and abilities are matched to job demands;

* Jobs are designed to be within capabilities of employees and;

* Employees' concerns about their work environment are addressed.

Management Standards themselves are a set of psychosocial hazards, commonly referred to as risk factors (demand, control, support, role, relationships and change) that, if not adequately managed within an organisation, can result in psychological harm to workers. Written guidance provided to users of the Management Standards tool kit (www.hse.gov.uk/stress) suggests and facilitates to identification of high risk groups (HSE Indicator and Analysis Tools) measured against the psychosocial risk factors. Primary objective of identifying high risk groups is to facilitate to prioritisation of organisational resources. Management Standards approach requires completion of a risk assessment. For large organisations (>250 employees) this will mean starting with high risk groups before moving on to all other employees. This type of implementation should allow organisations to learn from the high risk groups and apply that learning to other groups as appropriate. Conversely, it also facilitates to identification of good practice that can be introduced across the organisation to at risk groups.

Management Standards approach is designed to be a framework against which to carry out a risk assessment, rather than a prescriptive process that should be adhered to rigidly. Steps of the risk assessment process are specified and guidance given on one way of achieving the objectives of each step, but users free to use an alternative methodology to complete steps. This approach is based on an understanding that organisations do not operate in a vacuum. There are normally structures or initiatives in place within organisations that can be utilised to deliver some or all of desired outcomes from specific steps of process. This methodology is consistent with Management Standards approach having status of guidance under health and safety law and therefore it is not enforceable.

Steps of management standards approach require consultation between different groups of workers and their representative, if appropriate. This dialogue is a critical contributing factor in success of addressing the underlying causes of work related stress. This approach casts the worker as an expert, experts in their own work. Therefore, if an employer is to understand the issues for a particular group of workers, they have to ask experts and workers themselves. Experience has shown that many large employers rely heavily on the output from staff surveys as a way of measuring issues within workplace. This is a good starting point, but has limited value in understanding the underlying causes of issues identified. Therefore, HSE recommend that workers are involved in the process of identifying issues and development of strategies to address them. Within Management Standards approach it is suggested that focus groups should be used for face-to-face discussions on their issues, informed them by results of staff surveys, other available metrics and management standards themselves. However, it dependent on size of organization and their structure, other forums such as team meetings or existing working groups, can be utilised.

Conclusion

Stress is a complex phenomenon and is affected by various factors. There is no single method for Surviving stressful situations in life; Instead, it is a process of finding out what is best for the individual Time of stress. Coping strategies will guide a person to work through daily stress

As the stress of crisis. Cognitive behavioral approaches are effective in coping with stressful situations. Mindfulness-based approaches have recently been highlighted as interventions for managing stress. Stress Management is important because stress is associated with a variety of medical conditions that have lasting consequences on personal.

References:

1. Bailey, R. D. (1985). *Coping with stress in caring Oxford*, England: Blackwell Scientific Publications.
2. Cherniss, C. (1980). *Staff burnout: Job stress in the human services (Sage studies in com- munity mental health, 2)*. Beverly Hills, CA: Sage.
3. Farber, B. A. (Ed.). (1983). *Stress burnout in the human service professions*. New York: Pergamon.
4. Freudenberger, H. J., and Richelson, G. (1980). *Burn-out: The high cost of high achievement*. New York: Anchor, Doubleday.
5. David Wainwright and Michael Calnan (2002). Work Stress: The Making of a Modern Epidemic. Buckingham, U.K.: Open University
6. Maureen F. Dollard, Anthony H. Winefield, and Helen R. Winefield (2003). Occupational Stress in the Service Professions. London: Taylor &Francis).

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Original Research Paper

Library Science

STUDY OF STRESS MANAGEMENT OF LIBRARIAN AT WORK PLACE IN WORKING ENVIRONMENT OF BULDANA DISTRICT

Dr.Ranjana K. Jawanjal

(Librarian) Shri Dnyaneshwar M. Burungale Science And Arts College Shegaon.

ABSTRACT This a Research Paper deals with practical approach of stress management of librarian in working Environment in buldana district. Work is carried out by questionnaire ,interview, Google form and the result are analyses by chaque method.

KEYWORDS : stress management, working environment, Chi-square Test.

INTRODUCTION-

The study deals with the stress management of Library professionals at work place. Librarianship and information work is the profession which provides services to the users. The profession itself suffers tension related problems between the professional and para-professionals. The library structure includes librarian as the chief manager of the library having administrative technical and instructional staff in hierarchy. The status of libraries in Saint Gadge Baba jurisdiction has been observed that many libraries do not have enough staff in the library. Some libraries only have one librarian and one attendant provide service in circulation.

Stress in the workplace is currently a topic of great interest. For example, there is increasing awareness that excessive stress can be hazardous to employees' health, and stress as a cause for disability, can obligate employers and their insurers to worker compensation. Ineffective management of stress can lower the productivity of individual employees and, as a result, of an entire organization. This article will discuss some aspects of stress in the library.

Definition of Stress:

Stress is a general term applied to various psychologic (mental) and Physiological body) pressures felt by people throughout their lives.

Stress is defined as "a state of psychological and physiological imbalance resulting from the disparity between situational demand and the individual's ability and motivation to meet those needs."

Scope of The Study:

The scope of the present study was the stress management of college librarians from affiliated colleges of Sant Gadge Baba Amravati University Amravati. The colleges are located in rural and urban area in Buldhana District. The scope of research was based on working environment of librarian in buldana District.

OBJECTIVES OF THE STUDY:

1) To study and identify the personal and organizational details of librarians of affiliated to Sant Gadge Baba Amravati University, Amravati.
2) To study the working environment of the Library and Information.
3) To study the level of Job security and Job satisfaction among librarians in affiliated to Sant Gadge Baba Amravati University.
4) To study the Causes and Effect factors of Stress existing among the librarians at work place in affiliated to Sant Gadgebaba Amravati University Amravati.
5) To study different stress regarding to Coping strategies to adopt the comfort of stress at work place.
6) To suggest specific interventions to maximize professional success in College Librarians.

Research Hypotheses:

H1: There is no significant difference between the gender and working environment of Librarians.
H2: There is no significant difference between the gender and level of Job security and Job satisfaction of Librarians.
H3: There is no significant difference between Gender and Causes and Effect factors of Stress of Librarians.
H4: There is no significant difference between Gender and coping strategies adapted to combat the stress of Librarians.
H5: There is no significant difference between gender and level of occupational job stress of Librarians.
H6: There is no significant difference between gender and effects of job stress on effectiveness of Librarians.

REVIEW OF LITERATURE

Literature review accounts published research publications in books, research journals and thesis etc. Purpose of writing the literature review was understand knowledge and ideas have been established on a topic and their strengths and weaknesses. It is a source from where research ideas are drawn and developed into concepts and finally theories.

1) Gülten Vatansever and Ali Uslular (2011) was determined various causes of motivational problems related to employees duties. Scope of this study involved 4 and 5 star rated hotels around Antalya region in Turkey. Twenty seven different factors were analyzed regarding employees attitudes towards "importance" and "satisfaction" within workplace. Results reveal that employees give more importance to behavioral approaches. Also, findings show that most important issues that employees care about are being recognized about job policy and working beyond normal working hours.

2) M. Siva Kumar (2011) quoted that this century has belonged to IT era. IT sector professionals are characterized by differing nine long working hours, night shift, lack of mobility and continued visual focusing monitor leads to occupational stress. Present study illustrated that remains occupational stress among IT professionals in various companies in Chennai ,data were collected from 1041 IT professionals in Chennai. Occupational stress index developed by Srivastava Sing (1983) was used to assess the level of occupational stress among IT professionals. Whereas observed that middle level professionals are experiencing more stress than higher and lower level professionals. Implications of results are discussed with possible intervention to improvement of organizational resources among IT professionals.

Research Methodology

Primary data was collected using the questionnaire which google form was prepared and sent through mail and also had personal contact approach with in buldana district. The data collected through the questionnaire was analyzed with the help of the computer. The development of electronic devices, specially the computers, has given added impetus to this activity. The statistical analysis of the data for the present study was done by applying 1) Sample percentage 2) Arithmetic Mean and 3) Chi-square Test.

Table No 1 Responses Received

Sr. No	Districts	Total Colleges	Gen rated	Non graded	No of Questionnaire Distributed	No. of Questionnaire Responded	Response Rate (%)
1	Buldana	84	26	58	84	31	36.90

Total questionnaire 84 were distributed in buldana district, out of which 31 librarian responded from the granted and non granted colleges and their response rate was 36.90% in buldana district.

Table no. 2

GENDER WISE				
		Frequency	Percent	Valid Percent
Respondents	MALE	21	67.74	67.74
	FEMALE	10	32.25	32.25
	Total	31	100.0	100.0

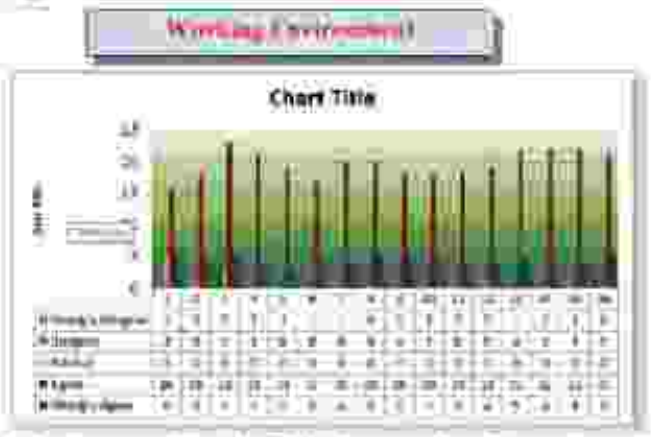
The responses from the target respondent were received i.e. 21 (67.74%) male and 10(32.25 %)female respondents. Male respondents were greater than female respondents.

Table no. 3

Educational Qualification				
S.N.	Educational Qualification	Frequency	Percent	Valid Percent
2	MLISC	10	32.25	32.25
3	MLISC NET OR SET	5	16.12	16.12
4	MLISC NET OR SET. MLISC Ph.d	4	12.90	12.90
5	MLISC Ph.d	8	25.80	25.80
7	MLISC MPHIL	4	12.90	12.90
	Total	31	100.0	100.0

The table no. 3 shows the higher qualification of the target respondents MLISC NET or SET were 5 (16.12%) librarian respondents and qualified with PHD were 4 [12.90%] respondents, MLISC qualified with PHD were 8(25.80%), MLISC qualified with MPhil degree were 4(12.90 %) mostly the librarian are qualified

Figure-1



1-I enjoy my working place 2 We have a good working environment 3 We have a clear plan of action for the library 4 We follow up and evaluate outcome in a way that improves the overall work of the library 5.The culture and emotional climate of the college is generally positive and supportive 6 My efforts are recognized and acknowledged 7 At work, I am accepted for the person I am 8. I feel in control of my work and capable of competently carrying out my daily tasks. 9 I tend to see problems as challenges, rather than as obstacles. 10 Colleagues provide an environment in which I feel safe and secure 11 The library supporting staff provides an environment in which honesty and openness are valued. 12 I see my principal as a resource rather than an obstacle 13 I have a clear understanding of the expectations of my principal. 14 I feel safe sharing my plans, programs and policies with my principal. 15 I trust my principal to be there for me and back me up. 16 My Principal is committed to finding win-win solutions to problems

CONCLUSION

It can be concluded from research work and data collected. It has been observed that Library professional have issues at there work place Librarian also face difficulty in your work place.

REFERENCES:

1. David Weinert Jr. and Matthew Lappin (2012) Work Issues That Hinder the Modern Professional Managing Time (UK: Oxford University)
2. Maureen K. Dolmage Academy of Witchcraft and Helen R. Wyndfield (2000) Occupational Issues in the Service Profession Leading Library (UK: Oxford)
3. Wanchoo, J. N. T. Methods (1980) Management & Tools Forecasting (Maynard R...
4. Kothari, C. R. (2004) Research Methodology: Methods & Techniques, New Age International Publishers New Delhi
5. Rao, Sree N. & Rao, Sreeni V. (2002) Research in Education (P ed.) New Delhi Sharma Printers (Unit of Indu
6. Mathew, R. (2000) Research methods with Jha Journal of Accommodation (XXI, 153)

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Library Consortia : A Need of Hour

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ABSTRACT

The concept of library consortia and library networking to aid information resource sharing and support activities in libraries has become a real necessity in India. This paper briefly discusses the concept, need, factors, advantages, disadvantages of library consortia and it gives brief information about Main Consortium likeCSIR,INDEST, INFLIBNET consortia in IndiaThis paper covers various models and the benefits of e-journals consortia. It also discussesthe existing environment about users preferences and difficulties.

Keywords: Library Consortia, CSIR,INDEST, INFLIBNET, E-Journal.

I. INTRODUCTION

The concept of library networking to aid information resource sharing and support activities in libraries has become a real necessity. explosion of information and inadequate library urged the libraries to adopt new philosophies and technologies for collection development and reduce the costs of information. Library Consortium is an Association of a group of libraries to achieve mutually the common objective. It is I felt that the concept of E-Journals consortia can work well the libraries without requiring additional fees to access the e-journal.

Definition of Consortia: A consortiais an association of two or more individuals, companies, organizations or governments (or any combination of these entities) with the objective of participating in a common activity orpooling their resources for achieving a common goal. Consortium is a Latin word meaning 'partnership,association or society' and derives from censors 'partner', itself from con- 'together' and sores 'fate',meaning owner ofmeans or comrade.

Need for library consortium:

The consortium isneeded for librarles because of:

1) Information explosion
2) Diversity ofuser needs
3) Financial crunch
4) Impossibility of self-sufficiency

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Factors to Consider before Consortia Formation: factors to be taken for an effective functioning of a successful consortium like resources identification on the basis of usage and usability, long run planning of the technology infrastructure,access to back runs of periodicals will have to clearly spelt, copyright and licensing, archival issue, price issue should be economically favorable. Last but not least, designing and launching a library consortium should be long term sustenance and robust models towards achieving the above goals.

Advantages of Consortia:

i. Consortia-based subscription to electronic resources provides access to wider number of electronic resources at substantially lower cost.
ii. Optimum utilization of funds.
iii. Facilities to build up digital libraries
iv. Helpful to provide better library services like CAS and SDI
v. Cost Sharing for Technical and training support
vi. ElectronicJournals demand neither library space nor shelling costs nor can they be stolen from the library
vii. The consortium have been offered better terms of licenses for use, archival access and preservation of subscribed electronic resources, which would not have been possible for any single institution;
viii. Available 24 hours a day, 7 days a week.
ix. Economy in maintain

Disadvantages of Consortia:

1. Absence of a printed copy of Journals
2. Require training of staffs in handling electronic documents etc.
3. Consortia require high initial investments in licensees and information and communication technology
4. Copyright problems
5. Unreliable telecommunication links and insufficient bandwidth
6. Lack of archiving and back files availability
7. Internet Access Id necessary
8. Users are not accepting e-journals as per with the printed Journals

CSIR Consortium:

The Council of Scientific and Industrial Research (CSIR) in India has 40scientific laboratories involved in basic and applied research in various disciplines. Many of the laboratories have well equipped libraries, and some of them act as the main information centers for different subjects, functioning as consultant libraries at the national level. Access to e-journals through the use of state-of-the art technology is possible in many of the libraries belonging to these laboratories. Each of the laboratories has a well-established library or documentation center.

INDEST Consortium:INDEST is an open-ended proposition, and welcomes other institutionswith the similar area of interest and who can join for sharing benefits. The INDESTConsortium is the most ambitious initiative taken up so far in India in the area of engineering and technology disciplines. The Ministry of Human Resource Development (MHRD) has set up the Indian National Digital Library in Science and Technology (INDEST) Consortium. Institutions including the Indian Institutes of Science (IISc), the Indian Institutes of Technology

(IITs), and a few other centrally funded government institutions through the consortium. Besides that, 60 government or government-aided engineering colleges and technical departments in universities have also joined the consortium with the financial support from the All India Council for Technical Education. In addition, a total of 26 other engineering colleges and institutions have also joined the consortium on a payment basis.

II. INFLIBNET

Information and Library Network (INFLIBNET), a programmer of the University Grants Commission, was launched in May 1991. The main aim of INFLIBNET is to establish a national computer-communication network to link libraries and information centers in universities, colleges, universities, UGC information centers, institutions of national importance, R&D institutions, etc., and thereby improve capability in information handling and services. It is a programme for academic excellence to be achieved through establishment of a mechanism for information transfer and access to support scholarship and academic work. It facilitates pooling, sharing and optimization of scarce library resources in the country. As a major programme it helps modernize libraries and information centers in the country through application of information technology.

Benefits of E-Journals Consortia:

a. Scope for electronic archives;
b. Availability and monitoring of usage statistics;
c. Getting deep discounts through joint pricing negotiations – hence lower unit cost Of information;
d can be read anywhere in the world, at any time, by any number of people as long as the readers have an internet connection;
e. Also allow the inclusion of audio-visual material as well as the other formats and technological innovations that are available on the Internet, such as keyword possibility of self-sufficiency.

Consortia Models

The types of consortia identified are generally based on various models evolved
in India in Varity of forms depending upon participations' affiliation and funding sources.

i). **Open Consortia**: -This type of consortia is very flexible and it is the wish of members of consortia can join and leave any they please. INDEST Consortium is an example to this.

ii). **Closed Group Consortia**: -It is within defined group. This kind of consortia emerges either by affiliation and collaboration among them like CSIR, DAE, IIM Consortium. And the formation and operation of the consortia guidelines and its administration are fairly simple and easy.

iii). **Centrally Funded Model:** -In this model, consortium will solely depend on the parent body. A few examples are INFONET by UGC, ICMR, CSIR by DSIR.

iv). **Shared-budget Model:** -"In this model the participating libraries take the lead and form the consortium. IIM and FORSA are examples of this model".

III. CONCLUSION

Library consortia providing for physical and electronic delivery of materials and integrating theCollection-developmentprocess is all distinct and crucial steps in moving toward the twenty-firstcentury library. It is the case: clearly identified landmarks represent important goals and milestonesfor measuring our common progress on a journey through a new and unfamiliar landscape. Consortia are tools which will aid in exploiting the features of the e-resources as well as in effecting savings.

IV.REFERENCES

[1]. karan.K.,Digital Library consortia :A book For Higher education in India
[2]. Yernagula .R. Library Consortia :benefits and models of e-journals consortiaIIT Kanpur
[3]. http://www.niscair.res.in/ActivitiesandServices/MajorProjects/majproj.htm#ejournalconsortia)
[4]. www.google.com

JOB SATISFACTION LEVEL AMONG LIBRARY PROFESSIONAL IN VIDARBHA REGION : A Study

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Abstract

The purpose the study currently discussing the importance of study for the satisfaction of a librarian's job The study focuses on job satisfaction comparisons among LIS professionals. In vidarbha region., Data were collected through structured questionnaires and google form. Total Were collected and analyzed according as per the objectives of the study.

Keywords- Job Satisfaction , Library professional

Introduction

Job satisfaction in regards one is feeling or state of regarding nature of their work. Job can be influenced by variety of factors like quality of one relationship with their supervision, quality of physical environment in which they work, degree of fulfillment their work etc.. Job satisfaction is very much emotional feeling for the employees may be positive or negative. Many research findings reveal that satisfied employee is an effective ob performer. (Boyatzis, 1982). The examples can be quoted from the affiliated colleges in UGC granted colleges. librarians are satisfied with the salary as they have the pay scales of teacher, but not satisfied with the infrastructure and facilities in the colleges as the colleges do not receive no salary grants, but still for NAAC purpose, institutions are spending, but it depends on the institutions.

Job satisfaction plays an important role in enhancing workforce productivity. The dimensions of ob satisfaction are pay, promotion, supervision, job condition, and benefits Ivancevich & Matteson, 1980; Locke, 1976), which the authors classified the term as intrinsic satisfaction, which signifies a category of situation of tasks that makeup the job, such as skills and extrinsic satisfaction refers to work state of affairs, for instance pay, co-worker etc. Spector, 1985).

Objectives of the Study:

1) To study and identify the personal and organizational details of library professionals affiliated to Sant Gadge Baba Amravati University, Amravati.
2) To study the working environment of the Library and Institution.

3) To study the level of Job security and Job satisfaction among librarians in Aided and Non-Aided libraries affiliated to Sant Gadge Baba Amravati University Libraries
4) To study, the Causes and Effect factor of Stress existing with the library professionals.
5) To study different stress Coping strategies to adopt the comfort of stress at work place.
6) Determine the level of occupational job stress among librarians in Aided and Non-Aided libraries affiliated to Sant Gadge Baba Amravati University, Amravati.
7) Determine the effect of job stress on effectiveness of librarians in College libraries of Sant Gadge Baba Amravati University.
8) To recommend specific interventions to minimize professional stress on College Librarians.

Review Of Literature

Pors, Niels Ole; Johannsen, Carl Gustav (2002) in cooperation with the Danish Union of Librarians in 2001 was carried out comprehensive survey of Danish library directors. Survey analysis focused on a whole army of topics connected with leadership qualities and perceptions of different future challenges. Wherein observed focus is on job satisfaction among library directors. Job satisfaction is a central topic for motivational theories and some of major of these are evaluated in relation to findings. Resultant analysis correlates job satisfaction with a number of both extrinsic and intrinsic factors and existence of major differences between these factors and levels of job satisfaction among library directors is found. Some of these factors appear to be connected with the level of activity in library. Context of the paper concerning to problems of recruiting right kind of staff. Wherein found that context include about need to create attractive workplaces. Pors, Niels O. (2003) studied survey of British and Danish Library Managers and elaborated the concept of job satisfaction and its relation to stress, job content and job conditions in published article. In which he was explored the theories of Hofstede as a tentative explanation of national differences. This study analyzed job satisfaction in relation to a range of demographic variables. On the basis of a multitude of questions and statements the author forms several composite variables. They concern factors such as stress, freedom in job, perception of management style and actual job content. Hofstede's theories about cultural differences are at least partly confirmed through analysis. They cannot explain all differences, but at least some of major ones. It is also evident that nationality plays a significant role in relation to factors such as stress and freedom in decision making. This investigation reported that an intervening variable could be the way nations adopt different methods to reorganize public sector. A last point made in the paper is a partial rejection of a generic theory about job

satisfaction. Factors tend to be same, but weighting of single factor and its significance are influenced by background factors such as nationality, size of the employing institution and mix of tasks in job.

Pors, Niels Ole (2005) investigation was explored changes in Danish public library managers perception of environment, their own knowledge about management methodologies and tools and their perceived need for further education. Exploration of the changing attitudes and perceptions is based on two comprehensive and comparable surveys conducted in 2001 and 2004. Frame of reference is the very distinctive changes in the public library system due to a very innovative employment of the technology and turbulent political and economic environment resulting from plans of merging the municipalities and counties into fewer units. Turbulent environment with coming merging of municipalities creates some job insecurity but it does not tend to decrease job satisfaction. Managers have undergone a process of professionalization in relation to their job. A higher degree of professionalization correlates with mental attitudes for job, self-esteem in relation to managerial tools and approaches and confidence in relation with stakeholders. Jean M. Leysen and Jeanne

Scope of the Study:

The scope of the present study was Job Satisfaction Level Among Library Professional In Vidarbha Region : A StudyThe colleges are located in rural and urban area in five district

Sources of Data collection

Primary data was collected using the questionnaire, which google form was prepared and sent through mail and also had personal contact approach with the librarians .During the data collection process, the researcher contacted personally through phone and explained them about the questionnaire and requested to provide with factual information. The researcher also approached personally to the librarians to seek responses. Secondary data was collected from other sources i.e. Internet, books, journals, published literature etc.

Table no. 5.46

		Statement						
			Job autonomy					Total
			Highly Dissatisfied	Dissatisfied	Average	Satisfied	Highly satisfied	
GENDER	FEMALE	Count	0	0	12	19	3	34
		Expected Count	0	2.6	11.7	15.8	3.8	34.0
		% within GENDER	0%	0.0%	35.3%	55.9%	8.8%	100.0%
		% of Total	0%	0.0%	10.3%	16.4%	2.6%	29.3%
	MALE	Count	0	9	28	35	10	82

		Expected Count	0	6.4	28.3	38.2	9.2	82.
		% within GENDER	0%	11.0%	34.1%	42.7%	12.2%	100.0%
		% of Total	0%	7.8%	24.1%	30.2%	8.6%	70.7%
Total		Count	0	9	40	54	13	116
		Expected Count	0	9.0	40.0	54.0	13.0	116.0
		% within GENDER	0%	7.8%	34.5%	46.6%	11.2%	100.0%
		% of Total	0%	7.8%	34.5%	46.6%	11.2%	100.0%

The satisfied respondents to the statement "Job autonomy" were 19(55.9%) female respondents and 35(42.7%) male respondents respectively and the neutral respondents to the statement "Job autonomy" were 12(35.3%) female respondents and 28(34.1%) male respondents respectively.

Table no. 5.47

		Statement						
			Job involvement					Total
			Highly Dissatisfied	Dissatisfied	Average	Satisfied	Highly satisfied	
GENDER	FEMALE	Count	0	0	11	20	3	34
		Expected Count	0	1.2	10.0	17.9	5.0	34.0
		% within GENDER	0%	0.0%	32.4%	58.8%	8.8%	100.0%
		% of Total	0%	0.0%	9.5%	17.2%	2.6%	29.3%
	MALE	Count	0	4	23	41	14	82
		Expected Count	0	2.8	24.0	43.1	12.0	82.0
		% within GENDER	0%	4.9%	28.0%	50.0%	17.1%	100.0%
		% of Total	0%	3.4%	19.8%	35.3%	12.1%	70.7%
Total		Count	0	4	34	61	17	116
		Expected Count	0	4.0	34.0	61.0	17.0	116.0
		% within GENDER	0%	3.4%	29.3%	52.6%	14.7%	100.0%
		% of Total	0%	3.4%	29.3%	52.6%	14.7%	100.0%

The satisfied respondents to the statement "Job involvement" were 20(58.8%) female respondents and 41(50.0%) male respondents respectively and the neutral respondents to the statement "Job involvement" were 11(32.4%) female respondents and 23(28.0%) male respondents respectively.

Job Satisfaction level: Mean & Standard Deviation:

Table no. 5.49

Descriptive Statistics

Sr No	Job Satisfaction level	N	Mean	Std. Deviation
1	Nature of Work	116	3.76	.776
2	Supervision	116	3.88	.546
3	Benefits	116	3.69	.751
4	Contingent/ Rewards	116	3.49	.797
5	Satisfaction with Pay	116	3.82	.929
6	Satisfaction with Communication	116	3.81	.779
7	Satisfaction with Co-workers	116	3.59	.987
8	Satisfaction with Professional Development	116	3.76	.851
9	Relationships with readers	116	4.26	.620
10	Job autonomy	116	3.61	.789
11	Job involvement	116	3.78	.732
12	Impact of ICT	116	3.93	.694

Conclusion

This study measures and analyse level of job satisfaction with respect to various factors like Nature of work, supervision, satisfaction with pay, Salary, Satisfaction with Communication , Satisfaction with Co-workers , Relationships with readers Job autonomy, Job involvement Impact of ICT, It says most of the library professionals are satisfied with the all the facilities they got such as Internet facility The professionals working as contract basis were less satisfied with their salary packages and job security as compare to other professional staff working as regular basis. It is concluded that university administration is not concern about the promotion policies for university library staff which results a different level of job dissatisfaction among the staff and need to be considered. It is also found that Cooperation and Coordination in work place are very important aspects that help to balance satisfaction level among the staffs. The findings will be helpful for concerned authorities and library management in reorganizing job structure and policies for Library and Information Science

References

1) Spector, P.E. (1985). Measurement of human service staff satisfaction: Development of the job satisfaction survey. American Journal of Community Psychology, 13(6), 693-713.

2) Pors, N. O. and Johannsen, C. G. (2002). Job satisfaction and motivational strategies among library directors. *New Library World, 103(6),* 199.

3) Pors, N. O. (2003). Job satisfaction among library managers: A cross-cultural study of stress, freedom and job conditions. *New Library World, 104(11),* 464-473.

4) Farzana Sultana and Bilkis Begum (2012). Measuring the job satisfaction of female Library professionals working in the health libraries in Dhaka city. *The Eastern Librarian 23(1),* 37-50.

5) Kothari, C. R.(2004). *Research Methodology: Methods & Techniques*. New Age International Publisher. New Delhi.

6) Kumar,Jitender (2019) Job Satisfaction Level Of Library Professional In Haryana: A Study. International Journal of Current Research, *Vol. 11, Issue, 11, pp. 8254-8257*

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Examining the Effects of Forest Fire on Terrestrial Ecosystem – A Comprehensive Review of Literature

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1.0 Abstract

Forest fire is very common in all the ecosystems and the forests of India are at risk of it due natural as well as anthropogenic interventions in these areas. Not all types of fires affect the forest ecosystems adversely; especially the larger ones have the potential to affect the ecosystems for a substantially longer period of time (in many cases the partial recovery also took more than a decade). In view of the above, this study was carried out to systematically assess the past research efforts in the focused area i.e. impact of forest fire on the forest ecosystem. For this study literature was collected from SCI journals and has been reviewed by following standard methodology. The review showed that more efforts are needed to control the large forest fires so that smaller fire incidences could allow the natural recovery processes to enhance biological diversity and sustainable development.

Keywords: *Forest fire, ecosystems, risk, biological diversity, sustainable development*

2.0 Introduction

Not just in India, but all over the world forest fire is very common to all the ecosystems. It affects both vegetation and soil. In certain instances it is also helpful in maintaining diversity and stability of ecosystems along with nutrient recycling. However, effect of forest fire and prescribed fire on forest soil is very complex as it (fire) affects soil organic matter, macro and micro-nutrients, and also the physical properties of soil like texture, colour, pH, Bulk Density as well as soil biota. Moreover, the incidences of forest fire are likely to increase in the future due to the climate warming. This also poses a serious challenge as there is very little understanding of the likely severity of such fire incidences. In addition to above, the uncertainty associated with the consequences of forest fire on the soil microbial communities would also have large scale complications thereby affecting the soil nutrient dynamics, which would pose a threat to the existing biodiversity. In view of the above, it was necessary to carry out a systematic study to understand the various efforts researchers have taken so far to gain knowledge of the implications of forest fires on the forest ecosystems.

3.0 Methodology

In the context of the aim and objectives of this study, a literature review was carried out to study the previous research efforts. For this review we considered following aspects, such as the research question posed in the previous studies; the theoretical background, methodology, findings, suggestions and recommendations, etc. moreover, the review was used to identify the research gaps and it (review) was used for synthesizing and gaining a new perspective of the issues concerning the litter decomposition under normal circumstances as well as during the **forest fire and its impact on microbial biomass present in the soil**. The discussion is presented in a chronological order, so that it also indicates the underlying pattern of evolution of thoughts and ideas in the focused domain. Similarly, to the extent possible, care was taken to reproduce the original terminology used by the authors, to preserve the originality of the views. The discussion is presented in the following section.

4.0 Discussion

In order to assess the influence of change in land use on microbial activity, Behera and Sahani (2003) conducted a systematic review and reported that soluble organic N and microbial N pools in terrestrial ecosystems have been less studied than those of inorganic N. Therefore, cross-system variation in their pool sizes and seasonal dynamics, both absolute and relative to inorganic N pools, needs to be quantified so that their ecological importance in different ecosystems can be evaluated. Zhu and Carreiro (2004) through their field based study reported that the extractable soil organic nitrogen and microbial biomass nitrogen dynamics are affected as a function of various seasons and further stated that the spring microbial biomass nitrogen increase could be an important retention mechanism for conserving soil inorganic N when plant N uptake may be low.

Pietikainen et al., (2000) has stated that the wildfires produce a charcoal layer, which has an adsorbing capacity resembling activated carbon; moreover, after the fire a new litter layer starts to accumulate on top of the charcoal layer, which liberates water-soluble compounds that percolate through the charcoal and the unburned humus layer. In view of this the author hypothesized that since charcoal has the capacity to adsorb organic compounds it may form a new habitat for microbes, which decompose the adsorbed compounds. Arunachalam and Arunachalam (2000) through his study of soil microbial biomass dynamics (in the humid subtropical broadleaved forest in north-east India) reported that canopy gaps had low soil moisture and low microbial biomass suggesting that belowground dynamics accompanied changes in light resources after canopy opening. Moreover, the study results indicate that fluctuation in microbial biomass related nutrient cycling processes in conjunction with the associated microclimate variation may affect the pattern of regeneration of tree seedlings in the gaps and hence be related with their size.

Michelsen et al., (2004) studied the seasonal changes and spatial distribution of soil total, dissolved organic C and microbial biomass C in relation to the fire frequency in dry vegetation types grassland, woodland and dry forest in Ethiopia. Based on the study results author reported that C release from burning organic matter may have strong implications for C and nutrient cycling in seasonally dry tropical ecosystems. In order to study the soil respiration and its spatial and temporal variation at boreal forest sites

in central Canada, Singh et al., (2008) collected soil respiration, soil temperature, and organic layer thickness measurements from 100 points in a grid pattern and reported that soil respiration was positively related to the fine root biomass stated that variation in root biomass has a larger effect than differential forest floor organic layers on variation in soil respiration in young boreal post fire forests.

Kondapani et al., (2008) used a combination of remote sensing data and GIS techniques to determine the burnt areas and reported that temporal trends suggest increasingly short fire-return intervals in the landscape and further found that forest fires had significant adverse impacts on species diversity and regeneration in the tropical dry deciduous forests. However, Somashekar et al., (2008) monitored the burnt areas of Western Ghats (a biodiversity hot spot) using March 2000 and 2004 IRS LISS — III data and found that an area of 2.15 km^2 and 4.46 km^2 was affected by fire in 2000 and 2004 respectively. Author reports the reasons for these wild fires were repeated drought, followed by mass flowering and dying of bamboo, which accelerated the spread of fire from ground to canopy in areas with high bamboo density.

Meigs et al., (2009) quantified the short-term effects of low, moderate, and high-severity fire on carbon pools and fluxes in the Eastern Cascades of Oregon. The study results show that though soil C, soil respiration, and fine root net primary productivity were conserved across severity classes, net ecosystem production declined with increasing severity, driven by trends in aboveground net primary productivity. Based on the data related to effect of a severe wildfire 10 years after burning Sullivan et al., (2010) determined decadal-scale changes in soil gas fluxes following fire incident and found that there was less carbon available at the burned site for respiration by plants and microbes.

Verma and Jayakumar (2012) reviewed the effect of forest fire on various properties of soil, which are important in maintaining healthy ecosystem and based on this review reported that it (forest fire) affects soil organic matter, macro and micro-nutrients, physical properties of soil like texture, colour, pH, Bulk Density as well as soil biota. However, the impact of fire on forest soil depends on various factors such as intensity of fire, fuel load and soil moisture. Holden and Treseder (2013) conducted a review to test the hypothesis that soil microbial biomass would decline following forest disturbances, but that abiotic disturbances would elicit greater reductions in microbial biomass than biotic disturbances. Author found that changes in microbial abundance following disturbance were significantly positively correlated with changes in microbial respiration. Altogether, the study results suggest that abiotic forest disturbances may significantly decrease soil microbial abundance, with corresponding consequences for microbial respiration.

Jhariya et al., (2014) identified the fire prone areas (of Tropical Deciduous forests of Bhoramdeo Wildlife Sanctuary) on the basis of historical ground fire data in conjunction with satellite remote sensing data provided by NRSA, based on the frequency of forest fire damage. Author also investigated the biomass and carbon storage pattern of the same area and observed that forest fires are driving factor in shaping forest vegetation, biomass accumulation and carbon storage. Kittur et al., (2014) assessed the effect of four levels of historic wildland fire frequency (high, medium, low, and no-fire) on regeneration of seedlings in fire affected areas of moist deciduous forests of Chhattisgarh. Based on the study results,

author reported that the major contributing components of fuel load included duff litter and small woody branches and twigs on the forest floor and repeated fires, however, slowly reduced stand stability.

Chandra (2015) had stated that forest fire is very common in all the ecosystems and plays an important role in ecosystem dynamics, biodiversity, soil and microbes. Author further stated that the low intensity fire results in combustion of litter and soil organic matter, increases nutrients availability which supports regeneration of herbs and growth of post fire community. However, the higher intensity fire results into complete loss of soil organic matter and volatilization of nitrogen, phosphorus and potassium but very high temperature is required for complete burning of Mn, Mg, Cu and other micronutrients. Satish and Reddy (2015) aimed to integrate satellite derived forest burnt areas over a multi-decadal scale to understand fire frequencies in Silent Valley National Park, Kerala, India and found that overall, there is a declining trend of forest fires, which indicates management effectiveness in this area.

Using a combination of remote sensing and GIS technologs Ajin et al., (2015) developed the Fire Risk Index model to prepare forest fire risk map of Nemmara Forest Division has classified the area into five risk zones: very high, high, moderate, low and very low. Maksimova et al., (2017) analyzed the state of microbial communities in gray-humus soils (Eutric Fluvic Arenosols (Ochric) of pine stands after forest fires of 2010 and found that it (fire) exert negative effects on the structure and metabolic activity of microbial communities in the postpyrogenic soils. The maximum content of the carbon of microbial biomass carbon and the maximum intensity of microbial respiration have been found in the subsurface and horizons two-three years the fire.

Singh et al., (2017) explored influence of wildfires on microbial biomass carbon, microbial respiration, and on representatives of hydrolytic (acid and alkaline phosphatase, β-glucosidase and dehydrogenase) and oxidative enzymes (phenol oxidase, Phenox and peroxidase; Perox) in tropical dry forest. The study results indicate that the role of oxidative enzymes in tropical dry forest is very critical for the ecosystems functioning and concluded that the wildfire resulted in a significant effect on soil microbial properties, and that these changes may exist for short-period, though it may lead to some critical changes in ecosystem functioning. Sharma et al., (2017) also supported the above mentioned observations and added that the forest fire also affect the soil nitrogen mineralization and microbial biomass.

Verma and Jayakumar (2018) studied how repeated fires affect physical and chemical properties of soil in a tropical dry deciduous forest and after soil fertility and health and found that specifically, NO_3^-N slightly decreased with high fire frequencies but NH_4^+N decreased significantly with increasing fire frequency. Dhiman (2018) studied the effect of fire on bacterial population and their enzymatic activity by comparing the soil samples of burnt and unburnt site. The study indicated Bacillus was dominant genera in both the samples but their abundance was higher 41% in burnt soil than unburnt soil i.e. 26%, while the enzymatic study revealed that bacteria showed 94% cellulase and 65% protease activity in burnt were as 86% cellulase and 43% protease activity in unburnt soil and concluded that fire affects not only the bacterial abundance but also their enzymatic properties.

Verma et al., (2019) recently studied the recovery of soil properties after fire incident and reported that soil organic carbon was lower in burned plots than unburned plots. Total N, available P, and extractable K were lower 2-years and 5-years after the fire but are higher than unburned plot after 15-yearsa and reported that the response of soil properties varied with years after fire and soil depth. Sannigrahi (2020) assessed the impacts of forest fires on terrestrial ecosystem productivity in India during the period of 2003–2017 using spatiotemporal changes observed from satellite remote sensing data. The data showed that the spatial correlation between the burn indices and net primary productivity were mainly negative (−0.01 to −0.89) for the fire-prone states as compared to the other neighbouring regions. Authors stated that this approach has the potential to quantify the loss of ecosystem productivity due to forest fires.

5.0 Conclusions

Based on the review of existing literature, it is evident that there are certain studies that were carried out in the Indian context vis-à-vis impacts of the forest fires on the ecosystems. Among other studies that are carried out, the major focus of these studies was on the nutrient dynamics and microbial abundance in view of the forest fire incidences. Additionally, the review also showed that the remote sensing and GIS technology based data was majorly used to identify the extent of effect of the forest fire on spatial scale. Also the temporal data was used to identify the incidences of forest fires in a geographic area and its severity has been studied to classify these areas into various zones with respect to the risk of forest fires. Altogether, the literature shows that the forest fires have severe impact on the abiotic as well as biotic factors of the forest ecosystem, which may significantly affect the sustainability of these ecosystems, unless serious efforts are taken by the communities as well as the Governing bodies and departments. In developing countries, apart from natural forest fires, protected forests experience extensive anthropogenic disturbance due to mane induced fire, grazing, extraction of fuel wood and collection of non-wood forest products are also major issues that pose threat to these ecosystems. Moreover, the existing body of knowledge pertaining to the impact of forest fire incidences on various environmental compartments needs to be assessed and for this further focused studies are needed.

6.0 References

- Ajin, R.S., Ciobotaru, A.M., Vinod, P.G and Jacob, M. K.(2015). Forest and wild land fire risk assessment using geospatial techniques: A case study of Nemmara forest division, Kerala, India. *Journal of Wetlands Biodiversity*, 5, pp 29-37.
- Arunachalam, A and Arunachalam, K. (2000). Influence of gap size and soil properties on microbial biomass in a subtropical humid forest of north-east India. *Plant and Soil*, 223, pp 187-195.
- Behera, N and Sahani, U. (2003). Soil Microbial Biomass and Activity in Response to Eucalyptus Plantation and Natural Regeneration on Tropical Soil. *Forest Ecology and Management*,174(1), pp.1-11.
- Chandra K.K. and Bhardwaj A.K. (2015). Incidence of Forest Fire in India and its Effect on Terrestrial Ecosystem Dynamics, Nutrient and Microbial Status of Soil. *International Journal of Agriculture and Forestry*, 5(2), pp. 69-78.

- Dhiman, P., Mehta, J. P., Singh, P., Shafil, S and Baldotra1, S. (2018). Effect of prescribe fire on Bacterial abundance and their enzymatic activity in burnt and unburnt soil of chilla forest Raja Ji National Park, Uttarakhand, India. *Plant Archives*, 18 (1), pp.1125-1128.
- Holden, S. R and Treseder, K.K.(2013). A meta-analysis of soil microbial biomass responses to forest disturbances., Department of Ecology and Evolutionary Biology, University of California, Irvine, CA, USA.
- Jhariya, M. K., Bargali, S. S., Swamy, S. L., Kittur, B., Bargali, K and Pawar, G.V.(2014). Impact of forest fire on biomass and carbon storage pattern of tropical deciduous forests in Bhorandeo Wildlife Sanctuary, Chhattisgarh, *International Journal of Ecology and Environmental Sciences*, 40(1), pp 57-74.
- Kittur, B.H., Swamy, S. L., Bargali, S.S and Jhariya, M. K.(2014) Wildland fires and moist deciduous forests of Chhattisgarh, India: divergent component assessment, *Journal of forestry Research*, 25, pp. 857-866.
- Kodandapani, N., Cochrane, M. A and Sukumar, R.(2008). A comparative analysis of spatial, temporal, and ecological characteristics of forest fires in seasonally dry tropical ecosystems in the Western Ghats, India., *Forest Ecology and Management*, 256(4), pp. 607-617.
- Maksimova, E.Yu., Kudinova, A.G and Abakumov, E.V. (2017). Functional activity of soil microbial communities in post-fire pine stands of Tolyatti, Samara oblast, *Eurasian Soil Science*, 50, pp 239-245.
- Meigs, G.W., Donato, D.C., Campbell, J. L., Martin, J.G and Law B.E. (2009). Forest Fire Impacts on Carbon Uptake, Storage, and Emission: The Role of Burn Severity in the Eastern Cascades, Oregon, *Ecosystem*, 12, pp. 1246-1267.
- Michelsen A., Andersson M., Jensen M., Kjoller A and Gashew M. (2004). Carbon stocks, soil respiration and microbial biomass in fire-prone tropical grassland, woodland and forest ecosystems, *Soil Biology and Biochemistry*, 36(11), pp. 1707-1717.
- Pietikainen J., Kiikkila O and Fritze Hannu., (2000). Charcoal as a habitat for microbes and its effect on the microbial community of the underlying humus, *Wiley Online Library*, 89(2), pp. 231-242.
- Sannigrahi, S., Pilla, F., Basu, B., Basu, A.S., Sarkar, K., Chakraborti, S., Joshi, P.K., Wang, Q. Y., Bhatt, S., Bhatt, A., Jha, S., Keesstra, S and Roy, P.S. (2020). Examining the effects of forest fire on terrestrial carbon emission and ecosystem production in India using remote sensing approaches, *Science of The Total Environment*, 725, pp. 773-787.
- Satish, K.V and Reddy, S.C. (2015). Long Term Monitoring of Forest Fires in Silent Valley National Park, Western Ghats, India Using Remote Sensing Data, *Journal of the Indian Society of Remote Sensing*, 44, pp.207–215.
- Sharma, U., Sharma, G and Devi, M.(2017). Effect of Forest fire on soil nitrogen mineralization and microbial biomass: A review, *Journal of Pharmacognosy and Phytochemistry*, 6(3), pp. 682-685.

- Singh, A. K., Kushwaha, M., Rai, A and Singh, N. (2017). Changes in soil microbial response across year following a wildfire in tropical dry forest. *Forest Ecology and Management*, 391, pp 458–468.
- Singh, S., Amiro, B. D and Quideau, S.A. (2008). Effects of forest floor organic layer and root biomass on soil respiration following boreal forest fire, Canadian *Journal of Forest Research*, 38(4), pp.647-655.
- Somashekar, R.K., Nagaraja, B. C and Kavya, U. (2008). Monitoring of forest fires in Bhadra wildlife sanctuary, *Journal of the Indian Society of Remote Sensing*, 36, pp. 99-104.
- Sullivan, B.W., Kolb, T.E., Hart, S.C., Kaye, J.P., Hungate, B.A., Dore, S and Hetu M. M. (2010) Wildfire reduces carbon dioxide efflux and increases methane uptake in ponderosa pine forest soils of the southwestern USA. *Biogeochemistry*, 104, pp. 251-265.
- Verma S., Singh D., Singh A.K and Jayakumar S. (2019). Post-fire soil nutrients dynamics in a tropical dry deciduous forest of Western Ghats, India. *Forest Ecosystems* 6(6), pp 1-6.
- Verma, S and Jayakumar, S. (2018). Effect of recurrent fires on soil nutrient dynamics in a tropical dry deciduous forest of Western Ghats, India. *Journal of Sustainable Forestry*, 37 (7), pp. 678-690.
- Verma, S and Jayakumar, S. (2012). Impact of forest fire on physical, chemical and biological properties of soil: A review. *Proceedings of the International Academy of Ecology and Environmental Sciences*, 2(3), pp.168-176.
- Zhua, W. and Carreiro, M. M. (2004). Variations of soluble organic nitrogen and microbial nitrogen in deciduous forest soils along an urban–rural gradient. *Soil Biology and Biochemistry*, 36(2), pp. 279-288.

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Studies of Some Substituted Dihydropyrimidinone By Ultrasonic Interferometer

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Abstract: Ultrasonic velocity of Dihydropyrimidinone in dioxane-water and DMF-water mixture has been determined. From these measured values, apparent molal volume (ϕ_v), partial molal volume (ϕ^0_v), adiabatic compressibility $\phi_{K_{ad}}$ intermolecular free length (L_f) and relative association have been calculated at 305° K. with & without bath by using Ultrasonic Interferometer.The observed and calculated values have been used to explain molecular association due to strong ion-ion interactions. The above study may be helpful in understanding the dynamics between metal ions and Dihydropyrimidinone. The excess Value of some parameters are also computed & interpreted elucidate the molecule interaction in the liquid
Keywords : Dihydropyrimidinone, Dioxane, DMF, Interferometer

Introduction :

In the recent years, ultrasonic waves have acquired the status of an important probe for the study of structure and properties of matter. In the field of technology, ultrasonic waves are being used for detection of flows, testing of materials, mechanical cleaning of surface etc. In medical sciences too, the ultrasonic waves are being used to diagnose bone fractures, cancer, tumors, fetal condition and in physiotherapy, bloodless surgery, gynecology etc. Present day applications of ultrasonic are emerging in the field of forensic science space research and in wars. Adiabatic compressibility and apparent molal compressibility have been used to study the relative association, specific constant factor and solvation number of the system. The study of molecular interactions in liquid provides valuable information regarding internal structures molecular association, complex formation internal pressure etc. Ultrasonic velocity and absorption studies in case of electrolyte solutions have led to a new insight into the process of ion association and complex formation.[1,2] Tabhane et.al[3] have investigated the cluster approach to thermodynamic behavior of ligand mixture of acrolein in methanol-cyclohexane and dioxane using Khasare's equation of state[4]. A.P. Mishra[5] has studied the ultrasonic velocities of some bio-applicable system involving $ZnCl_2$, dextrose and methionine in water. The apparent and partial molal volume of electrolyte solutions has proved a very important tool in elucidating the structural interactions i.e. ion-ion, ion-solvent and solute-solvent interactions occurring in solutions. Partial molal volumes and adiabatic compressibility properties reflect the structural interactions with water molecules or organic solvent molecules and dihydropyrimidinone are selected for these investigations.Ultrasonic study of interactions in ternary solutions has been done by Pandey et.al[6]. Aswar[7] studied the interactions between bio-molecules involving Mg ion in aqueous solutions. The compressibility and apparent molal volume of any electrolyte in mixed organic solvents are found out earlier.[8] The compressibility and apparent molal volume of peptides in aqueous as well as water-organic solvent mixtures are studied by Khobragade et.al[9]. But compressibility's and apparent molal volumes of substituted dihydropyrimidinone in water-organic solvent mixtures are not studied so far. The apparatus is a Michelson Interferometer built at a massive scale.[10]Thus we herein present the ultrasonic systematic studies of substituteddihydropyrimidinone in dioxane-water and DMF-water mixtures.

Experimental: Materials and Reagents

All analytical grade chemicals and solvents used were obtained from Merck, India. The distilled water used has a specific conductivity of about 1×10^{-6} ohm^{-1}cm^{-1}. Stock solutions of dihydropyrimidinone were prepared in different percentage of dioxane-water and DMF-water mixtures. Ultrasonic velocity (2 MHz) was measured by single crystal path interferometer with an accuracy of 0.03%. The density measurements were carried out at 305° K.The apparent molal volumes (ϕ_v) and apparent molal adiabatic compressibility $\phi_{K_{ad}}$ of dihydropyrimidinone in solutions are determined from density (ds)and adiabatic compressibility (β_s) of solution using following equations

$$\phi_v = \left\{ \frac{(d_0 - d_s) \times 10^3}{m\, d_s\, d_0} \right\} + \frac{M}{d_s} \quad \text{---------- (1)}$$

Where M is molecular weight of the solute, m is the molality of solution, do is the density of the solvent and ds is the density of the solution.

$$\phi k_s = \left\{ \frac{(\beta_s d_s - \beta_0 d_0) \times 10^3}{m d_s d_0} \right\} + \frac{\beta_s M}{d_s} \quad \text{------ (2)}$$

Where β_s is the adiabatic compressibility of solution and β_0 is the adiabatic compressibility of solvent which can be calculated by

$$\beta_s = \frac{100}{U_s^2 \times d_s} \quad \text{------ (3)} \quad \text{for solution and}$$

$$\beta_0 = \frac{100}{U_0^2 \times d_0} \quad \text{------ (4)} \quad \text{for solvent}$$

Where U_s &U_0 are the ultrasonic velocities of ultrasonic waves in solution and solvent respectively. Knowing U_s &$U_0$and molecular weight of dihydropyrimidinone , the values of $\phi_s$and $\phi_{k(s)}$are calculated. The values of $\phi_s$and $\phi_{k(s)}$ are plotted against molality (m) ofdihydropyrimidinone . The curve represented the least square and $\phi_s$and $\phi_{k(s)}$can be given as

$$\phi_s = (\phi^0_s + S_s m) \quad \text{------ (5)}$$

$$\phi k_s = (\phi^0 k_{(s)} + Sk_{(s)} m) \quad \text{------ (6)}$$

Where $\phi^0_s = v^0$and $\phi^0_{K(s)} = \kappa^0$ are the infinite dilution partial molal volumes and adiabatic partial molal compressibilities respectively. S_s and $Sk_{(s)}$ are the experimental slopes.
The $\phi_{k(s)}$ and $\phi_s$values ofdihydropyrimidinone in two mixed solvents are calculated and given in Table 1 (a,b) to 11(a,b)

The intermolecular free length (L_f), specific acoustic impendence (z) and relative association (R_A) are calculated by using the following relations

$$L_f = K \times (\beta_s)^{1/2} \quad \text{------ (7)}$$

Where K is Jacobson's constant = 6.0186×10^{-8} and

$$Z = U_s \times d_s \quad \text{---------(8)}$$

$$R_A = (d_s/d_0)(U_0/U_s)^{1/3} \quad \text{---------(9)}$$

The ligands used in these investigations are

1. 5-ethoxy carbonyl-4(4-methoxy phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

ii.

2. 5-ethoxy carbonyl-4(4-nitro phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

iii.

3. 5-ethoxy carbonyl-4(4-bromo phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Table No. 1(a)

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibility's (β_a) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L_1 5-ethoxy carbonyl-4(4-methoxy phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

% Dioxane	Conc. Inmol dm^{-3}	Ultrasonic velocities	Densities (ds)in g cm^{-3}	Adiabaticcompressibility's (β_a)	Inter molecular free length (L_f)
95	9.5×10^{-3}	1411.2	1.0538	4.76×10^{-5}	4.15×10^{-2}
90	9.0×10^{-3}	1427.2	1.0633	4.61×10^{-5}	4.08×10^{-2}
85	8.5×10^{-3}	1457.6	1.0603	4.43×10^{-5}	4.00×10^{-2}
80	8.0×10^{-3}	1469.0	1.0549	4.23×10^{-5}	3.91×10^{-2}
75	7.5×10^{-3}	1507.2	1.0588	4.17×10^{-5}	3.88×10^{-2}
70	7.0×10^{-3}	1535.0	1.0593	4.00×10^{-5}	3.80×10^{-2}

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Table No. 1(b)

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_a), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L_1 5-ethoxy carbonyl-4(4-methoxy phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_a)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-3}	-692.0	-1.99×10^{-4}	1.0063	1.487×10^{3}
9.0×10^{-3}	-1695.6	-4.34×10^{-4}	1.0116	1.517×10^{3}
8.5×10^{-3}	-1515.5	-6.45×10^{-4}	1.0017	1.545×10^{3}
8.0×10^{-3}	-1011.7	-9.01×10^{-4}	0.9879	1.578×10^{3}
7.5×10^{-3}	-1181.9	-10.58×10^{-4}	0.9892	1.595×10^{3}
7.0×10^{-3}	-1788.2	-13.663×10^{-4}	0.9838	1.620×10^{3}

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Table No. 2 (a)

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibility's (β_a) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L_2 5-ethoxy carbonyl-4(4-nitro phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

% Dioxane	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibility's (β_a)	Inter molecular free length (L_f)
95	9.5×10^{-3}	1374.4	1.0679	4.957×10^{-5}	4.237×10^{-2}

90	9.0×10^{-1}	1409.6	1.0546	4.772×10^{-5}	4.157×10^{-7}
85	8.5×10^{-1}	1476.8	1.0423	4.399×10^{-5}	3.991×10^{-7}
80	8.0×10^{-1}	1539.2	1.0529	4.098×10^{-5}	3.810×10^{-7}
75	7.5×10^{-1}	1569.6	1.0562	3.843×10^{-5}	3.731×10^{-7}
70	7.0×10^{-1}	1596.8	1.0740	3.651×10^{-5}	3.636×10^{-7}

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Table No. 2(b)

Apparent molal volume (U_v), apparent adiabatic compressibility (βk_s), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L,5-ethoxy carbonyl-4(4-nitro phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Conc. Immol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-1}	-692.0	-1.99×10^{-4}	1.0063	1.487×10^{3}
9.0×10^{-1}	-1695.6	-4.34×10^{-4}	1.0116	1.517×10^{3}
8.5×10^{-1}	-1515.5	-6.45×10^{-4}	1.0017	1.545×10^{3}
8.0×10^{-1}	-1011.7	-9.01×10^{-4}	0.9879	1.578×10^{3}
7.5×10^{-1}	-1181.9	-10.58×10^{-4}	0.9892	1.595×10^{3}
7.0×10^{-1}	-1788.2	-13.663×10^{-4}	0.9838	1.620×10^{3}

Table No. 3 (a)

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibility's (β_s) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L,5-ethoxy carbonyl-4(4-bromo phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

% Dioxane	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibility's (β_s)	Inter molecular free length (L_f)
95	9.5×10^{-1}	1398.40	1.0663	4.795×10^{-5}	4.167×10^{-7}
90	9.0×10^{-1}	1422.30	1.0660	4.636×10^{-5}	4.097×10^{-7}
85	8.5×10^{-1}	1470.30	1.0826	4.272×10^{-5}	3.933×10^{-7}
80	8.0×10^{-1}	1497.60	1.0725	4.157×10^{-5}	3.880×10^{-7}
75	7.5×10^{-1}	1518.40	1.0759	4.031×10^{-5}	3.821×10^{-7}
70	7.0×10^{-1}	1555.20	1.0732	3.852×10^{-5}	3.735×10^{-7}

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Table No. 3 (b)

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L,5-ethoxy carbonyl-4(4-bromo phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-1}	-718.05	-3.288×10^{-4}	1.0021	1440.00
9.0×10^{-1}	-740.56	-5.199×10^{-4}	0.9964	1516.27
8.5×10^{-1}	-2543.11	-10.168×10^{-4}	1.0010	1591.85

8.0×10^{-3}	-1586.06	-11.168×10^{-4}	0.9855	1606.17
7.5×10^{-3}	-2107.59	-14.207×10^{-4}	0.9841	1633.34
7.0×10^{-3}	-1489.80	-17.494×10^{-4}	0.9737	1669.04

Table No. 4 (a)

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibility's (β_s) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System L_1 5-ethoxy carbonyl-4(4-methoxy phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

% DMF	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibility's (β_s)	Inter molecular free length (L_f)
95	9.5×10^{-3}	1520.8	0.9867	4.381×10^{-5}	398.36
90	9.0×10^{-3}	1542.4	0.9912	4.240×10^{-5}	391.90
85	8.5×10^{-3}	1611.2	0.9726	3.960×10^{-5}	378.74
80	8.0×10^{-3}	1611.2	0.9950	3.871×10^{-5}	374.46
75	7.5×10^{-3}	1628.8	0.9825	3.836×10^{-5}	372.76
70	7.0×10^{-3}	1651.2	1.032	3.554×10^{-5}	358.80

Ultrasonic frequency: 2MHzTemperature: 303 K Medium: DMF-water

Table No. 4 (b)

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System L_1 5-ethoxy carbonyl-4(4-methoxy phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-3}	149.02	-3.570×10^{-4}	0.9907	1500.47
9.0×10^{-3}	-381.1	-5.578×10^{-4}	0.9906	1528.82
8.5×10^{-3}	1850.4	-8.354×10^{-4}	0.9580	1567.05
8.0×10^{-3}	-3208.00	-11.160×10^{-4}	0.9808	1603.24
7.5×10^{-3}	-305.82	-11.730×10^{-4}	0.9642	1600.29
7.0×10^{-3}	-6338.08	-19.178×10^{-4}	1.0906	1704.03

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

Table No. 5 (a)

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibility's (β_s) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System $L_2$5-ethoxy carbonyl-4(4-nitro phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

% DMF	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibility's (β_s)	Inter molecular free length (L_f)

95	9.5×10^{-3}	1523.20	1.06790.9715	4.436×10^{-5}	4.008×10^{2}
90	9.0×10^{-3}	1560.00	1.0039	4.093×10^{-5}	3.850×10^{2}
85	8.5×10^{-3}	1625.60	1.0129	3.735×10^{-5}	3.678×10^{2}
80	8.0×10^{-3}	1678.40	1.0232	3.461×10^{-5}	3.545×10^{2}
75	7.5×10^{-3}	1694.40	1.0253	3.397×10^{-5}	3.507×10^{2}
70	7.0×10^{-3}	1699.20	1.0261	3.375×10^{-5}	3.416×10^{2}

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

Table No. 5 (b)

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System L$_2$5-ethoxy carbonyl-4(4-nitro phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-3}	-1591.46	-0.4979	1.0065	1479.78
9.0×10^{-3}	-5402.90	-1.0717	1.0316	1566.08
8.5×10^{-3}	-6787.60	-1.5973	1.0268	1646.57
8.0×10^{-3}	-8564.20	-2.0686	1.0372	1663.31
7.5×10^{-3}	-9322.40	-3.3110	1.0283	1720.86
7.0×10^{-3}	-10128.53	-2.5122	1.0258	1738.62

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

Table No. 6 (a)

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibility's (β_s) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System L$_2$5-ethoxy carbonyl-4(4-bromo phenyl),6-methyl, 3,4 dihydropyrimidin-2(1H)-one

% DMF	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibility's (β_s)	Inter molecular free length (L_f)
95	9.5×10^{-3}	1510.4	0.9987	4.389×10^{-5}	398.72
90	9.0×10^{-3}	1588.8	1.0190	3.887×10^{-5}	375.23
85	8.5×10^{-3}	1641.6	1.0177	3.646×10^{-5}	363.41
80	8.0×10^{-3}	1678.4	1.0216	3.477×10^{-5}	354.89
75	7.5×10^{-3}	1699.2	1.0241	3.381×10^{-5}	349.95
70	7.0×10^{-3}	1652.8	1.0379	3.526×10^{-5}	357.38

Ultrasonic frequency: 2MHzTemperature: 303 KMedium: DMF-water

Table No. 6 (b)

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System $L_3$5-ethoxy carbonyl-4(4-bromo phenyl).6-methyl, 3,4 dihydropyrimidin-2(1H)-one

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-3}	-3208.40	-0.56171	1.0248	1508.43
9.0×10^{-3}	-5634.44	-1.2553	1.0283	1618.98
8.5×10^{-3}	-5832.45	-1.6011	1.0159	1670.65
8.0×10^{-3}	-6923.53	-1.9142	1.0122	1714.65
7.5×10^{-3}	-7488.25	-2.1797	1.0106	1740.15
7.0×10^{-3}	-9908.96	-2.1974	1.0337	1715.44

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

Result And Discussion:

The experimental and calculated values of ultrasonic velocities(U_s), densities (ds), adiabatic compressibility's (β_s),apparent adiabatic compressibility (ϕk_s), relative association (R_A), specific acoustic impendence (z), apparent molal volume (ϕ_v) and intermolecular free length (L_f) for dihydropyrimidinone are tabulated in Table No. 1(a,b) to 6(a,b). These values have been used to discuss the interaction s of unlike molecules of solvent in presence of solute. The variation of ultrasonic velocity in solution depends on the intermolecular free length on mixing on the basis of a model for sound propagation proposed by Eryng and Kincaid[11]. Present work reveals the increase in (ϕk_s)values above 70%organic solvent –water mixture Table 1(a,b) to 6(a,b). This fact shows that ϕk_s increases at higher percentage of organic solvent – water mixture. This suggests that loss of compressibility of water due to electrostatic forces in the vicinity of ions causing electro-strictive hydration of ions. The apparent molal volume (ϕ_v) has been calculated from density data of solution using equation (2). The data obtained are in well agreement with Masson equation as the plot of ϕ_v against $(c)^{1/2}$ or mole fraction is linear. The ϕ_v values of substituted dihydropyrimidinone are found to increase with increasing percentage of organic solvent –water mixture. Das[13] studied the apparent molal volume (ϕ_v) of univalent ions up to 30% dioxane-water mixture and reported that values of these ions increases with increase in dioxane content in dioxane-water mixture. In the present investigation it is found that the values of ϕ_v values are higher in dioxane-water mixture as compared to DMF-water mixture due to decreasing dielectric constant of medium[14] It can be explained by postulating that the [polar –OH group interact with the surrounding organic solvent-water mixture through dipole-dipole interaction in such away that the surrounding water losses its own compressibility to certain extent.

The ϕk_s values are found to be decrease in the following order of organic solvent-water mixture – dioxane-water< DMF-water, which suggest that dihydropyrimidinone are extensively hydrated in dioxane-water mixture than DMF-water mixture. This can be explained on the basis of higher polarity of dioxane-water mixture than DMF-water mixture. Dipole induced- dipole interactions between unlike molecules are more in dioxane-water mixture.In the present investigation, the values of L_f, R_A and Z are also evaluated (Table 1(a,b) to 6(a,b). It could be seen from above table that intermolecular free length increase linearly with increasing concentration of dihydropyrimidinone. This indicates that there are significant interactions between ions and solvent molecules suggesting structure-promoting behavior of added electrolyte molecule. This may also imply that decrease in number of free ions showing the occurrence of ionic association due to strong ion-ion interactions. Relative association (R_A) is influenced by two factors- 1) the breaking up of solvent molecules on addition of electrolyte to it. And 2) the solvation of ions that simultaneously present the former resulting in decrease and later increase of relative association. The increase of R_A with concentration suggest that solvation of ions predominates over the breaking up of solvent aggregates (water-water, water-dioxane and water-DMF) on addition of dihydropyrimidinone. It is observed from the table that there is linear variation of R_A signifies the weaker association between solvent and solute molecules.

Conclusions:

In the present work, the measurement of ultrasonic velocity, density & viscosity theoretical parameters were calculated with & without bath. Comparative study of a liquid for with & without water bath there is variation observed. The observed & calculated values have been used to explain molecular association due to strong ion -ion interactions.

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References:

1. S.K. Kor and S. S. Bhatti. *Indian J. Pure Appl. Phys.*, 1969, **7**, 184.
2. V.S. Sonkar and S.N. Jajoo. *Acoustic Lett.*, 1984, **7**, 191.
3. V.A. Tabhane, V.T. Bhandarkar and S.B. Khasare. *Indian J. Pure Appl. Phys.*, 1995, **33**, 248.
4. S.B. Khasare. *Indian J. Pure Appl. Phys.*, 1993, **31**,224.
5. A.P. Mishra. *Indian J. Chem.* 2004, **43A**, 730.
6. V. Wadhwani, Y. Akhtar and J.D. Pandey. *Proc. Indian Acd. Sci.* 1997, **109**, 353.
7. A.S. Aswar. *J. Pure Appl. Ultrason.*, 1998, **20**, 82
8. S.D. Hamann and S.C. Limb. *Aus. J. Chem.*, 1954, **7**, 329
9. B.G. Khobragade and M.L. Narwade. Ph.D. thesis in Chemistry, Amravati University, Amravati. 1999.
10. LIGO's Interferometer [Internet]. Available from- https://www.ligo.
11. Caltech edu page/ligos-ifo[Accessed January 12,2019]
12. H.H. Erying and J.F. Kincaid. *J. Chem. Phys.*, 1938, **6**, 620
13. S.U. Pankanti and D.V. Jahagirdar, Ph.D. thesis in Chemistry, Marathwada University, Aurangabad, 1986.
14. P.B. Das. *J. Indian Chem. Soc.*, 1989, **66**, 380
15. P.B. Das. *Electrochem. Acta*. 1981, **26**, 1099.

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Viscometric measurement of some substituted drugs such as Chlorothalidon in Diaxone-Water solvent at different temperature.

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Abstract : Measurements of density & Viscosity has been carried out for some substituted drugs such as Chlorothalidon(2-chloro-5-(1-hydroxy-3-oxo-1,2-dihydroisoindol-1-yl)-benzenesulfonamide) in Diaxone-Water solvent at different temperature.. Viscosities & densities of present system has been measured at 300K,305K, 310K, 315K. Using above data various parameters such as Relative Viscosity, Falkenhagen Coefficient A, Jones Doles Coefficient B, & Thermodynamic Parameters have been computed. The results are interpreted on the basis of solute -solvent & solute-solute interaction.

Keywords : Chlorothalidon Falkenhagen Coefficient A, Jones Doles Coefficient B, & Thermodynamic Parameters.

Introduction: Viscosity is one of the important properties of the liquid. It implies resistance to flow. Those liquids flow slowly and those which flow readily are respectively said to have high and viscosity. It may be looked upon as the force of friction between two layers of a liquid moving past one another with different velocities. The Studies on Viscometric Measurements has been regarded as a sensitive tool for understanding various interactions occurs in the solution of liquid mixtures & their dependence on composition & temperature are of importance in many fields of applied research. Viscosity & Its derived parameters provide the valuable information regarding molecules. Viscosity is one of the important property of liquid. The measurement of viscosity like other transport properties of electrolytes. Provide useful information about Solute-Solute & Solute-Solvent Interaction The present study deals with the study of molecular interaction in terms of viscosity & Some Substituted Chlorothalidon (2-chloro-5-(1-hydroxy-3-oxo-1,2-dihydroisoindol-1-yl)-benzenesulfonamide) of a Solvent-Water mixture in different Concentration. Viscosity measurement like other transport properties of electrolyte, provides useful information about Solute-Solute & Solute-Solvent interactions. These interactions have been studied in aqueous & non aqueous Solutions by manyworkers[1-3].

Viscometry[4-5] is an important tool in order to elucidate the solute as a structure maker or a structure breaker. Viscosity provides an insight into the stage of association of the solute & extent of its interaction with solvent. The nature & degree of molecular interaction in different solution depends upon several factors i.e. the nature of the solvent, the structure of the Solute & also the extent of Solvation taking place in the solution. Viscosity is one of the Physical Properties of the liquid & gas as it implies resistance to flow as fluid exhibit a Characteristics property of flowing under applied force, even the force of their own weight, physical properties of liquid & binary mixture have been the subject of interest in research laboratories[6-8].

In recent years, such the considerable efforts have been given for the elevation of ideal & excess thermodynamic quantities of binary & ternary liquid mixture[9-10]. The Study of Molecular interaction in the liquid mixtures is of Considerable in the elucidation of the structural properties of the molecules. The nature & degree of molecular interactions in different solutions depend upon the nature of the medium, the structure of the solute molecule & also the extent of solvation taking place in solution. The present study of some substituted dihydropyrimidinone is selected. In Acoustic Parameters provide a better insight into molecular environment to liquid mixture. It seemed important to study molecular interaction, which motivated the authors to carry out the present investigation in the binary liquid mixtures of Chlorothalidon(2-chloro-5-(1-hydroxy-3-oxo-1,2-dihydroisoindol-1-yl)-benzenesulfonamide)with Dioxane-Water Solvent at different temperatures.

Materials & Methods : Solvent Dioxane used in the present work was of AR grade, Purified & dried by the usual procedure. Densities, Viscosity, Relative Viscosity & Specific Viscosity were measured at different temperatures over a wide range of composition. Densities were determined by using bicapillary pycnometer. The Viscometer Calibrated with double distilled water[11-12]. All the measurements were carried out at different temperatures. Ligand solutions of different concentration were prepared in 20% Dioxane - Water of Chlorothalidon, for each measurement sufficient time was allowed to attain thermal equilibrium in thermostat.

Table 1 : System- Chlorothalidon in 20% Dioxane-Water Medium

Table 1.1

At 300 K					
Conc. Mol dm^{-3}	Density $x10^{3}$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99481	66.1	0.50509	0.93516	-0.85278
0.04	0.99503	66.6	0.50832	0.94111	-0.57794
0.06	0.99522	66.8	0.50998	0.94418	-0.46196
0.08	0.99547	66.9	0.51093	0.94520	-0.38550
0.1	0.99574	66.9	0.51196	0.94850	-0.34919

Table 1.2 :

At 305 K					
Conc. Mol dm^{-3}	Density $x10^{3}$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99411	64.2	0.49910	0.96026	-0.68905
0.04	0.99414	64.4	0.49915	0.96035	-0.48979
0.06	0.99418	64.6	0.49915	0.96152	-0.39678
0.08	0.99420	64.8	0.4942	0.96256	-0.39426
0.1	0.99422	64.9	0.49950	0.96956	-0.39223

Table 1.3 :

At 310 K					
Conc. Mol dm^{-3}	Density $x10^{3}$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99284	60.7	0.46822	0.93791	-0.85503
0.04	0.99287	60.8	0.46915	0.93978	-0.59730
0.06	0.99310	60.9	0.47161	0.94372	-0.58730
0.08	0.99333	61.1	0.47329	0.94809	-0.46.772
0.1	0.99355	61.2	0.47596	0.95143	-0.38683

Table 1.4 :

At 315 K					
Conc. Mol dm^{-3}	Density $x10^{3}$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99051	58.8	0.44872	0.95468	-0.67920
0.04	0.99089	59.2	0.54654	0.95648	-0.51587
0.06	0.99109	59.4	0.54056	0.95574	-0.51589
0.08	0.99124	59.6	0.54212	0.95209	-0.51590
0.1	0.99152	59.7	0.54345	0.95342	-0.51592

...ble 2 : Values of Falkenhagen Coefficient A, Jones – Dole Coefficient B, at different temperatures in Dioxane-Water Medium

Temp T (K)		300K	305K	310K	315K
20 %Acetone-Water medium	A	-1.189	-0.979	-1.206	-1.039
	B	2.835	2.309	2.876	2.458

Result and Discussion :

The densities & viscosities of Chlorothalidon 20% Dioxane-Water medium at 300K, 305K, 310K, & 315K have been measured in the concentration range 0.02 to 0.1mol/dm^3. The viscosity A & B Coefficient have been Computed by the least squares method from the plot of $(\eta r\text{-}1/\sqrt{c})$ Vs $\sqrt{c}$.

A Is measure of ion-ion interactions & B is measure of Solute-Solvent interaction has been calculated & listed in table. In the present study viscosity of liquid solutions increases with increase in concentration of drugs salts solution in 20% Dioxane-Water mixture & decreases with increase in temperature. The increasing values of density & viscosity shows that there is a moderate attraction with Solute & Solvent molecules. The decrease values with increase of temperature shows a decrease in intermolecular forces due to increase thermal energy of the system. The increases in viscosity with increases in concentration may be attributed to the increases in solute may be attributed to the increase in solute solvent interaction. Observation of above data shows that the viscosity A – Coefficients are found to be negative. The viscosity A Coefficient represent the ion interactions & negative Values have shown some physical significance. However negative a values have also been reported to be in other solvents in some studies[12-16]. The large & Small values of " A" Shows the stronger & weaker solute – solute interactions respectively. When solute is introduced into solvent of organic water mixture it will interfere with the ordered structure of water in the solute co-sphere. As only one solute is present so such variation in the values can be explained.

It is evident from table 2 that the "B" Coefficient is an adjustable parameter, which may be either positive or negative & it is a measure of the effective hydrodynamic volume of solute which accounts for the solute solvent interactions. Viscosity B Coefficients have been established to arise from ion – solvent interactions & are responsible for introducing order or disorder in the structure of the solvent. Solute with negative B Coefficient is Characterized as structure breakers indicating weak solute – solvent interactions. The Values of viscosity A & B Coefficient responsible for solute – solute & Solute Solvent interactions.

Conclusion :

In the present study viscosity of liquid solutions increases with increase in Concentration of Chlorothalidon solution in 20%Dioxane – Water mixture & decreases with increases in temperature. It also observed that the value of viscosity A & B Coefficient responsible for solute & solute – solvent interactions.

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References :

1) Aminabhai T. M., Joshi S. S.& Shukla S. S. Can. J. Chem.68,319,(1990)
2) Aralaguppi M.I., Aminabhai T.M., Balundgi R. H.; J. Phys. Chem. 95, 5299 (1991)
3) Karia F, Balujas.: Asian J. Chem. 12(2),593 (2000)
4) Hagenmuller P., Preparative methods in solids state Chemistry (Academic press,London) 367 (1972)
5) Chalmers B., Principles of Solidificaton (John Valey, New York) 194 (1964).
6) Joshi S.S. Aminabhai, T.H., Balandgi R. H. & Shukla S.S., J Of Chem. Ing. Data 35,1185(1990)
7) Aminabhai T.M., Joshi S. S.& Shukla S.S.,Can. J. Chem, 68, 319(1990)
8) Aralaguppi M.I. Aminabhai T.M., Balundgi R.H. & Joshi S.S., J. Phys. Chem.95, 5299 (1991)
9) Jayakumar S, Karunanithi N, Kannappan V & Gunasekaran S Asian Chem Lett 1999;3,224.
10) Yonzhan luo & Robert L Bldwin J Mol Biology 1998;49,279.
11) Kannappan V& Jaya Santhi R Indian J Pure & appl Phy 2005;43,167.
12) Owen B.B. & Kronick PK, J Phys Chem 1961;65:81.
13) H.Yao N. P & Bennion D.N.; J. Phys Chem, 77,1894 (1973)
14) Succo A, Petrella G & Castagnolo M.; J. Phys Chem,749.
15) Gill D.S. & Sharma A; J. Chem Soc faraday Trans 475 (1982)
16) Jouhar S.P.; Phys Chem. (NF),134,9(1983).

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Effect of Dielectric Constant of Substituted Dihydropyrimidinone by pH -Metrically

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Abstract: *To Studies on pH metry by using dihydropyrimidinone has been regarded as a sensitive tool for understanding various effect of dielectric constant of dihydropyrimidinone by evaluating the log k & pk value of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one by keeping ionic strength 0.1M constant at temperature 40° C study the dielectric constant. Log k values increased with the increases in percentage of organic solvents. This phenomenon was elucidated by using well characterized films especially prepared for the purpose.*

Keywords: Dihydropyrimidinone, Dioxane, DMF, DMSO, Dielectric constant

I. INTRODUCTION

Dielectric constant is one of the characteristics of liquid. Dielectric constant of great importance in determining the solvent potentialities of a solvent. Forces leading the ions of a molecule are electrical in origin, they are diminished when a substance of high inductive capacity surrounds the molecules. To separate the ions, it is necessary to interpose between them or to surround one or both of the ions by a solvent layer so as to reduce their attraction for each other. Proton ligand & Metal ligand are stability constants are strongly affected by the dielectric constant of medium because of the fact that at least one of the constituents is charged & the other is either charged or has a dipole moment. Specific variations in relative strength of acids & bases, with changing solvents should be the functions of the charge, the radices of ions & they separate contribution of an individual constituent in mixed solvents particularly, at higher percentages of the organic solvents, where it is not known to H^+ ions are solvated. An Understanding of the influence of medium on reactivity is therefore difficult even at a qualitative level. It has been reported that an acid in solvents of dielectric constant exhibits different strengths eg. Dissociation of substituted dihydropyrimidinone & aqueous dioxane with identical dielectric constant, is different[1]

Solvent effect is quantitatively interpreted in terms of the decrease of dielectric constants of the solvent & decrease of water which solvates the proton released in dissociation[2]GostaAkerl of have studied dielectric constant of some organic solvent – water mixture at various temperatures he found that in very dilute solutions of dielectric constant of pure solvent is used for limitation law[3]Rahul Kaur et.al.[4] have studied the effect of dielectric constant on reactivity like hardness chemical potential by taking into consideration of protic or aprotic solvent. pH metry can be used to evalutedihydropyrimidinone by analytical method using Calvin Bjerrum[5] process.

K.T. Kirnapure[6] et al have studied the effect of dielectric constant of methanol- water & acetone – water mixtures. K.P. Kakade et.al.[7] have studied the effect of dielectric constant of medium on stability constant of substituted Chaloneimine pH Metrically.

II. EXPERIMENTAL

2.1 Synthesis of ligands

Synthesis of dihydropyrimidine by the condensation of diketoester, aldehydes & ures are synthesized by using general claiswnschichomelrymethod. For evaluating the stability constant the very pure & double distilled water is used. The solutions of ligands were prepared in purified 70% Dioxane -water, DMF – water, DMSO – water mixture & Standardized by pH metric technique. Systronicmicro processor based instrument with accuracy ± 0.01 units with glass

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& Saturated Calomel electrode used for the titrations. It was calibrated by buffer solution of pH 7.00 & 9.20 at 40±01°C, before processing the titrations. Titrations were carried out in an inert atmosphere by bubbling a constant flow of nitrogen gas.

1. Ligands used for study of dielectric constant.
2. L1 – 5-ethoxy carbonyl 1- 4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one

III. OBSERVATIONS

The present study deals with the study of the influence of dielectric constants of Dioxane -water, DMF -water & DMSO-water mixtures following systems have been investigated in the present work for studying the influence of dielectric constant of different percentage of Dioxane-water, DMF-water & DMSO-water mixtures.

A. PK – values of

1. (L1) (Dioxane-water)
2. (L1) (DMF-water)
3. (L1) (DMSO-water)

B. Log K values of

1. (L1) (Dioxane-water)
2. (L1) (DMF-water)
3. (L1) (DMSO-water)

Table 1: Proton-ligand stability constant (pk) of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1) in different percentage of Dioxane- water at 0.1M ionic strength.

% of Dioxane	Dielectric Constant (D)	1/D	Mole fraction	pK
70	10.80	0.09259	0.09259	7.6270
65	14.30	0.06993	0.06993	5.0697
60	17.59	0.05685	0.05685	3.3658

Table 2: Proton-ligand stability constant (pk) of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1) in different percentage of DMF- water at 0.1M ionic strength.

% of DMF	Dielectric Constant (D)	1/D	Mole fraction	pK
70	29.50	0.03389	0.4841	4.9784
65	27.72	0.03607	0.4130	5.6843
60	25.67	0.03895	0.3537	6.4389

Table 3: Proton-ligand stability constant (pk) of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1) in different percentage of DMSO- water at 0.1M ionic strength.

% of DMSO	Dielectric Constant (D)	1/D	Mole fraction	pK
70	69.79	0.01432	0.5038	5.7595
65	70.39	0.01420	0.4322	5.3250
60	71.07	0.01407	0.3719	4.2586

Table 4: Metal-ligand stability constant (log k) of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1) in different percentage of Dioxane- water at 0.1M ionic strength.

% of Dioxane	Dielectric Constant (D)	1/D	Mole fraction	Log K_1	Log K_2	Log K_1- LogK_2
70	10.80	0.09259	0.09259	8.7882	7.5452	1.243

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65	14.30	0.06993	0.06991	5.6001	4.3291	1.271
60	17.59	0.05685	0.05685	4.7451	3.2740	1.471

Table 5: Metal-ligand stability constant (log k) of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1) in different percentage of DMF- water at 0.1M ionic strength.

% of DMF	Dielectric Constant (D)	1/D	Mole fraction	Log K_1	Log K_2	log K_1- logK_2
70	29.50	0.03389	0.4841	4.6560	3.4487	1.2073
65	27.72	0.03607	0.4130	3.6892	2.4848	1.2044
60	25.67	0.03895	0.3537	2.9741	1.0252	1.9489

Table 6: Metal-ligand stability constant (log k) of 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1) in different percentage of DMSO- water at 0.1M ionic strength.

% of DMSO	Dielectric Constant (D)	1/D	Mole fraction	Log K_1	Log K_2	Log K_1- LogK_2
70	69.79	0.01432	0.5038	5.7890	4.1482	1.6408
65	70.39	0.01420	0.4322	5.3756	4.0022	1.3734
60	71.07	0.01407	0.3719	4.4030	3.0700	1.3333

Table 7: System:- 5-ethoxy carbonyl 1-4-(4-methoxy-phenyl)-6 methyl 1,3,4-dihydropyrimidin-2-(1H)- one (L1)

% of Dioxane - water	L1 (Log K_1- LogK_2)	% of DMF - water	L1(Log K_1- LogK_2)	% of DMSO - water	L1(Log K_1- LogK_2)
70	1.243	70	1.2073	70	1.6408
65	1.271	65	1.2044	65	1.3734
60	1.471	60	1.9489	60	1.3333

IV. Result and Discussion

It could be seen from observation that PK values increased with the increase in the percentage of Dioxane, DMF, DMSO in mixture. The increase in pk value of ligand is due to the presence of group attached to phenyl ring is a electron withdrawing group. The difference between log K_1&log $K_2$is greater than 1(>1) which shows the formation of simultaneous complex. It could be seen from Table 7 that the difference between log K_1&log K_2 continuously decrease with the increase in the percentage of Dioxane, Dioxane & DMF this increased dielectric constant would decreases the electrostatic forces of attraction between metal ion & negatively charged ligand to form 1:1 complex. The formation of 1:2 complex on the other hand is due to the reaction between similarly charged ions. This would probably explain the observed behavior.

V. Conclusion

From above observation it is concluded that the difference between log K_1&log K_2 greater than 1 this indicate that the concentration of dihydropyrimidinone.

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References

[1]. Dippy. J.F.J.J. Chem. Soc, 550 (1941)
[2]. Yasuda, M.Bull. Chem Soc Japan 32,429

[3]. GostaAkerlof, journal of American Chemical Society 54,11 (1932)
[4]. Rahul Kaur, Saurav pal, therotical& computational development, 110,(9), 2010
[5]. Bjerrum J-"Metal amine formation in aqpous solution" P. Hars & Son Copenhagen,1941,201-210
[6]. Ludaon, C.J. & Waddington, T.C., J. Chem. Soc (A) 1816 (1966)
[7]. K. T. Kirnapure, P. J. Sondawale& B. D. Saraf oriental Journal of Chemistry, Vol. 26 (2), 565-571 (2010)

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Studies of Some Substituted Dihydropyrimidinones in DMF-Water Solvent by Viscometrically at Different Temperature

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ABSTRACT

Measurements of density & Viscosity has been carried out for some substituted dihydropyrimidinones at different temperature in DMF-Water medium. Viscosities & densities of present system has been measured at 300K,305K, 310K, 315K. Using above data various parameters such as Relative Viscosity, Falkenhagen Coefficient A, Jones Doles Coefficient B, & Thermodynamic Parameters have been computed. The results are interpreted on the basis of solute -solvent & solute-solute interaction.

Keywords: Falkenhagen Coefficient A, Jones Doles Coefficient B, & Thermodynamic Parameters.

I. INTRODUCTION

The Studies on Viscometric Measurements has been regarded as a sensitive tool for understanding various interactions occurs in the solution of liquid mixtures & their dependence on composition & temperature are of importance in many fields of applied research. Viscosity & Its derived parameters provide the valuable information regarding molecules. Viscosity is one of the important property of liquid. The measurement of viscosity like other transport properties of electrolytes. Provide useful information about Solute-Solute & Solute-Solvent interaction The present study deals with the study of molecular intraction in terms of viscosity & Some Substituted dihydropyrimidinone of an Solvent-Water mixtures in different Concentration. Viscosity measurement like other transport properties of electrolyte, provides useful information about Solute-Solute & Solute-Solvent interactions. These interaction have been studied in aqueous & non aqueous Solutions by manyworkers[1-3].

Viscometry[4-5] is an important tool in order to elucidate the solute as a structure maker or a structure breaker. Viscosity provides an insight into the stage of association of the solute & extent of its interaction with solvent. The nature & degree of molecular interaction in different solution depends upon several factors i.e. the nature of the solvent, the structure of the Solute & also the extent of Solvation taking place in the solution . Viscosity is one of the Physical Properties of the liquid & gas as it implies resistance to flow as fluid exhibit a Characteristics property of flowing under applied force, even the force of their own weight, physical properties of liquid & binary mixture have been the subject of interest in research laboratories[6-8].

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In recent years, such the considerable efforts have been given for the elevation of ideal & excess thermodynamic quantities of binary & ternary liquid mixture[9-10]. The Study of Molecular interaction in the liquid mixtures is of Considerable in the elucidation of the structural properties of the molecules. The nature & degree of molecular interactions in different solutions depend upon the nature of the medium, the structure of the solute molecule & also the extent of solvation taking place in solution. The present study of some substituted dihydropyrimidinone is selected. In Acoustic Parameters provide a better insight into molecular environment to liquid mixture. It seemed important to study molecular interaction, which motivated the authors to carry out the present investigation in the binary liquid mixtures of dihydropyrimidinone with DMF-Water Solvent at different temperatures.

II. MATERIALS & METHODS

Solvent DMF used in the present work was of AR grade, Purified & dried by the usual procedure. Densities, Viscosity, Relative Viscosity & Specific Viscosity were measured at different temperatures over a wide range of composition. Densities were determined by using bicapillary pycnometer. The Viscometer Calibrated with double distilled water[11-12]. All the measurements were carried out at different temperatures. Ligand solutions of different concentration were prepared in 20% DMF-Water of Dihydropyrimidinoes, for each measurement sufficient time was allowed to attain thermal equilibrium in thermostat.

Table 1 : System-TFP in 20% DMF-Water Medium

Table 1.1

At 300 K					
Conc. Mol dm^{-1}	Density $x10^3$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99481	66.1	0.50509	0.93516	-0.85278
0.04	0.99502	66.6	0.50832	0.94111	-0.57794
0.06	0.99522	66.8	0.50998	0.94418	-0.46196
0.08	0.99547	66.9	0.51093	0.94520	-0.38550
0.1	0.99574	66.9	0.51196	0.94850	-0.34919

Table 1.2 :

At 305 K					
Conc. Mol dm^{-1}	Density $x10^3$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99411	64.2	0.49910	0.96026	-0.68905
0.04	0.99414	64.4	0.49913	0.96035	-0.48979
0.06	0.99418	64.6	0.49915	0.96152	-0.39678
0.08	0.99420	64.8	0.4942	0.96256	-0.39426
0.1	0.99422	64.9	0.49950	0.96956	-0.39223

Table 1.3 :

At 310 K					
Conc. Mol dm^{-1}	Density $x10^3$ Kg m^{-3}	Time flow In sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99254	60.7	0.46822	0.93791	-0.85308
0.04	0.99287	60.8	0.46915	0.93978	-0.59730
0.06	0.99310	60.9	0.47161	0.94572	-0.58730
0.08	0.99333	61.1	0.47329	0.94809	-0.46.772
0.1	0.99355	61.2	0.47596	0.95143	-0.38683

Table 1.4 :

At 315 K					
Conc. Mol dm^{-1}	Density $x10^3$ Kg m^{-3}	Time flow in sec.	Viscosity $x10^{-3}$ Nsm^{-2}	Relative Viscosity	Sp. Viscosity
0.02	0.99051	58.8	0.44872	0.95468	-0.67920
0.04	0.99089	59.2	0.54654	0.95648	-0.51587
0.06	0.99109	59.4	0.54056	0.95574	-0.51589
0.08	0.99124	59.6	0.54212	0.95209	-0.51590
0.1	0.99152	59.7	0.54345	0.95342	-0.51592

Table 2 : Values of Falkenhagen Coefficient A, Jones – Dole Coefficient B, at different temperatures in DMF-Water Medium

Temp T (K)		300K	305K	310K	315K
20 %Acetone-Water medium	A	-1.189	-0.979	-1.206	-1.039
	B	2.835	2.309	2.876	2.458

III. RESULT AND DISCUSSION

The densities & viscosities of trifluoperazine hydrochloride (TFP), 20% DMF-Water medium at 300K, 305K, 310K, & 315K have been measured in the concentration range 0.02 to 0.1mol/dm^3. The viscosity A & B Coefficient have been Computed by the least squares method from the plot of $(\eta r-1/\sqrt{c})$ Vs $\sqrt{c}$.

A Is measure of ion-ion interactions & B is measure of Solute-Solvent interaction has been calculated & listed in table. In the present study viscosity of liquid solutions increses with increase in concentration of antipsychotic drugs salts solution in 20% DMF-Water mixture & decreases with increase in temperature. The increasing values of density & viscosity shows that there is a moderate attraction with Solute & Solvent molecules. The decrease values with increase of temperature shows a decrease in intermolecular forces due to increase thermal energy of the system. The increases in viscosity with increases in concentration may be attributed to the increases in solute may be attributed to the increase in solute solvent interaction. Observation of above data shows that the viscosity A – Coefficients are found to be negative. The viscosity A Coefficient represent the ion interactions & negative Values have shown some physical significance. However negative a values have also been reported to be in other solvents in some studies[13-16]. The large & Small values of " A"

shows the stronger & weaker solute – solute interactions respectively. When solute is introduced into solvent of organic water mixture it will interfere with the ordered structure of water in the solute co-sphere. As only one solute is present so such variation in the values can be explained.

It is evident from table 2 that the "B" Coefficient is an adjustable parameter, which may be either positive or negative & it is a measure of the effective hydrodynamic volume of solute which accounts for the solute solvent interactions. Viscosity B Coefficients have been established to arise from ion – solvent interactions & are responsible for introducing order or disorder in the structure of the solvent. Solute with negative B Coefficient is Characterized as structure breakers indicating weak solute – solvent interactions. The Values of viscosity A & B Coefficient responsible for solute – solute & Solute Solvent interactions.

IV. CONCLUSION

In the present study viscosity of liquid solutions increases with increase in Concentration of dihydropyrimidinone solution in 20% DMF – Water mixture & decreases with increases in temperature. It also observed that the value of viscosity A & B Coefficient responsible for solute & solute – solvent interactions.

V. ACKNOWLEDGMENT:

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VI.REFERENCES

[1]. Aminabhai T. M., Joshi S. S.& Shukla S. S. Can. J. Chem.68,319,(1990)
[2]. Aralaguppi M.I., Aminabhai T.M., Balundgi R. H.; J. Phys. Chem. 95, 5299 (1991)
[3]. Karia F, Bulujas.: Asian J. Chem. 12(2),593 (2000)
[4]. Hagenmuller P., Preparative methods in solids state Chemistry (Academic press,London) 367 (1972)
[5]. Chaimers B., Principles of Solidificaton (John Valey, New York) 194 (1964).
[6]. Joshi S.S. Aminabhai, T.H., Balandgi R. H. & Shukla S.S., J Of Chem. Ing. Data 35,1185(1990)
[7]. Aminabhai T.M., Joshi S. S.& Shukla S.S.,Can. J. Chem, 68, 319(1990)
[8]. Aralaguppi M.I, Aminabhai T.M., Balundgi R.H. & Joshi S.S., J. Phys. Chem.95, 5299 (1991)
[9]. Jayakumar S, Karunanithi N, Kannappan V & Gunasekaran S Asian Chem Lett 1999;3,224.
[10]. Yonzhan luo & Robert L Bldwin J Mol Biology 1998;49,279.
[11]. Kannappan V& Jaya Santhi R Indian J Pure & appl Phy 2005;43,167.
[12]. Owen B.B. & Kronick PK. J Phys Chem 1961,65:81.
[13]. H.Yao N. P & Bennion D.N.; J. Phys Chem, 77,1894 (1973)
[14]. Succo A, Petrella G & Castagnolo M.; J. Phys Chem,749.
[15]. Gill D.S. & Sharma A; J. Chem Soc faraday Trans 475 (1982)
[16]. Jouhar S.P.; Phys Chem. (NF),134,9(1983).

EVALUATION OF ACOUSTICAL PARAMETERS AND INTERACTION OF 5-AMINO-1-NAPHTHOL STUDIED IN 60% SOLVENT MIXTURE

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Abstract

In present work molecular interaction of 5-Amino-1-naphthol studied for 0.1M, 0.050M, 0.025M, 0.012M and 0.006M solutions in 60% ethanol-water mixtures at 298 K at atmosphere pressure. During current work acoustical parameters like adiabatic compressibility, linear free length, acoustic impedance, and relative association are evaluated from experimental values of density and ultrasonic velocity of solvent and solutions. This works reveals that density and ultrasonic velocity of solute linearly increases along with increase concentrations from 0.006M to 0.1M. At the same time acoustic impedance increases with increasing concentrations while linear length and relative association decrease simultaneously. This investigation helps to understand solute-solute and solute solvent interactions and impact of molecular interaction of 5-amino-1-naphthol their structure in solution.

Keywords: 5-amino-1-naphthtol, acoustic parameters, ultrasonic technique, molecular interaction.

Introduction:

Heterocyclic compounds and their substituted derivatives are become more interesting for researchers due to their applications in various science fields [1]. They have good availability in nature and also can synthesize in laboratory [2, 3]. Heterocyclic compounds plays intermediately role in biological and pharmaceutical activities [4-5]. Solute-solvent interaction is of current interest in all branches of chemistry and in other disciplines as well physical chemists and investigators from the traditional classification of chemistry are involved in fundamental studies of these interactions. The measurements of ultrasonic velocity provide useful information regarding the internal structure, complex formation and molecular interaction in liquids because of their accuracy. Physicochemical behavior of heterocyclic compound effectively characterized and studies from Ultrasonic and density [6]. From last few decades observed that researcher interested in use of mix solvent medium in the study of thermodynamic and acoustical properties of solution [7-8]. In industrial processes measurement of various parameters; density, viscosity, refractive indices and ultrasonic velocity of materials played crucial role [9-10]. Current work deals with ultrasonic investigation and molecular interaction of 5-amino-1-naphthol at different concentrations (0.1M, 0.050M, 0.025M, 0.012M and 0.006M) in 60% ethanol-water mixtures at 298 K at atmosphere pressure.

Materials and Method

Materials

Freshly prepared solution used through this work. All used chemical are AR grade and purified by literature method [11] Double distilled water used through experimental work. (Specific conductivity is 0.74 µS at 298 K)

Method

The solvents were purified by standard method. 0.1M, 0.050M, 0.025M, 0.012M and 0.006M solutions of 5-amino-1-naphthol in 60% ethanol-water mixture were prepared. Solvent purified by standard procedure [12]. Densities were measured with the help of bicapillary pyknometer (10.1 % kg m-3). Pyknometer used is of Borosil make. The sample solutions were prepared by mixing appropriate volumes of the ethanol-water components in standard flasks with airtight caps and the mass measurements were performed on precision digital balance (SHIMADZU AUY-220 of accuracy ± 0.1 mg). The sound velocity of pure components and their mixtures were measured by ultrasonic interferometer (Mittal enterprises, model F-81s at variable frequency) at 2 MHz with frequency tolerance was 0.03%. It consists of high frequency generator and a measuring cell. The densities were measured by Densitometer (DMA-35, Anton Paar, Austria, accuracy + 0.001gm.cc-3). Temperature variation was maintained within ± 0.1 0C. Measured densities and ultrasonic velocity of liquids in 60% ethanol-water mixture at 298K and Jocobson's constant used to calculate intermolecular free length.

Result and Discussion:

After calibration of the ultrasonic interferometer and densitometer measured ultrasonic velocity and densities of 0.1M, 0.050M, 0.025M, 0.012 and 0.006M solutions of 5-amino-1-naphthol in 60% ethanol-water mixture at 298 K atmosphere pressure respectively.

Table-1: Experimental values and literature values of 60% ethanol –water.

Liquid	Density $kg.m^{-3}$		Ultrasonic velocity $m.s^{-1}$	
	Exp.	Lit	Exp.	Lit.
Distilled water	999.5	999.0	1501	1498
Ethanol	1024.5	1026.9	1301.5	1311
Ethanol (60%)	1021.6	--	1333.2	--

Table-2: Density, ultrasonic velocity and acoustic parameters of 5-amino-1-naphthol at 298 K

Conc. M	Average Ultrasonic Vel. Us(m/sec)	Density Ds (Kg.m-3)	βsx10-10 (pa-1)	Lf (A0) x 10-6	RA x 10-4	Z * 10^4 (Kgm-2sec-1)
0.006	1305	971.2	2.2198	3.4267	0.9513	135.181
0.012	1390	979.5	2.2276	3.5291	0.9543	136.941
0.025	1450	980.1.	2.2866	3.6822	0.9537	138.725
0.05	1490	980.6	2.3080	3.8007	0.9522	139.445
0.1	1602	995.5	2.3289	3.9518	0.9520	142.015

Table-2 reveals that density, ultrasonic velocity and acoustic impedance increases along with along with increasing concentration from 0.006M to 0.1M to at the same time linear free length and relative association decreases. Concentration increases density and u of solute increases in straightway due to cohesive forces because of strong molecular interactions. It propose powerful dipole-dipole interaction between the component molecules [14]. Ultrasonic velocity decreases with increase in free length and vice versa because of accordance with the expected molecular interaction between the solute-solvent. The acoustic impedance increase along with increasing concentration it suggests the possibility of molecular interaction between solute and solvent through hydrogen bonding [15]. The relative association shows increasing trend with increasing concentration.

Conclusion: In present work carried out ultrasonic investigation and molecular interaction study of 5-amino-1-naphthol at different concentrations (0.1M, 0.050M, 0.025M, 0.012M and 0.006M) in 60% ethanol-water mixtures at 298 K at atmosphere pressure. This work reveals that acoustic parameters are strongly related to molecular interaction.

References

1) D.T.Tayade and A.B.Wadekar, Green Synthesis of 5-p-clorophenylthiocarbamido-1-naphthol s, Journal of Medicinal Chemistry and Drug Discovery 2016, 1(2): 1-5.
2) Naik A B. Studies thermodynamical stability of complexes of rare earth metal ions with substituted Pyrazole. Universal J Chem. 2013; 1(1): 7-10.
3) Bhoi M N, Borad M A, Patel H D. Synthetic strategies for fused benzothiazoles: past, present, and future Synthetic Communications 2014;44: 2427-57.
4) Zhang L-J, Xia J, Zhou Y-Q, Wang H, Wang S W. Rare-earth metal chlorides as efficient catalysts for the simple and green synthesis of 1, 2-disubstituted benzimidazoles and 2-substituted benzothiazoles under ultrasound irradiation. Synthetic Communications 2012; 42: 328-336.
5) Ajay B. Wadekar, Amol P. Nagrale and Dipak T. Tayade. Studies In The Antimicrobial Activities Of Some Newly Synthesized 5-p-clorophenylthiocarbamido-1-naphthol By Disc Diffusion Method, Research Journey International Multidisciplinary E- Research Journal 2016; 4:5-6.
6) R.D.Isankar, D.T.Tayade and A.B.Wadekar, Ultrasonic Interferometric Study Of 4-(*P*-Chloro) -Phenylthiocarbamidophenol In Mixed Solvent Media, Indo. American Journal of Pharmaceutical science. 2018; 5(5): 4796-4798.
7) Sharma V K, Satish Kumar. Isentropic compressibility changes of mixing for 1,3-dioxolane or 1,4-dioxane – water + propanol ternary mixtures. J Sol Chem 2005; 34(4): 387-405.
8) R.D.Isankar, D.T.Tayade and A.B.Wadekar, Interferometric Investigation Of 4-E(hylthio carbamido- Phenol In 60% Mixed Solvent Media, International Journal Of Engineering Development and Research 2018; 6(2): 596-598.

9) P. S. Bodkhe, A. B. Wadekar, R. D. Isankar and D. T. Tayade, Assessment Of Molecular Interactions Of 4-Ethyl Thiocarbamidophenol On Acoustic Parameters Base, Journal of Chemistry and Chemical Sciences, 2019; 9(2): 45-48.

10) Muley G, Labde P, Gambhire A, Naik A. Novel study on determination of crystal growth conditions for L-arginine phosphate monohydrate crystal by ultrasonic velocity measurement in aqueous solution of L-arginine and phosphoric acid. Ana Chem Lett 2014; 4(2): 86-92.

11) Furniss B S, Hannaford A J, Smith P W, Tatachell A R. Vogel's Textbook of Practical Organic Chemistry Vth Ed. 407- 2004.

12) Vasanthrani P, Kalaimagal K, Kannappan A N. Interaction studies on some organic liquid mixtures at different temperatures using ultrasonic techniques. Asian J of App Sci 2009; 2(4): 96-100.

13) Dinesh A Punda, Dipak T. Tayade, Anil B. Naik,Density and Ultrasonic Study of Benzothiazole and Chlorobenzothiazole At 298.15k, Elsevier: Procedia Technology 2016; 24: 677– 681.

14) Kumar R, Muhesh R, Shanmugapriyan B, Kannappan V. Volumetric, viscometeric, acoustic and refractometric studies of molecular interactions in certain binary systems of o-chlorophenol at 303.15K. Ind J Pure Appl Phys 2012; 50: 633-640.

15) Morey P B, Naik A B. Acoustical studies of ternary liquid mixtures of 2-Aminothiazole in DMF-water at different temperatures. Int Lett Chem Phys and Astronomy 2015; 59: 188-198.

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Ultrasonic Investigation of 5-P-Clorophenylthi Ocarbamido-1-Naphthol In 80% Dioxane

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ABSTRACT

Ultrasonic techniques are best suited for physicochemical studies of a system hence it has received special attention of researcher community. In present work molecular interaction of 5-p-clorophenylthiocarbamido-1 naphthol studied for 0.1M, 0.050M, 0.025M, 0.012M and 0.006M solutions in 80% dioxan-water mixture at 298 K at atmosphere pressure. During this work acoustical parameters like adiabatic compressibility, linear free length, acoustic impedance, and relative association are evaluated from experimental values of density and ultrasonic velocity of solvent and solutions. This works reveals that density and ultrasonic velocity of solute linearly increases along with increase concentrations from 0.006M to 0.1M. At the same time acoustic impedance increases with increasing concentrations while linear length and relative association decrease simultaneously. This investigation helps to understand solute-solute and solute solvent interactions and impact of molecular interaction of 5-p-clorophenylthiocarbamido-1-naphthol their structure in solution.

Keywords: acoustic parameters, ultrasonic technique, molecular interaction

I. INTRODUCTION

Heterocyclic compounds and their substituted derivatives are become more interesting for researchers due to their applications in various science fields [1]. They have good availability in nature and also can synthesize in laboratory [2, 3]. Heterocyclic compounds plays intermediately role in biological and pharmaceutical activities [4-5]. Solute-solvent interaction is of current interest in all branches of chemistry and in other disciplines as well physical chemists and investigators from the traditional classification of chemistry are involved in fundamental studies of these interactions. The measurements of ultrasonic velocity provide useful information regarding the internal structure, complex formation and molecular interaction in liquids because of their accuracy. Physicochemical behavior of heterocyclic compound effectively characterized and studies from Ultrasonic and density [6]. From last few decades observed that researcher interested in use of mix solvent medium in the study of thermodynamic and acoustical properties of solution [7-8]. In industrial processes

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measurement of various parameters; density, viscosity, refractive indices and ultrasonic velocity of materials played crucial role [9-10]. Current work deals with ultrasonic investigation and molecular interaction of 5-p-clorophenylthiocarbamido-1-naphthol at different concentrations (0.1M, 0.050M, 0.025M, 0.012M and 0.006M) in 80% dioxan-water mixtures at 298 K at atmosphere pressure.

II. MATERIALS AND METHOD

Materials

5-p-clorophenylthiocarbamido-1-naphthol used during present works [1] is newly synthesized and dioxan (Dx) used in the present study was AR grade and purified by literature method [11]. Double distilled water used through experimental work. (Specific conductivity is 0.74 μS at 298 K)

Method

Freshly prepared solution used during study. The solvents were purified by standard method. 0.1M, 0.050M, 0.025M, 0.012M and 0.006M solutions of 5-p-clorophenylthiocarbamido-1-naphthol in 80% dioxan-water mixture were prepared. Solvent purified by standard procedure [12]. Densities were measured with the help of bicapillary pyknometer (10.1 % kg m-3). Pyknometer used is of Borosil make. The sample solutions were prepared by mixing appropriate volumes of the Dx-water components in standard flasks with airtight caps and the mass measurements were performed on precision digital balance (SHIMADZU AUY-220 of accuracy ± 0.1 mg). The sound velocity of pure components and their mixtures were measured by ultrasonic interferometer (Mittal enterprises, model F-81s at variable frequency) at 2 MHz with frequency tolerance was 0.03%. It consists of high frequency generator and a measuring cell. The densities were measured by Densitometer (DMA-35, Anton Paar, Austria, accuracy ± 0.001gm.cc-3). Temperature variation was maintained within ± 0.1 0C. Measured densities and ultrasonic velocity of liquids in 80% dioxin-water mixture at 298K and Jacobson's constant used to calculate intermolecular free length.

III. RESULT AND DISCUSSION

After calibration of the ultrasonic interferometer and densitometer measured ultrasonic velocity and densities of 0.1M, 0.050M, 0.025M, 0.012 and 0.006M solutions of 5-p-clorophenylthio -carbamido-1-naphthol in 80% dioxan-water mixture at 298 K atmosphere pressure respectively.

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Liquid	Density $kg.m^{-3}$		Ultrasonic velocity m.s-1	
	Exp.	Lit. [13]	Exp.	Lit. 13]
Distilled water	999.5	999.0	1501	1498
Dioxan (Dx)	1025.5	1026.9	1340.5	1345
Dioxan (80% Dx)	1028.6	--	1338.2	--

Table-2: Density, ultrasonic velocity and acoustic parameters of 5-p-clorophenylthio-carbamido-1-naphthol at 298 K

Conc. M	Average Ultrasonic Vel. Us(m/sec)	Density Ds (Kg.m-3)	βsx10-10 (pa-1)	Lf (A0) x 10-6	RA x 10-4	Z * 10^4 (Kgm-2sec-1)
0.006	1458	975.2	2.1798	3.0367	0.9213	142.184
0.012	1468	980.6	2.1976	3.0491	0.9243	143.952
0.025	1475	981.5	2.2166	3.0622	0.9237	144.771
0.05	1490	983.2	2.2580	3.0907	0.9222	146.496
0.1	1502	985.6	2.2889	3.1118	0.9220	148.037

Table-2 reveals that density, ultrasonic velocity and acoustic impedance increases along with along with increasing concentration from 0.006M to 0.1M to at the same time linear free length and relative association decreases. Concentration increases density and u of solute increases in straightway due to cohesive forces because of strong molecular interactions. It propose powerful dipole-dipole interaction between the component molecules [14]. Ultrasonic velocity decreases with increase in free length and vice versa because of accordance with the expected molecular interaction between the solute-solvent. The acoustic impedance increase along with increasing concentration it suggests the possibility of molecular interaction between solute and solvent through hydrogen bonding [15]. The relative association shows increasing trend with increasing concentration.

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V. REFERENCES

[1]. D.T.Tayade and A.B.Wadekar, Green Synthesis of 5-p-clorophenylthiocarbamido 1 naphthol s, Journal of Medicinal Chemistry and Drug Discovery 2016, 1(2): 1-5.

[2]. Naik A B. Studies thermodynamical stability of complexes of rare earth metal ions with substituted Pyrazole. Universal J Chem. 2013; 1(1): 7-10.

[3]. Bhoi M N, Borad M A, Patel H D. Synthetic strategies for fused benzothiazoles: past, present, and future Synthetic Communications 2014;44: 2427-57.

[4]. Zhang L-J, Xia J, Zhao Y-Q, Wang H, Wang S W. Rare-earth metal chlorides as efficient catalysts for the simple and green synthesis of 1, 2-disubstituted benzimidazoles and 2-substituted benzothiazoles under ultrasound irradiation. Synthetic Communications 2012; 42: 328-336.

[5]. Ajay B. Wadekar, Amol P. Nagrale and Dipak T. Tayade, Studies In The Antimicrobial Activities Of Some Newly Synthesized 5-p-clorophenylthiocarbamido-1-naphthol By Disc Diffusion Method, Research Journey International Multidisciplinary E- Research Journal 2016; 4:5-6.

[6]. R.D.Isankar, D.T.Tayade and A.B.Wadekar, Ultrasonic Interferometric Study Of 4-(P-Chloro) - Phenylthiocarbamidophenol In Mixed Solvent Media, Indo. American Journal of Pharmaceutical science, 2018; 5(5): 4796-4798

[7]. Sharma V K, Satish Kumar. Isentropic compressibility changes of mixing for 1,3-dioxolane or 1,4-dioxane + water + propanol ternary mixtures. J Sol Chem 2005; 34(4): 387-405.

[8]. R.D.Isankar, D.T.Tayade and A.B.Wadekar, Interferometric Investigation Of 4-Ethylthio carbamido-Phenol In 60% Mixed Solvent Media, International Journal Of Engineering Development and Research 2018; 6(2): 596-598.

[9]. P. S. Bodkhe, A. B. Wadekar, R. D. Isankar and D. T. Tayade, Assessment Of Molecular Interactions Of 4-Ethyl Thiocarbamidophenol On Acoustic Parameters Base, Journal of Chemistry and Chemical Sciences. 2019; 9(2): 45-48.

[10]. Muley G, Labde P, Gambhire A, Naik A. Novel study on determination of crystal growth conditions for L-arginine phosphate monohydrate crystal by ultrasonic velocity measurement in aqueous solution of L-arginine and phosphoric acid. Ana Chem Lett 2014; 4(2): 86-92.

[11]. Furniss B S, Hannaford A J, Smith P W, Tatachell A R. Vogel's Textbook of Practical Organic Chemistry Vth Ed. 407: 2004.

[12]. Vasanthrani P, Kalaimagal K, Kannappan A N. Interaction studies on some organic liquid mixtures at different temperatures using ultrasonic techniques. Asian J of App Sci 2009; 2(4): 96-100.

[13]. Dinesh A. Punda, Dipak T. Tayade, Anil B. Naik,Density and Ultrasonic Study of Benzothiazole and Chlorobenzothiazole At 298.15k, Elsevier: Procedia Technology 2016; 24: 677 – 681.

[14]. Kumar R, Mahesh R, Shanmugapriyan B, Kannappan V. Volumetric, viscometeric, acoustic and refractometric studies of molecular interactions in certain binary systems of o-chlorophenol at 303.15K. Ind J Pure Appl Phys 2012; 50: 633-640.

[15]. Morey P B, Naik A B. Acoustical studies of ternary liquid mixtures of 2-Aminothiazole in DMF-water at different temperatures. Int Lett Chem Phys and Astronomy 2015; 59: 188-198.

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Viscometrically Investigated Thermodynamic Of 5-P-Chlorophenylthiocarbamidonapthtol In 60% Solvent Mixture

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ABSTRACT

Thioarbamid nuclei has their various pharmaceutical significances, due to substitution of this nuclei it become more interesting task to understand their molecular interactions in solution and their potency. Present work concern to viscometric investigate thermodynamic of 5-p-chlorothiocarbamidonaphthtol at different concentrations (i.e. 0.1M,0.05M, 0.025M and 0.012M) and 303K in 60% ethanol-water mixture. Obtained data help to interpreted viscosity behavior and thermodyamic parameters of 5-p-chlorothiocarbamidonaphthol molecule. In this work investigated density, relative viscosity and A, β-coefficient values. This work interpreted solute-solute, solute solvent interactions in solution.

Keywords: Viscometric behavior, thermodynamic, molecular interaction, Jones-Dole coefficient.

I. INTRODUCTION

Viscometric measurement received more attention of researchers due to its reliability and significances. Viscometry data closely related to the pharmacodynamic and pharmacokinetics of drugs. Intra and inter molecular interactions studies plays crucial role in to understand their behave pattern in solution. Viscosity measurements had significantly used in biochemical, agricultural, pharmaceutical, medicinal, and industrial and drug sciences. Drug behavior like absorption, transmission and its effect will directly relate to its viscosity measurements and solvent interactions in the human framework. Tayade et al[1] viscometrically investigated 3-(2-hydroxy-3-nitro-5-methyl) phenyl-6-amino-1,2,5-thioxazine in 60% ethanol water mixture at various temperatures by keeping constant molar concentration 0.1 M . Effect of temperature on viscosity of s-substituted triazinothiocarbamides in 60% dioxane water mixture investigated Tayade et al[2]. Various substituted molecules like substituted triazine, substituted thiocarbamidonaphtols, substituted thiocarbamidophenol, substituted cumarine and likewise other molecules studied with viscometrically[3-10].

Bering these all we designed this research scheme and carried out present work deals with viscometric investigate thermodynamic of 5-p-chlorothiocarbamidonaphthtol at different concentrations (i.e. 0.1M,0.05M, 0.025M and 0.012M) and 303K in 60% ethanol-water mixture. In this work investigated density, relative

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viscosity and A, β-coefficient values. Obtained data help to interpreted solute-solute and solute-solvent interactions of 5-p-chlorothiocarbamido -naphthol molecule in solution.

II. EXPERIMENTAL

All AR grade chemicals used during present work. The binary mixture of 60% dioxane-water and 60% ethanol water was prepared gravimetrically in stoppard bottle. Mechaniki Zakrudy Precyzyjnej Gdansk balance made in Poland (0.001 gm) use for weighing and Densities of solutions were determined by a bicapillary pyknometer (0.2 %) having a bulb volume of about 10 cm3 and capillary having an internal diameter of 1mm and calibrated with deionised doubly distilled water . The accuracy of density measurements were within 0.1 Kgm-3.The viscosities were measured by means of Ostwald's viscometer thoroughly cleaned and dried. The viscometer was kept in Elite thermostatic water bath and temperature variation was maintained at 28 0C (0.1). for each measurements, sufficient time was allowed to attain thermal equilibrium between viscometer and water bath.

III. OBSERVATIONS AND CALCULATIONS

Current investigation concern to viscometrically investigate thermodynamic of 5-p-chlorothio carbamidonaphthol at different concentrations (i.e. 0.1M, 0.05M, 0.025M and 0.012M) and 303K in 60% ethanol-water mixture.

IV. RESULT AND DISCUSSION

Viscometric study with variation in concentration

The viscometric readings were taken as described in literature. The results obtained were mentioned in Table-1 and A and β-coefficient values calculated shown in Table 2.

The relative viscosity of each solution during study was determined by formula depicted below,

$$\eta_r = \frac{D_s t_s}{D_o t_o}$$

Where,

η_r = Relative viscosity of ligand solution, Do and Ds = Density of ligand solution and water , t_o and t_s =Time of flow for ligand solution and water respectively

The relative viscosities have been analyzed by Jone's Dole equation

$$(\eta_r - 1)\sqrt{C} = A + B\sqrt{C}$$

Where,

C for Concentration, A and β are the Falkenhagen and the Jones Dole coefficients. A is a constant arising from the ion–ion or solute–solute interactions and is called Falkenhagen coefficient, while B is the Jones–Dole coefficient, which measures the size, shape, charge and structural effects induced by solute-solvent interactions[10-12]. Jones–Dole B coefficient can be explained in terms of competition among the special viscosity effects at a given concentration[13] and is regarded as an important parameter to study solute-solvent interactions in the systems. The graph was plotted between $(\eta_r - 1)/\sqrt{C}$ verses $\sqrt{C}$ and the value of coefficient 'A'and 'B' calculated.

Table-1: Relative viscosity and specific viscosity of 5-p-chlorothiocarbamidonaphthtol at different concentrations 303K in 60% ethanol-water mixture

Conc. C (M)	√C	Time t (sec.)	Density ρx10³ (kg.cm⁻³)	η_r	$\eta_{sp}=\eta_r-1$
0.1	0.31622	60.3	0.9568	2.4552	1.4552
0.05	0.2236	59.58	0.9522	2.4552	1.412
0.025	0.15811	57.4	0.9431	2.458	1.458
0.0125	0.1118	56.29	0.9352	2.0245	1.0245

Table-2: A and β-coefficient value in 60% Ethanol-Water mixture at 303K.

Ligand	A (Falkenhagen coefficient)	β-coefficient (Jones-Dole coefficients)
5-p-chlorothiocarbamidonaphthtol	0.64919	-1.69076

From the results, it is observed that, the concentration of ligand is directly proportional to density and relative viscosity for 5 p chlorothiocarbamidonaphthtol at temperature 303K for 60% ethanol-water mixture. This may be due to the weak solvation effect which interprets weak molecule interaction. The negative values of β-coefficient characterized as 'structure-breaker' indicating a weak solute solvent interaction which is good for interactions in between the drug and the drug receptors shows best drug activity and drug effect and it favors pharmacokinetics and pharmacodynamics of drug. At the same time, both ligands are hydrophilic in nature and they disrupted the hydrogen bonding in the mixture of solvent causing lesser molecular interaction. Thus, these factors plays important role during designing of any drug[2].The value of A coefficient show that, the solute solute interaction is weak it is also supporting for good transmission.

V. CONCLUSION

from above discussion A and β-coefficient values support to good activity of 5-p-chlorothiocarbamidonaphthtol in 60% ethanol-water mixture. This study may become a milestone in the interpretation of the drug diffusion and drug transmission steps of pharmacodynamic.

VI. REFERENCES

[1]. D.T. Tayade, S.S. Padhen, A.B. Wadekar, S.A. Waghmare, Viscometric Measurements Of 3-(2-Hydroxy-3-Nitro-5-Methyl) Phenyl-6-Amino-1,2,5-Thioxazine In 60% Ethanol Water Mixture At Various Temperatures, Int. Journal Of Medicinal Chemistry & Analysis, 5(4),2015, Xxx-Xxx.

[2]. M. Kshirsagar, D.T. Tayade, Effect Of Temperature On Viscosity Of S-Substituted Triazino thiocarbamides In 60% Dioxane Water Mixture, international Journal Of Advancements In Research & Technology, 1(5),2012, 1-12.

[3]. D.T.Tayade, N.J. Meshram,Viscometric Studies Of 4-(Ptolyl)Thiocarbamidophenol At Various Molar Concentrations And At 25 C In 60 % Ethanol-Water Mixture, indian Journal Of Applied Research,7(1),2017,820-820.

[4]. D. T.Tayade, N.J.Meshram, R. Ullah S. Ullah, M.P.Wadekar ,The Viscometric Measureme -nts Of S-Substituted Triazinothiocarbamides At Various Compositions, Int. Journal Of Bioscience, Agriculture And Technology, 2(1),2014,1251-1258.

[5]. Amalendu Pal, Viscometric studies of L-Valine and L-leucine in aqueous solution of NaBr at 298.15K, Indian Journal Chem. 44(A), 2005, 1589-1593.

[6]. Grinnell Jones. The Viscosity of Aqueous Solutions of Strong Electrolytes with Special Reference to Barium Chloride J. of American Chemical Society, 51(10),1929,2950-2964.

[7]. Ruijiao Dong et al. Viscometric measurement of the thermodynamics of PAN terpolymer /DMSO/water system and effect of fiber-forming conditions on the morphology of PAN precursor. Journal of Polymer Science, 46(19), 2008, 1997-2011.

[8]. Jumde Kp et al. Viscometric Measurement Of Substituted-Dioxo-Naphthacene-2-CarboxamideAnd Substituted-Spiro[1-Benzofuran2,1'-Cyclohex-2-Ene]-3,4'-Dione Drugs In Ethanol–Water Mixture At Various Percentage Compositions. International Journal of Chemical and Physical Sciences, 2(5), 2013, 26-32.

[9]. Sohail Aslam et al. Viscometric Measurement Of Chromium(Iii)-Polyacrylamide Gels Chemical Engineering Communications, 48(4-6), 1986, 287-301.

[10]. Scott Blair GW et al. Viscometric measurements of the activities of commercial renners using sodium caseinate as substrate. Journal of Dairy Research, 29(01) 1962, 37-46.

[11]. A. K. Nain and R. Pal. J. Chem. Thermodyn. 60, 98 (2013).

[12]. A.K. Nain, R. Pal, and R. K. Sharma, J. Mol. Liq. 165, 154 (2012).

[13]. T. S. Banipal, H. Singh, P. K. Banipal, and V. Singh, Thermochim. Acta 553, 31 (2013).

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SYNTHESIS OF SOME NOVEL ARYLDITHIOCARBAMATES

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Abstract: Several *S*-hepta-*O*-benzoyl lactosyl aryldithiocarbamates have been synthesized by the interaction of hepta-*O*-benzoyl lactosyl bromide with ammonium aryldithiocarbamates. The identities of these newly synthesized compounds have been established on the basis of usual chemical transformations, IR, ^{1}H NMR and Mass spectral studies. Antimicrobial activities of these compounds were evaluated.

Key words: - Lactosyl bromide, Ammonium aryldithiocarbamates, Lactosyl Aryldithiocarbamates.

Introduction

S-lactosides are those compounds in which Lactosyl group or its derivatives are attached to the sulphur of sulphur derivatives exhibiting antifungal[1], anticumor[2], anticancer[3], antiviral[4] and antimalarial activity[7]. Benzoyl derivatives of carbohydrate are interestingly becoming important in medicinal chemistry, industries and in many other ways[5,6].

The present work deals with the synthesis of several *S*-hepta-*O*-benzoyl lactosyl aryldithiocarbamates. These were prepared by the interaction of *S*- hepta-*O*-benzoyl lactosyl bromide (1) and ammonium arydithiocarbamates (2a-g).

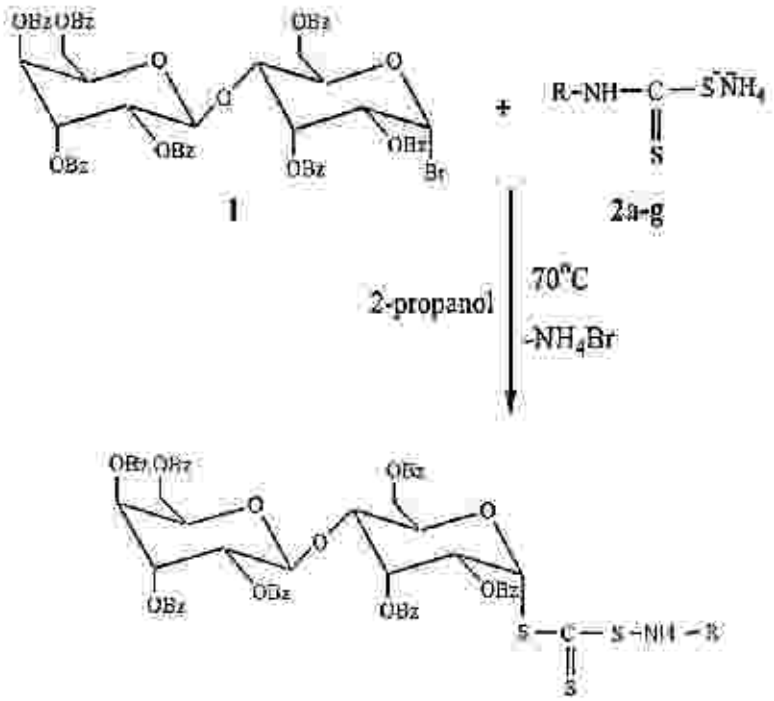
Result and discussion

Isopropanolic (40 ml) suspension of hepta-O-benzoyl lactosyl bromide and ammonium phenyldithiocarbamate was heated on water bath at about 70°C and kept at room temperature for 20 hrs. Solid thus obtained was identified ammonium hydroxide. Clear filtrate on dilution with distilled water afforded a solid, which was purified by ethanol and water. It gave charring and was desulphurisable with alkaline plumbite Solution. Its specific rotation was found $[\alpha]_D^{31}$ -182.28 (c, 0.980 in $CHCl_3$).

The IR, ^{1}H NMR and mass spectral analysis[10-13] and elemental analysis (Table 1) clearly indicated the product and were assigned the structure as *S*-hepta-*O*-benzoyl lactosyl-1-phenyl dithiocarbamate (3a).

When the interaction of hepta-*O*-benzoyl lactosyl bromide[14] was extended to other aryldithiocarbamates[15], the related *S*-hepta-*O*-benzoyl lactosyl-1-aryldithiocarbamates (3b-g) were isolated.

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Where, Bz = COC_6H_5

R = a) phenyl, b) *o*-tolyl, c) *m*-tolyl, d) *p*-tolyl, e) *o*-Cl-phenyl, f) *m*-Cl-phenyl, g) *p*-Cl-phenyl.

Experimental

All the melting points recorded are found uncorrected. IR Spectra were recorded on Perkin-Elmer spectrum RXI FTIR Spectrometer. ^1H NMR was obtained on Bruker DRX-300 NMR Spectrometer. Samples were prepared in $CDCl_3$ with TMS as an internal reference. The mass spectra were obtained on Thermo Fennigan LCQ Advantage max ion trap mass spectrometer. Optical rotations $[\alpha]_D^{31}$ were measured on the Equip-Tronics EQ-800 Digital Polarimeter at 31°C in $CHCl_3$.

General Procedure

Synthesis of S-hepta -O-benzoyl lactosyl -1-phenyldithiocarbamate (3a-g)

Isopropanolic (40 ml) suspension of *S*-hepta-*O*-benzoyl lactosyl bromide (0.01M, 11.32g) and ammonium phenyldithiocarbamate (0.01M, 1.73g) was heated on water bath at about 70°C until the suspension gets cleared. The clear solution was kept at room temperature for 20 hours.The solid formed was filtered off and identified as NH_4Br. The reaction mixture was mixed with 100 mL distilled water. It afforded solid (3a-g) The products were crystallized by ethanol-water. Purity was checked by TLC (Table 2).

Spectral data

3a. IR (KBr) : ν 3458 cm^{-1} (N-H), 1728 cm^{-1} (C=O), 2973 (C-H Ar-stretching); 1453 cm^{-1} (C-N), (characteristic of lactose unit) and 710 cm^{-1} (C-S); ^{1}HNMR ($CDCl_3$): δ 8.05- 7.18 (40 H, m, Ar-H), δ 5.79 -5.39 (14 H, m, lactose ring protons); δ 7.16 (1H, s, N-H) MS (*m/z*): 1221 (M^+), 1100, 1053, 976, 948, 932, 918, 579. Anal. Found : C, 66.40; H, 4.72; N, 1; S, 5.84 Calcd. For $C_{68}H_{55}O_{17}NS_2$: C, 66.83; H, 4.5; N, 1.1; S, 5.24 %

3b. IR (KBr) : ν 3483 cm^{-1} (N-H), 2976 (C-H Ar stretching), 1452 cm^{-1} (C-N), 1271 cm^{-1} (C-O), 1026 (characteristic of lactose unit) and 710 cm^{-1} (C-S); ^{1}HNMR ($CDCl_3$):δ 8.07- 7.18 (39 H, m, Ar-H); δ 5.74 -5.43 (14 H, m, lactose ring protons); δ 6.1 (1H, s, N-H), MS (*m/z*): 1253 (M^+), 1134, 1053, 976, 932, 579. Anal. Found : C, 64.88.; H, 4.01; N, 1 S, 5 Calcd. for $C_{68}H_{54}O_{17}NS_2Cl$: C, 65.01; H, 4.37; N, 1.1; S, 5.09 %

3c. IR (KBr) : ν3481 cm^{-1} (N-H), 2972 (C-H Ar stretching); 1452 cm^{-1} (C-N), 1271 cm^{-1} (C-O), 1068 (characteristic of lactose unit) and 710 cm^{-1} (C-S); ^{1}HNMR ($CDCl_3$):δ 8.05- 7.18 (39 H, m, Ar-H); δ 5.79–5.39(14 H, m, lactose ring protons), δ 2.9 (3H, s, Ar-CH_3) δ 6.8-6.7(1H, s, N-H). MS (*m/z*): 1235 (M^+), 1114, 1053, 976, 948, 932, 918, 579. Anal. Found : C, 66.88; H, 4.2; N, 1.1 S, 5.1 Calcd For $C_{68}H_{55}O_{17}NS_2$: C, 67; H, 4.6; N, 1.13; S, 5.1 %

Table 2:- Characterization data of *S*-hepta-*O*-benzoyl lactosyl-1-aryldithiocarbamate (3a-g)

Reactants: - 1) Hepta-*O*-benzoyl lactosyl bromide **(1)** [0.01M].
2) Ammonium aryldithiocarbamate **(2a-g)** [0.01M].

Sr. No.	Product	Yield (%)	m. p. (°C)	$[\alpha]_D^{31}$ (c in $CHCl_3$)	Analysis (%): Found(Required) N	S
1.	3a	70	124	-182.28° (c,0.980)	1 (1.1)	5.84 (5.24)
2.	3b	64	118	-188° (c, 0.693)	1 (1.1)	5.0 (5.9)
3.	3c	76	98	-190° (c, 0.986)	1 (1.1)	5.0 (5.9)
4.	3d	71	137	-202° (c, 0.786)	1 (1.1)	5.0 (5.9)
5.	3e	67	150	-218° (c, 0.966)	1.1 (1.13)	5.1 (5.0)
6.	3f	62	176	-136° (c, 1.006)	1.1 (1.13)	5.1 (5.0)
7.	3g	72	120	-169° (c, 1.040)	1.1 (1.13)	5.1 (5.0)

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References

1. Quing-Li Wei, Shu-Sheng Zhang, Jun Gao, Wei-hua Li, Liang-Zhang Xu and Zhi-Gang Yu, *Bioorg. Med. Chem.*, 2006,14, 7146.
2. K. Taujithara, M, Ozeki, T Morikawa, M, Kawamori, Akaike and Y Arai, *J. Med. Chem.*, 1982, 25, 441.
3. Haung Shu-Ting, Hsei I-Jen and Chen-Chinpiao, *Bioorg. Med. Chem.*, 2006, 14, 6106.
4. P.C.Tome Joao, G. Neves Maria, A. Tome, A. S. Gavaleiro Jose, F. Mendonka Ana, I. N. Pegado, R. Duarte and M. L. Valdeira, *Bioorg. Med. Chem.*, 2005, 14, 3878.
5. S. Hout, N. Azas, A. Darque, M. Robin, C. Di. Giorgio, M. Gasquet, J. Galy and Timon-Savid, P. Parasitology, 2004, 129, 525.
6. D. V. Mangte and S. P. Deshmukh, *Int. J. Chem. Sci.*, 2004, 2, 159-163.
7. L Goodmann, *Adv. Carbohydr. Chem. Biochem.*, 1958, 13, 215-236.
8. J. J. Garcia-Lopez, F. Hernandez-Mateo, J. Isac-Garcia, J. M. Kin, R. Roy, F. Santoyo-Gonzalez and A. Vargas-Berenguel, *J. Org. Chem.*, 1999, 64, 522-531.
9. A. S. Dandale, D. V. Mangte and S. P. Deshmukh, *Carbohydr. Res.*, 2007, 342, 753-756.. 10. R.M.Silverstain and G.C. Bassler and T. C. Morrill "*Spectrometric Identification of Organic Compounds*", 5th ed., John Wiley & sons, Inc, New York, 1991.
11. J.R Dyer, "*Applications of Absorption Spectroscopy of Organic Compounds*", 8th ed., Prentice hall, 1991.
12. S. A. Barker, J. Homer, M. C. Keith and L. F. Thomas, *J. Chem. Soc.*, 1963, 1538-1543.
13. R. Verma, S. Y. Kulkarni, C. J. Jose and V. S. Parsare, *Carbohydr. Res.*, 1984, 133, 25-32.
14. P. C. Scheurer and F. Smith, *J.Am.Chem.Soc.*,1954, 76,3234 .
15. A. I. Vogel, *A Text Book of Practical Organic Chemistry*, Vol. V, ELBS, Longman 1989,967

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ARTICLE

Synthesis of (s)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-substituted-urea derivatives as antibacterial agents

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Abstract

A new series of (s)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-substituted-urea derivatives have been synthesized and characterized with spectral data, such as IR, NMR and Mass spectroscopies. All compounds are *in vitro* evaluated for their efficacy as antimicrobial agent against the gram-positive pathogenic strains such as *Bacillus subtilis ATCC 6633*, *Staphylococcus aureus ATCC 25923*, *Staphylococcus epidermidis ATCC 12228* and *Streptococcus pyogens ATCC 8668*. Five compounds (**19k**, **19l**, **19m**, **19n** and **19o**) out of 15 compounds showed moderate activity.

1 | INTRODUCTION

In recent years, the sharp rise in antibiotics resistance zoomed up due to the misuse of antibiotics and now it is becoming a significant health problem [1–2]. Consequently, there is an urgent need to find out an effective solutions against the outbreak of antibiotic resistance [3–5]. During the past two decades the number of scientific publications on the synthesis and biological investigation of oxazolidinone derivatives has considerably increased due to their immense pharmacological applications. Oxazolidinone derivatives are one of the most potent and well-known biologically active heterocycles probably due to their novel mechanism of actions. Oxazolidinones are an innovative class of completely synthetic antibacterial agents, active against many antibiotic-resistant organisms especially against gram-positive bacteria and even those cross-resistant to other protein synthesis inhibitors [6–14].

Linezolid (1) was the first approved and marketed antibiotic from the class of oxazolidinones [15]. Eventually resistance to the linezolid started to appear after its execution for the therapeutic use. It might be because of the steady use or changes in genetic coding of microorganisms [16–27]. Hence, to find out an eternal solution, discovery of new, safe, and potential candidates from the class of oxazolidinones is indispensable. A large number of biologically active molecules containing oxazolidinone moiety in their structural framework is depicted in Figure 1.

To overcome such antibacterial resistances and to reduce or eliminate adverse effects, modification in the existing scaffold to provide the new analogues with broaden spectrum of activity found to be the customary approach [28]. 1,2-Benzisothiazole is another important biological scaffold in term of medicinal chemistry.

1,2-Benzisothiazole and their derivatives show notable biological activities. Ziprasidone (8), perispirone (9) and lurasidone (10) are the examples of marketed drugs which have an equally sharing common moiety, that is, 3-(piperazin-1-yl)-1,2-benzisothiazole (Figure 2).

spectrum of compound **13** showed parent ion peak at m/z 359 $[M - H]^-$. Reduction of nitro compound **13** into amine **14** by using iron and ammonium chloride followed by a reaction with 2-[(2*S*)-oxiran-2-ylmethyl]-1*H*-isoindole-1,3(2*H*)-dione afforded compound **15** in good yield. The structure of intermediate **15** confirmed from the ^{1}H-NMR, the peak appears at δ 8.09–7.17 ppm. Furthermore, mass spectrum of compound **15** showed parent ion peak at m/z 558 $[M + H]^+$.

Targeted oxazolidinone pharmacophore **16** formed by cyclization of compound **15** with *N,N*′-carbonyldiimidazole (CDI). The structure of key intermediate is determined from IR spectrum, which shows the presence of absorption band at 1745 cm^{-1} providing a strong evidence for the formation of oxazolidinone ring. Another piece of evidence for the cyclization is the appearance of a signal due to two equivalent protons in the ^{1}H-NMR spectrum, at δ 4.95 and 4.19 ppm (diastereotopic protons). In addition, the mass spectrum revealed a peak at m/z 558 corresponding to the molecular ion. Compound **17** was obtained by deprotection of the phthalamide group of compound **16** by using 60% hydrazine hydrate solution. Reaction of compound **17** with bis-(4-nitrophenyl) carbonate as the reagent to afford vital compound **18** from Scheme 1.

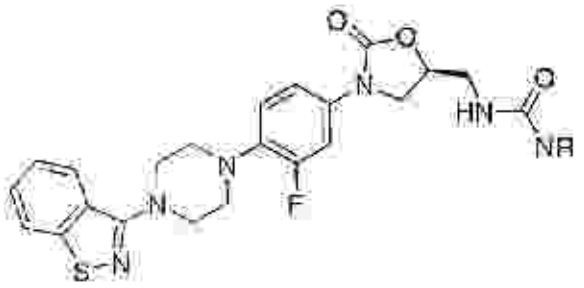
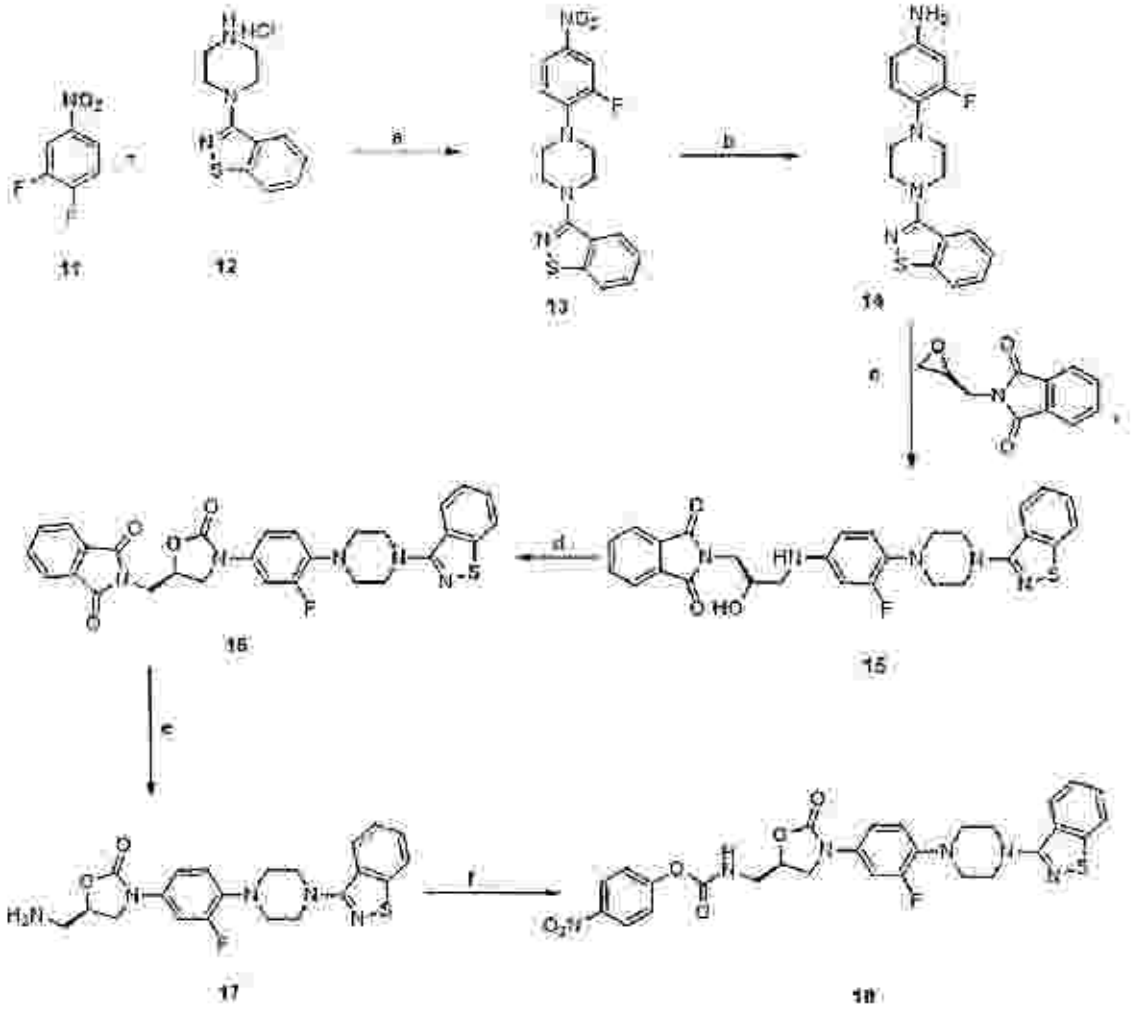


FIGURE 3 Targeted oxazolidinone analogous



SCHEME 1 Reagents and condition: (a) K_2CO_3, CH_3CN, 75–80°C, 6–8 h; (b) Fe/aq. NH_4Cl, ethanol, 25–80°C, 6–8 h; (c) 2-[(2*S*)-oxiran-2-ylmethyl]-1*H*-isoindole-1,3(2*H*)-dione, IPA, 75–80°C, 10–12 h; (d) CDI, K_2CO_3, DCM, 25–30°C, 10–12 h; (e) 60% hydrazine hydrate solution, THF, 25–30°C, 1–2 h; (f) Bis-(4-nitrophenyl) carbonate, K_2CO_3, DMF, 50–55°C, 1 h

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ARTICLE

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Synthesis of (s)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-substituted-urea derivatives as antibacterial agents

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Abstract

A new series of (s)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-substituted-urea derivatives have been synthesized and characterized with spectral data, such as IR, NMR and Mass spectroscopies. All compounds are *in vitro* evaluated for their efficacy as antimicrobial agent against the gram-positive pathogenic strains such as *Bacillus subtilis ATCC 6633*, *Staphylococcus aureus ATCC 25923*, *Staphylococcus epidermidis ATCC 12228* and *Streptococcus pyogens ATCC 8668*. Five compounds (**19k**, **19l**, **19m**, **19n** and **19o**) out of 15 compounds showed moderate activity.

1 | INTRODUCTION

In recent years, the sharp rise in antibiotics resistance zoomed up due to the misuse of antibiotics and now it is becoming a significant health problem [1–2]. Consequently, there is an urgent need to find out an effective solutions against the outbreak of antibiotic resistance [3–5]. During the past two decades the number of scientific publications on the synthesis and biological investigation of oxazolidinone derivatives has considerably increased due to their immense pharmacological applications. Oxazolidinone derivatives are one of the most potent and well-known biologically active heterocycles probably due to their novel mechanism of actions. Oxazolidinones are an innovative class of completely synthetic antibacterial agents, active against many antibiotic-resistant organisms especially against gram-positive bacteria and even those cross-resistant to other protein synthesis inhibitors [6–14].

Linezolid (1) was the first approved and marketed antibiotic from the class of oxazolidinones [15]. Eventually resistance to the linezolid started to appear after its execution for the therapeutic use. It might be because of the steady use or changes in genetic coding of microorganisms [16–27]. Hence, to find out an eternal solution, discovery of new, safe, and potential candidates from the class of oxazolidinones is indispensable. A large number of biologically active molecules containing oxazolidinone moiety in their structural framework is depicted in Figure 1.

To overcome such antibacterial resistances and to reduce or eliminate adverse effects, modification in the existing scaffold to provide the new analogues with broaden spectrum of activity found to be the customary approach [28]. 1,2-Benzisothiazole is another important biological scaffold in term of medicinal chemistry.

1,2-Benzisothiazole and their derivatives show notable biological activities. Ziprasidone (8), perisiprone (9) and lurasidone (10) are the examples of marketed drugs which have an equally sharing common moiety, that is, 3-(piperazin-1-yl)-1,2-benzisothiazole (Figure 2).

spectrum of compound **13** showed parent ion peak at m/z 359 $[M + H]^+$. Reduction of nitro compound **13** into amine **14** by using iron and ammonium chloride followed by a reaction with 2-[(2*S*)-oxiran-2-ylmethyl]-1*H*-isoindole-1,3(2*H*)-dione afforded compound **15** in good yield. The structure of intermediate **15** confirmed from the ^{1}H-NMR, the peak appears at δ 8.09–7.17 ppm. Furthermore, mass spectrum of compound **15** showed parent ion peak at m/z 558 $[M + H]^+$.

Targeted oxazolidinone pharmacophore **16** formed by cyclization of compound **15** with *N,N'*-carbonyldiimidazole (CDI). The structure of key intermediate is determined from IR spectrum, which shows the presence of absorption band at 1745 cm^{-1} providing a strong evidence for the formation of oxazolidinone ring. Another piece of evidence for the cyclization is the appearance of a signal due to two equivalent protons in the ^{1}H-NMR spectrum, at δ 4.95 and 4.19 ppm (diastereotopic protons). In addition, the mass spectrum revealed a peak at m/z 558 corresponding to the molecular ion. Compound **17** was obtained by deprotection of the phthalamide group of compound **16** by using 60% hydrazine hydrate solution. Reaction of compound **17** with bis-(4-nitrophenyl) carbonate as the reagent to afford vital compound **18** from Scheme 1.

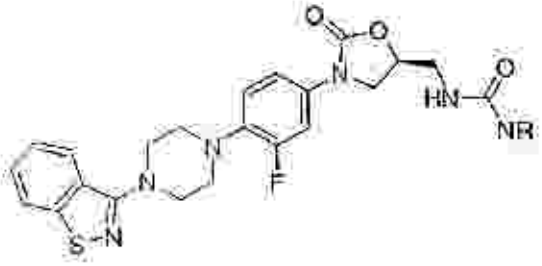
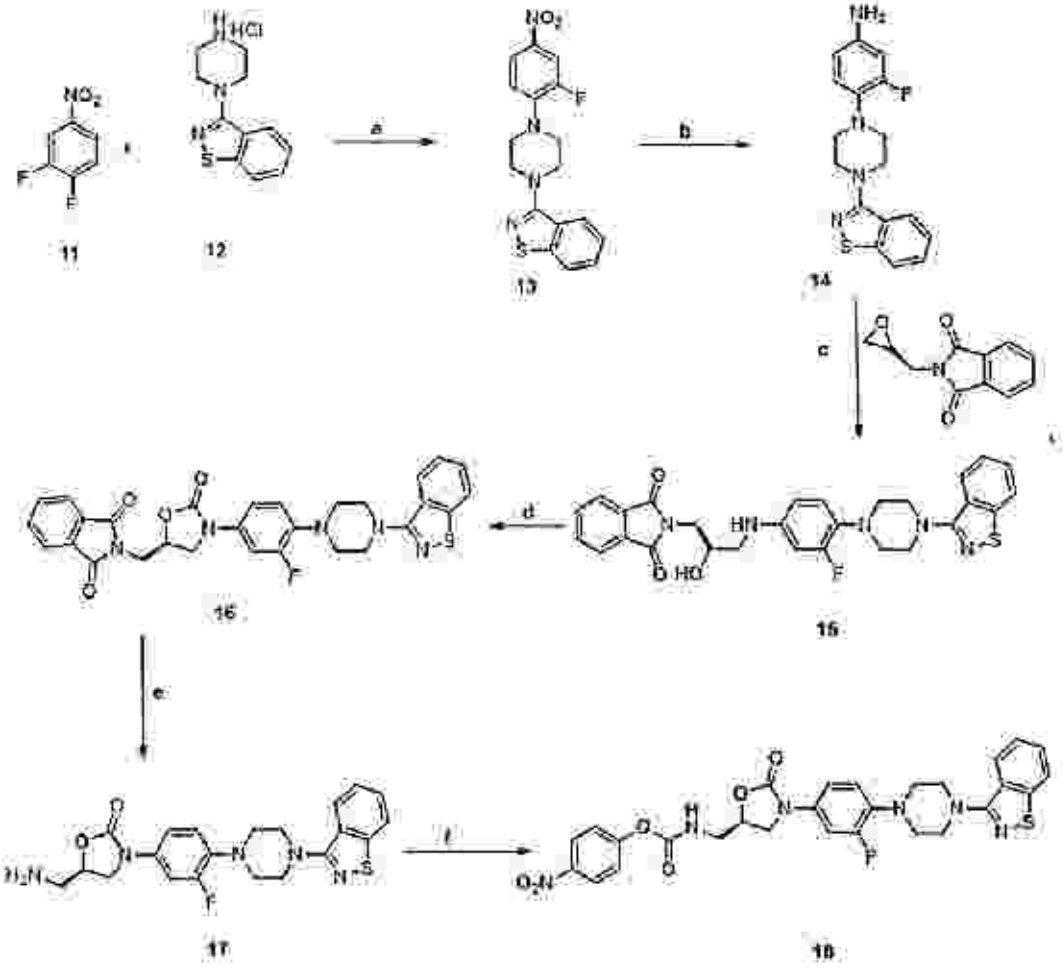


FIGURE 3 Targeted oxazolidinone analogues



SCHEME 1 Reagents and condition: (a) K_2CO_3, CH_3CN, 75–80°C, 6–8 h; (b) Fe/aq. NH_4Cl, ethanol, 75–80°C, 6–8 h; (c) 2-[(2*S*)-oxiran-2-ylmethyl]-1*H*-isoindole-1,3(2*H*)-dione, IPA, 75–80°C, 10–12 h; (d) CDI, K_2CO_3, DCM, 25–30°C, 10–12 h; (e) 60% hydrazine hydrate solution, THF, 25–30°C, 1–2 h; (f) *Bis*-(4-nitrophenyl) carbonate, K_2CO_3, DMF, 50–55°C, 1 h

TABLE 4 Antibacterial activity data of synthesized compounds (19a–o)

Compound	Zone of inhibition (mm)			
	B. subtilis	*S. epidermidis*	*S. aureus*	*S. Pyogens*
19a	11.6 ± 0.5	12.6 ± 0.4	11.8 ± 0.3	13.3 ± 0.7
19b	12.5 ± 0.4	14.4 ± 0.5	12.7 ± 0.2	16.2 ± 0.5
19c	8.3 ± 0.2	11.3 ± 0.7	10.9 ± 0.5	11.4 ± 0.4
19d	9.4 ± 0.6	11.8 ± 0.2	10.3 ± 0.7	12.5 ± 0.3
19e	8.8 ± 0.4	10.2 ± 0.3	9.7 ± 0.2	11.4 ± 0.6
19f	9.6 ± 0.3	11.7 ± 0.5	10.5 ± 0.3	12.2 ± 0.2
19g	9.7 ± 0.3	13.7 ± 0.4	13.1 ± 0.4	14.8 ± 0.2
19h	0.4 ± 0.2	11.5 ± 0.2	11.3 ± 0.7	13.6 ± 0.3
19i	11.1 ± 0.7	13.4 ± 0.6	12.2 ± 0.2	15.6 ± 0.7
19j	10.5 ± 0.3	12.6 ± 0.3	11.5 ± 0.2	14.7 ± 0.2
19k	18.2 ± 0.2	24.6 ± 0.7	23.1 ± 0.2	24.4 ± 0.2
19l	16.4 ± 0.6	21.3 ± 0.2	20.4 ± 0.6	22.6 ± 0.5
19	15.7 ± 0.2	20.2 ± 0.4	18.3 ± 0.4	21.5 ± 0.6
19n	14.4 ± 0.4	18.5 ± 0.3	18.6 ± 0.7	20.3 ± 0.3
19o	13.6 ± 0.6	17.3 ± 0.4	16.2 ± 0.3	19.8 ± 0.4
Linezolid	25.2 ± 0.3	26.3 ± 0.4	25.5 ± 0.2	27.3 ± 0.5

Abbreviation: *B. subtilis*: *Bacillus subtilis* ATCC 6633; *S. aureus*: *Staphylococcus aureus* ATCC 25923; *S. epidermidis*: *Staphylococcus epidermidis* ATCC 12228; *S. pyogens*: *Streptococcus pyogens* ATCC 8668.
The bold value are moderate to good antibacterial activity.

capillary tube on digital melting point apparatus (Sr. No. ZXII-02-332) and were uncorrected. All reactions monitoring and purity of compounds were checked by thin layer chromatography (TLC) using UV light for detection and Iodine (I_2) chamber for visualization. Newly synthesized compounds were purified by using column chromatography which carried out on silica gel (60–120 mesh) and methanol and dichloromethane as solvents system. The NMR was run on a BRUKER AVANCE II 300 MHz spectrometer (δ in ppm relative to Me_4Si) and d_6-DMSO as solvent. Mass spectra were recorded on a Shimadzu Nexara 2020 LC–MS. Infrared spectra were recorded as KBr pellets on Bruker FTIR-TENSOR-II spectrometer.

5.1 | 3-[4-(2-Fluoro-4-nitrophenyl) piperazin-1-yl]-1, 2-benzisothiazole (13)

A mixture of compound **12** (50 g, 0.198 mol) and potassium carbonate (54.61 g, 0.396 mol) in acetonitrile (500 ml) was added to compound **11** (31.48 g, 0.198 mol) then resulting mixture was maintained for 10–12 h at reflux temperature. After ascertaining the completion of reaction by silica gel precoated TLC plates using ethyl acetate-hexane (1:1) as solvent phase, reaction solvent was distilled under reduces pressure to obtain the residue. Purified water (500 ml) was added in residue and mixture was allowed to stir for 30 min. Precipitated crude solid was filtered, followed by washing with purified water. Crude solid was recrystallized using ethanol, furnished yellow colored solid **13**. 96.8 g, Yield: 86%, mp: 105–107°C; IR (KBr): 2925, 1538, 1345 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6): δ 8.14–8.03 (m, 4H, Ar-H), 7.61–7.56 (t, 1H, J = 7.2 Hz, Ar—H), 7.49–7.44 (t, 1H, J = 7.5 Hz, Ar—H), 7.27–7.21 (t, 1H, J = 9 Hz, Ar—H), 3.64–3.63 (d, 4H, J = 3.3 Hz, CH_2-piperazine), 3.54–0.353 (d, 4H, J = 3 Hz, CH_2-piperazine), ^{13}C-NMR (75 MHz, DMSO-d_6) δ: 163.1, 153.7, 152.0, 145.2, 139.6, 127.9, 127.2, 124.4, 124.1, 121.34, 121.31, 121.19, 118.09, 118.0, 112.4, 112.1 ppm; ESI-MS, m/z calculated for $C_{17}H_{15}FN_4O_2S$, 358.3, found $[M + H]^+$ 359.

5.2 | 4-[4-(1,2-Benzisothiazol-3-yl) piperazin-1-yl]-3-fluoroaniline (14)

A mixture of compound **13** (50 g, 0.139 mol), iron (78.2 g, 1.396 mol) and aqueous solution of ammonium chloride (74.7 g, 1.396 mol) in ethanol (800 ml) was micro refluxed up to completion of reaction. After completion of reaction hot reaction mass filtered through hyflow bed and filtrate was concentrated to obtain the solid. Purified water (250 ml) was added to the obtained solid and pH of

5.6 | (S)-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-carbamic acid-4-nitro-phenyl ester (18)

A mixture of compound **17** (2 g, 0.0046 mol) and potassium carbonate (0.97 g, 0.0070 mol) in DMF (20 ml) stirred for 10 min at 25–30°C. *bis*-(4-nitrophenyl) carbonate (1.6 g, 0.0051 mol) was charged and resulting solution was heated at 50–55°C for 1 h. After completion of reaction, reaction mixture was allowed to cool at 25–30°C and then poured onto crushed ice water. Precipitated solid was stirred for 30–45 min and filtered, washed with purified water (20 ml). Obtained crude solid was purified by using column chromatography (60–120 mesh), in methanol-dichloromethane as solvent; a light yellow solid **18**, 2.23 g, Yield 80%; mp: 135–137°C; IR (KBr): 2950, 1730, 1550, 1347, 1509 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.50–8.46 (t, 1H, J = 5.7 Hz, Ar—H), 8.28–8.25 (d, 2H, J = 9 Hz, Ar—H nitro), 8.12–8.07 (t, 2H, J = 7.2 Hz, Ar—H), 7.60–7.52 (m, 2H, Ar—H), 7.48–7.43 (t, 1H, Ar—H), 7.40–7.37 (d, 2H, J = 9.2 Hz, Ar—H nitro), 7.20–7.23 (m, 1H, Ar—H), 7.19–7.13 (t, 1H, Ar—H), 4.84–4.78 (m, 1H, CH-oxazolidinone ring), 4.20–4.14 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone ring), 3.86–3.81 (dd, 1H, diastereotopic proton-oxazolidinone ring), 3.62 (s, 4H, CH_2-piperazine), 3.49–3.46 (t, 2H, J = 5.1 Hz, CH_2-alkyl), 3.22 (s, 4H, CH_2-piperazine). ESI-MS, *m/z* calculated for $C_{28}H_{25}FN_6O_6S$, 592.59, found $[M]^+$ 592.

6 | GENERAL PROCEDURE FOR SYNTHESIS OF UREA DERIVATIVES (19A–O)

To a well-stirred solution of compound **18** (0.00084 mol) and potassium carbonate (0.0016 mol) in DMF (15 ml) was added aliphatic/aryl amine (0.0016 mol) at 25–30°C. Resulting reaction mixture was heated at 60–65°C for 5–6 h. Progress of reaction was monitored on TLC. After ascertaining the completion of reaction by silica gel precoated TLC plates using methanol-dichloromethane (1:9) as solvent phase, reaction mixture was allowed to attain room temperature and poured onto crushed ice water. Resulting precipitated solid was filtered and wash with purified water. Obtained crude solid was purified by column chromatography 60–120 mesh silica gel using methanol-dichloromethane as solvents, to afford the pure compounds **19a-o**. Physicochemical and analytical data of the compounds (**19a-o**) are described in Table 2.

6.1 | (S)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-phenyl-urea (19a)

White solid, 0.26 g, Yield: 65%; mp: 234–236°C; IR (KBr): 3314, 2940, 1754 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.58 (s, 1H, —NH-urea), 8.11–8.07 (t, 2H, J = 7.2 Hz, Ar—H), 7.60–7.52 (m, 2H, Ar—H), 7.38–7.36 (m, 3H, J = 7.8 Hz, Ar—H), 7.24–7.10 (m, 4H, Ar—H), 6.92–6.87 (t, 1H, J = 7.2 Hz, Ar—H), 6.51–6.47 (t, 1H, J = 5.7 Hz, Ar—H), 4.80–4.78 (m, 1H, CH-oxazolidinone), 4.16–4.10 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone), 3.80–3.74 (dd, 1H, diastereotopic proton-oxazolidinone), 3.61 (s, 4H, CH_2-piperazine), 3.47 (d, 2H, CH_2-alkyl), 3.21 (s, 4H, CH_2-piperazine). ESI-MS, *m/z* calculated for $C_{28}H_{25}FN_6O_3S$, 546.61, found $[M + NH_4]^+$ 564.

6.2 | (S)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-(4-iodo-phenyl)-urea (19b)

Off-white solid; 0.39 g, Yield: 70%; mp: 237–239°C; IR (KBr): 3320, 2950,1750, 1719 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.70 (s, 1H, —NH-urea), 8.10–8.05 (t, 2H, Ar—H), 7.58–7.49 (m, 3H, Ar—H), 7.43–7.33 (m, 4H, Ar—H), 7.20–7.13 (t, 1H, Ar—H), 7.10–7.12 (t, 1H, Ar—H), 6.57–6.53 (t, 1H, Ar—H), 4.75–4.70 (m, 1H, CH-oxazolidinone ring), 4.10–4.06 (t, 1H, J = 8.5 Hz, diastereotopic proton-oxazolidinone ring), 3.70–3.65 (m, 1H, diastereotopic proton-oxazolidinone ring), 3.58 (s, 4H, CH_2-piperazine), 3.40–3.35 (t, 2H, CH_2-alkyl), 3.18 (s, 4H, CH_2-piperazine). ESI-MS, *m/z* calculated for $C_{28}H_{26}IN_6O_3S$, 672.51, found $[M + ACN + H]^+$ 715.

6.3 | (S)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-(4-bromo-phenyl)-urea (19c)

White solid; 0.39 g, Yield: 75%; mp: 229–231°C; IR (KBr): 3325, 3035,1745,1715 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.74 (s, 1H, -NH-urea), 8.11–8.07 (t, 2H, J = 6.9 Hz, Ar—H), 7.60–7.55 (m, 2H, Ar—H),7.55–7.51 (d, 2H, J = 2.6 Hz, Ar—H), 7.48–7.33 (m, 4H, Ar—H), 7.24–7.20 (t, 1H, Ar—H), 7.15–7.09 (t, 1H, Ar—H), 6.57–6.53 (t, 1H, J = 5.7 Hz, Ar—H), 4.80–4.74 (m, 1H, CH-oxazolidinone ring), 4.16–4.10 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone ring), 3.80–3.75 (dd, 1H, diastereotopic proton-oxazolidinone ring), 3.61 (s, 4H, CH_2-piperazine),

6.7 | (S)-moprpholine-4-carboxylicacid-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluorophenyl]-2-oxo-oxazolidin-5-ylmetyl}-amide (19g)

White solid, 0.40 g, Yield: 88%, mp: 94–96°C; IR (KBr) 2991, 1715, 1242 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.12–8.07 (t, 2H, J = 7.5 Hz, —NH-urea), 7.60–7.43 (m, 3H, Ar—H), 7.24–7.12 (m, 2H, Ar—H), 6.94–6.90 (t, 1H, J = 5.4 Hz, Ar—H), 4.74–4.69 (m, 1H, CH-oxazolidinone ring), 4.12–4.06 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone ring), 3.83–3.78 (dd, 1H, diastereotopic proton-oxazolidinone ring), 3.61 (s, 4H, CH_2-morprpholine), 3.51–3.48 (t, 4H, J = 4.8 Hz, CH_2-alkyl), 3.41–3.39 (d, 2H, CH_2-alkyl), 3.26–3.23 (m, 8H, CH_2-piperazine and morpholine); ESI-MS, m/z calculated for $C_{26}H_{29}FN_6O_4S$, 540.60, found $[M + NH_4]^+$ 555.

6.8 | (S)-piperidine-1-carboxylicacid-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-amide (19h)

Light cream solid; 0.41 g, Yield: 90%; mp: 89–91°C; IR (KBr): 3000, 1738, 1201 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.12–8.07 (t, 2H, J = 7.5 Hz, —NH-urea and Ar—H), 7.60–7.43 (m, 3H, Ar—H), 7.23–7.11 (m, 2H, Ar—H), 6.80–6.77 (t, 1H, J = 5.9 Hz, Ar—H), 4.73–4.67 (m, 1H, CH-oxazolidinone ring), 4.11–4.05 (t, 1H, J = 8.7 Hz, diastereotopic proton-oxazolidinone ring), 3.86–3.81 (dd, 1H, diastereotopic proton-oxazolidinone ring), 3.61 (s, 4H, CH_2-piperidine), 3.46–3.22 (m, 1H, CH-piperidine), 1.48–1.46 (m, 2H, CH_2-piperidine), 1.35–1.34 (m, 4H, CH_2-piperidine); ESI-MS, m/z calculated for $C_{27}H_{31}FN_6O_3S$, 539.63, found $[M + H]^+$ 540.

6.9 | (S)-1-[3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-ethyl-urea (19i)

Light cream solid, 0.35 g, Yield: 85%; mp: 205–207°C; IR (KBr) 3307, 2930, 1735 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.12–8.07 (t, 2H, J = 7.5 Hz, —NH-urea and Ar—H), 7.60–7.43 (m, 3H, Ar—H), 7.23–7.11 (m, 2H, Ar—H), 6.19–6.17 (t, 1H, J = 5.1 Hz, Ar—H), 5.96–5.93 (t, 1H, J = 5.1 Hz, —NH-urea), 4.70–4.68 (m, 1H, CH-oxazolidinone ring), 4.11–4.05 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone ring), 3.76–3.71 (t, 1H, J = 6 Hz, diastereotopic proton-oxazolidinone ring), 3.62 (s, 4H, CH_2-piperazine), 3.35 (s, 2H, CH_2-alkyl), 3.21 (s, 4H, CH_2-piperazine), 3.04–2.95 (m, 2H, CH_2-alkyl), 0.97–0.92 (t, 3H, J = 7.2 Hz, CH_3-alkyl); ESI-MS, m/z calculated for $C_{24}H_{27}FN_6O_3S$, 498.57, found $[M + Na]$ 521.

6.10 | (S)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-butyl-urea (19j)

White solid; 0.39 g, Yield: 90%; mp: 199–201°C; IR (KBr): 3325, 3112, 1690, 1210 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.32–8.23 (t, 2H, J = 7.8 Hz, —NH-urea and Ar—H), 7.60–7.43 (m, 3H, Ar—H), 7.23–7.11 (m, 2H, Ar—H), 6.47–6.49 (t, 1H, J = 5.5 Hz, Ar—H), 6.12–6.18 (t, 1H, J = 5.1 Hz, —NH-urea), 4.93–4.98 (m, 1H, CH-oxazolidinone ring), 4.11–4.05 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone ring), 3.76–3.71 (t, 1H, J = 8 Hz, diastereotopic proton-oxazolidinone ring), 3.62 (s, 4H, CH_2-piperazine), 3.35 (s, 2H, CH_2-alkyl), 3.21 (s, 4H, CH_2-piperazine), 3.04–2.95 (m, 2H, CH_2-alkyl), 1.65–1.69 (m, 4H, CH_2-alkyl), 0.87–0.90 (t, 3H, J = 7.2 Hz, CH_3-alkyl); ESI-MS, m/z calculated for $C_{26}H_{31}FN_6O_3S$, 526.62, found $[M + H]^+$ 527.

6.11 | (S)-1-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-3-methyl-urea (19k)

Light yellow solid; 0.29 g, Yield: 72%; mp: 206–208°C; IR (KBr): 3290, 2964, 1780 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.02–8 (t, 2H, J = 7.5 Hz, —NH-urea and Ar—H), 7.60–7.43 (m, 3H, Ar—H), 7.23–7.11 (m, 2H, Ar—H), 5.95–5.98 (t, 1H, J = 5.1 Hz, Ar—H), 5.75–5.7 (t, 1H, J = 5.1 Hz, —NH-urea), 4.70–4.68 (m, 1H, CH-oxazolidinone ring), 4.11–4.05 (t, 1H, J = 9 Hz, diastereotopic proton-oxazolidinone ring), 3.76–3.71 (t, 1H, J = 6 Hz, diastereotopic proton-oxazolidinone ring), 3.62 (s, 4H, CH_2-piperazine), 3.35 (s, 2H, CH_2-alkyl), 3.21 (s, 4H, CH_2-piperazine), 1.23 (s, 3H, CH_3-alkyl); ESI-MS, m/z calculated for $C_{23}H_{25}FN_6O_3S$, 484.54 found $[M - H]^+$ 485.

6.12 | (S)-3-{3-[4-(4-benzo[d]isothiazol-3-yl-piperazin-1-yl)-3-fluoro-phenyl]-2-oxo-oxazolidin-5-ylmetyl}-1,1-dimetyl-urea (19l)

White solid; 0.35 g, Yield: 80%; mp: 214–216°C; IR (KBr): 3117, 2980, 2934, 2854, 1676 cm^{-1}; ^{1}H-NMR (300 MHz, DMSO-d_6) δ: 8.12–8.09 (t, 1H, J = 7.5 Hz, —NH-urea), 7.61–7.43 (m, 3H, Ar—H), 7.24–7.11 (m, 2H, Ar—H), 6.67–6.63 (t, 1H, J = 5.7 Hz, Ar—H), 4.72–4.65 (m, 1H, CH-oxazolidinone ring), 4.11–4.05 (t, 1H, J = 9 Hz,

[20] E. Krawczyk, M. Wysocka, R. Kotłowski, M. Bronk, M. Michalik, A. Samet, *PLoS One* **2020**, *15*, e0233501.
[21] H. Y. Kang, D. C. Moon, A. F. Mechesso, J. H. Choi, S. J. Kim, H. J. Song, M. H. Kim, S. S. Yoon, S. K. Lim, *Antibiotics* **2020**, *9*, 769.
[22] S. Samantaray, A. C. Deepashree, A. S. Anitha, *Indian J. Microbiol.* **2020**, *7*, 99.
[23] Y.-F. Zhou, L. Li, M.-T. Tao, J. Sun, X.-P. Liao, Y.-H. Liu, Y. Q. Xiong, *Front. Microbiol.* **2020**, *101*, 1.
[24] F. Shirvani, A. S. Dastuti, K. Seifi, *Arch. Pediatr. Infect. Dis.* **2018**, *6*, e12336.
[25] V. Gupta, N. Gulati, S. Sharma, R. Gupta, A. Soni, J. Chander, *Infect. Disord. Drug Targets.* **2020**, *20*, 713.
[26] S. A. Egan, S. Corcoran, H. McDermott, M. Fitzpatrick, A. Heyne, O. McCormack, A. Cullen, G. T. Brennan, B. O'Connell, D. C. Coleman, *J. Hosp. Infect.* **2020**, *105*, 726.
[27] M. Niebel, M. Peters, T. Shah, R. Muruganayagam, K. Martin, B. Oppenheim, M. David, *Liver Transpl.* **2016**, *22*, 201.
[28] D. N. Wilson, *Nat. Rev. Microbiol.* **2014**, *12*, 35.
[29] G. R. Jadhav, D. G. Deshmukh, V. J. Medhane, V. B. Gaikwad, A. D. Bholay, *Heterocycl. Commun.* **2016**, *22*, 121.

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Accelerated expansion of the Universe With Wet Dark Fluid In $f(T)$ Theory of Gravity

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Abstract:

In this paper we have investigated spatially homogeneous Bianchi type-I (LRS) space-time filled with wet dark fluid (WDF), which is a candidate for dark energy in the framework of $f(T)$ gravity. The equation of state model on $p=\omega(\rho-\rho^{*})$ in the form of wet dark fluid for the dark energy component of the universe. Solutions to the corresponding field equations are obtained for power law. The geometrical and physical parameters of the derived model are studied.

Keywords:

Bianchi-I, Teleparallel gravity, WDF, dark energy

1. Introduction:

The $f(T)$ theory is an expansion of teleparallel theory of gravity, where T is torsion scalar. The $f(T)$ theory of gravity uses the weitzenbök connections which has no curvature but only torsion. Here torsion is answerable for accelerated expansion of the universe and is formed using four parallel vector fields. A significant advantage of this theory is that its field equations are second order and hence easy to handle as compare to fourth order equation of $f(R)$ theory. The Universe is undergoing accelerated expansion [1–6] as through an experiment evidenced by current remarks. Dark energy (DE) with a negative pressure is may be well-thought-out as the foremost cause of accelerated expansion behaviour of the universe. In interpretation of the late time acceleration of the Universe and the presence of dark energy and dark matter, numerous modified theories of gravity have been established and considered. The new theories of gravity $f(R)$, $f(R,T)$, $f(G)$ and $f(T)$ are recently developed. $f(T)$ theory has motivating features as it enlightens the current acceleration without linking dark energy. Ferraro & Fiorini [7] examined models based on

modified TG to inflation. In $f(T)$ gravity, the Teleparallel Lagrangian density described by the function of the torsion scalar T in order to account for the late time cosmic acceleration [8-11]. Jamil and his collaborators [12] explored the Dark Matter (DM) problem in $f(T)$ gravity. In Ref. [13], the authors inspected particle creation in the context of $f(T)$ gravity. $f(T)$ gravity has been broadly considered in the literature by several eminent researchers [14-21]. Motivated by above investigations, the paper deals with the investigations of Wet dark fluid for a linearly varying deceleration parameter of $f(T)$ model by using spatially homogeneous and anisotropic Bianchi type-I (LRS) space-time.

2. Wet Dark Fluid:

Wet dark fluid is a new candidate for dark energy in the spirit of generalized chaplygin gas, where a physically motivated equation of state is offered with the properties relevant for a dark energy problem. The equation of state for a wet dark fluid is $\frac{p_{WDF}}{\omega}+\rho^{*}=\rho_{WDF}$. The parameter ω and ρ^{*} are taken to be positive and we restrict ourselves $0\le\omega\le 1$. Note that if c_s denotes the adiabatic sound speed in wet dark fluid, then $c_s^2=\partial p/\partial\rho\ge 0$.

The energy conservation equation $\dot{\rho}_{WDF}+3H(p_{WDF}+\rho_{WDF})=0$. Using $3H=\frac{\dot{V}}{V}$, we get $p_{WDF}=\left(\frac{\omega}{1+\omega}\right)\rho^{*}+\frac{c}{V^{(1+\omega)}}$, where c is the constant of integration and V is the volume expansion. If we take $c>0$, this fluid will not violate the strong energy condition $p+\rho\ge 0$. Thus, we get $p_{WDF}+\rho_{WDF}=(1+\omega)\rho_{WDF}-\omega\rho^{*}-(1+\omega)\left(\frac{c}{V^{(1+\omega)}}\right)\ge 0$.

The wet dark fluid has been used as dark energy in the homogeneous, isotropic FRW case by Holman and Naidu [22]. Singh and Chanbey [23] examined Bianchi type-I universe filled with dark energy in the form of wet dark fluid. The author in Ref. [24] explored the panoramic scenario of wet dark fluid. Several Relativists [25-37] considered cosmological models with WDF in General Relativity and theories of gravitations.

3. $f(T)$ gravity, field equations and some physical quantities

We define the action by generalizing the TG i.e. $f(T)$ theory as

$$S=\int\left[T+f(T)+L_{matter}\right]e\,d^{4}x \quad . \tag{1}$$

Here, $f(T)$ denotes an algebraic function of the torsion scalar T. Making the functional variation of the action (1) with respect to the tetrads, we get the following equations of motion

$$S_{\mu}^{\nu\rho}\partial_{\rho}T_{(1)}+\left[e^{-1}e_{\mu}^{\lambda}\partial_{\rho}\left(ee_{i}^{\alpha}S_{\alpha}^{\nu\rho}\right)+T^{\alpha}{}_{\mu\lambda}S_{\alpha}^{\nu\rho}\right](1+f_{T})+\frac{1}{4}\delta_{\mu}^{\nu}(T+f)=4\pi(T_{\mu}^{\nu}+\bar{T}_{\mu}^{\nu}). \tag{2}$$

where T^{ν}_{μ} is the energy momentum tensor, $f_T = df(T)/dT$ and by setting $f(T) = a_0$ =constant this is dynamically equivalent to the GR. We consider spatially homogeneous and anisotropic Bianchi type-I (LRS) space-time of the form

$$ds^2 = dt^2 - A^2(t)dx^2 - B^2(t)\left[dy^2 + dz^2\right], \tag{3}$$

where A and B be the metric potential which is the functions of cosmic time t only.

The corresponding Torsion scalar is given by $T = -2\left(2\frac{\dot{A}}{A}\frac{\dot{B}}{B} + \frac{\dot{B}^2}{B^2}\right)$. Let us consider that the matter content is dark energy in the form of wet dark fluid such that the energy momentum tensor T^{ν}_{μ} given by $T^{\nu}_{\mu} = (\rho_{wdf} + p_{wdf})u^{\nu}u_{\mu} - p_{wdf}\,g^{\nu}_{\mu}$, together with commoving coordinates $u^{\nu} = (0,0,0,1)$ and $u^{\nu}u_{\nu} = 1$, where u^{ν} is the four-velocity vector of the fluid. p and ρ be the pressure and energy density of the fluid respectively. The field equations can be written as

$$(T + f) + 4(1 + f_T)\left\{\frac{\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} + \frac{\dot{A}}{A}\frac{\dot{B}}{B}\right\} + 4\frac{\dot{B}}{B}\dot{T}f_{TT} = k^2(-p_{wdf}), \tag{4}$$

$$(T + f) + 2(1 + f_T)\left\{\frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} + 3\frac{\dot{A}}{A}\frac{\dot{B}}{B}\right\} + 2\left\{\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right\}\dot{T}f_{TT} = k^2(-p_{wdf}), \tag{5}$$

$$(T + f) + 4(1 + f_T)\left\{\frac{\dot{B}^2}{B^2} + 2\frac{\dot{A}}{A}\frac{\dot{B}}{B}\right\} = k^2(\rho_{wdf}). \tag{6}$$

where the dot $(\cdot)$ denotes the derivative with respect to time t. Here we have three differential equations with five unknowns namely $A, B, f, p_{wdf}, \rho_{wdf}$. The relation between average scale factor and volume is given by $V = a^3 = \sqrt{AB^2}$. The deceleration parameter is $q = -1 + \frac{d}{dt}\left(\frac{1}{H}\right)$, for $-1 \le q < 0$, $q > 0$ and $q = 0$ the universe exhibit accelerating volumetric expansion, decelerating volumetric expansion and expansion with constant-rate respectively. The mean Hubble parameter, which expresses the volumetric expansion rate of the universe, given as

$H = \frac{1}{3}(H_1 + H_2 + H_3)$, where H_1, H_2, H_3 are the directional Hubble parameter in the direction of x, y and z-axis respectively. Thus, we have $H = \frac{1}{3}\frac{\dot{V}}{V} = \frac{1}{3}(H_1 + H_2 + H_3) = \frac{a}{a}$. We define an anisotropy parameter, expansion scalar and shear scalar as $A_m = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2$,

$\theta = u^{\mu}_{;\mu} = \frac{\dot{A}}{A} + 2\frac{\dot{B}}{B}$, $\sigma^2 = \frac{3}{2}H^2 A_m$.

4. Law of Variation for Hubble's parameter and solution of field equations:

Akarsu and Dereliwe [38] proposed a linearly varying deceleration parameter of the form $q=-\frac{a\ddot{a}}{\dot{a}^2}=-kt+m$, (7)

where $k\geq 0$ and $m\geq 0$ are constant. Solving (7) one obtains different form of solutions for the scale factor:

$a=a_1(mt+m_1)^{\frac{1}{m}}$, for $k=0$ and $m>0$, (8)

$a=a_2e^{m_2t}$, for $k=0$ and $m=0$, (9)

where a_1, a_2, m_1, m_2 are the constants of integration.

Using equations (4) and (5), we get $\frac{d}{dt}\left(\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right)+\left(\frac{\dot{A}}{A}-\frac{\dot{B}}{B}\right)\frac{\dot{V}}{V}=0$, which on integration gives

$$\frac{A}{B}=k_2\exp\left[k_1\int\frac{dt}{V}\right], \tag{10}$$

where k_1 and k_2 are constants of integration. In view of $V=AB^2=a^3$, we write A and B in the explicit form as

$$A=D_1V^{\frac{1}{3}}\exp\left(\chi_1\int\frac{1}{V}dt\right), \tag{11}$$

$$B=D_2V^{\frac{1}{3}}\exp\left(\chi_2\int\frac{1}{V}dt\right), \tag{12}$$

where $D_i(i=1,2)$ and $\chi_i(i=1,2)$ satisfy the relation $D_1D_2^2=1$ and $\chi_1+2\chi_2=0$.

5. Model for $k=0$ and $m>0$

We get the following expressions for metric potentials:

$$A=D_1a_1(mt+m_1)^{\frac{1}{m}}\exp\left(\frac{\chi_1}{a_1^3}\int\frac{1}{(mt+m_1)^{\frac{3}{m}}}dt\right), \tag{13}$$

$$B=D_2a_1(mt+m_1)^{\frac{1}{m}}\exp\left(\frac{\chi_2}{a_1^3}\int\frac{1}{(mt+m_1)^{\frac{3}{m}}}dt\right), \tag{14}$$

Using metric potentials, the model can be written as

$$ds^2=dt^2-(D_1a_1)^2(mt+m_1)^{\frac{2}{m}}\exp\left(\frac{2\chi_1(mt+m_1)^{\frac{m-3}{m}}}{ma_1(m-3)}\right)dx^2$$
$$-(D_2a_1)^2(mt+m_1)^{\frac{2}{m}}\exp\left(\frac{2\chi_2(mt+m_1)^{\frac{m-3}{m}}}{ma_1(m-3)}\right)\left[dy^2+dz^2\right] \tag{15}$$

We obtain the expressions for pressure and energy density as

$$\rho_{MDF} = \left(\frac{\omega}{1+\omega}\right)\rho^* + \frac{c}{a_1^3(mt+m_1)^{\frac{3(1+\omega)}{m}}}, \quad m \neq -1 \tag{16}$$

and

$$p_{MDF} = \frac{c\omega}{a_1^3(mt+m_1)^{\frac{3(1+\omega)}{m}}} - \left(\frac{\omega}{1+\omega}\right)\rho^*. \tag{17}$$

The scalar expansion, shear scalar, the average anisotropy parameter and deceleration parameter are obtained as

$$\theta = \frac{3}{(mt+m_1)}, \sigma^2 = \frac{(\chi_1^2+2\chi_2^2)}{18a_1^2}(mt+m_1)^{\frac{2}{3}(m-6)}, A_m = \frac{(\chi_1^2+2\chi_2^2)}{27a_1^2}(mt+m_1)^{\frac{2}{3}(m-9)}.$$

The average generalized Hubble's parameter and deceleration parameter are given by

$$H = \frac{1}{(mt+m_1)}$$

$$q = -1+m$$

6. Discussion and Concluding Remarks:

In this paper we have obtained some exact Bianchi type-I space-time in $f(T)$ theory of gravitation with wet dark fluid. It can be seen that the spatial volume is constant at $t=0$ if $m_1 > 0$ and zero if $m_1 = 0$ and expands with cosmic time. In derived model, the energy density and pressure tend to infinity at $t=0$. The energy density and pressure become zero as $t \to \infty$ [39-40]. The model has the point-type singularity at $t=0$. The rate of the expansion, the mean anisotropy parameter for $m<3$ and shear scalar all diverse at $t=0$. As $t \to \infty$, the scale factors A and B tend to infinity. The expansion scalar, mean anisotropy parameter and shear scalar all tend to zero as $t \to \infty$ (for $m<3$). The isotropy condition $\frac{\sigma^2}{\theta^2} \to$ constant satisfied at infinite expansion, this indicates that after a large time the expansion will stop completely and approaches to Isotropy in singular model. The model represents an accelerated universe. Therefore, the model is consistent with the cosmological observations [41-42].

References:

1. S Perlmutter et al, Astrophys. J. 517, 565 (1999)
2. G Fedeli, L Moscardini and M Bartelmann, Astron. Astrophys. 500, 667 (2009)
3. Z Y Huang, B Wang, E Abdalla and R K Sul, J. Cosmol. Astropart. Phys. 13, 0605 (2006)
4. R R Caldwell and M Doran, Phys. Rev. D 69, 103517 (2004)
5. S F Daniel, Phys. Rev. D 77, 103513 (2008)
6. R. Ferraro & F. Fiorini: Phys. Rev. D. 75, 084031(2007)

7. G.R.Bengochea and R. Ferraro: Phys. Rev. D79, 124019(2009).

8. K.Bamba , C.Q.Geng and C.C.Lee: arXiv: [astro-ph.] 1008.4036 (2010).

9. K. Bamba, C.Q. Geng: JCAP 11, 008 (2011).

10. R. Myrzakulov :Eur. Phys. J. C. 71 ,1752, (2011).

11. M. Jamil, D. Momeni, and R. Myrzakulov, Eur. Phys. J. C 72, 2122 (2012).

12. M. Sotare and M. Houndjo, Can. J. Phys. 91, 168 (2013).

13. M.E.Rodrigues,A.V.Kpadonou,F.Rahaman,P.J.Oliveira andM.J.S. Houndjo : arXiv:1408.2689v1 [gr-qc] (2014)

14. M. Jamil and M. Yussouf : arXiv:1502.00777v1 [gr-qc] (2015).

15. G. Abbas, A.Kanwal, M. Zubair: Astrophys Space Sci ,357:109(2015).

16. M. Khurshudyan, R. Myrzakulov and As. Khurshudyan: Modern Physics Letters A Vol. 32, No. 18, 1750097 (2017).

17. M.Hohmann, L.Järv, and U.Ualikhanova: Phys. Rev. D 96, 043508 (2017)

18 S. Capozziello, G. Lambiase,and E. N. Saridakis: Eur Phys J C Part Fields. 77(9): 576(2017).

19. P.Channuie and D.Momeni: arXiv:1712.07927v2 [gr-qc] (2018)

20. A.V. Toporensky, Petr V. Tretyakov: arXiv1911.06064v1 (2019)

21. Holman, R. ; Naidu, S.: arXiv:astro-ph/0408102 (2005)

22. Singh, T., Chaubey,R.:Pramana J. Phys. 71,447-458(2008)

23. Chaubey,R.:Astrophys Space Sci : 321:241-246 (2009)

24. Adhv et.al. : Int. J Theor. Phys. (2010)DOI 10.1007/s 10773-010-0530-z.

25. Katore,S. D.,Shaikh, A.Y., Sancheti, M. M. & Bhaskar, S. A.: Prespacetime Journal , 2(1) , 16-32 (2011)

26. Katore, S. D., A. Shaikh, A. Y., & Bhaskar, S. A.,: Prespacetime Journal , 2(8).1232-1245(2011).

27. S. D. Katore, A. Y. Shaikh, S. A. Bhaskar and G. B. Tayade: The African Review of Physics (2012) 7:0035.

28. Mishra and Sahoo : Journal of Theoretical and Applied Physics 2013, 7:36.

29. K. S. Adhav, M. V. Dawande, R G Deshmukh: International Journal of Theoretical and Mathematical Physics 2013, 3(5): 139-146.DOI: 10.5923/j.ijtmp.20130305.02

30. Jain, P., et al.: Int. J. Theor. Phys. 51, 2546 (2012).

31. Samanta, G. C. :Int. J. Theor. Phys.:DOI:10.1007/s10773-013-1513-7(2013).

32. Mishra, B., Sahoo, P. 2014a, Astrophys. Space Sci., doi: 10.1007/s10509-014-1914-y.

33. Mishra, B., Sahoo, P. 2014b, Astro. Space Sci., 349, 491,doi: 10.1007/s10509-013-1652-6.

34. Deo et. al.: International Journal of Mathematical Archive-7(3), 2016, 113-118.

35. Mete, V. G., Mule, K. R. and Elkar, V. D.: International Journal of Current Research, 8, (11), 41464(2016).

36. A.Y.Shaikh: Carib.j.SciTech, 2016, Vol.4, 983-991

37. Ozgur Akarsu and Tekin Dereli. Int. J. of Theor. Phy. 51 612 (2012).

38. A.Y.Shaikh ,S.D. Katore :Pramana J. Phys., 87, 83(2016)

39. A.Y.Shaikh ,S.D. Katore : Pramana J. Phys., 87, 88(2016)

40. A.Y.Shaikh,S.V.Gore,S.D.Katore: New Astronomy 80, 101420(2020).

41. A.Y.Shaikh and B.Mishra : Int. Jou. of Geom.Methods in Modern Physics (2020).Doi.org/10.1142/S0219887820501583.

Magnetized Bianchi Type-III Perfect Fluid Cosmological Model in Brans-Dicke Theory of Gravitation

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Abstract:

In this paper, we investigate the role of relativistic charged perfect fluid in Bianchi type-III cosmological model in Brans-Dicke theory of gravitation. Solutions of the models are obtained by volumetric exponential expansion, power law expansion and power law relation between scalar field ϕ and the scale factor a. Some physical and kinematical properties of the model are also discussed

Keywords: *Bianchi type-III universe, Brans-Dicke theory of gravitation, electromagnetic field, perfect fluid, constant vector potentials*

I. Introduction:

Brans and Dicke (BD) theory of gravitation is a well-known modified version of Einstein's theory. (Brans and Dicke 1961) formulated a theory of gravitation in which, besides a gravitational part, a dynamical scalar field is introduced to account for variable gravitational constant and to incorporate Mach's [1]Principle in Einstein's theory. In this theory, the scalar field has the dimension of the universe of a gravitational constant and its role is confined to its effect on gravitational field equations.[2] BD scalar-tensor theory of gravitation is quite important in view of the fact that scalar fields play a vital role in inflationary cosmology. In recent years, there has been a renewed interest of the gravitational constant.[3] The latest inflationary models (Mathiazhagan and Johri 1984),possible "graceful exit" problem (Pimental 1997) and extended chaotic inflations (Linde 1990) are based on BD theory of gravitation.[4-6]

The scalar-tensor theories have been subject of considerable interest in the study of various cosmological models due to their relevance for the inflationary expansion of the universe and to solve many outstanding problems in cosmology. Several aspects of BD cosmology have been extensively investigated by[7] many authors. Bardeen et al. (1983) explored the inflationary universe models which provide a mechanism for galaxy formation by generating small scale density fluctuation in the universe, Banerjee et al.(1990) studied Bianchi type-I string cosmological models with and without a source-free magnetic field. Johri and Desikan (1994) have investigated cosmological models with constant deceleration parameter in Nordtvedt's theory.[8] Bianchi type-III cosmological model with a negative constant deceleration parameter in BD theory of gravity in presence of perfect fluid has been studied by Adhav et al.(2012), Katore et al. (2012) explored plane symmetric space-time filled with dark energy models in BD theory, Bhoyar et al. (2018) studied Bianchi type-III and Kantowski Sachs cosmological models containing magnetic field with variable cosmological constant. [9-11]

Lorenz-Petzold (1982), Kumar et al. (2008), Pawar et al. (2009), Rao et al.(2011), Naidu et al.(2012), Kandalkar et al. (2014),Mete et al. (2018), are some of the authors who have investigated several aspects of BD theory of gravitation.[12-15]

Tikekar and Patel (1992) have obtained some exact Bianchi type-III cosmological solutions of massive string in the presence of magnetic field.[16] Singh and Shri Ram (1996) have presented a technique to generate new exact Bianchi type-II cosmological solutions of massive strings in the presence and absence of the magnetic field. Tripathy et al. (2009) and Pradhan (2007) studied string cosmological models in the presence of the electromagnetic field.[17-20] A detailed discussion of BD cosmology is given by Singh et al. (2010).Singh J. K and Sharma N. K (2010a) have investigated some Bianchi type-II cosmological models in BD theory,

Shamir et al. (2012) explored anisotropic dark energy Bianchi type-III cosmological models in BD theory of gravity, Solanke and Kamde (2016,2017) have investigated Bianchi type-I and III universe[21] field with perfect fluid and scalar field coupled with electromagnetic fields in theory of gravity. Recently Katore et al. (2018) have investigated Bianchi type-I dark energy cosmological model with power-law relation in BD theory of gravitation.[22-25]

In this paper, we discuss Bianchi type-III perfect fluid cosmological model with electromagnetic field in BD theory of gravitation.

2. The Metric And Field Equation:

We consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2dx^2 + B^2e^{-2mx}dy^2 + C^2dz^2, \qquad (1)$$

where A, B and C are functions of t and m is a constant.

Brans-Dicke field equations for the combined scalar and tensor fields are

$$G_j^i = \frac{-8\pi}{\phi}T_j^i - \frac{\omega}{\phi^2}\left(g^{ik}\phi_{,j}\phi^{,l} - \frac{1}{2}g_j^i\phi_{,l}\phi^{,l}\right) - \frac{1}{\phi}\left(g^{ik}\phi_{;jk} - g_j^i\phi_{;k}^{;k}\right), \qquad (2)$$

where G_j^i is Einstein's tensor, ϕ is a dimensionless coupling constant and T_j^i is energy momentum tensor for perfect fluid with conservation equation.

$$\phi_{;k}^{;k} = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^{,i}\right]_{,i} \qquad (3)$$

3. Energy Momentum Sources:

The energy momentum tensor for matter under discussion given by

$$T_j^i = {}^pT_j^i + E_j^i, \qquad (4)$$

where ${}^pT_j^i$ is energy momentum tensor for perfect fluid and E_j^i is energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{\alpha\beta}F^{\alpha\beta}g_{ij} - F_{i\alpha}F_{j\beta}g^{\alpha\beta}, \qquad (5)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial A_i}{\partial x^j} - \frac{\partial A_j}{\partial x^i}, \qquad (6)$$

where A_i is a four potential vector.

To achieve the compatibility with the metric (1), we assume electromagnetic vector potential as

$$A_i = [\lambda(x)v_1(t), v_2(t), v_3(t), v_4(t)]. \qquad (7)$$

From equations (6) and (7), we deduce

$$F_{14} = \lambda\dot{v}_1, \; F_{24} = \dot{v}_2, \; F_{34} = \dot{v}_3, \; F_{43} = -\dot{v}_3. \qquad (8)$$

Using equations (6), (7) and (8), we obtained

$$F_{\alpha\beta}F^{\alpha\beta} = -2\left[\frac{\lambda^2\dot{v}_1^2}{A^2} - \frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{\dot{v}_3^2}{C^2}\right]. \qquad (9)$$

The energy momentum tensor for a perfect fluid is given by

$${}^pT_j^i = (\rho + p)u^iu_j - p\delta_j^i, \qquad (10)$$

where v_i is an unknown function of t

Integrating equation (26) with respect to t, we get

$$v_1 = k_1 D,\ v_2 = k_2 D,\ v_3 = k_3 D, \tag{27}$$

where k_1, k_2 and k_3 are constants.

Using equations (25) and (27), we get

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} = 0. \tag{28}$$

With an aid of equation (27), we can write the equations (21) to (23) as

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} + \left(\frac{\dot{D}}{D}\right)^{2} + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \tag{29}$$

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} + \left(\frac{\dot{D}}{D}\right)^{2} + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \tag{30}$$

$$\left(\frac{\dot{D}}{D}\right)^{\cdot} + \left(\frac{\dot{D}}{D}\right)^{2} + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0. \tag{31}$$

We attempt to express the component of T_j^i in terms of v_i^4 already used as in (Solanke and Karade (2016,2017). For this, we consider the expression as

$$\frac{\lambda^2 v_1^2}{A^2} + \frac{v_2^2}{B^2 e^{-2mx}} + \frac{v_3^2}{C^2} = \left[\frac{\lambda^2 v_1^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2 - \frac{v_2^2}{B^2 e^{-2mx}}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_3^2}{C^2}\left(\frac{\dot{D}}{D}\right)^2\right] = 0 \tag{32}$$

$$\frac{\lambda^2 v_1^2}{A^2} + \frac{v_2^2}{B^2 e^{-2mx}} + \frac{v_3^2}{C^2} = \left[\frac{\lambda^2 v_1^2}{A^2} + \frac{v_2^2}{B^2 e^{-2mx}} + \frac{v_3^2}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0 \tag{33}$$

$$T_0^4 = \frac{1}{2}\frac{\lambda^2 v_1^2}{A^2} + \frac{1}{2}\frac{v_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{v_3^2}{C^2} + p = \rho. \tag{34}$$

$$T_1^1 = -p = T_2^2 = T_3^3.$$

5. Solution of Field Equations:

Considering the non-vanishing component of Einstein's tensor from equation (3), we derive

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = 8\pi p - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{35}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = 8\pi p - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right) - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right), \tag{36}$$

$$-\frac{m^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} = 8\pi p - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{37}$$

$$\frac{m^2}{A^2} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = 8\pi p + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{38}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0. \tag{39}$$

where ρ is the density, p is the pressure of perfect fluid and four velocity u_i is given by

$$g_{ij}u^i u^j = -1.$$

For co-moving coordinate system, we have

$$u_1 = 0, \quad u_2 = 0, \quad u_3 = 0, \quad u_4 \neq 0. \tag{11}$$

Accordingly equation (10), provides

$${}^pT_1^1 = {}^pT_2^2 = {}^pT_3^3 = -p, \; {}^pT_4^4 = \rho, \; T_i^j = 0 \quad \forall i, j \tag{12}$$

Using equations (5), (9) and (12), we obtained

$${}^pT_1^1 + E_1^1 = \frac{1}{2}\frac{\lambda^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2\alpha r}} - \frac{1}{2}\frac{v_3^2}{C^2} - p, \tag{13}$$

$${}^pT_2^1 + E_2^1 = {}^pT_1^2 + E_1^2 = \frac{\lambda^2 v_1 v_2}{A^2}, \tag{14}$$

$${}^pT_3^1 + E_3^1 = {}^pT_1^3 + E_1^3 = \frac{\lambda^2 v_1 v_3}{A^2}, \tag{15}$$

$${}^pT_2^2 + E_2^2 = -\frac{1}{2}\frac{\lambda^2 v_1^2}{A^2} + \frac{1}{2}\frac{v_2^2}{B^2 e^{-2\alpha r}} - \frac{1}{2}\frac{v_3^2}{C^2} - p, \tag{16}$$

$${}^pT_3^2 + E_3^2 = {}^pT_2^3 + E_2^3 = \frac{v_2 v_3}{B^2 e^{-2\alpha r}}, \tag{17}$$

$${}^pT_3^3 + E_3^3 = -\frac{1}{2}\frac{\lambda^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2\alpha r}} + \frac{1}{2}\frac{v_3^2}{C^2} - p \tag{18}$$

$${}^pT_4^4 + E_4^4 = \frac{1}{2}\frac{\lambda^2 v_1^2}{A^2} + \frac{1}{2}\frac{v_2^2}{B^2 e^{-2\alpha r}} + \frac{1}{2}\frac{v_3^2}{C^2} + p. \tag{19}$$

4. Conservation Law:

The Conservation equation is given by

$$\frac{\partial}{\partial x^i}\left(\sqrt{-g}\,T_i^j\right) = 0. \tag{20}$$

Equation (20) with different combination of i and j gives following equations

$$\left[\frac{v_1}{v_2}\right]^{\cdot} + \frac{v_1^2}{v_1^2} + \frac{v_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \tag{21}$$

$$\left[\frac{v_2}{v_2}\right]^{\cdot} + \frac{v_2^2}{v_2^2} - \frac{v_2}{v_2}\left[\frac{\dot{A}}{A} - \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \tag{22}$$

$$\left[\frac{v_3}{v_3}\right]^{\cdot} + \frac{v_3^2}{v_3^2} + \frac{v_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \tag{23}$$

$$\phi_4^2 = -\phi - \phi^2\left[\frac{\dot{A}}{A} + \frac{B}{B} - \frac{C}{C}\right]. \tag{24}$$

From the vanishing components of Einstein's tensor and using (5) and (7), we deduce

$$\frac{\dot{v}_1 v_2}{v_1 v_2} = \frac{\dot{v}_1 v_3}{v_1 v_3} = \frac{\dot{v}_2 v_3}{v_2 v_3} = 0, \tag{25}$$

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}. \tag{26}$$

Integrating (39) with respect to t, we get

$$A = k_4 B, \tag{40}$$

where k_4 is a constant of integration. Without loss of generality let us assume k_4 as unity so that equation (40) written as

$$A = B. \tag{41}$$

Using equations (41) and (35) to (38), we yield

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{42}$$

$$\frac{m^2}{B^2} + \frac{2\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} = \frac{8\pi\rho}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{43}$$

$$\frac{m^2}{B^2} + \frac{2\ddot{A}}{A} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right). \tag{44}$$

Since the field equations are highly nonlinear with three equations and five unknown. Therefore two extra conditions can be considered to solve the field equations.

Let us choose power law form of metric potential (Katore et al. (2018) given by

$$B = \alpha t^n, \text{ and } C = \beta t^m \tag{45}$$

The power law relation between scalar field ϕ and the scale factor a has already used by Johri and Desikan (2014) in the context of Robertson Walker Brans-Dicke models. Thus the power law relation between ϕ and the scale factor a is $\phi = \eta a^m$, where η is constant of proportionality. The average scalar factor is given by

$$a = (ABC)^{\frac{1}{3}} = k_5 t^n, \tag{46}$$

where $k_5 = \alpha^{\frac{2}{3}}\beta^{\frac{1}{3}}$ is a constant.

Hence scalar field ϕ is obtained as

$$\phi = k_5 t^m$$

$$\phi = k_5 t^s,$$

where $s = m$ is a constant.

Using equations (24) and (25), we have

$$\frac{\dot{D}}{D} = k_6, \tag{47}$$

where k_6 is a constant of integration.

Integrating equation (47), we deduce

$$D = e^{k_6 t}. \tag{48}$$

Using equations (46) and (27), we have

$$v_1 = k_1 e^{k_6 t}, \tag{49}$$

$$v_2 = k_2 e^{k_6 t}, \tag{50}$$

$$v_3 = k_3 e^{k_6 t}, \tag{51}$$

v_4 remained undetermined.

The metric in (1), with the help of (45), can be redefined in the form

$$ds^2 = \alpha^2 t^{2n}(dx^2 + e^{2mx}dy^2) + \beta^2 t^{2s}dz^2 - dt^2. \tag{52}$$

6. Physical and Kinematical Properties of the Model:

The physical and kinematical properties of the model (52) are obtained as follows.

For the investigated model the pressure p and the density ρ are given by

$$p = \frac{k_4 t^4}{8\pi}\left[\frac{2n(n-1)+n^2}{t^2} + \omega\frac{s^2}{2t^2} + \frac{s^2(s-1)}{t^2} + \frac{2sn}{t^2}\right], \tag{53}$$

$$\rho = \frac{k_4 t^4}{8\pi}\left[\frac{4n^2}{t^2} - \frac{m^2}{\alpha t^{2n}} - \omega\frac{s^2}{2t^2} + \frac{3sn}{t^2}\right], \tag{54}$$

where k_4 is a constant of integration.

The physical quantities of observational interest in cosmology are,

The spatial volume is obtained as

$$V = \sqrt{-g} = \left(\alpha^2\beta t^{2n+s}\right)e^{mx}, \tag{55}$$

The expansion scalar become

$$\theta = 3H = \left(2\frac{A}{A} + \frac{B}{B}\right),$$

$$\theta = 3H = \frac{3n}{t}, \tag{56}$$

The shear scalar is given by

$$\sigma^2 = \frac{1}{2}\sum_{i=1}^{3} H_i^2 - \frac{\theta^2}{6} = 0 \tag{57}$$

The mean anisotropic parameter Δ as

$$\Delta = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2$$

$$\Delta = 0. \tag{58}$$

The mean Hubble parameter

$$H = \frac{n}{t}, \tag{59}$$

The deceleration parameter is given by

$$q = \frac{d}{dt}(H^{-1}) - 1 = \frac{1-n}{n} \tag{60}$$

The cosmic Jerk parameter is given as,

$$J = q + 2q^2 - \frac{\dot{q}}{H}$$

$$= \frac{(n-1)(n-2)}{n^2}. \tag{61}$$

Integrating (39) with respect to t, we get

$$A = k_4 B, \tag{40}$$

where k_4 is a constant of integration. Without loss of generality let us assume k_4 as unity so that equation (40) written as

$$A = B, \tag{41}$$

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$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{42}$$

$$-\frac{m^2}{B^2} + \frac{2\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{43}$$

$$-\frac{m^2}{B^2} + \frac{2\dot{A}^2}{A^2} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{44}$$

Since the field equations are highly nonlinear with three equations and five unknown. Therefore two extra conditions can be considered to solve the field equations.

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Hence scalar field ϕ is obtained as

$$\phi = k_5 t^{mn}$$

$$\phi = k_6 t^s,$$

where $s = mn$ is a constant.

Using equations (24) and (25), we have

$$\frac{\dot{D}}{D} = k_6, \tag{47}$$

where k_6 is a constant of integration.

Integrating equation (47), we deduce

$$D = e^{k_6 t} \tag{48}$$

Using equations (46) and (27), we have

$$v_1 = k_1 e^{k_6 t}, \tag{49}$$

$$v_2 = k_2 e^{k_6 t}, \tag{50}$$

$$v_3 = k_3 e^{k_6 t}, \tag{51}$$

7. Conclusion:

In this paper, we have presented Bianchi Type-III charged fluid universe in BD theory of gravitation in presence of perfect fluid with electromagnetic field. The spatial volume V of the model increases with time showing the spatial expansion of the universe. It is observed that Hubble's parameter H vanishes with extremely large value and continue to decrease with time. The scalar expansion and the physical parameters energy density and pressure diverge at $t = 0$ and they all vanish as t approaches to infinity. The scalar field increases with time and at $t = 0$, it vanishes. The recent observations of type Ia supernovae reveal that the present universe is accelerating and the value of deceleration parameter lies somewhere in the range $-1 < q < 0$. It follows that one can choose the value of n in the range $0 < n < 1$ to ensure that the derived model is consistent with observations. It is also seen that the value of the cosmic jerk parameter is positive throughout the entire history of this model. This shows that our model strongly agrees to present day observations.

8. References:

1] Adhav K.S.(2012). LRS Bianchi type-II cosmological model with anisotropic dark energy, *Electronic J of Theo. Physics*, Vol.9, No. 26: 239.

2] Banerjee A., Sanyal A. K and Chakraborty S.(1990). String cosmology in Bianchi type-I space-time, *Pramana J. of Phys.* Vol.34, No. 6: 1.

3] Bardeen M., Steinhardt P. J. and Turner M.S.(1983). Spontaneous creation of almost scale-free density in an inflationary universe, *Phys. Rev.* Vol. 28, No. 4: 670.

4] Brans H and Dicke R. H.(1961). Mach's Principle and a relativistic theory of gravitation, *Physical review A*, Vol.124, No. 3: 925-935. doi:10.1103/PhysRev.124.925

5] Boyar S.R and Chirde V.R.(2018). Magnetized anti-stiff fluid cosmological models with variable cosmological constant, *Int. J. of Scientific research in mathematical and statistical Sci.*,Vol.5, No.18:11-18. https://doi.org/10.26438/ijsrmss/v5i1.1118

6] Juluri V.R and Desikan Kalyani (1994). Cosmological models with constant deceleration parameter in Nordtvedt's theory, *Pramana J. of Phys.*, Vol.42, No. 6: 473.

7] Kandalkar S.P and Samdurkar S.(2014). Bianchi type-V cosmological model with linear equation of state in Brans-Dicke theory of gravitation, *Int. J. of Astrophysics*, Vol.4, No. 3:420.

8] Katore S. D and Shaikh A.Y.(2012). Plane Symmetric Dark Energy Model in Brans-Dicke Theory of Gravitation, *Bulgarian J. of Physics*, Vol. 39, Number 3: 241.

9] Katore S. D and Kapse D.V.(2018). Bianchi type-I dark energy cosmology with power-law relation in Brans-Dicke theory of gravitation, *Int. J. Advances in High Energy Physics*, Vol.10 No. 4:1155.

10] Kumar S and Singh C.P.(2008). Exact Bianchi type-I cosmological models in scalar tensor theory, *Int. J. of Theor. Physics*, Vol. 47, No. 6: 1722.

11] Linde A. D.(1990). Extended chaotic inflation and spatial variations of the gravitational constant, *Physics Letters B*, Vol. 238, No. 2-4,160-165. doi:10.1016/0370-2693(90)91713-I.

12] Lorenz-Petzold D.(9182). Electromagnetic Bianchi type-III cosmological solution, *Astrophysics and space science*, Vol. 85, No. 2: 59.

13] Mathiazhagan C and Johri V. B.(1984). An inflationary universe in Brans-Dicke theory: a hopeful sign of theoretical estimation of the gravitational constant, *Classical and Quantum Gravity*, Vol.1, No. 2: L29-L32. doi:10.1088/0264-9381/1/2/005

14] Mete V.G and Mule K.R. (2018). Bianchi type-III charged fluid universe in Brans-Dicke theory of gravitation, *Int.J.of Sci.Res. in Phy and Apl. Sci.* Vol.6, No. 5: 57-61.

15] Naidu R. L., Satyanaryan B and Reddy K.(2012).Bianchi Type-III Dark Energy Model in a Saez-Ballester Scalar-Tensor Theory, *Int. J.of Phys.*, Vol.51,No. 5: 2857.

16] Pawar D. D., Bayaskar S. N and Patil V. R.(2009). Plane Symmetric Cosmological Model with Thick Domain Walls in Brans-Dicke Theory of Gravitation, *Bulgarian J. of Physics*, Vol. 36, No. 4: 68.

17] Pimentel L. O.(1997). New Exact Vacuum Solutions in Brans–Dicke Theory, Modern Physics Letters A, Vol.12, No.25:1865-1870. doi:10.1142/S0217732397001904

18] Pradhan A., Rai A and Singh S. K.(2007). Cylindrically symmetric inhomogeneous universe with electromagnetic field in string cosmology, *Astrophys. Space Science*, Vol. 312: 261.

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Feature Extraction of Medical Images Using Moment Invariants

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Abstract— Automatic shape recognition and feature extraction from images has become very significant in today's digital world as the use of digital images has grown exponentially over the last few decades. Image processing is a method which applies computer algorithms to extract various useful information from the digital images. Image processing mainly involves visualization, pattern recognition, feature extraction, classification etc. Moment invariants have been used as features for image processing. Moments can provide features of an object that uniquely represent its shape. These features are independent of translation, scale and rotation. The aim of this paper was to investigate the usefulness of moment invariants for the feature extraction from digital images. Two experiments were conducted to test the moment invariant for rotation invariance and scale invariance. The study found that most of the seven features had minor fluctuations when rotating or scaling the image.

Keywords—Moment Invariant, Image processing, Pattern recognition, Feature extraction

I. INTRODUCTION

Digital computers have evolved tremendously in the last few decades, so data from almost all fields is available in digital format. This is multimedia data in the forms such as text, images, videos, audios etc. Digital images are a potential source of information which needs to be analyzed; digital image processing techniques are used to process it. Digital image processing widely used in applications such as satellite images, military and weaponry, meteorology, astronomy, text images and medical technology. Digital image processing speedily substituting optical image processing [1], as it is more flexible and provides much wider range of algorithms to be applied to the digitally stored data.

Digital image processing usage computer algorithms to perform various operations on digital images, the fundamental steps in the processing includes image acquisition, image enhancement, image restoration, color image processing, image Compression, Morphological processing, Segmentation, Recognition, feature extractions, classification etc. Any digital images contain huge amount of information. This is why automated and sophisticated image analysis tools are truly needed. Several methods of digital image processing were developed at the Jet Propulsion Laboratory, MIT, Bell Labs, University of Maryland, and a few other places around the 1960s but the image processing cost was very high at that era. With the advent of affordable computers and dedicated hardware in the 1970s, digital image processing was reproduced [2].

Because of its invariant properties on image translation, scaling, and rotation, moment invariants have been widely used in image pattern recognition in a number of applications. For the continuous function, the moments are strictly invariant. Images, on the other hand, are discrete in practical applications. As a result, image geometric transformations may modify the moment invariants [3].

Rest of the paper is organized as follows, Section I contains the introduction of digital image processing, Section II contain the related work of moment invariants in image processing, Section III contain the some measures of moment invariants, Section IV contain the application of moment invariants in digital images and experimental background, section V describes results and discussion and Section VI concludes research work.

II. RELATED WORK

We started our literature review since moment invariant was introduced and we then reviewed the application of moment invariants in various areas of image processing. The history of moment invariants began many years before the first computer, in the nineteenth century, within the scope of algebraic invariants theory. The idea of algebraic invariants is said to have originated with David Hilbert, a notable German mathematician [4]. Hu [5], who used the conclusions of the theory of algebraic invariants to construct his seven renowned invariants to rotation of 2-D objects, was the first to propose moment invariants to the pattern recognition area in 1962. Since then, many papers have been dedicated to different refinements and generalisations of Hu's invariants, as well as their application in a variety of fields. Wong and Hall in [6] used moment invariants with satellite images for matching templates and also several researchers used moment invariants for character recognition [7, 8]. By revising the

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fundamental theorem and deriving invariants to general affine motion. Flusser and Suk [7] and Flusser [9] made major contributions in the theory of moment invariants.

In [10] Yali Amit et al introduced affine-photometric invariants for gray level and color images. These characteristics are unaffected by the affine transform as well as simultaneous changes in picture contrast and brightness intensity. Moments can be applied to many different aspects of image processing, including invariant pattern recognition, image normalization, image registration, correspondence measurement, and compression [11]. Recognition of human facial expression has turned into a growing research field. Facial expression is one amongst the vital step within the recognition of facial expressions. In [12] Geometric Moment Invariants was used as a feature extraction method to recognize human facial expression. Hu's moment invariants were also used for the extraction of shape and texture features [13].

Moment Invariant has been used by different researchers in different areas of image processing. Over the past few decades, the use of Moment Invariant in medical image processing has grown significantly. S. Sharma et al. in [14] used Zernike moments along with support vector machine (SVM) to detect abnormalities in suspicious areas in digital mammograms. They used Zernike moments with order 20 and got better results among other studies. S. Dubey et al. in [15] were presented a complete framework for computing invariant feature extraction using Hu's moment and utilized Hu' seven moment invariants to extract the invariant features from medical images. The proposed method tested against scale invariance and rotation invariance. V. M. Vardya et al. in [16] presented an algorithm using different moment invariants for feature extraction of blood vessels of retinal fundus images and various of moment invariants such as geometric and Zernike moment invariants were employed in the algorithm. A further study was employed on radiographic images of four dental caries in [17] and features were extracted by using Hu's moment invariants.

III. MOMENT INVARIANTS

Moments can provide features of an object that uniquely represent its shape and hence moment invariants used to extract features of images. Several strategies for obtaining invariant features from moments for object recognition and representation have been developed [18]. Hu [5] provided the mathematical basis for two-dimensional moment invariants and exhibited their applications for shape recognition. Hu's moment invariant values are invariant to translation, scale and rotation of the shape.

Hu [5] defines seven of these shape descriptor values computed from central moments through order up to three that are independent to object translation, scale and orientation. Translation invariance moments are derived by calculating central moments, size invariance moments are achieved from algebraic invariants and a set of seven invariant moments can be calculated from the second and third order values of the normalized central moments which are independent of rotation.

Moment invariants are usually calculated based on the information provided by both the shape boundary and its interior region [7]. Given a function $f(x,y)$, these regular moments are defined by

$$M_{pq} = \iint x^p y^q f(x,y)\,dx\,dy \qquad (1)$$

Where, M_{pq} is the two-dimensional moment of the function $f(x,y)$ for $p, q = 0, 1, 2, \ldots$. The order of the moment is $(p+q)$ where p and q are both natural numbers. For implementation in digital form this becomes

$$M_{pq} = \sum_x \sum_y x^p y^q f(x,y) \qquad (2)$$

Image centroids are used to define the central moments and to normalize the image for translation. The equations (2) further used to calculate the co-ordinates of the centre of gravity of the image and is shown by

$$\mu_{pq} = \sum_x \sum_y (x-\bar{x})^p (y-\bar{y})^q \qquad (3)$$

Where, $\bar{x} = \frac{M_{10}}{M_{00}}$ and $\bar{y} = \frac{M_{01}}{M_{00}}$

The central moments do not change, therefore, the central moments are invariants under translation. From (3), it is easy to express the central moments of order up to 3 are as follows in expression (4).

$$\eta_{pq} = \mu_{pq} / \mu_{00}^{\gamma} \qquad (4)$$

Where the normalization factor: $\gamma = (p+q/2)+1$. A set of seven values can be determined from normalized central moments and they are described by:

$$\begin{aligned}
\phi_1 &= \eta_{20} + \eta_{02} \\
\phi_2 &= (\eta_{20} - \eta_{02})^2 + 4\eta_{11}^2 \\
\phi_3 &= (\eta_{30} - 3\eta_{12})^2 + (3\eta_{21} - \eta_{03})^2 \\
\phi_4 &= (\eta_{30} + \eta_{12})^2 + (\eta_{21} + \eta_{03})^2 \\
\phi_5 &= (\eta_{30} - 3\eta_{12})[\eta_{30} + \eta_{12}][(\eta_{30} + \eta_{12})^2 - 3(\eta_{21} + \eta_{03})^2] \\
&\quad + (3\eta_{21} - \eta_{03})(\eta_{21} + \eta_{03})[3(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2] \\
\phi_6 &= (\eta_{20} - \eta_{02})[(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2] \\
&\quad + 4\eta_{11}(\eta_{30} + \eta_{12})(\eta_{21} + \eta_{03}) \\
\phi_7 &= (3\eta_{21} - \eta_{03})(\eta_{30} + \eta_{12})[(\eta_{30} + \eta_{12})^2 - 3(\eta_{21} + \eta_{03})^2] \\
&\quad - (\eta_{30} - 3\eta_{12})(\eta_{21} + \eta_{03})[3(\eta_{30} + \eta_{12})^2 - (\eta_{21} + \eta_{03})^2]
\end{aligned} \qquad (5)$$

All the seven Hu's [5] invariant moments, ϕ_i, $1 \le i \le 7$, computed on the shape boundary and its interior region and also shown to independent to scale and rotation.

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IV. MOMENT INVARIANTS APPLIED TO DIGITAL IMAGES

... image processing systems based on: Image ... Preprocessing of the images, Feature ... and Classification. Common example is the ... of alphabetic characters in text [19]. Pattern ... is a crucial measure of any image processing ... applications employing moment invariant ... recognition for the classification of such definite ... is one of the most primary and common ... pattern recognition.

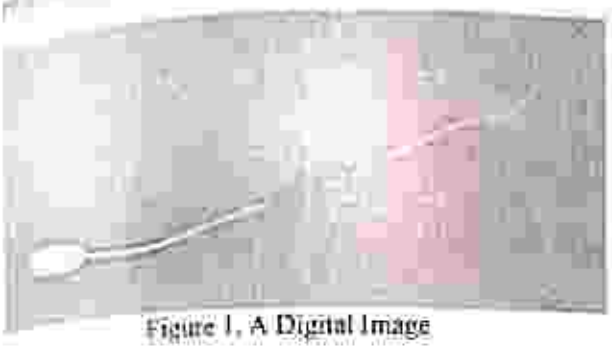


Figure 1. A Digital Image

The digital image shown in Fig.1 is used for the ... and also the necessary preprocessing steps ... carried out on the image [20] to meet the requirement ... experiment. All the algorithms were tested on ... version 7 platform.

V. RESULTS AND DISCUSSION

This section shows the results obtained by applying the moment invariants technique to the chosen image in order to calculate the usefulness of shape recognition in digital images. The test image is shown in Fig.-1. All the experiments performed on MatLlab 7. Firstly, we tested the proposed moments for rotation invariance and then for scale invariance.

The first experiment was conducted to examine the invariant moment for rotation invariance. The test image is rotated by 0 to 60 degree with 10 degree increment step and the seven invariant moments are computed for each of the rotation of the test image. The obtained results are summarized in Table 1. It is observed that ϕ_3, ϕ_5 and ϕ_7 shows almost rotational invariance properties.

The second experiment was conducted to examine the invariant moment for scale invariance. The test image is scaled by positive scale factor such as 0.1, 0.2, 0.3, 0.4, and 0.5 with 0.1 increment step and the seven invariant moments are computed for each of the scaled value. The obtained results are summarized in Table 2. It is observed that highest fluctuation occurs for the features ϕ_2 and ϕ_7 and the ϕ_1, ϕ_3 and ϕ_7 shows almost scale invariance properties.

Table 1. Features of Moment Invariant under different rotation angles

	Rotation by 10 degrees						
Original	5.7928	11.6573	33.2390	32.8843	66.1683	38.8356	67.4323
10	5.6800	11.4327	33.2442	32.8661	66.1742	38.8097	67.4381
20	5.6361	11.3675	33.2483	32.7145	66.1784	38.9611	67.4139
30	5.6801	11.5024	33.2254	32.4986	66.1711	39.4142	67.4104
40	5.7242	11.6553	33.2022	32.2980	66.1414	40.3256	67.3803
50	5.8633	12.0415	33.3583	32.2116	66.1724	40.9747	67.4348
60	6.0621	12.6120	33.2467	32.2656	66.1574	40.2260	67.4037

Table 2. Features of Moment Invariant under different Scaling factors

	Scaling by 0.1 factor						
Original	5.7928	11.6573	33.2390	32.8843	66.1683	38.8356	67.4323
0.1	5.7898	11.6489	31.8850	31.6769	63.6183	37.5829	64.9369
0.2	5.7925	11.6559	33.2941	32.9546	66.3377	38.9109	67.3492
0.3	5.7812	11.6322	33.5909	32.8138	66.3714	38.8729	68.1472
0.4	5.7845	11.6394	33.4326	32.8676	66.3053	38.8645	67.8407
0.5	5.7850	11.6403	33.1024	32.7939	65.9453	38.7248	67.2478

VI. CONCLUSION

In the study, an outline of feature extraction using moment ... is studied. The seven features of moment ... are employed to extract the invariant features ... the test image. Two experiments were conducted to ... the moment invariant for rotation invariance and scale ... The study found that most of the seven features ... fluctuations when rotating or scaling the image.

REFERENCES

[1] R. L. Twogood and F. G. Sommer, "*Digital Image Processing*", in IEEE Transactions on Nuclear Science, vol. 29, no. 3, pp. 1075-1086, 1982.

[2] Z. Hu, H. Zheng and J. Gu, "*A Novel Interactive Image Processing Approach for DICOM Medical Image Data*", 2nd International Conference on Biomedical Engineering and Informatics, pp. 1-4, 2009.

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[3] Huang Zhihu and Jinsong Leng, *"Analysis of Hu's moment invariants on image scaling and rotation"*, 2nd International Conference Computer Engineering and Technology (ICCET), vol. 7, 2010

[4] Jan Flusser, *"Moment Invariants in Image Analysis"*, Proceedings of World Academy of Science, Engineering and Technology, Vol 11, pp. **196-201, 2006**.

[5] M. K. Hu, *"Visual Pattern Recognition by Moment Invariants"*, IRE Trans. on Information Theory, Vol. **IT-8**, pp. **179-187, 1961**

[6] R. Y. Wong and E. L. Hall, *"Scene Matching with Invariant Moments"*, Computer Graphics and Image Processing, vol. 8, pp. **16–24, 1978**.

[7] J. Flusser and T. Suk, *"Affine moment invariants: A new tool for character recognition"*, Pattern Recognition Letters, vol. 15, pp. **433–436, 1994**.

[8] S. O. Belkasim, M. Shridhar, and M. Ahmadi, *"Pattern recognition with moment invariants: a comparative study and new results"*, Pattern Recognition, vol. 24, pp. **1117–1138, 1991**.

[9] T. H. Reiss, *"The revised fundamental theorem of moment invariants"*, IEEE Trans. Pattern Analysis and Machine Intelligence, vol. 13, pp. **830–834, 1991**

[10] L. van Gool, T. Moons, and D. Ungureanu, *"Affine/photometric invariants for planar intensity patterns"*, in Proc. 4th ECCV'96, Springer, vol. LNCS **1064**, pp. **642–651, 1996**.

[11] Jan Flusser, Barbara Zitova, Tomas Suk, *"Moments and Moment Invariants in Pattern Recognition"*, Wiley Publications, **2009**

[12] M Fachrurrozi, Saparudin, A Lestari, O. Arsalan, Samsuryadi and Erwanita, *"Multiple Face Image Feature Extraction Using Geometric Moment Invariants Method"*, International Conference on Informatics, Multimedia, Cyber and Information System (ICIMCIS), pp. **219-224, 2019**

[13] B. P. H. K. M. D. Senarathna and R. M. T. P. Rajakaruna, *"Feature Descriptor for Sri Lankan Batik Patterns Using Hu Moment invariants and GLCM"*, 10th International Conference on Information and Automation for Sustainability (ICIAfS), pp. **197-202, 2021**

[14] S. Sharma and P. Khanna, *"Computer-Aided Diagnosis of Malignant Mammograms using Zernike Moments and SVM"*, Journal of digital imaging vol. **28**, 1, pp. 77-90, **2015**.

[15] S. Dubal and S. P. Singh, *"Geometric invariant feature extraction of medical images using Hu's invariants"*, 3rd International Conference on Computing for Sustainable Global Development (INDIACom), pp. **1560-1562, 2016**.

[16] Y. M. Vaidya, B. S. V. Swati and N. Kanitpudi, *"Moment Invariants based feature techniques for segmentation of retinal images using supervised method"*, International Conference on Industrial Instrumentation and Control (ICIC), pp. **1373-1377, 2015**

[17] Y. Idzan, M. K. Anam, S. Puspita and E. Saleh, *"Machine Learning of Dental Caries Image based on Hu Moment Invariant Features"*, International Seminar on Application for Technology of Information and Communication (iSemantic), pp. **296-299, 2021**.

[18] Laura Keyes and Adam Winstanley, *"Applying Computer Vision Techniques To Topographic Objects"*, International Archives of Photogrammetry and Remote Sensing, Vol. **XXXIII**, Part **B3**, Amsterdam, pp. **480-487, 2000**.

[19] Dehghan, M. and Faez, K., *"Farsi Handwritten Character Recognition with Moment Invariants"*, International Conference on Digital Signal Processing, Vol. 2, pp. **507-510, 1997**.

[20] V. V. Agatkar, *"Analysis of Sperm Morphology in Microscopic Images based on Moment Invariants"*, M. Phil Dissertation, Alagappa University, Karaikudi, **2009**

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Viscometrically Investigated Thermodynamic Of 5-P-Chlorophenylthiocarbamidonapthtol In 60% Solvent Mixture

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ABSTRACT

Thiocarbamid nuclei has their various pharmaceutical significances, due to substitution of this nuclei it become more interesting task to understand their molecular interactions in solution and their potency. Present work concern to viscometric investigate thermodynamic of 5-p-chlorothiocarbamidonaphthtol at different concentrations (i.e. 0.1M,0.05M, 0.025M and 0.012M) and 303K in 60% ethanol-water mixture. Obtained data help to interpreted viscosity behavior and thermodyamic parameters of 5-p-chlorothiocarbamidonaphthol molecule. In this work investigated density, relative viscosity and A, β-coefficient values. This work interpreted solute-solute, solute solvent interactions in solution.

Keywords: Viscometric behavior, thermodynamic, molecular interaction, Jones-Dole coefficient.

I. INTRODUCTION

Viscometric measurement received more attention of researchers due to its reliability and significances. Viscometry data closely related to the pharmacodynamic and pharmacokinetics of drugs. Intra and inter molecular interactions studies plays crucial role in to understand their behave pattern in solution. Viscosity measurements had significantly used in biochemical, agricultural, pharmaceutical, medicinal, and industrial and drug sciences. Drug behavior like absorption, transmission and its effect will directly relate to its viscosity measurements and solvent interactions in the human framework. Tayade et al[1] viscometrically investigated 3-(2-hydroxy-3-nitro-5-methyl) phenyl-6-amino-1,2,5-thioxazine in 60% ethanol water mixture at various temperatures by keeping constant molar concentration 0.1 M . Effect of temperature on viscosity of s-substituted thiazinothiocarbamides in 60% dioxane water mixture investigated Tayade et al[2]. Various substituted molecules like substituted triazine, substituted thiocarbamidonaphtols, substituted thiocarbamidophenol, substituted cumarine and likewise other molecules studied with viscometrically[3-10]. Seeing these all we designed this research scheme and carried out present work deals with viscometric investigate thermodynamic of 5-p-chlorothiocarbamidonaphthtol at different concentrations (i.e. 0.1M,0.05M, 0.025M and 0.012M) and 303K in 60% ethanol-water mixture. In this work investigated density, relative

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viscosity and A, β-coefficient values. Obtained data help to interpreted solute-solute and solute-solvent interactions of 5-p-chlorothiocarbamido -naphthol molecule in solution.

II. EXPERIMENTAL

All AR grade chemicals used during present work. The binary mixture of 60% dioxane-water and 60% ethanol-water was prepared gravimetrically in stoppard bottle. Mechaniki Zaktady Precyzyjnej Gdansk balance made in Poland (0.001 gm) use for weighing and Densities of solutions were determined by a bicapillary pyknometer (± 0.2 %) having a bulb volume of about 10 cm3 and capillary having an internal diameter of 1mm and calibrated with deionised doubly distilled water . The accuracy of density measurements were within 0.1 Kgm-3.The viscosities were measured by means of Oswald's viscometer thoroughly cleaned and dried. The viscometer was kept in Elite thermostatic water bath and temperature variation was maintained at 28 0C (0.1) for each measurements, sufficient time was allowed to attain thermal equilibrium between viscometer and water bath.

III. OBSERVATIONS AND CALCULATIONS

Current investigation concern to viscometrically investigate thermodynamic of 5-p-chlorothio carbamidonaphthol at different concentrations (i.e. 0.1M, 0.05M, 0.025M and 0.012M) and 303K in 60% ethanol-water mixture.

IV. RESULT AND DISCUSSION

Viscometric study with variation in concentration

The viscometric readings were taken as described in literature. The results obtained were mentioned in Table-1 and A and β-coefficient values calculated shown in Table 2.

The relative viscosity of each solution during study was determined by formula depicted below,

$$\eta_r = \frac{D_s t_s}{D_w t_w}$$

Where,

η_r = Relative viscosity of ligand solution, Dw and Ds – Density of ligand solution and water , t_w and t_s =Time of flow for ligand solution and water respectively

The relative viscosities have been analyzed by Jone's-Dole equation

$$(\eta_r - 1)\sqrt{C} = A + \beta\sqrt{C}$$

Where,

C for Concentration, A and β are the Falkenhagen and the Jones-Dole coefficients. A is a constant arising from the ion-ion or solute-solute interactions and is called Falkenhagen coefficient, while *B* is the Jones-Dole coefficient, which measures the size, shape, charge and structural effects induced by solute-solvent interactions[11,12]. Jones-Dole *B* coefficient can be explained in terms of competition among the special viscosity effects at a given concentration[13] and is regarded as an important parameter to study solute-solvent interactions in the systems. The graph was plotted between $(\eta_r - 1)/\sqrt{C}$ verses $\sqrt{C}$ and the value of coefficient 'A and 'β calculated.

Table-1: Relative viscosity and specific viscosity of 5-p-chlorothiocarbamidonaphthtol at different concentrations 303K in 60% ethanol-water mixture

Conc. (M)	√C	Time t (sec.)	Density ρx10³ (kg.cm⁻³)	η_r	$\eta_{sp}=\eta_r-1$
0.1	0.31622	60.3	0.9568	2.4552	1.4552
0.05	0.2236	59.58	0.9522	2.4552	1.412
0.025	0.15811	57.4	0.9431	2.458	1.458
0.0125	0.1118	56.29	0.9352	2.0245	1.0245

Table-2: A and β-coefficient value in 60% Ethanol-Water mixture at 303K.

Ligand	A (Falkenhagen coefficient)	β-coefficient (Jones-Dole coefficients)
5-p-chlorothiocarbamidonaphthtol	0.64919	-1.69076

From the results, it is observed that, the concentration of ligand is directly proportional to density and relative viscosity for 5-p-chlorothiocarbamidonaphthtol at temperature 303K for 60% ethanol-water mixture. This may be due to the weak solvation effect which interprets weak molecule interaction. The negative values of β-coefficient characterized as 'structure-breaker' indicating a weak solute-solvent interaction which is good for interactions in between the drug and the drug receptors shows best drug activity and drug effect and it favors pharmakinetics and pharmacodynamics of drug. At the same time, both ligands are hydrophilic in nature and they disrupted the hydrogen bonding in the mixture of solvent causing lesser molecular interaction. Thus, these factors plays important role during designing of any drug[2].The value of A coefficient show that, the solute-solute interaction is weak it is also supporting for good transmission.

V. CONCLUSION

From above discussion A and β-coefficient values support to good activity of 5-p-chlorothiocarbamidonaphthtol in 60% ethanol-water mixture. This study may become a milestone in the interpretation of the drug diffusion and drug transmission steps of pharmacodynamic.

VI. REFERENCES

1. D.T. Tayade, S.S. Padhen, A.B. Wadekar, S.A. Waghmare, Viscometric Measurements Of 3-(2-Hydroxy-5-Nitro-5-Methyl) Phenyl-6-Amino-1,2,5-Thioxazine In 60% Ethanol Water Mixture At Various Temperatures, Int. Journal Of Medicinal Chemistry & Analysis. 5(4),2015, Xxx-Xxx.
2. M. Kahirsagar, D.T. Tayade, Effect Of Temperature On Viscosity Of S-Substituted Triazino thiocarbamides In 60% Dioxane Water Mixture, international Journal Of Advancements In Research & Technology, 1(5),2012, 1-12.
3. D.T.Tayade, N.J. Meshram,Viscometric Studies Of 4-(Prolyl)Thiocarbamidophenol At Various Molar Concentrations And At 25 C In 60 % Ethanol-Water Mixture, indian Journal Of Applied Research,7(1),2017,820-820.

[4]. D. T.Tayade, N.J.Meshram, R. Ullah S. Ullah, M.P.Wadekar .The Viscometric Measureme -nts Of S-Substituted Thiazinothiocarbamides At Various Compositions. Int. Journal Of Bioscience, Agriculture And Technology. 2(1),2014,1251-1258.

[5]. Amalendu Pal. Viscometric studies of L-Valine and L-leucine in aqueous solution of NaBr at 298.15K, Indian Journal Chem. 44(A), 2005, 1589-1593.

[6]. Grinnell Jones .The Viscosity of Aqueous Solutions of Strong Electrolytes with Special Reference to Barium Chloride J. of American Chemical Society. 51(10),1929,2950-2964.

[7]. Ruijian Dong et al. Viscometric measurement of the thermodynamics of PAN terpolymer /DMSO/water system: and effect of fiber-forming conditions on the morphology of PAN precursor. Journal of Polymer Science, 46(19), 2008, 1997-2011.

[8]. Jumde Kp et al. Viscometric Measurement Of Substituted-Dioxo-Naphthacene-2-CarboxamideAnd Substituted-Spiro[1-Benzofuran2,1'-Cyclohex-2-Ene]-3,4'-Dione Drugs In Ethanol–Water Mixture At Various Percentage Compositions. International Journal of Chemical and Physical Sciences, 2(5), 2013, 26-32.

[9]. Sohail Aslam et al. Viscometric Measurement Of Chromium(Iii)-Polyacrylamide Gels. Chemical Engineering Communications, 48(4-6), 1986, 287-301.

[10]. Scott Blair GW et al. Viscometric measurements of the activities of commercial rennets using sodium caseinate as substrate. Journal of Dairy Research, 29(01) 1962, 37–46.

[11]. A. K. Nain and R. Pal, J. Chem. Thermodyn. 60, 98 (2013).

[12]. A.K. Nain, R. Pal, and R. K. Sharma, J. Mol. Liq. 165, 154 (2012).

[13]. T. S. Banipal, H. Singh, P. K. Banipal, and V. Singh, Thermochim. Acta 553, 31 (2013).

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Examining the Effects of Forest Fire on Terrestrial Ecosystem – A Comprehensive Review of Literature

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1.0 Abstract

Forest fire is very common in all the ecosystems and the forests of India are at risk of it due natural as well as anthropogenic interventions in these areas. Not all types of fires affect the forest ecosystems adversely; especially the larger ones have the potential to affect the ecosystems for a substantially longer period of time (in many cases the partial recovery also took more than a decade). In view of the above, this study was carried out to systematically assess the past research efforts in the focused area i.e. impact of forest fire on the forest ecosystem. For this study literature was collected from SCI journals and has been reviewed by following standard methodology. The review showed that more efforts are needed to control the large forest fires so that smaller fire incidences could allow the natural recovery processes to enhance biological diversity and sustainable development.

Keywords: *Forest fire, ecosystems, risk, biological diversity, sustainable development*

2.0 Introduction

Not just in India, but all over the world forest fire is very common to all the ecosystems. It affects both vegetation and soil. In certain instances it is also helpful in maintaining diversity and stability of ecosystems along with nutrient recycling. However, effect of forest fire and prescribed fire on forest soil is very complex as it (fire) affects soil organic matter, macro and micro-nutrients, and also the physical properties of soil like texture, colour, pH, Bulk Density as well as soil biota. Moreover, the incidences of forest fire are likely to increase in the future due to the climate warming. This also poses a serious challenge as there is very little understanding of the likely severity of such fire incidences. In addition to above, the uncertainty associated with the consequences of forest fire on the soil microbial communities would also have large scale complications thereby affecting the soil nutrient dynamics, which would pose a threat to the existing biodiversity. In view of the above, it was necessary to carry out a systematic study to understand the various efforts researchers have taken so far to gain knowledge of the implications of forest fires on the forest ecosystems.

3.0 Methodology

In the context of the aim and objectives of this study, a literature review was carried out to study the previous research efforts. For this review we considered following aspects, such as the research question posed in the previous studies, the theoretical background, methodology, findings, suggestions and recommendations, etc. moreover, the review was used to identify the research gaps and it (review) was used for synthesizing and gaining a new perspective of the issues concerning the litter decomposition under normal circumstances as well as during the **forest fire and its impact on microbial biomass present in the soil**. The discussion is presented in a chronological order, so that it also indicates the underlying pattern of evolution of thoughts and ideas in the focused domain. Similarly, to the extent possible, care was taken to reproduce the original terminology used by the authors, to preserve the originality of the views. The discussion is presented in the following section.

4.0 Discussion

In order to assess the influence of change in land use on microbial activity, Behera and Sahani (2003) conducted a systematic review and reported that soluble organic N and microbial N pools in terrestrial ecosystems have been less studied than those of inorganic N. Therefore, cross-system variation in their pool sizes and seasonal dynamics, both absolute and relative to inorganic N pools, needs to be quantified so that their ecological importance in different ecosystems can be evaluated. Zhu and Carreiro (2004) through their field based study reported that the extractable soil organic nitrogen and microbial biomass nitrogen dynamics are affected as a function of various seasons and further stated that the spring microbial biomass nitrogen increase could be an important retention mechanism for conserving soil inorganic N when plant N uptake may be low.

Pietikainen et al., (2000) has stated that the wildfires produce a charcoal layer, which has an adsorbing capacity resembling activated carbon, moreover, after the fire a new litter layer starts to accumulate on top of the charcoal layer, which liberates water-soluble compounds that percolate through the charcoal and the unburned humus layer. In view of this the author hypothesized that since charcoal has the capacity to adsorb organic compounds it may form a new habitat for microbes, which decompose the adsorbed compounds. Arunachalam and Arunachalam (2000) through his study of soil microbial biomass dynamics (in the humid subtropical broadleaved forest in north-east India) reported that canopy gaps had low soil moisture and low microbial biomass suggesting that belowground dynamics accompanied changes in light resources after canopy opening. Moreover, the study results indicate that fluctuation in microbial biomass related nutrient cycling processes in connection with the associated microclimate variation may affect the pattern of regeneration of tree seedlings in the gaps and hence be related with their size.

Michelsen et al., (2004) studied the seasonal changes and spatial distribution of soil total, dissolved organic C and microbial biomass C in relation to the fire frequency in dry vegetation types grassland, woodland and dry forest in Ethiopia. Based on the study results author reported that C release from burning organic matter may have strong implications for C and nutrient cycling in seasonally dry tropical ecosystems. In order to study the soil respiration and its spatial and temporal variation at boreal forest sites

in central Canada. Singh et al., (2008) collected soil respiration, soil temperature, and organic layer thickness measurements from 100 points in a grid pattern and reported that soil respiration was positively related to the fine root biomass stated that variation in root biomass has a larger effect than differential forest floor organic layers on variation in soil respiration in young boreal post fire forests.

Kondapani et al., (2008) used a combination of remote sensing data and GIS techniques to determine the burnt areas and reported that temporal trends suggest increasingly short fire-return intervals in the landscape and further found that forest fires had significant adverse impacts on species diversity and regeneration in the tropical dry deciduous forests. However, Somashekar et al., (2008) monitored the burnt areas of Western Ghats (a biodiversity hot spot) using March 2000 and 2004 IRS LISS – III data and found that an area of 2.15 km^2 and 4.46 km^2 was affected by fire in 2000 and 2004 respectively. Author reports the reasons for these wild fires were repeated drought, followed by mass flowering and dying of bamboo, which accelerated the spread of fire from ground to canopy in areas with high bamboo density.

Meigs et al., (2009) quantified the short-term effects of low, moderate, and high-severity fire on carbon pools and fluxes in the Eastern Cascades of Oregon. The study results show that though soil C, soil respiration, and fine root net primary productivity were conserved across severity classes, net ecosystem production declined with increasing severity, driven by trends in aboveground net primary productivity. Based on the data related to effect of a severe wildfire 10 years after burning Sullivan et al., (2010) determined decadal-scale changes in soil gas fluxes following fire incident and found that there was less carbon available at the burned site for respiration by plants and microbes.

Verma and Jayakumar (2012) reviewed the effect of forest fire on various properties of soil, which are important in maintaining healthy ecosystem and based on this review reported that it (forest fire) affects soil organic matter, macro and micro-nutrients, physical properties of soil like texture, colour, pH, Bulk Density as well as soil biota. However, the impact of fire on forest soil depends on various factors such as intensity of fire, fuel load and soil moisture. Holden and Treseder (2013) conducted a review to test the hypothesis that soil microbial biomass would decline following forest disturbances, but that abiotic disturbances would elicit greater reductions in microbial biomass than biotic disturbances. Author found that changes in microbial abundance following disturbance were significantly positively correlated with changes in microbial respiration. Altogether, the study results suggest that abiotic forest disturbances may significantly decrease soil microbial abundance, with corresponding consequences for microbial respiration.

Jhariya et al., (2014) identified the fire prone areas (of Tropical Deciduous forests of Bhoramdeo Wildlife Sanctuary) on the basis of historical ground fire data in conjunction with satellite remote sensing data provided by NRSA, based on the frequency of forest fire damage. Author also investigated the biomass and carbon storage pattern of the same area and observed that forest fires are driving factor in shaping forest vegetation, biomass accumulation and carbon storage. Kittur et al., (2014) assessed the effect of four levels of historic wildland fire frequency (high, medium, low, and no-fire) on regeneration of seedlings in fire affected areas of moist deciduous forests of Chhattisgarh. Based on the study results,

author reported that the major contributing components of fuel load included duff litter and small woody branches and twigs on the forest floor and repeated fires, however, slowly reduced stand stability.

Chandra (2015) had stated that forest fire is very common in all the ecosystems and plays an important role in ecosystem dynamics, biodiversity, soil and microbes. Author further stated that the low intensity fire results in combustion of litter and soil organic matter, increases nutrients availability which supports regeneration of herbs and growth of post fire community. However, the higher intensity fire results into complete loss of soil organic matter and volatilization of nitrogen, phosphorus and potassium but very high temperature is required for complete burning of Mn, Mg, Cu and other micronutrients. Satish and Reddy (2015) aimed to integrate satellite derived forest burnt areas over a multi-decadal scale to understand fire frequencies in Silent Valley National Park, Kerala, India and found that overall, there is a declining trend of forest fires, which indicates management effectiveness in this area.

Using a combination of remote sensing and GIS technology Ajin et al., (2015) developed the Fire Risk Index model to prepare forest fire risk map of Nemmara Forest Division has classified the area into five risk zones: very high, high, moderate, low and very low. Maksimova et al., (2017) analyzed the state of microbial communities in gray-humus soils (Eutric Fluvic Arenosols (Ochric) of pine stands after forest fires of 2010 and found that it (fire) exert negative effects on the structure and metabolic activity of microbial communities in the postpyrogenic soils. The maximum content of the carbon of microbial biomass carbon and the maximum intensity of microbial respiration have been found in the subsurface and horizons two–three years the fire.

Singh et al., (2017) explored influence of wildfires on microbial biomass carbon, microbial respiration, and on representatives of hydrolytic (acid and alkaline phosphatase, β-glucosidase and dehydrogenase) and oxidative enzymes (phenol oxidase; Phenox and peroxidase; Perox) in tropical dry forest. The study results indicate that the role of oxidative enzymes in tropical dry forest is very critical for the ecosystems functioning and concluded that the wildfire resulted in a significant effect on soil microbial properties, and that these changes may exist for short-period, though it may lead to some critical changes in ecosystem functioning. Sharma et al., (2017) also supported the above mentioned observations and added that the forest fire also affect the soil nitrogen mineralization and microbial biomass.

Verma and Jayakumar (2018) studied how repeated fires affect physical and chemical properties of soil in a tropical dry deciduous forest and alter soil fertility and health and found that specifically, NO_3^-N slightly decreased with high fire frequencies but NH_4^+N decreased significantly with increasing fire frequency. Dhiman (2018) studied the effect of fire on bacterial population and their enzymatic activity by comparing the soil samples of burnt and unburnt site. The study indicated Bacillus was dominant genera in both the samples but their abundance was higher 41% in burnt soil than unburnt soil i.e. 26%, while the enzymatic study revealed that bacteria showed 94% cellulase and 65% protease activity in burnt were as 86% cellulase and 43% protease activity in unburnt soil and concluded that fire affects not only the bacterial abundance but also their enzymatic properties.

Verma et al., (2019) recently studied the recovery of soil properties after fire incident and reported that soil organic carbon was lower in burned plots than unburned plots. Total N, available P, and extractable K were lower 2-years and 5-years after the fire but are higher than unburned plot after 15-yearsa and reported that the response of soil properties varied with years after fire and soil depth. Sannigrahi (2020) assessed the impacts of forest fires on terrestrial ecosystem productivity in India during the period of 2003–2017 using spatiotemporal changes observed from satellite remote sensing data. The data showed that the spatial correlation between the burn indices and net primary productivity were mainly negative (−0.01 to −0.89) for the fire-prone states as compared to the other neighbouring regions. Authors stated that this approach has the potential to quantify the loss of ecosystem productivity due to forest fires.

5.0 Conclusions

Based on the review of existing literature, it is evident that there are certain studies that were carried out in the Indian context vis-a-vis impacts of the forest fires on the ecosystems. Among other studies that are carried out, the major focus of these studies was on the nutrient dynamics and microbial abundance in view of the forest fire incidences. Additionally, the review also showed that the remote sensing and GIS technology based data was majorly used to identify the extent of effect of the forest fire on spatial scale. Also the temporal data was used to identify the incidences of forest fires in a geographic area and its severity has been studied to classify these areas into various zones with respect to the risk of forest fires. Altogether, the literature shows that the forest fires have severe impact on the abiotic as well as biotic factors of the forest ecosystem, which may significantly affect the sustainability of these ecosystems, unless serious efforts are taken by the communities as well as the Governing bodies and departments. In developing countries, apart from natural forest fires, protected forests experience extensive anthropogenic disturbance due to man induced fire, grazing, extraction of fuel wood and collection of non-wood forest products are also major issues that pose threat to these ecosystems. Moreover, the existing body of knowledge pertaining to the impact of forest fire incidences on various environmental compartments needs to be assessed and for this further focused studies are needed.

6.0 References

- Ajin, R.S., Ciobotaru, A.M., Vinod, P.G. and Jacob, M. K.(2015). Forest and wild land fire risk assessment using geospatial techniques: A case study of Nenmara forest division, Kerala, India. *Journal of Wetlands Biodiversity*, 5, pp.29-37.
- Arunachalam, A and Arunachalam, K. (2000). Influence of gap size and soil properties on microbial biomass in a subtropical humid forest of north-east India. *Plant and Soil*, 223, pp.187-195.
- Behera, N and Sahani, U. (2003). Soil Microbial Biomass and Activity in Response to Eucalyptus Plantation and Natural Regeneration on Tropical Soil. *Forest Ecology and Management*,174(1). pp.1-11.
- Chandra K.K. and Bhardwaj A.K. (2015). Incidence of Forest Fire in India and Its Effect on Terrestrial Ecosystem Dynamics, Nutrient and Microbial Status of Soil. *International Journal of Agriculture and Forestry*, 5(2), pp. 69-78.

- Dhiman, P., Mehta, J. P., Singh, P., Shafil, S and Baldotra1, S. (2018). Effect of prescribe fire on Bacterial abundance and their enzymatic activity in burnt and unburnt soil of chilla forest Raja Ji National Park, Uttarakhand, India. *Plant Archives*, 18 (1), pp.1125-1128.
- Holden, S. R and Treseder, K.K.(2013). A meta-analysis of soil microbial biomass responses to forest disturbances., Department of Ecology and Evolutionary Biology, University of California, Irvine, CA, USA.
- Jhariya, M. K., Bargali, S. S., Swamy, S. L., Kittur, B., Bargali, K and Pawar, G.V.(2014). Impact of forest fire on biomass and carbon storage pattern of tropical deciduous forests in Bhoramdeo Wildlife Sanctuary, Chhattisgarh. *International Journal of Ecology and Environmental Sciences*, 40(1), pp.57-74.
- Kittur, B.H., Swamy, S. L., Bargali, S.S and Jhariya, M. K.(2014).Wildland fires and moist deciduous forests of Chhattisgarh, India: divergent component assessment. *Journal of forestry Research*, 25, pp. 857-866.
- Kodandapani, N., Cochrane, M. A and Sukumar, R.(2008). A comparative analysis of spatial, temporal, and ecological characteristics of forest fires in seasonally dry tropical ecosystems in the Western Ghats, India., *Forest Ecology and Management*, 256(4), pp. 607-617.
- Maksimova, E.Yu., Kudinova, A.G and Abakumov, E.V. (2017). Functional activity of soil microbial communities in post-fire pine stands of Tolyatti, Samara oblast, *Eurasian Soil Science*, 50, pp 239-245.
- Meigs, G.W., Donato, D.C., Campbell, J. L., Martin, J.G and Law B.E. (2009). Forest Fire Impacts on Carbon Uptake, Storage, and Emission: The Role of Burn Severity in the Eastern Cascades, Oregon, *Ecosystem*, 12, pp. 1246-1267.
- Michelsen A., Andersson M., Jensen M., Kjoller A and Gashew M. (2004). Carbon stocks, soil respiration and microbial biomass in fire-prone tropical grassland, woodland and forest ecosystems, *Soil Biology and Biochemistry*, 36(11), pp. 1707-1717.
- Pietikainen J., Kiikkila O and Fritze Hannu., (2000). Charcoal as a habitat for microbes and its effect on the microbial community of the underlying humus, *Wiley Online Library*, 89(2), pp. 231-242.
- Sannigrahi, S., Pilla, F., Basu, B., Basu, A.S., Sarkar, K., Chakraborti, S., Joshi, P.K., Wang, Q. Y., Bhatt, S., Bhatt, A., Jha, S., Keesstra, S and Roy, P.S. (2020). Examining the effects of forest fire on terrestrial carbon emission and ecosystem production in India using remote sensing approaches, *Science of The Total Environment*, 725, pp. 773-787.
- Satish, K.V and Reddy, S.C. (2015). Long Term Monitoring of Forest Fires in Silent Valley National Park, Western Ghats, India Using Remote Sensing Data, *Journal of the Indian Society of Remote Sensing*, 44, pp.207–215.
- Sharma, U., Sharma, G and Devi, M.(2017). Effect of forest fire on soil nitrogen mineralization and microbial biomass: A review, *Journal of Pharmacognosy and Phytochemistry*, 6(3), pp. 682-685.

- Singh, A. K., Kushwaha, M., Rai, A and Singh, N. (2017). Changes in soil microbial response across year following a wildfire in tropical dry forest, *Forest Ecology and Management*, 391, pp 458-468.
- Singh, S., Amiro, B. D and Quideau, S.A. (2008). Effects of forest floor organic layer and root biomass on soil respiration following boreal forest fire, Canadian *Journal of Forest Research*, 38(4), pp.647-655.
- Somashekar, R.K., Nagaraja, B. C and Kavya, U. (2008). Monitoring of forest fires in Bhadra wildlife sanctuary, *Journal of the Indian Society of Remote Sensing*, 36, pp. 99-104.
- Sullivan, B.W., Kolb, T.E., Hart, S.C., Kaye, J.P., Hungate, B.A., Dore, S and Hefu M. M. (2010) Wildfire reduces carbon dioxide efflux and increases methane uptake in ponderosa pine forest soils of the southwestern USA, *Biogeochemistry*, 104, pp. 251-265.
- Verma S., Singh D., Singh A.K and Jayakumar S. (2019). Post-fire soil nutrients dynamics in a tropical dry deciduous forest of Western Ghats, India, *Forest Ecosystems* 6(6), pp 1-6.
- Verma, S and Jayakumar, S. (2018). Effect of recurrent fires on soil nutrient dynamics in a tropical dry deciduous forest of Western Ghats, India, *Journal of Sustainable Forestry*, 37 (7), pp. 678-690.
- Verma, S and Jayakumar, S. (2012). Impact of forest fire on physical, chemical and biological properties of soil: A review, *Proceedings of the International Academy of Ecology and Environmental Sciences*, 2(3), pp.168-176.
- Zhua, W. and Carreiro, M. M. (2004). Variations of soluble organic nitrogen and microbial nitrogen in deciduous forest soils along an urban–rural gradient, *Soil Biology and Biochemistry*, 36(2), pp. 279-288.

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Reactivity of Novel Schiff Bases and its Antimicrobial Study

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Abstract— **A series of Schiff bases were synthesized by using mixture of 3,4- methylenedioxybenzaldehyde (Piperonal) and substituted aniline was dissolved in ethanol and 2-3 drops of concentrated sulphuric acid and resultant mixture was refluxed for an hour to yield Schiff bases. The synthesised compounds were characterized using spectral data. Result shows that Schiff bases with substituted moiety exhibit pronounced physiological and pharmacological activities compared with standards used.**

Keywords— **Schiff bases, Piperonal, pharmacological activities, antimicrobial activities, drug development**

INTRODUCTION

Hugo Schiff was the first scientist who described Schiff bases in 1864 [1]. The preparation of Schiff bases involves a variety of conditions and is brought about by mixing carbonyl compounds and amines in suitable proportions using wide range of solvents. The formation of Schiff bases is generally favoured by making use of dehydrating agents. Schiff bases are degradable so its purification process requires great care.

The common structural feature of these compounds is the azomethine group with a general formula $RHC{=}N{-}R_1$. These compounds are also known as anils, imines or azomethines [2]. The nitrogen atom of imines may be involved in the formation of a hydrogen bond with the active centres of cell constituents and interferes in normal cell processes. Azomethine linkages might be responsible for biological activities of Schiff bases. Spectacular development in physiology, biochemistry and organic chemistry during the recent years have greatly accelerated the advances in pharmacology.

Number of potential Schiff bases have been reported to possess bactericidal [3]-[4], anti-inflammatory [5], antipyretic [6], antitumour [7], anticancer [8] and analgesic activities [9]. Literature survey shows that Schiff bases were not prepared from 3,4- methylenedioxybenzaldehyde (Piperonal) hence it was thought of interest to prepare substituted Schiff bases.

MATERIALS AND METHODS

A mixture of 3,4- methylenedioxybenzaldehyde (Piperonal) and substituted aniline was dissolved in 25 ml absolute ethanol and 2-3 drops of concentrated H_2SO_4 then resultant mixture was refluxed for one hour. Then it was cooled, diluted with ice cold water and resulting solid was crystallized from ethanol to yield Schiff Bases (Figure 1).

2020 - 21

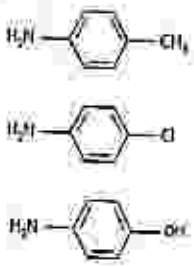
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REACTION SCHEME

Fig 1. Reaction Scheme Used in the Synthesis of Schiff's Bases



Where
Substituted Aniline -



All synthesized compounds were characterized by using IR spectra using 8101FT-IR Spectrophotometer and ultraviolet spectrum using Schimadzu Make UV-2401 PC Spectrophotometer at department of Pharmaceutical Sciences, Rashtra Sant Tukdoji Maharaj University Nagpur, and PMR spectrum was recorded on AMX-400 MHz.

ANTIMICROBIAL ACTIVITY

The synthesized molecules were used to assess their antimicrobial potential. A macro-broth dilution method was used to determine the Minimum Inhibitory Concentrations (MICs). Three bacteria were used in the study; *Staphylococcus aureus*, *Escherichia coli*, and *Bacillus subtilis*. The bacterial cultures were stored on Nutrient Agar (NA) Slants at 4 °C until use. A single colony from overnight grown NA plates was inoculated into nutrient broth and incubated overnight at 30 °C to achieve OD 0.5 McFarland. The activated cultures were washed in sterile saline. Test tubes containing Nutrient broth and serial dilutions of drugs were kept ready and 100 ul of above culture were added to each tube. One tube without inoculum was kept ruling out any contamination. And one tube without any drug was kept as control. Chloramphenicol was used as standard drug. The lowest concentration of drug causing no visible growth was considered as MIC [10].

RESULTS AND DISCUSSIONS

The method used in the present study was found suitable for the synthesis of Schiff's bases mentioned. The maximum yield was obtained for compound Ib (3,4-methylenedioxyphenylidine-4'-methyl aniline) that is 98.5 %, next to which was Ia (3,4-methylenedioxyphenylidine-4'-nitro aniline) with

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92% yield. The lowest yield was obtained for Ic (3,4-methylenedioxyphenylidine-4'-chloro aniline); 46 % and Id (3,4-methylenedioxyphenylidine-4'-hydroxy aniline) was obtained 72%. The melting points observed 198, 98, 80 and 180 for Ia, Ib, Ic and Id respectively (Table I.)

TABLE I

Characterisation of Compounds

Sr No.	Name of Compound	Melting Point (°C)	% Yield
Ia	3,4-methylenedioxyphenylidine-4'-nitro aniline	198	92
Ib	3,4-methylenedioxyphenylidine-4'-methyl aniline	98	96.5
Ic	3,4-methylenedioxyphenylidine-4'-chloro aniline	80	46
Id	3,4-methylenedioxyphenylidine-4'-hydroxy aniline	180	72

UV VISIBLE SPECTRUM

UV-VIS spectrum [11]- [13] was recorded in methanol and reproduced. λ_{max} values are 350 nm and 210 nm. These values correspond to $n \longrightarrow \pi^*$, $\pi \longrightarrow \pi^*$ transition in Schiff Base. The large value of λ_{max} indicated extended conjugation.

TABLE II

IR Spectrum [11]-[13]

Expected Value	Absorption Observed	Assignment
2790-2770	2780	-O-CH2-O-streching
1660-1580	1614	-CH=N (Schiff base)
1585-1570	1587	=C-H str (Azomethine)
1555-1487	1550	C-N02(Ar str)
1520-1488	1500	C=C str
1070-1000	1040	C-O str

TABLE III

PMS Spectrum [11]-[13]

Peak Observed	Multiplicity	Assignment
5.90	singlet	-CH2(2H)
6.25	singlet	-CH=(1H)
7.4 – 8.8	multiplet	Ar-H(7H)

ANTIBACTERIAL ACTIVITY:

All synthesised compounds were tested against pathogenic bacteria using macro broth dilution method and their MICs were determined. Tested compounds showed promising activity against the

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bacteria. The range of sensitivity of the bacteria used was *B. subtilis>E. coli>S. aureus*. *S. aureus* was comparatively more tolerant to the drugs and showed MIC at 125, 250, 250, 125 and 200 µg/ml for drugs, Ia, Ib, Ic, Id and Chloramphenicol respectively. *B. subtilis* was highly sensitive to the molecules tested and showed MIC at 62.5, 31.25, 31.25, 62.5 and 100 µg/ml for molecules Ia, Ib, Ic, Id and Chloramphenicol respectively. While *E. coli* was similarly sensitive to all the molecules tested and showed MIC at 62.5 µg/ml, and 100 µg/ml for Chloramphenicol (Fig. 2.)

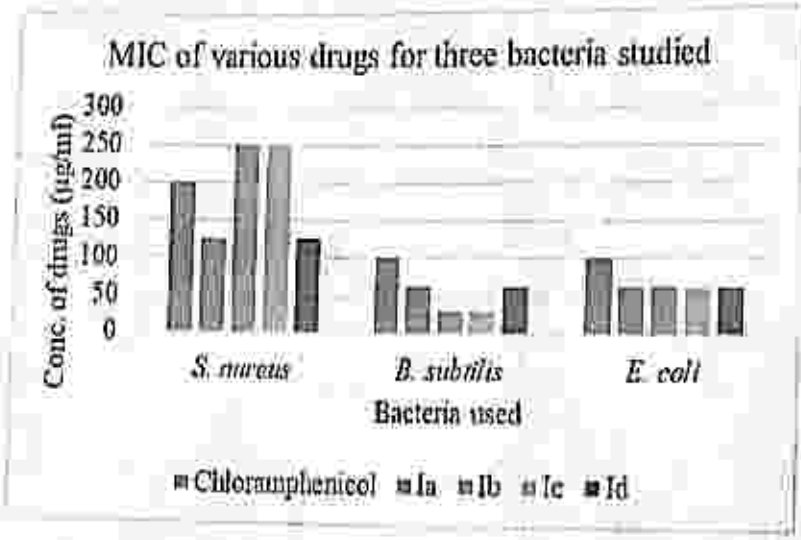


Fig 2. Graph showing MIC's of various drugs for three bacteria studied.

REFERENCES

1. Burnett DA. *Beta-lactam cholesterol absorption inhibitors.* Curr Med Chem. 2004 Jul;11(14):1873-87.
2. Banik BK, Becker FF, and Banik I. *Synthesis of antitumor beta-lactams: mechanism of action.* Bioorganic & Medicinal Chemistry. 2004 May;12(10):2523-2528.
3. Gostczyńska A, Kwiecień H, and Fijałkowski K. *Synthesis and antibacterial activity of Schiff bases and amines derived from alkyl 2-(2-formyl-4-nitrophenoxy) alkanoates.* Med Chem Res. 2015;24(9):3561-3577.
4. Cleiton M. da Silva, Daniel L. da Silva, Luzia V. Modolo, Rosemeire B. Alves, Maria A. de Resende, Cleide V.B. Martins, Ângelo de Fátima, Schiff bases: A short review of their antimicrobial activities, Journal of Advanced Research, 2011, 2 (1): 1-8,
5. Alnfeefy AM, Bakht MA, Ganaie MA, Ansarie MN, El-Sayed NN, and Awaad AS. *Synthesis, analgesic, anti-inflammatory and anti-ulcerogenic activities of certain novel Schiff's bases of fenamate isosteres.* Bioorg Med Chem Lett. 2015, 15;25(2):179-83.
6. Unver Y., and Bekhas E., *Synthesis and Biological Activity of New Schiff Bases of Benzylideneamino Bearing Thiophene, 1,2,4-triazolone, 1,3,4-oxadiazole, Morpholine Moieties.* Letters in Drug Design & Discovery 2018; 15(7)
7. Maciej G, *Schiff Bases and Complexes: A Review on Anti-Cancer Activity.* Anticancer Agents Med Chem. 2020; 20 (16):1908-1917.
8. Tadele KT, Tsega TW. *Schiff Bases and their Metal Complexes as Potential Anticancer Candidates: A Review of Recent Works.* Anticancer Agents Med Chem. 2019; 19(15):1795-1795
9. Jesmin M., Khairul Islam M., Shaikh M. and Mohsin Ali. *Analgesic and Anti-Inflammatory Activities of some Transition Metal Schiff Base Complexes.*, International Letters of Chemistry, Physics and Astronomy, 2014, [27]: 64-72.
10. CLSI. *CLSI document M07-A10.* Wayne, PA: Clinical and Laboratory Standards Institute; 2015
11. Parikh V. M., *Absorption spectroscopy of organic molecules.* Addison Wesley Pub. Co., London. 1978. 243.
12. Rao C. N., *Chemical application of infrared spectroscopy.* Academic Press, NewYork. 1963. 157.
13. Bhatt, H., *Ph.D. Thesis in Chem. Saurashtra University, Rajkot,* 1999.

ULTRASONIC STUDIES OF SOME SUBSTITUTED HETEROCYCLIC MOLECULES AND DYNAMIC FUNCTIONS IN DIOXANE-WATER AND DIMETHYLSULFOXIDE-WATER MIXTURES

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ABSTRACT

Ultrasonic velocity, density and viscosity measurements in binary mixtures of 1,4-dioxane and dimethylsulfoxide with water have been carried out at 303 K. From the experimental data, adiabatic compressibility, intermolecular free length, specific acoustic impedance, relaxation time, molar sound velocity, molar compressibility, molar volume, apparent molal volume, apparent molal compressibility, molar refraction

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Table No. 4 : Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕ_{K_s}), specific acoustic impedance (z) and relative association (R_A) of different concentration of ligands in different percentage of dioxane-water mixture at 303 K.

System L_1 : Dioxane-water + Alanine (Ala) + Medium: Fluoride free

Conc. in mol.kg^{-1}	Apparent molal volume, ϕ_v	Apparent adiabatic compressibility, ϕ_{K_s}	Specific acoustic impedance, z	Relative association, R_A
0.01	87.5	-1.0×10^{-9}	1.2181	1.0000
0.02	89.0	-2.0×10^{-9}	1.2190	1.0008
0.03	90.5	-3.0×10^{-9}	1.2199	1.0016
0.04	92.0	-4.0×10^{-9}	1.2208	1.0024
0.05	93.5	-5.0×10^{-9}	1.2217	1.0032
0.06	95.0	-6.0×10^{-9}	1.2226	1.0040
0.07	96.5	-7.0×10^{-9}	1.2235	1.0048

Table No. 5 : Ultrasonic velocities (U), density (ρ), specific acoustic impedance (z), adiabatic compressibilities (β_s) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of DMF-water mixtures at 303 K.

System L_2 : Dioxane-water + Alanine (Ala) + Medium: DMF-water

Conc. in mol.kg^{-1}	Density, ρ in kg.m^{-3}	Ultrasonic velocity, U in m.s^{-1}	Specific acoustic impedance, z in kg.m^{-2}.s^{-1}	Adiabatic compressibility, β_s in m^2.N^{-1}	Intermolecular free length, L_f in Å
0.01	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.02	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.03	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.04	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.05	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.06	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.07	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849

Table No. 6 : Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕ_{K_s}), specific acoustic impedance (z) and relative association (R_A) at different concentrations of ligands in different percentage of DMF-water mixtures at 303 K.

System L_3 : Dioxane-water + Arginine (Arg) + Medium: Fluoride free

Conc. in mol.kg^{-1}	Apparent molal volume, ϕ_v	Apparent adiabatic compressibility, ϕ_{K_s}	Specific acoustic impedance, z	Relative association, R_A
0.01	147.0	-1.0×10^{-9}	1.2181	1.0000
0.02	148.0	-2.0×10^{-9}	1.2190	1.0008
0.03	149.0	-3.0×10^{-9}	1.2199	1.0016
0.04	150.0	-4.0×10^{-9}	1.2208	1.0024
0.05	151.0	-5.0×10^{-9}	1.2217	1.0032
0.06	152.0	-6.0×10^{-9}	1.2226	1.0040
0.07	153.0	-7.0×10^{-9}	1.2235	1.0048

Table No. 7 : Ultrasonic velocity (U), density (ρ), adiabatic compressibility (β_s) and intermolecular free length (L_f) at different concentrations of ligand in different percentage of DMF-water mixtures at 303 K.

System L_4 : Dioxane-water + Arginine (Arg) + Medium: Fluoride free

Conc. in mol.kg^{-1}	Density, ρ in kg.m^{-3}	Ultrasonic velocity, U in m.s^{-1}	Specific acoustic impedance, z in kg.m^{-2}.s^{-1}	Adiabatic compressibility, β_s in m^2.N^{-1}	Intermolecular free length, L_f in Å
0.01	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.02	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.03	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.04	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.05	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.06	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849
0.07	0.9 X 10	1500.0	1.4850 X 10	4.4444 X 10	0.3849

Table No. 8 : Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕ_{K_s}), specific acoustic impedance (z) and relative association (R_A) at different concentrations of ligands in different percentage of DMF-water mixtures at 303 K.

System L_5 : Dioxane-water + Arginine (Arg) + Medium: Fluoride free

Conc. in mol.kg^{-1}	Apparent molal volume, ϕ_v	Apparent adiabatic compressibility, ϕ_{K_s}	Specific acoustic impedance, z	Relative association, R_A
0.01	147.0	-1.0×10^{-9}	1.2181	1.0000
0.02	148.0	-2.0×10^{-9}	1.2190	1.0008
0.03	149.0	-3.0×10^{-9}	1.2199	1.0016
0.04	150.0	-4.0×10^{-9}	1.2208	1.0024
0.05	151.0	-5.0×10^{-9}	1.2217	1.0032
0.06	152.0	-6.0×10^{-9}	1.2226	1.0040
0.07	153.0	-7.0×10^{-9}	1.2235	1.0048

Table No. 9

Limiting apparent molal volume (ϕ^0_v) and limiting molal compressibility ($\phi^0_{K_s}$) of different ligands in Dioxane-water and DMF-water mixtures at 303 K.

Sr. No.	System	ϕ^0_v	$\phi^0_{K_s}$
1.	L_1 (Dioxane-water)	147.0	-1.0×10^{-9}
2.	L_2 (Dioxane-water)	147.0	-1.0×10^{-9}
3.	L_3 (DMF-water)	147.0	-1.0×10^{-9}
4.	L_4 (DMF-water)	147.0	-1.0×10^{-9}

References

1 S.C. Kar and S.S. [illegible] Indian J. Exp. Appl. Phys., 15(5), 5, 50
2 V.C. Sutton and S.S. Jaju, Atom. [illegible], 1968, 7, 191
3 A.A. Talhan, V.T. Bhandarkar [illegible] Electron. Infolit. Tunc Appl. Phys., 1995, 21, 219
4 S.B. Ghosale, Indian J. Pure Appl. Phys., 1983, 11, 254
5 N.T. Shevtsova, Indian J. Chem. 2004, 43A, 231
6 V. Walther, V. Y. Akhtar and U.U. Pandey, [illegible] Indian Acad. Sci. 1997, 109, 267
7 A.B. Anwar, J. [illegible] Appl. Electron., 1998, 2, 45.
8 S.S. Hunter and S.C. Lamb, Adv. Electron., 1955, 7, 329
9 P.G. Ellerbrandt and M.T. Sherwood, Ph.D. thesis in Chemistry, Assam, [illegible], Assam, 1996
10 H. Eyring and [illegible] J. Chem. Phys., 1938, 6, 880
11 S.D. Bakhrani and D.V. Elangovan, Ph.D. thesis in Chemistry, Mississippi University, Aizawl, 1998
12 [illegible] Phys. Chem. Solids, 1998, 60, 383
13 [illegible] Electron. Acta, 1981, 26, 1005

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ANTIMICROBIAL ACTIVITIES OF SOME *S*- LACTOSYLATED ARYLISOTHIOCARBAMIDES

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ABSTRACT

Several S-hepta-O-benzoyl lactosyl-1-aryl isothiocarbamides have been synthesized by the interaction of hepta-O-benzoyl lactosyl bromide and arylthiocarbamides. The identities of these newly synthesized compounds have been established on the basis of usual chemical transformations, IR, ^{1}H NMR and Mass spectral analysis.

Keywords: *- Lactosyl bromide, arylthiocarbamides, arylisothiocarbamides.*

Introduction

Thiolactosides constitute an important family of carbohydrate derivatives. These carbohydrate derivatives bearing *S*-linked functionalities at anomeric position are biologically and pharmacologically important[1]. Urea, thiourea and their derivatives are versatile reagent in organic synthesis and show strong antibacterial activity[2]. This type of compounds show antidiabetic and antituberculosis[3] significance. Lactosyl bromide[4] is an important reagent in the synthesis of *S*-lactosylated compounds. They were prepared by the interaction of hepta-*O*-benzoyl lactosyl bromide (**1**) and arylthiocarbamides[5] (**2a-g**).

Experimental

All the melting points recorded are found uncorrected. IR Spectra were recorded on Perkin-Elmer spectrum RXI FTIR Spectrometer. ^{1}H NMR was obtained on Bruker DRX-300 NMR Spectrometer. Samples were prepared in $CDCl_3$ with TMS as an internal reference. The mass spectra were obtained on Thermo Fennigan LCQ Advantage max ion trap mass spectrometer. Optical rotations $[\alpha]_D^{31}$ were measured on the Equiptronics EQ-800 Digital Polarimeter at 31 °C in $CHCl_3$.

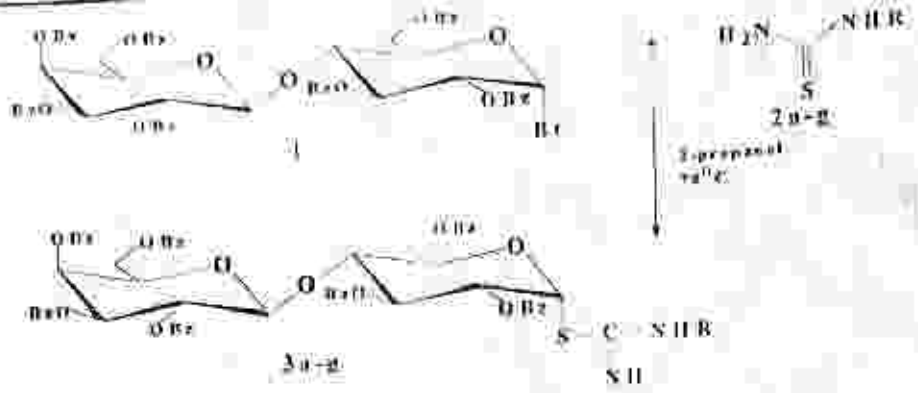
Result And Discussion

Isopropanolic (40 ml) suspension of hepta-*O*-benzoyl lactosyl bromide and phenyl thiocarbamide was heated on water bath at about 70°C until the suspension gets cleared. The clear solution was kept at room temperature for 20 hours. It was mixed with 100 ml distilled water. This aqueous solution was acidic and non-desulphurisable when boiled with alkaline plumbite solution. The aqueous solution was basified with ammonium hydroxide afforded a

sticky mass which was not solidified on standing for several hours. It was purified by ethanol and water. It gave charring test and was found to be non-desulphurisable. Its specific rotation was found $[\alpha]_D^{31}$ -30 (c, 0.980 in $CHCl_3$).

The IR, ^{1}H NMR and mass spectral analysis[6-11] and elemental analysis (Table 1) clearly indicated the product and was assigned the structure as *S*-hepta-*O*-benzoyl lactosyl-1-phenyl isothiocarbamide (**3a**).

When the interaction of hepta-*O*-benzoyl lactosyl bromide was extended to other arylthiocarbamides the related *S*-hepta-*O*-benzoyl lactosyl-1-arylisothiocarbamides (**3b-g**) were isolated.



Scheme 1

Where, Bz = COC_6H_5

R = a) phenyl, b) *o*-tolyl, c) *m*-tolyl, d) *p*-tolyl, e) *o*-Cl-phenyl, f) *m*-Cl-phenyl, g) *p*-Cl-phenyl.

General Procedure

Synthesis of S-hepta -O-benzoyl lactosyl -1-phenylisothiourobromides (3a-g)

Isopropanolic (40 ml) suspension of S-hepta-*O*-benzoyl lactosyl bromide (0.01M, 11.32g) and phenyl thiourea (0.01M, 1.52g) was heated on water bath at about 70°C until the suspension gets cleared. The clear solution was kept at room temperature for 20 hours.

The aqueous solution when basified with ammonium hydroxide and afforded a sticky mass which was not solidified on standing for several hours. This sticky mass was purified by ethanol and water, the solid was obtained.

3a. IR (KBr) : ν 3460 cm^{-1} (N-H), 1728 cm^{-1} (C=O), 1655 cm^{-1} (C=N), 1454 cm^{-1} (C-N), 1271 cm^{-1} (C-O), 1026,858 (characteristic of lactose unit) and 709 cm^{-1} (C-S); ^{1}HNMR (CDCl$_3$): δ 8.14- 7.16 (40 H, m, Ar-H); δ 5. -5.39 (14 H, m, lactose ring protons); δ 5.7 2H, s, 2N-H), MS (*m/z*): 1204 (M^+), 1083, 1053, 976, 948, 932, 918, 579, Anal. Found : C, 67.70; H, 4.70; N, 2.32 S, 2.74 Calcd. For $C_{68}H_{56}O_{17}N_2S$; C, 67.77; H, 4.65; N, 2.32, S, 2.26 %

3b. IR (KBr) : ν 3469 cm^{-1} (N-H), 1728 cm^{-1} (C=O), 1632 cm^{-1} (C=N), 1453 cm^{-1} (C-N), 1271 cm^{-1} (C-O), 1028 (characteristic of lactose unit) and 710 cm^{-1} (C-S); ^{1}HNMR (CDCl$_3$):δ 8.07- 7.18 (39 H, m, Ar-H); δ 5.7 - 5.43 (14 H, m, lactose ring protons); δ 5.7 (1H, s, 2N-H), δ 6.1 (1H, s, N-H), MS (*m/z*): 1238 (M^+), 1203, 1133, 1103, 1053, 976, 579, Anal. Found : C, 63.85.70; H, 4.25;

3c IR (KBr) : ν3469 cm^{-1} (N-H), 1728 cm^{-1} (C=O), 1602 cm^{-1} (C=N), 1454 cm^{-1} (C-N), 1453 cm^{-1} (C-O), 1027, 855, (characteristic of lactose unit) and 710 cm^{-1} (C-S); ^{1}HNMR (CDCl$_3$):δ 8.05- 7.18 (39 H, m, Ar-H); δ 5.79 - 5.39 (14 H, m, lactose ring protons); δ 2.9 (3H, s, Ar-CH$_3$), δ 6.8-6.7(2H, s, N-H), MS (*m/z*): 1218 (M^+), 1133, 1097, 1053, 932, 918, 579, Anal. Found : C, 66.78; H, 4.56; N, 2.4 S, 2.50 Calcd. For $C_{68}H_{58}O_{17}N_2S$: C, 67.98; H, 4.76; N, 2.2; S, 2.56 %

Antimicrobial Activities

All the compounds have been screened for both antibacterial and antifungal activities using cup plate agar diffusion method by measuring the inhibition zone in mm. The compounds were taken at a concentration of 1µ/mL using dimethyl sulphoxide as solvent. Amikacin (100µg/ml) was used as a standard for antibacterial and antifungal activity and fluconazole (100µg/ml) as a standard for antifungal activity. The compounds were screened for antibacterial activity against *Escherichia coli*, *Staphylococcus aureus*, *Proteus vulgaris*, *Salmonella typhi*, *Klebsiella Pneumoniae*, *Pseudomonas aeruginosa*, *Bacillus subtilis* in nutrient agar medium and for antifungal activity against *Candida albicanes* and *Aspergillus niger* in potato dextrose agar medium.It has been observed that all of these synthesized compounds showed nearly the same inhibitory activity as that of the standard Amikacin and Fluconazole.

These sterilized agar media were poured i... Petri dishes and allowed to solidify on t... surface of the media, microbial suspensio... were spread with the help of sterilized triangular loop. A stainless steel cylinder of 8mm diameter (pre-sterilized) was used to b... the cavities. 0.1ml portions of the ... compounds in solvent were added into th... wells. The drug solution was allowed to diff... for about an hour into the medium. The pl... were incubated at 37°c for 24h and 30°c ... 48h for antibacterial and antifungal activit... respectively. The zone of inhibition obser... around the cups after respective incubation ... measured. The results are presented in (T... 1).

Table 1. Antimicrobial activities of S-Lactosides (3a-g).

Comp d.	Antibacterial**							Antifun...	
	E. coli	S. aureus	P. vulgaris	S. typhi	K. Pneumoniae	P. aeruginosa	B. Subtilis	C. albicans	
3a	16	14	20	16	19	15	12	07	
	23	13	13	12	15	17	22	10	07
	19	20	-	10	17	-	16	08	11
	-	17	22	-	13	13	17	07	-
	13	19	12	-	20	-	15	07	09
	16	19	17	14	-	14	-	07	08
	12	19	17	11	14	-	11	09	08
...ulk ...in	28	21	25	28	22	25	22	-	28
...cin ...zole	-	-	-	-	-	-	-	18	-

* Zone of inhibition in mm (15 or less) ...istance, (16-20mm) moderate and (more ... 20mm) sensitive. *Escherichia coli, ...phylococcus aureus, Proteus vulgaris, ...monella typhi Klebsiella Pneumoniae, ...domonas auriginosa, Bacillus subtilis, ...ndida albicanes* and *Aspergillus niger*.

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1) M. Jose, Garcia Fernandez, and Cun... Ortiz Mellet, *Adv. Carbohydr. Ch... Biochem.*
2) 2000, 55, 97-98 , L. H. Cao,C. J. Zhou... Y. Guo,Y. T. Liu, *J.Chin.Chem.Soc.*, 2... 48, 207-210 .
3) M.Tomoya, N.Shigery, K. Kazuo and Testsuo, *Bull. Chem. Soc.*, 1976, 48, 17...
4) P. C. Scheuzer and F. Su... *J.Am.Chem..Soc.*,1954, 76,3234 .
5) H. Krall and R. D. Gupta, *J. In... Chem.,Soc.*,1935 12,629 .
6) (a) R.M.Silverstain and G.C. Bas... "Spectrometric Identification of Orga... Compounds", 5th ed., John Wiley & ... Inc. New York, 1991. (b) D.H. Will... and Ian Fleming, "Spectrometric Met... of Organic Chemistry", 4th ed., ... McGraw Hill, 1991; (c) J.R.Dyer. "Applications of Absorption Spectroscopy ... Organic Compounds", 8th ed., Prentice ...ll, 1991.
7) ... Verma, S. Y. Kulkarni, C. L. Jose and ... S. Pansave, *Carbohydr. Res.*, 1984, 133,25.
8) S. A. Barker, J. Homer, M. C. Keith and L. Thomas, *J. Chem. Soc.*, 1963, 1538.
9) S. A. Barker, E.J. Bourne, R. Stephens and ...H.Whiffen, *J.Chem. Soc.*, 1954, 3468.
10) ...ola Prata, Nathie Mora, J. Lacombe, ...aurizis and B. Pucci, *Carbohydr. Res.*, ...999, 321,
11) ...se L. J. Blanco, C.S. Barria, Benito, C. ...z Mellet, J. Fuentes, F.S.Gonzalez and ...reia Fernandez, *Synthesis*, 1999, 11, ...07.

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BACTERIOLOGICAL PROFILE WITH ANTIBIOTIC RESISTANCE PATTERN AMONG DIABETIC AND NON-DIABETIC PATIENTS

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ABSTRACT

Diabetes mellitus is a metabolic disorder which impedes the normal steps of the process of woundhealing Ithashigherriskoffootinfectionandpostoperativewoundinfectionthatispolymicrobial with increased antibiotic resistance. A comparative study of bacteriological profile from the wound samples of diabetic and non-diabetic patients and to understand the relationship between bacterial load and high glycemic index among diabetic patients. A cross sectional study involving 50 diabetic and 50 non- diabetic patients wound swab or pus samples collected under aseptic precautions. Results: Polymicrobial infection is mostly observed. Among the isolates, gram negative bacilli were about 55% and gram-positive cocci were about 45%. The most common organism isolated was Staphylococcus aureus in diabetic and non- diabetic wound. In diabetic wound the predominant organism isolated was Staphylococcus aureus and followed by Pseudomonas species. In non-diabetic wound, the predominant organism isolated was Staphylococcus aureus followed by Pseudomonas species. The Total Extended spectrum beta lactamase producer was about 77% where as total Methicillin Resistant Staphylococcusaureus was 22%. In diabetic wound, glycemic index was poorly controlled in which fasting blood glucose level was >150mg and post prandial blood glucose level was >210mg among majority of cases. Antibiotic susceptibility test screening showed gram positive cocci isolates to more sensitive towards Erythromycin, Vancomycin, Linezolid and gram-negative bacilli isolates to be more sensitive for Amikacin, Cefoperazone and Imipenem. Thus, early diagnosis of diabetic wound infection is required for the antimicrobial therapy.

Keywords: Bacteriological profile, Diabetic wound, Glycemic index, Non diabetic wound.

1. Introduction

Diabetes Mellitus a global disease, which was declared as an epidemic in developing countries where there is insulin deficiency causing increased blood glucose level. Approximately 347 million people are suffering from Diabetes Mellitus worldwide, which would be double by the year 2025 (Jones RN. *et al* 2006). With increased blood glucose level, there is always a lack of enough nutrients and oxygen to the energizing cells which reduces the normal functional activity of immune system and increases the process of inflammation in the body cells. Reduced process of wound healing leads to the peripheral arterial diseases and peripheral neuropathy causing reduced circulation and reduced oxygen supply, essential in the wound healing process. Hyperglycemia facilitates growth of many organisms as well as colonization by bacterial and fungal pathogens (Karmakar M. *et al* 2016). Commonly isolated organisms include Staphylococcus aureus, Gram negative bacteria like Escherichia coli, Pseudomonas aeruginosa, Klebsiella species, Proteus species and anaerobic organisms. These infections are mostly polymicrobial with serious complications (Rani V. *et al* 2014). On comparing the microbial profile of diabetic wound to that of non-diabetic wound, the severity of infectionean he seen much aggravated among diabetic patients. This condition brings in recurrence of infection which further results in more comorbid conditions (Jonkhwala S. *et al* 2014). Once an infection has developed in diabetic patients, it is difficult to treat because of impairment in microvascular circulation that limits phagocytic cell action and curtails the reach of antibiotics to the infected sites (Singhai M. *et al* 2012) Early diagnosis of diabetic wound infection is required for the antimicrobial therapy. This study is expected to generate valuable information, which will be helpful in the management and prevention of diabetic infection in our population and will guide clinicians in the management of such condition with appropriate as well as judicious use of antimicrobial therapy.

2020-21

2. Material andMethods

The present study was carried out in the Department of Microbiology for a period of two months between January to February 2020. A total of 100 wound swab or pus samples were collected from 50 diabetic patients and 50 non-diabetic patients of any age group for the study. To avoid contamination, wound and tissue debris were thoroughly cleaned with sterile normal saline followed by gentle rubbing of the wound site with 70% alcohol prior to swabbing the pussample. Samples were collected in sterile screw-capped containers and were transported to the laboratory immediately. If it was wound swab, two swabs were collected per patient where one was used for microscopy (Gram's staining) and the other for routine conventional culture method. Blood was also collected for biochemical analysis for the estimation of glycemicindex. Samples were properly labeled and transported to the laboratory for further investigation. In furthermethodology, the identification of aerobic bacteria and detection of its antimicrobial susceptibility was performed by Kirby Bauer disk diffusion method as per the Clinical and Laboratory Standards Institute (CLSI) guidelines 2017. Extended spectrum beta-lactamases (ESBL) positive organisms were screened by observing an increase 5mm in zone diameter with ceftazidime/clavulanate versus its zone size when tested with ceftazidime disc alone (Rawat D. *et al* 2010). An inhibition zone diameter of 21mm in case of Staphylococcus aureus and 24 mm for coagulase negative Staphylococcus was considered as methicillin resistantorganisms.

3. Results

A total of 100 samples were collected for 50 diabetic and 50 non diabetic included in the study. The study population represented 65% male whereas 35% as female patients. The mean age of the patients was 52 years ranging from 10 to 85 years. All patients presented with ulcers which were graded 0-5 in the Wagner classification and majority belonged to Grade 2 (i.e., deep ulcer, penetrating down to ligaments and muscles, but no bone involve mentor abscess formation). (Sun JH. 2012 and Nour S. 2015). Among the total 100 samples, 55% were wound swabs and 45% accounted for the pus samples received from the surgery department. All the samples showed bacterial growth of aerobic bacteria. The distribution of bacteriological profile is shown in the Tables 1 and2. Our study showed polymicrobial distribution of infection and it was found to be about 32% among the total samples. The most common organism isolated was Staphylococcus aureus in both diabetic and non-diabetic wound samples. Therewas45%ofgram-positiveisolateswhereas55%were identified as gram-negative isolates. Among all the isolates, Staphylococcus aureus was the most frequent pathogen (35%), followed by Pseudomonas aeruginosa (20%). Among the gram-positive organisms, Staphylococcus aureus (77.8%) was most frequent in which 6% were found to be staphylococcus aureus. The second common estpathogeningram positive organism was Enterococcus spp. (26.7%) followed by coagulasene gativestaphylococci(17.8%)whicharemainly recognized as normalcommensals. Pseudomonas aeruginosa (36.4%) was the predominant pathogen isolated among the gram-negative organisms followed by Escherichia coli (18.2%). In-vitro antibiotic susceptibility pattern are depicted in Table 3 & 4. All gram-positive isolates were sensitive towards vancomycin and linezolid was found to be efficient against all Staphylococcus species isolates. Among the gram negative, most of the isolates were sensitive to Amikacin, Cotrimoxazole and Imipenem. The total Staphylococcus aureus was 6%,in which both diabetic and non-diabetic wound was about 4% each. The total extended spectrum betal actamases organism in our study was about 27% among which 22% was diabetic whereas only 5% wasnon-diabetic. On comparison among diabetic wound, the glycaemic index was poorly controlled wherein fasting blood glucose level was found to be >150mg/dL in 35 patients and postprandial blood glucose level was about >210mg/dLin 43patients. These patients also found to have polymicrobial growth of microbial pathogens which were resistant to most of the antibiotics.

Table 1: Distribution of bacterial isolates among the clinical samples (N=100)

Sr. No.	Name of Organisms	N (%)
1	*Staphylococcus aureus*(MR)	35
2	*Enterococcus Spp.*	12
3	*Staphylococcus* (Coagulase negative)	8
4	*Streptococcus Spp.*	3
5	*Pseudomonas aeruginosa*	20
6	*Escherichia coli*	10
7	*Klebsiellapneumonia*	12

- MR- Methicillin resistant

Table 2: Percentage distribution of organisms among the clinical isolates

Sr. No.	Name of Organisms	DM Wound	Non-DM Wound
1	*Staphylococcus aureus* (MR)	20	15
2	*Enterococcus Spp.*	5	7
3	*Staphylococcus* (Coagulase negative)	4	4
4	*Streptococcus Spp.*	1	2
5	*Pseudomonas aeruginosa*	12	8
6	*Escherichia coli*	7	3
7	*Klebsiellapneumonia*	6	6

Table 3: In-vitro susceptibility pattern of Gram-positive organisms (N= 45) to various antimicrobials (%)

Sr. No.	Name of Organisms	AZIT	CD	CIP	COT	ERY	LZ	P	VAN
1	*Staphylococcus aureus* (MR)	46	58	54	48	82	100	2	100
2	*Enterococcus Spp.*	25	72	84	72	31	100	10	100
3	*Staphylococcus* (Coagulase negative)	22	73	80	74	27	100	0	100
4	*Streptococcus Spp.*	50	27	60	46	62	100	4	100

P – Penicillin; ERY- erythromycin; CIP- ciprofloxacin; COT- cotrimoxazole; AZIT-azithromycin, clindamycin, VAN- vancomycin, LZ-linozolid.

Table 4: In-vitro susceptibility pattern of Gram-negative organisms (N= 55) to various antimicrobials (%)

Sr. No.	Name of Organisms	AK	AMC	ATM	CES	CIP	COT	CTX	IPM
1	*Pseudomonas aeruginosa*	64	10	88	87	52	57	24	100
2	*Escherichia coli*	83	54	61	98	81	84	52	100
3	*Klebsiellapneumoniae*	84	40	72	62	73	64	42	100

AK-amikacin; CTX- cefotaxime; CIP- ciprofloxacin; COT- cotrimoxazole; AMC-amoxicillin/ clavulanic acid, IPM- imipenem, ATM- aztreonam, CES- cefoperazone.

4. Discussion

In our study, diabetics mostly in the aged category were more prone and susceptible for the diabetic foot infections. This was found to be in similar with the study from Bangladesh which too reports most of their patients being in the older category (Karmakar M. *et al* 2016) The mean age of the patients was 52 years which was similar to the 55-mean age of the subjects reported from the Bangladesh study. Isolation of only aerobic pathogens were found in both the diabetic and non-diabetic categories which included gram positive and gram-negative organisms owing to the aerobic incubation conditions followed in the laboratory whereas other studies showed isolation of anaerobic pathogens also in the diabetic foot infections.Among the isolated pathogens Staphylococcus aureuswas the commonest gram-positive bacteria and, in the gram, negative category Pseudomonas aeruginosa was the frequently isolated microbial pathogen in the diabetic foot ulcer patients as well as in non-diabetic patient. These findings were similar to the many other Indian and international studies carried out among the diabetic foot infections (Ramakant P. *et al* 2011and Almobarak AO. *et al* 2017) Diabetic foot infections are considered to be polymicrobial in nature. This polymicrobial infection rate was comparable to the other studies where polymicrobial isolation of

pathogens were more when compared to the monomicrobial organisms (Ogba OM. *et al* 2019 and Anyim O. *et al* 2019). Also, preponderance of the organisms isolated is gram positive followed by gram negative and anaerobic pathogens (Lipsky BA. *et al* 2012). The polymicrobial nature of the diabetic foot infections reveals indirect relationship between the occurrence of bacterial infections and increased duration of the diabetic foot ulcer which results in many complications. Effective antimicrobial usage is prerequisite in the control and care of the diabetic foot infections. Antibiotics susceptibility pattern of the commonly isolated organisms are low and none of the isolates prove 100% efficient in treating the infections. Also, like other reported studies there is presence of multiple antibiotic resistances in the isolated microorganisms (Keteel R. *et al* 2018 and Belefquih B. *et al* 2016). This low susceptibility for antimicrobial agents' attributes for the extensive usage of the available treatment options without the judiciousthinking. Though, Pseudomonas species show the highest rate of isolation among diabetic as well as non-diabetic like other studies, we also recommend adequate care like avoiding moisture frequent wound dressings etc. to eradicate this pathogen (Shanmugam P. *et al* 2013). Also, overall incidence of Staphylococcus spp. is considered to be more as stated in other similar studies among diabetic as well as among non-diabetic patients (Chhibber S. *et al* 2013). Our findings are comparable to a recent study done suggesting more chronic and complicated diabetic foot infections are by gram negative pathogen spredominantly (Turhan V. *et al* 2013).

Like other reported studies, our findings state presence of antibiotic resistant organisms like methicillin resistance and ESBL producers more common among the diabetic people on comparing with non-diabetic patients (Braun LR. *et al* 2014).

5. Conclusion

It is concluded through our study that polymicrobial infections are more prevalent among diabetic patientswhen compared to non-diabetic group of patients. Hence, early diagnosis of diabetic wound infections with proper therapy and care is essential in order to avoid complications and deep seeded systemic infections among diabeticpatients.

References

1. AlmobarakAO, AwadallaH, Osman M, Ahmed MH. Prevalence of diabetic foot ulceration and associated risk factors: an old and still major public health problem in Khartoum, Sudan? Ann TranslMed. 2017;5.
2. Anyim O, Okafor C, Young E, Obumneme-Anyim I, Nwatu C. Pattern and microbiological characteristics of diabetic foot ulcers in a Nigerian tertiary hospital. Afr Health Sci.2019;19:1617–27.
3. Belefquih B, Frikh M, BenlahlouY, Maleh A, Jadid L, BssaibisF, et al.2016.
4. Braun LR, Fisk WA, Lev-Tov H, Kirsner RS, Isseroff RR. Diabetic Foot Ulcer: An Evidence-Based Treatment Update. Am J ClinDermatol.2014; 15:267–81.
5. Chhibber S, KaurT, Kaur S. Co-therapy using lytic bacteriophage and linezolid: effective treatment in eliminating methicillin resistant Staphylococcus aureus (MRSA) from diabetic foot infections. PloSOne.2013; 8:56022.
6. Everett E, Mathioudakis N. Update on management of diabetic foot ulcers. Ann New York Acad Sci.1411;(1):153.
7. Increasing incidence of Gram-negative organisms in bacterial agents isolated from diabetic foot ulcers. J Infect DevCtries. 2013;7(10):707–12.
8. Jankhwala S, Singh S, Nayak S. A comparative study of profile of Infections in diabetic and non-diabetic Patients. Int J Med SciPublic Health.2014;3(8):982–6.
9. Jones RN, Fritsche TR, Sader HS, Ross JE. LEADER surveillance program results for 2006: an activity and spectrum analysis of linezolid using clinical isolates from the United States (50 medical centers). Diagnostic Microbiol Infect Dis.2007;59:309–326.
10. Karmaker M, Sanyal SK, Sultana M,

Hossain MA. Association of bacteria in diabetic and non-diabetic foot infection – Aninvestigation in patients from Bangladesh. J Infect Public Health.2016; 9:267–77.

10. Karmaker M, Sanyal SK, Sultana M, Hossain MA. Association of bacteria in diabetic and non-diabetic foot infection – Aninvestigation in patients from Bangladesh. J Infect Public Health. 2016;9(3):267–77.
11. KateelR,AugustineAJ,PrabhuS,UllalS,Pai M, AdhikariP.Clinical and microbiological profile of diabetic foot ulcer patients in a tertiary carehospital.DiabetesMetabSyndr:ClinRes Rev.2018;12(1):27–30.
12. Lipsky BA, Berendt AR, Cornia PB, Pile JC, Peters EJ, Armstrong DG, et al. Infectious Diseases Society of America clinical practice guideline for the diagnosis and treatment of diabetic foot infections. Clin Infect Dis.2012; 54:132–73.
13. Noor S, Zubair M, Ahmad J. Diabetic foot ulcer—A review on pathophysiology, classification and microbial etiology. Diabetes MetabSyndr: Clin Res Rev.2015;9(3):192–9.
14. Ogba OM, Nsan E, Eyam ES. Aerobic bacteria associated with diabeticfootulcersandtheirsusceptibilitypat tern.BiomedDermatol. 2019;3.doi:10.1186/s41702-019-0039-x.
15. Performance standards for antimicrobial susceptibility testing 27th informationsupplement.ClinicalLaboratory StandardInstitute;2017.
16. RamakantP, VermaA, Misra R, Prasad K. Changing microbiological profile of pathogenic bacteria in diabetic foot ulcer. Diabetol. 2011;54(1):58–64.
17. Rani V, Nithyalakshmi J. A comparative study of Diabetic and Non-diabeticwoundinfectionswithspecialreferen cetoMRSAandESBL. Int J CurrMicrobiol App Sci.2014;3(12):546–54.
18. Rawat D, Nair D. Extended-spectrum β-lactamases in gram negative bacteria. J Glob Infect Dis.2010; 2:263–74.
19. ShanmugamP, Susan LS. The bacteriology of diabetic foot ulcers, with a special reference to multidrug resistant strains. J ClinDiagnostic Res: JCDR. 2013; 7(3):441–5.
20. Singhai M, Kumar A, JhaP, Goyal R, RawatV. Bacteriological and resistance profile in isolates from diabetic patients. North Am J Med Sci.2012; 4:563.
21. Sun JH, Tsai JS, Huang CH, Lin CH, Yang HM, Chan YS, et al. Risk factors for lower extremity amputation in diabetic foot disease categorized by Wagner classification. Diabetes Res ClinPract. 2012; 95:358–63.
22. TurhanV, Mutluoglu M, Acar A, Hatipoglu M, OnemY,Uzun.

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Antibiogram of *E coli* isolates having heavy metals tolerance

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ABSTRACT

In the present Study total 10 heavy metal resistant *E. coli* were isolated from sewage of industrial effluents from waste water of Khamgaon MIDC area. Against copper, aluminium, iron, nickel and chromium. All the isolates exhibited high resistance to heavy metals with minimum inhibitory concentration for heavy metals ranging from 50 ug / ml to 500 ug / ml. All isolates showed multiple tolerance to heavy metal and were multi antibiotic resistant. heavy metal tolerance test indicated maximum microbial tolerance of *E. coli* to chromium (480 ug / ml) and lowest to Copper (60 ug / ml).

Keywords Antibiotic resistance, heavy metal resistant bacteria, multiple tolerance.

INTRODUCTION

As the industrialization increases the pollution of the environment with toxic heavy metal also increases and spreads throughout the world. Copper, chromium, Aluminium, iron and nickel are known to be the most common heavy metals used and the more widespread contaminants of the environment (Patterson, 1977; Aksu, 1998; Doenmez and Aksu, 1999). The microorganisms respond to these heavy metals by several processes, including transport across the cell membrane, biosorption to the cell walls and entrapment in extracellular capsules, precipitation, complexation and oxidation reduction reactions (Rai et al. 1981; Macaskie and Dean, 1989; Huang et al. 1990; Avery and Tobin, 1993; Brady et al. 1994; Veglio et al. 1997). The bioremediation of heavy metals using microorganisms received attention in recent years, not only as a scientific novelty but also for its potential application in industry. Metal accumulative bioprocess generally falls into one of two categories, biosorptive (passive) uptake by nonliving, non growing biomass or biomass products and bioaccumulation by living cells (Macaskil and Dean, 1989; Aksu and Kutsal, 1990; Huang et al. 1990; Volesky et al. 1992; Avery and Tobin, 1993; Brady and Duncan, 1994; Aksu, 1998; Doenmez and Aksu, 1999; 2001).

Industrial wastes containing toxic metals were characterized by their differences rather than their similarities. These toxic metals can arise from

2021

a wide variety of industrial processes. The quality and the quantity of the wastes containing toxic heavy metals are dependent upon their industrial sources. Naturally occurring bacteria that are capable of metal accumulation have been extensively studied since it is difficult to imagine that a single bacterium could be capable to remove all heavy metals from its polluted site (Clausen, 2000). Apparently, the metal, which has been introduced into the bacterial suspension by vigorous mixing, forms complexes with various ligands available (Hussein *et al.*, 1998; 2001). Consequently, the largest number of metals will be found as hydroxide or as a stable metal-ligand complex. Under a specific stress conditions, a relatively constant amount of metal reacts to stable and inactive complexes with active cellular components (Hussein, 1999). However, it is very important before the optimization of the bacterial growth process is to study at which pH value will be found as metal ions to study the exact interaction between the free metal ions and the bacterial strain. This study aimed to isolate and characterization of *E. coli* sp resistant to heavy metals contaminants from sewage of industrial effluents from waste water of Khamgaon M1DC area.

MATERIAL & METHODS

Sample collection

The sampling area was the sewage of industrial effluents from waste water of Khamgaon M1DC area. Samples was collected in sterile plastic bottles. A total of twenty samples were taken for study.

Isolation and identification of bacterial heavy metal resistance

For the selective isolation of heavy metals resistant bacteria, media incorporated with heavy metals were used. The Nutrient agar incorporated with heavy metals like Cr^{6+}, Ni^{2+}, Al^{2+}, Fe^{2+} and Cu^{2+} were prepared. The concentration of each heavy metal was maintained at 50 µg/ml of the medium. The wastewater sample directly streaked on (N. A.) media and incubated at 37°C for 24 h. After the incubation period the plates were observed for any kind of growth on the media. The isolated colonies of *E. coli* sp. on the Nutrient agar media were sub cultured and obtain in the form of pure culture and identified on the basis of their morphology and biochemical characters.

Determination of Minimum Inhibitory Concentration (MIC)

MIC of the heavy metal resistant *E. coli* sp. grown on heavy metals incorporated media, against respective heavy metal was determined by gradually increasing the concentration of the heavy metal, 10 µg/ml each time on Nutrient agar plate until the strains failed to give colonies on the plate. The starting concentration used was 50µg/ml. The culture growing on the last concentration was transferred to the higher concentration by streaking on the plate. MIC was recorded when the isolates failed to grow.

Determination of antibiotic sensitivity and resistance pattern

Antibiotic sensitivity and resistance of the isolated heavy metal resistant isolates were assayed according to the Kirby-Bauer disc diffusion method given by Bauer *et al.* (1996). On completing incubation, the organisms were classified as sensitive or resistant to given antibiotic according to the zone diameter showing inhibition given in standard antibiotic disc chart.

RESULTS & DISCUSSION

Isolation and identification of bacterial heavy metals resistance

Ten heavy metal resistant *E. coli* were isolated from sewage of industrial effluents from waste water of Khamgaon M1DC area. against chromium, copper, nickel, aluminium, iron. All the isolates exhibited high resistance to heavy metals with minimum inhibitory concentration (MIC) for heavy metals ranging from 50µg/ml to 500µg/ml. All isolates showed multiple resistance to heavy metal and were multi antibiotic resistant. Heavy Metal Tolerance Test indicated highest tolerance to Chromium (480µg/ml) by Ec -5 isolates and lowest to Copper (60µg/ml) by Ec 7

Antibiotic sensitivity of heavy metals resistant isolates

All the isolates were resistant to antibiotics of which EC-7 was found to be single antibiotic resistance while the rest of the isolates were found to be multi-antibiotic resistant (Table 2).

The sewage of industrial effluents from waste water of Khamgaon MIDC area, the domestic as well as industrial wastewater from Khamgaon region were collected.

Table 1. Resistance of bacteria to other heavy metals. (Ec= *E. coli* isolates).

Bacteria	Resistance to	MIC
Ec-1	Al^{+2}	130 µg / ml
	Cr^{+6}	180 µg / ml
	Cu^{+2}	120 µg / ml
	Fe^{+2}	180 µg / ml
	Ni^{+2}	140 µg / ml
Ec-2	Al^{+2}	120 µg / ml
	Cr^{+6}	180 µg / ml
	Cu^{+2}	120 µg / ml
	Fe^{+2}	125 µg / ml
	Ni^{+2}	130 µg / ml
Ec-3	Al^{+2}	140 µg / ml
	Cr^{+6}	225 µg / ml
	Cu^{+2}	80 µg / ml
	Fe^{+2}	80 µg / ml
	Ni^{+2}	110 µg / ml
Ec-4	Al^{+2}	180 µg / ml
	Cr^{+6}	90 µg / ml
	Cu^{+2}	140 µg / ml
	Fe^{+2}	110 µg / ml
	Ni^{+2}	120 µg / ml
Ec-5	Al^{+2}	120 µg / ml
	Cr^{+6}	480 µg / ml
	Cu^{+2}	150 µg / ml
	Fe^{+2}	80 µg / ml
	Ni^{+2}	280 µg / ml
Ec-6	Al^{+2}	70 µg / ml
	Cr^{+6}	300 µg / ml
	Cu^{+2}	120 µg / ml
	Fe^{+2}	200 µg / ml
	Ni^{+2}	180 µg / ml
Ec-7	Al^{+2}	400 µg / ml
	Cr^{+6}	180 µg / ml
	Cu^{+2}	60 µg / ml
	Fe^{+2}	100 µg / ml
	Ni^{+2}	120 µg / ml
Ec-8	Al^{+2}	60 µg / ml
	Cr^{+6}	210 µg / ml
	Cu^{+2}	120 µg / ml
	Fe^{+2}	250 µg / ml
	Ni^{+2}	140 µg / ml
Ec-9	Al^{+2}	120 µg / ml
	Cr^{+6}	240 µg / ml
	Cu^{+2}	200 µg / ml
	Fe^{+2}	70 µg / ml
	Ni^{+2}	340 µg / ml
Ec-10	Al^{+2}	130 µg / ml
	Cr^{+6}	160 µg / ml
	Cu^{+2}	120 µg / ml
	Fe^{+2}	180 µg / ml
	Ni^{+2}	140 µg / ml

Table 2. Antibiotic sensitivity and resistant activity of heavy metal resistant *E. coli* sp

Sr.No.	Bacteria	Sensitive to	Resistant to
1	Ec-1	Bacitracin, Vancomycin, Chloramphenicol, Erythromycin, Tetracycline, Amikacin and kanamycin	Ampicillin, Ciprofloxacin, Tetracycline,
2	Ec-2	Ampicillin, Ciprofloxacin, Chloramphenicol, Erythromycin, Amikacin and kanamycin	Tetracycline, Bacitracin, Vancomycin,
3	Ec-3	Ampicillin, Bacitracin, Vancomycin, Chloramphenicol, Erythromycin, Tetracycline and Amikacin	Ciprofloxacin, and kanamycin
4	Ec-4	Ampicillin, Ciprofloxacin, Bacitracin, Vancomycin and kanamycin	Chloramphenicol, Erythromycin, Tetracycline, and Amikacin
5	Ec-5	Ciprofloxacin, Bacitracin, Vancomycin, Chloramphenicol and Erythromycin	Ampicillin, Tetracycline, Amikacin and kanamycin
6	Ec-6	Ciprofloxacin, Tetracycline Bacitracin, Tetracycline, Amikacin and kanamycin	Ampicillin, Vancomycin, Chloramphenicol, Erythromycin
7	Ec-7	Ampicillin, Ciprofloxacin, Vancomycin, Chloramphenicol, Erythromycin, Amikacin and kanamycin	Tetracycline,
8	Ec-8	Ampicillin, kanamycin, Ciprofloxacin, Tetracycline, Bacitracin, Vancomycin, Chloramphenicol, Erythromycin, Tetracycline, Amikacin	Ampicillin, Vancomycin, Chloramphenicol, Erythromycin
9	Ec-9	Ampicillin, Bacitracin, Vancomycin, Chloramphenicol, Erythromycin, Tetracycline and Amikacin	Ciprofloxacin, and kanamycin
10	Ec-10	Ciprofloxacin, Tetracycline Bacitracin, Tetracycline, Amikacin.	Ampicillin Erythromycin

The wastewater coming from domestic and industrial sources is the appropriate environment where the microorganisms can develop resistance to heavy metals and antibiotics. The presence of small amount of antibiotics and heavy metals in the wastewater induce the emergence of Antibiotic resistance of heavy metal resistant isolates antibiotic resistance and heavy metal resistant microorganisms. Most of the isolates in the present study showed multiple tolerances to both heavy metals and antibiotics. The microbial resistance to heavy metal is attributed to a variety of detoxifying mechanism developed by resistant microorganisms such as complex exopolysaccharides, binding with bacterial cell envelopes, metal reduction, metal efflux etc. These mechanisms are sometime encoded in plasmid genes facilitating the transfer of toxic metal resistance from one cell to another (Silver,1996). Filali *et al.* (1999) studied wastewater bacteria isolates *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Proteus mirabilis* and *Staphylococcus* resistant to heavy metals and antibiotics. Similarly, Sharma *et al.* (2000) isolated highly cadmium resistant Klebsiella that was found to precipitate significant amount of Cds. The heavy metal resistant organism could be a potential agent for bioremediation of heavy metals pollution. Multiple tolerances occur only to toxic compounds that have similar mechanisms underlying their toxicity. Since heavy metals are all similar in their toxic mechanisms, multiple tolerances are common phenomena among heavy metal resistant bacteria. In wastewater, there are some substances that have the potential to select for antibiotic resistance even though they are not antibiotics themselves. Heavy metals and biocides are two of them. The exposure to heavy metals or biocides results in the selection of bacterial strain also able to resist antibiotics. This happens because genes encoding heavy metals and biocides are located together with antibiotic resistance genes or alternatively because bacteria can have unspecific mechanism of resistance common to different substances including heavy metals, biocides and antibiotics (Dalsgaard and Guardabassi, 2002). It is therefore, likely that selective pressure by one such compound indirectly selects for the whole set of resistances.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Akar Z (1998). Biosorption of heavy metals by microalgae in batch and continuous systems. In: Algae for waste water treatment. eds Y.-S Wong and N. F. Y. Tam, 99.37-53. Springer, Germany.

Aksu Z and Kutsal T (1990). Acomparative study for biosorption characteristics of heavy metal ions with C. vulgaris. Environ. Technol., 11: 979-987.

Avery SV and Tobin JM (1993). Mechanism of adsorption of hard and soft metal ions to Saccaromyces cerevisiae and influence of hard and soft anions. Appl. Environ. Microbiol. 59: 2851-2856.

Brady D and Duncan JR (1994). Chemical and enzymatic extraction of heavy metal binding polymers from isolated cell walls of Saccharomyces cerevisiae. Biotechnol. Bioeng., 44: 297-302.

Brady D, Stoll AD, Starke L and Duncan JR (1994). Bioaccumulation of metal cations by Saccaromyces cerevisiae. Appl Microbiol. Biotechnol., 41: 149-154.

Clausen CA (2000). Isolating metal-tolerant bacteria capable of removing copper, chromium, and arsenic from treated wood. Waste Manage Res., 18: 264-268.

Doenmez G and Aksu Z (1999). The effect of ropper(II) ions on the growth and bioaccumulation properties of some yeasts. Process Biochem., 35: 135-142.

Dalsgarrd A and L Guardbassi (2002). Occurrence and fate of antibiotics resistant bacteria in sewage. Danish, EPA Environment Project No. 722.

Doenmez G and Aksu Z (2001). Bioaccumulation of copper(II) and Nickel (II)m by the non adapted and adapted growing Candida sp. Wat. Res., 35: 1425-1434.

Filali BK, J Taoufik, Y Zeroual, FAZ Dzairi, M Talbi and M Blaghen (1999). Waste water bacterial Isolates resistant to heavy metals and antibiotics.Current Microbiology 41: 151-156.

Huang C, Huang C and Morehart AL (1990). The removal of copper from dilute aqueous solutions by Saccharomyces cerevisiae. Wat. Res., 24: 433-439.

Hussein H, Krull R, Abou-ElEla SI and Hempel DC (1998). Influence of heavy metal ions on the microbial degradation of xenobiotic waste water compounds. AWT98-Advanced wastewater treatment, recycling and reuse. Milano, 14-16 September.

Hussein H, Krull R, Abou-ElEla SI and Hempel DC (2001). Interaction of the different heavy metal ions with immobilised bacterial culture degrading xenobiotic waste water compounds. Second International Water Association World Water Conference (2nd IWA) Berlin, 15-19 October.

Koedam N, Wittouck E, Gaballa A, Gillis A, Hfte M and Cornelis P (1994): Detection differentiation of microbial siderophores by isoelectric focusing and chrome azural S overlay. Biometals, 7: 287- Krieg, N.R. (Ed.) (1984). Bergey's manual of systematic bacteriology. Baltimore, Hong Kong, London, and sydney, 1: 178-182.

Macaskie L and Dean ACR (1989). Microbial metabolism, desolubilisation and deposition of heavy metals: Metal uptake by immobilised cells and application to the detoxification of liquid wastes. Adv. Biotechnol. Proc., 12: 159-172.

Patterson JW (1977). Wastewater treatment technology. Ann Arbor science Publishers,Ann Arbor, MI, USA.

Rai LC, Gaur JP and Kumar HD (1981). Phycology and heavy metal pollution. Biol. Rev., 56: 99-151.

Silver S (1996). Bacterial resistances to toxic metal ions-a review. Gene 179: 9-19.

Sharma KP, A Frenkel and LD Ballewill (2000). A new Klebsiella planticola strain (cd-1) grows anaerobically at high cadmium concentrations and precipitates cadmium sulphide. Applied and Environmental Microbiology 66: 3083-3087.

Veglio F, Beolchini F and Gasbarro A (1997). Biosorption of toxic heavy metals: an equilibrium study using free cells of Arthrobacter sp. Process Biochem., 32: 99-105.

Volesky B, May H and Holan ZR (1992).Cadmium biosorption by Saccharomyces cerevisiae. Biotechnol. Bioeng., 41: 826-829.

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ANTIBACTERIAL ACTIVITY OF MEDICINAL PLANTS IN SALINE TRACT OF PURNA RIVER BASIN

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Abstract

Present work is carried out with the objective to study antibacterial activity of medicinal plants of Purna river basin saline tract. For this purpose, aqueous, ethanol and acetone extract of leaves of plants Acacia arabica, Aegle marmelos, Azadirachta indica, Eucalyptus globules and Justicia adhatoda were prepared. The antibacterial activity of aabove extracts were tested against pathogen Staphylococcus aureus (MTCC96), Escherichia coli (MTCC443), Salmonella typhi (MTCC734) and Klebsiella pneumonia (MTCC2653) by using agar diffusion method. Results of the study indicated that the traditionally used medicinal plants in saline tract of Purna river basin have effective antimicrobial properties and are potential against bacterial pathogens S. aureus, E. coli and S. typhi. Among these plants the leaves extract of Acacia arabica, Azadirachta indica, Eucalyptus globules.

Key Words: Medicinal Plant, Saline tract, Antibacterial Activity

INTRODUCTION

Plants have traditionally provided a source of hope for novel drug compounds, as plant herbal mixtures have made large contributions to human health and well-being (Iwu et al., 1999). Owing to their popular use as remedies for many infectious diseases, searches for substances with antimicrobial activity in plants are frequent (Betoni et al., 2006; Shibata et al., 2005). Plants are rich in a wide variety of secondary metabolites, such as tannins, terpenoids, alkaloids, and flavonoids, which have been found *in vitro* to have antimicrobial properties (Lewis and Ausubel, 2006; Cowan, 1999). Despite this abundant literature on the antimicrobial properties of plant extracts, none of the plant derived chemicals have successfully been exploited for clinical use as antibiotics (Gibbons, 2004).

A significant part of the chemical diversity produced by plants is thought to protect plants against microbial pathogens. Gibbons (2004), observes that a number of plant compounds often classified as antimicrobial produce MIC ranges greater than 1,000 µg/ml which are of no relevance from a clinical perspective. Tegos et al. (2002) suggests that a vast majority of plant compounds showing little *in vitro* antibacterial activity are not antimicrobial but are regulatory compounds playing an indirect role in the plant defence against microbial infections.

Medicinal plants (fruits, vegetables, medicinal herbs, etc.) are a source for a wide variety of natural products, such as the phenolic acids and flavonoids which are very interesting for their antioxidant properties.

2020 -21

In addition to their ability to act as an efficient free radical scavengers5 their natural origin represents an advantage to consumer in contrast to synthetic antioxidants which their use is being restricted due to their carcinogenicity. Epidemiological studies have shown that many of these antioxidant compounds possess anti-inflammatory, antiatherosclerotic, antitumor, antimutagenic, anticarcinogenic, antibacterial, or antiviral activities to a greater or lesser extent. The intake of natural antioxidants has been associated with reduced risks of cancer, cardiovascular disease, diabetes, and diseases associated with ageing.

Most of the synthetic antibiotics now available in the market have major setback due to the multiple resistance developed by pathogenic micro-organisms against these drugs (Akinpelu *et al*, 2008). Many vaccines and antibacterial agents are available in the market now-a-days but they are less effective because of the indiscriminate use of these antimicrobial drugs in treatment of infectious diseases leading to increase in the resistance in bacteria. Hence, there is an urgent need to discover new antimicrobial compound with diverse chemical structure and novel mechanism of action for new and re- emerging infectious diseases, therefore researchers are increasingly turning their attention to herbal medicines looking for new treatments leads to develop better drug against microbial infections. Many of the existing medicinal system such as Ayurveda, Homeopathy, Naturopathy and other alternative medicinal system have been utilizing plants as an effective medicine to cure many harmful diseases (Bandow *et al*, 2003).

Many efforts have been made to discover new antimicrobial components from various kinds of sources such as micro-organisms, animals, and plants. One of such resources is saline tract of purna river basin which is a unique in the environment and contains the lots of variety of the medicinal plant which may be useful for the preparation of herbal drugs. The present study may explore, the variety of the medicinal plant found in the saline tract environment of Purna River basin and give the database of their antimicrobial activity to use against the bacterial, fungal and viral infection and creates a new alternative for the allopathic drugs which overcome the problem of antibiotic resistance occurring in the pathogens.

Review of Literature

Bbosa *et al*, (2007) found that leaf extracts of *M. indica* possess some antibacterial activity against *S. aureus*, *E. coli* and *P. aeruginosa* that could be the basis for their medicinal use in Uganda. Girish *et al*, (2008) found maximum antibacterial activities of the methanol extract as compare to aqueous extract of leaves of 5 different plants viz. *Boerhaavia diffusa, Cassia auriculata, Cassia Lantana, Eclipta alba* and *Tinospora cordifolia* against *E. coli, K. pneumoniae, P. aeruginosa* and *Sal. typhi*. Tambekar *et al*, (2009) studied *Cyperus rotundus, Caesalpinia bonducella, Tinospora cordifolia, Gardenia gummifera, Ailanthus excelsa, Acacia arabica, Embelia ribes* and *Ventilago maderspatana* from Melghat forest that were screened for their antibacterial potential against *E. coli, S. aureus, K. pneumoniae, P. vulgaris, S. typhi, S. flexneri, S. paratyphi, S. typhimurium, P. aeruginosa, E. aerogenes*. Out of these medicinal plants *Caesalpinia bonducella, Gardenia gummifera* and *Acacia arabica* showed remarkable antibacterial potential. Makhija *et al*, (2010) provided an overview on phytochemistry and pharmacological properties of *Ficus religiosa*. They investigated phytochemical in plant and showed the presence of Tannins, Saponins, Flavonoids, Steroids, Tapernoids and Cardiac glycosides. Bukkiyaraj and Pandiyaraj (2011) observed that extract of leaves of 5 medicinal plant that were *Azadirachta indica* (Meliaceae), *Portuloca oleracea* (Portulacaceae), *Euphorbia hirta* (Euphorbiaceae), *Gmelina asiatica* (Verbenaceae), *Santalum album* (Santalaceae), were screened for their anti-microbial activity against *E. coli, B. subtilis, P. aeruginosa*, S. typhimurium, *S. aureus, C. albicans* and *A. Niger*. Murugan, (2012) screened the antimicrobial activity of leaves and latex extract of the herbal plant *Calotropis gigantean* and concluded that the leaf and latex extract of *Calotropis gigantean* was effectively inhibit the growth of test organisms (*Bacillus subtilis, Micrococcus luteus* and *Pseudomonas aeruginosa*). Mayeku *et al.*, (2013) evaluated in-vitro anti-bacteria activities and phytochemical profiles of solvent extracts of the leaves, stem bark and root of *Thalictrum rhyncocarpum* against *Bacillus subtilis*-6633, *Staphylococcus aures*-SG 511, *Escherichia coli* SG 458, *Pseudomonas aeruginosa*-K799/61 and *Mycobacterium vaccae*-10670. Pinho *et al.*, (2014) assessed the antibacterial potential of phenolic extracts, recovered from plants obtained on the North East of Portugal, and of their phenolic compounds (ellagic, caffeic, and gallic acids, quercetin, kaempferol, and rutin), against bacteria commonly found on skin infections. He found that gallic acid had a higher activity, against gram-positive (*S. epidermidis* and *S. aureus*) and gram-negative bacteria (*K. pneumoniae*) at lower concentrations, than the other compounds. Koubaal, *et al.*, (2015) investigated the phytochemical properties of solvent extract from rocket flowers. The antibacterial activities were tested against 11 pathogenic strains. The antibacterial activities showed good growth inhibition compared to positive controls. Benedec, *et al.*, (2016) evaluated the phenolic profile, and antioxidant and antimicrobial activity of *Achillea schurii Sch.-Bip.*, an endemic species from Romania that has not been investigated yet. The antimicrobial tests reveal a remarkable inhibitory activity against *Listeria monocytogenes, Staphylococcus aureus* and *Salmonella typhimurium*. Fernandes *et al.*, (2017) provided

valuable information on edible flowers in order to better characterize them and to increase their popularization among the food industry and consumers. This review summarizes the data of more than 100 studies performed until now on edible flowers, focusing on nutritional, antioxidant and antimicrobial activities, as well as health effects. Oueghemmi, *et al.*, (2017) assessed the antioxidant and antibacterial activities of phenolic compounds from cultivated and wild Tunisian *Ruta chalepensis* L., leaves, stems, and flowers were assessed. Spontaneous stems had the strongest activity against *Pseudomonas aeruginosa*. Aljanaby, (2018) investigated the ability of an aqueous extracts of Matricaria chmomilla flowers to inhibit growth of pathogenic bacteria isolated from pregnant women with urinary tract infection. Hot water extract has excellent anti-bacterial activity against all bacterial isolates, the inhibition zone diameters of *E. coli*, *K. pneumoniae*, *A. baumanii*, *E. aerogenes*, *C. freundii*, *P. mirabilis* and *S. saprophyticus*. Manandhara *et al.*, (2019) explored the antimicrobial properties of the plants that are commonly being used as traditional medicines. Most of the extracts exhibited antimicrobial properties. The highest potential was observed in the extract of *O. corniculata* against *Escherichia coli*, *Salmonella Typhi*, MDR *Salmonella Typhi*, *Klebsiella pneumoniae*, and *Citrobacter koseri*. Danish et al., (2020) used aloe vera for antibacterial and antifulgal activity against different strains of bacteria and pathogenic fungal strains *Escherichia coli* and *Agrobacterium tumefaciens* shows zone of inhibition around 18mm which consider as good result. *Bacillus subtilis* and *Bacillus megaterium* also shows good result around 16mm. Proteus mirabilis and *Pseudomonas aeruginosa* shows minimum zone of inhibition.

Materials and Methods

Five medicinal plants were collected from Purna River Basin saline tract in Shegaon Taluka, of Buldana District Maharashtra. The plants were *Acacia arabica*, *Aegle marmelos*, *Azadirachta indica*, *Eucalyptus globules* and *Justicia adhatoda*. Leaves of these plants were taken for experimental purpose. The leaves were cleaned and disinfected with sterile distilled water and mercuric chloride (0.5%), air dried and ginded to make a powder. 10 g powder of each type of dried leaves was dissolved in 100ml solvent (water, ethanol and acetone) and refluxed in Soxhelt apparatus. The extract was filtered and filtrate was evaporated under controlled temperature condition. The dried material such recovered was weighed (1 g/ type) and dissolved in 10 ml sterile distilled water. By following above procedure all three i.e., aqueous, ethanol and acetone were prepared.

Pathogenic bacterial cultures used to see antibacterial activity were *Staphylococcus aureus* (MTCC96), *Escherichia coli* (MTCC443), *Salmonella typhi* (MTCC734) and *Klebsiella pneumonia* (MTCC2653)

The disc diffusion method was used to dtAntimicrobial activity discs were prepared by blotting paper discs in extract solutions so that, the disc would absorb approximately 0.1ml solution which contain approximately 10mg extract. The discs were dried overnight at controlled temperature (37°C).

Petri plates containing agar medium were prepared and uniformly spreaded with 0.1ml bacterial suspension to form a lawn culture. Dried discs were kept on the surface of lawn culture aseptically with the help of sterile forceps. Plates were incubated for 24hrs at 37°C. After incubation plates were observed or one of growth inhibition. The diameter of zone of inhibition was measured in mm. The procedure was carried out under strict sterile conditions (Bauer et al., 1966).

Result and Discussion

Table 1: Zone of inhibition (mm) of different extracts of selected plants with test pathogens

Plant	Extract Type	*S. aureus*	*E. coli*	*S. typhi*	*K. pneumonia*
Acacia arabica	Aqueous	21	21	0	0
	Ethanol	15	19	17	0
	Acetone	0	0	0	0
Aegle marmelos	Aqueous	0	0	0	0
	Ethanol	10	11	0	0
	Acetone	0	0	0	0
Azadirachta indica	Aqueous	16	12	0	0
	Ethanol	12	18	22	0
	Acetone	0	0	0	0
Eucalyptus globules	Aqueous	12	0	0	16
	Ethanol	15	0	15	0
	Acetone	20	14	6	0
Justicia adhatoda	Aqueous	0	0	0	0
	Ethanol	0	15	0	0
	Acetone	0	0	0	0

above table 1 illustrates results of antibacterial activity of different plant leaves extracts on test pathogens selected, it is apparent that –

- the zone of inhibition of aqueous extract of *acacia arabica* against pathogen *s. aureus* and *e. coli* was 21mm each, however it did not show activity against *s. typhi* and *k. pneumonia*, the zone of inhibition of ethanol extract of *acacia arabica* against pathogen *s. aureus*, *e. coli* and *s. typhi* was 15mm, 19mm and 17mm respectively, however it did not show activity against *k. pneumonia*, no zone of inhibition was demonstrated by acetone extract of *acacia arabica* against test pathogen.
- no zone of inhibition was demonstrated by aqueous extract of *aegle marmelos* against test pathogen, the zone of inhibition of ethanol extract of *aegle marmelos* against pathogen *s. aureus* and *e. coli* was 10mm and 11mm respectively, however it did not show activity against *s. typhi* and *k. pneumonia* no zone of inhibition was demonstrated by acetone extract of *aegle marmelos* against test pathogen,
- the zone of inhibition of aqueous extract of *azadirachta indica* against pathogen *s. aureus* and *e. coli* was 16mm and 12 mm respectively, however it did not show activity against *s. typhi* and *k. pneumonia*, the zone of inhibition of ethanol extract of *azadirachta indica* against pathogen *s. aureus*, *e. coli* and *s. typhi* was 12mm, 18mm and 22mm respectively, however it did not show activity against *k. pneumonia*, no zone of inhibition was demonstrated by acetone extract of *azadirachta indica* against test pathogen.
- the zone of inhibition of aqueous extract of *eucalyptus globules* against pathogen *s. aureus* and *k. pneumonia* was 12mm and 16mm respectively, however it did not show activity against *e. coli* and *s typhi*, the zone of inhibition of ethanol extract of *eucalyptus globules* against pathogen *s. aureus*, and *s. typhi* was 15mm each, however it did not show activity against *e. coli and k. pneumonia*, the zone of inhibition of acitone extract of *eucalyptus globules* against pathogen *s. aureus* and *e. coli* was 20mm and 15mm respectively, however it did not show activity against *s. typhi* and *k. pneumonia*.
- no zone of inhibition was demonstrated by aqueous extract of *justicia adhatoda* against test pathogen the zone of inhibition of ethanol extract of *justicia adhatoda* against pathogen *e. coli* was 15 mm, however it did not show activity against *s. aureus*, *s. typhi* and *k. pneumonia*, no zone of inhibition was demonstrated by acetone extract of *justicia adhatoda* against test pathogen.

tambekar et al., (2009) studied on the antibacterial activity of various plants extracts against all test pathogens. among these different plants, *acacia arabica* showed remarkable antibacterial potential. bhosa *et al*, (2007) found that leaf extracts of *n. indica* possess some antibacterial activity against *s. aureus*, *e. coli* and *p. aeruginosa* that could be the basis for their medicinal use. bukkiyaraj and pandiyaraj (2011) observed that extract of *azadirachta indica* showed anti-microbial activity against *e. coli*, *b. subtilis*, *p. aeruginosa*, s. typhimurium, *s. aureus and c. albicans*.

Conclusions

On the basis of results obtained in the present study, it can be concluded that the traditionally used medicinal plants in saline tract of purna river basin have effective antimicrobial properties and are potential against bacterial pathogens *s. aureus, e. coli* and *s. typhi*, among these plants the leaves extract of *acacia arabica, azadirachta indica, eucalyptus globules*

references

1. akinpelu, da., aiyegoro, oa, & okoh, ai (2008). in vitro antibacterial and phytochemical properties of crude extract of stem bark of afzelia africana (smith). afr j biotech 7(20): 3662-3667
2. aljanaby, a.a.j. (2018). in vitro antibacterial activity of an aqueous extracts of matricaria chmomilla flowers against pathogenic bacteria isolated from pregnant women with urinary tract infection. *biomedical research*, 29 (11): 2395-2400
3. bakkiyaraj s and pandiyaraj s, (2011). evaluation of potential antimicrobial activity of some medicinal plants against common food- borne pathogenic microorganism. int j bio sci, 2 (2): 484-491.
4. bindow, je., brotz, h., leichert, lio., lahischinski, h. & hecker, m. (2003). *proteomic approach to understanding antibiotic action*, antimicro. agents. chemotherapy 47: 948-955.
5. bhosa gs, kyegombe db, ogwal-okeng j, bukenya-ziraba r, odyek o and waako p. (2007). antibacterial activity of *mangifera indica* (l.). afr j ecol, 45: 13–16.
6. benedec, d., hanganu, d., oniga, i., bischin, c.f.l., silaghi-dumitrescu, r., tiperciuc, b. and vlase, l. (2016). achillea schurii flowers: chemical, antioxidant, and antimicrobial investigations, *molecules*, 21(8): 1050.
7. betoni, jec., mantovani, rp., barbosa, ln., di-stasi, lc. & fernandes, a. (2006). *synergism between plant extract and antimicrobial drugs used on staphylococcus aureus diseases*. mem. inst. oswaldo cruz, 101 no. 4.
8. cowan, mm. (1999). *plant products as antimicrobial agents*. clin. microbiol rev 12(4): 564-582.
9. danish, p., ali, q., hafeez, m. and malik, a. (2020). antifungal and antibacterial activity of aloe vera plant extract. *biological and clinical sciences research journal*, e004.
10. fernandes, l., casal, s., jurge, j.a.p., sarniva, a. and ramalhosa, r. (2017). edible flowers: a review of the nutritional, antioxidant, antimicrobial properties and effects on human health, *journal of food composition and analysis*, 60: 38-50.
11. gibbons, s. (2004). *anti-staphylococcal plant natural products*. nat.prod. rep., 21: 263-277.
12. girish hv and satish s, (2008). antibacterial activity of aimportant amedicinal plants on human pathogenic bacteria-a comparative analysis. world applied sci j 5(3): 267-271.
13. iwu, mw., duncan, ar. & okunji, co. (1999). *new antimicrobials of plant origin*. janick j (ed.), perspectives on new crops and new uses, pp. 457-462.
14. koubaal, m., driss, d., bouaziz, f., gharbel, r.e. and chaabouni, s.e. (2015). antioxidant and antimicrobial activities of solvent extract obtained from rocket (eruca sativa l.) flowers, *free radicals and antioxidants*, 5(1): 29-34.
15. lewis, k. & ausubel, fm. (2006). *prospects for plant-derived antibacterials*. nat. biotechnol. 24(12): 1504-1507
16. makhija ik, sharma ip and khamar d, (2010). phytochemistry and pharmacological properties of *ficus religiosa*. annals of biological res 1 (4):171-180.
17. manandhara, s., liutel, s. and dahl, r. (2019). in vitro antimicrobial activity of some medicinal plants against human pathogenic bacteria, *journal of tropical medicine*, article id 1895340, 5 pages
18. mayeku, pw., hussanali, a., kiremire, bt., odalo, jo. & hertweck c. (2013) anti-bacterial activities and phytochemical screening of extracts of different parts of thalictrum rhynchocarpum. *afr j tradit complement altern med*;10(5):341-4.
19. murugan t (2012). antimicrobial activity of leaves and latex extract of the herbal plant calotropis gigantean. international journal of biology, pharmacy and allied sciences (ijbpas). (3):261-270.
20. ouerghemmi, i., rebey, i.b., rahali, f.z., bourgou, s., pistelli, l., ksouri, r., marzouk, b. and tounsi, m. s. (2017). antioxidant and antimicrobial phenolic compounds from extracts of cultivated and wild-grown tunisian *ruta chalepensis*, *journal of food and drug analysis*, 25 (2): 350-359
21. pinho, e., ferreira, ic., barros, l., carvalho, am., soares, g. & henriques, m. (2014). antibacterial potential of northeastern portugal wild plant extracts and respective phenolic compounds. *biomed res int*;2014:814590.

22. shibata, h., kondo, k., katsuyama, r., kawazoe, k., sato, y., murakami, k., takaishi, y., arakaki, n. & higuti, t. (2005). *alkyl gallates, intensifiers of β-lactam susceptibility in methicillin-resistant staphylococcus aureus*. antimicrob. agents chemother. 49(2): 549-555.
23. tambekar dh, khante bs, chandak br, tlare as, boralkar ss and aghadte sn, (2009). screening of antibacterial potentials of some medicinal plants from melghat forest in india. afr j trad cam, 6(3): 228-232.
24. tegos, g., stermitz, fr., lomovskaya, o. & lewis, k. (2002). *multidrug pump inhibitors uncover remarkable activity of plant antimicrobials*. antimicrob. agents chemother 46(10): 3133-3141.



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Soil Actinomycetesas an effective source of antibiotics active against bacterial Species

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Abstract-

A total of 108 actinomycetes strains were Isolated from the wasteland alkaline and garden soil samples of the Shegaonand screened for their anti-bacterial activity. They were evaluated for their inhibitory activities on four test microorganisms. Elevenactinomycetes isolate which exhibited antimicrobial activity against at least two of the test organisms and were characterized by conventional methods. The cultural characteristics of isolates were also studies in different culture media. The results indicated that six isolates were highly active against Staphylococcus aureus strains. Seven isolates were highly active with an inhibition zone more than 20 mm in diameter. Most of the isolates inhibited growth of the Gram negative bacteria tested. All the antibiotic producing actinomycetes were Isolated at different temperatures from non agricultural wasteland alkaline soil and compost rich garden soil. Eleven isolates showed activity against bacteria in which most of them from wasteland alkaline soil where the less interference by human for agriculture or other purpose. These microorganisms may have capability to produce some of the most important medicines ever developed

Key words: Actinomycetes, Anti-bacterial activity, Bacterial Species.

Introduction

Actinomycetes are the most widely distributed group of microorganisms in nature which Primarily inhabit the soil.The drug resistant strains of pathogen emerge more quickly than the rate of discovery of new drugs and antibiotics. Because of this, many scientists and pharmaceutical industry have actively involved in isolation and screening of actinomycetes from different untouched habitats, for their production of antibiotics (Oskay M.,*etal*2004).They have provided many important bioactive compounds of highcommercial value and continue to be routinely screened for new bioactive compounds. Thesesearches have been remarkably successful and approximately two thirds of naturally occurringantibiotics, including many of medical importance, have been isolated fromactinomycetes(Okami Y. *etal*1988). Almost 80% of the world's antibiotics are known to come fromactinomycetes, mostly from the genera *Streptomyces* and *Micromonospora*(Pandey B., *etal*2004)

.According to the World Health Organization, over-prescription and the improper use ofantibiotics has led to the generation of antibiotic resistance in many bacterial pathogens.Serious infections caused by bacteria have becomeresistant to commonly used antibiotics and become a major global healthcare problem in the21st century (Alanis A. J. 2005). *Staphylococcus aureus*, for instance, a virulent pathogen that is responsiblefor a wide range of infections, has developed resistance to most classes of antibiotics (Enright M. C. 2003). Clinicians and public health officials have faced hospital acquired drug resistant *S. aureus*, whichalso bears resistance to many antibiotics. Hence there is need to rediscover new drugs *active*against these drug resistance pathogens. Majority of the actinomycetes in soil that arepotential drug sources remain uncultivable, and therefore inaccessible for novel antibioticdiscovery. Goodfellow and Haynes reviewed the literature on isolation of actinomycetes andsuggested that only 10% of the actinomycetes are isolated from nature (Goodfellow M. *etal* 1984).Most of theantibiotics in use today are derivatives of natural products of actinomycetes and fungi(Butler M.S*etal*2006 and Newman D. J. *etal* 2007).Actinomycetes can be isolated from soil and marine sediments. Although soils have been screened by the pharmaceutical industry for about 50 years, only a small fraction of thesurface of the globe has been sampled, and only a small fraction of actinomycetes taxa has beendiscovered(Baltz R.H. 2005 and 2007). The present study was undertaken to isolate actinomycetes from the soilsamples of wasteland and garden of Shegaon and to assess their anti-bacterial properties. Theresistance problem demands that to discover new antibacterial agents effective againstpathogenic bacteria resistant to current antibiotics. So we need to screen more and moreactinomycetes from different habitats for antimicrobial activity in hope of getting someactinomycetes strains that produce antibiotics that have not been discovered yet and activeagainst drug resistant pathogens.

Materials and methods

Soil sample collection:

Soil samples were collected from different wasteland and garden habitats of Shegaon.

Each collection was made from 10-15 cm depth of the soil (Saadoun I. *etal* 2003). These were air-dried for 1 weekcrushed and sieved (Williams S. T., *etal* 1972). The sieved soils were then used for actinomycete isolation.

Isolation of actinomycetes:

For each collected sample, 1g of the soil were suspended in 100 ml of physiological water (NaCl) 8.5 g/l) then incubated in an orbital shaker incubator at 28 0C with shaking at 200 rpm for 30 min. Mixtures were allowed to settle, and serial dilutions up to 10-5 were prepared using sterile physiological water and agitated with the vortex at maximum speed. An aliquot of 0.1 ml of each dilution from 10-2 to 10-5 was taken and spread evenly over the surface of actinomycetes

Isolation agar and starch casein agar medium. The both media are added to rifampicin (2.5mg/ml) and amphotericin B (75 mg/ml) to inhibit bacterial and fungal contamination, respectively. Plates were incubated at 28 and 37 0C, and monitored after 48, 72, and 96 h. Repeated streaking on starch casein agar plates led to purify bacterial colonies that showed an
actinomycetes like appearance. The isolated strains are preserved at 4 0C during two months
and maintained for longer period by serial subculture.The culturecretaining the violet color indicated that it was Gram-positive organism.

***In vitro* screening of isolates for anti-bacterialactivity**

Morphologically distinct actinomycete isolates were selected for anti-bacterial activity screeningagainst the pathogenic test organisms by conventional spot inoculation method (Shomurat T., *etal* 1979).and single line streak method (Duraipandiyan V., *etal* 2010).on agar medium. In spot inoculation method, pure actinomycetesisolates were spot inoculated on starch casein agar medium. The plates were incubated at 28 0Cfor six days, and then inverted for 40 min over chloroform in fumehood. Colonies were thencovered with a 0.6% agar layer of nutrient agar medium, previously seeded with one of the testorganisms. The antimicrobial activity was observed after 24 h incubation at 37 0C. In singleline streak method, pure actinomycetes isolates were inoculated in a single streak down themiddle of a plate of screening media and incubated at 28 0C for 4 days for the productionof any antibiotics. A single streak of each test organism was added perpendicular to theactinomycetes streak. Test organisms were placed perpendicular to culture streak. The plateswere incubated for 24 h at 37 0C.

Test organisms

The test organisms used in present study were the Gram positive bacteria *Staphylococcus aureus*, *Bacillus subtilis*and the Gram negative bacteria *Escherichia coli*.

Results and discussion

Soil samples were collected from wasteland alkaline soil and garden soil of Shegaon.
RegionofBuldhana District ofMaharashtra, India. One gram of soil samplewas dried and taken for isolation ofactinomycetes. The suspected 108actinomycetes were isolated at two differenttemperatures (28^0 & 37^0C) in which 60 (55.55%) from wasteland soil and 48 (44.44%) from garden soil are inoculated on the starch casein agarmedium for purification. And the pure colonies were maintained in the starch casein agarmedium slant at 4 0C. All the 108 cultures were screened against bacteria but only the 18 isolatesshowed the antibacterial activity and were designated as WRN1,2,3,4, WBC1,2,GCS1,2,3and GDMBC1,2(Table 1). They were also studied for culture characteristics (Table 2).This study was undertaken with an aim of isolation and screening of actinomycetes inwasteland soil and garden soil of Shegaonregion at two different temperatures and selectingthe isolates with antibacterial activity. Using the selective media and cultivation conditionsdescribed

previously a total of 108 different actinomycetes isolates were recovered from 20soil samples that were collected from wasteland soil and garden soil of Shegaon. The soil of wasteland from Rokdianagar and BhairavChawk gives the higher number of actinomycetes isolates (30 isolates each) with respect to garden soils (Table 1). All isolates grew on starch casein agar media showing morphology typical of actinomycetes, since the colonies were slow growing, aerobic, glabrous, folded and with aerial and substrate mycelin ofdifferent colors. All actinomycetes isolates wereGram-stain positive. The cultural characteristics(Pigment production), morphologicalcharacteristics of the different actinomycetesisolates are presented in Table 2. The colour of the substrate mycelium and aerial spore masswas varied. During screening of new isolates for drug discovery, many potentially interestingmicroorganisms might be excluded due to theirmorphological similarities, suggesting similarbiochemical behavior; thus, many isolates are lost and only a few of them are finally tested. Inthis study, the total number of isolated actinomycetes (108) was screened on agarmedium and antibacterial activity was observed in 18 (16.66 %) of the isolates and appearedpromising (Table 1). In previous studies, it was shown that the isolation rate of actinomyceteswith antimicrobial activity is higher than 40% (Lomriss S.,*etal* 2003).And in others less than 10% (Jiang C.L.*etal* 1996). These results confirm that the actinomycetes are able to produce a wide variety of antibiotics withantibacterial activity. Thakur et al. also reported that a total of 110 actinomycetes isolates wereisolated from the soil samples collected from the protected forest soil from two states in Northeast India (Thakur D.,*etal* 2007). These were then characterized by conventional methods and assessed for their antagonistic activity preliminary against test microorganisms. Results of the present studyalso indicate that the higher number of actinomycetes was isolated from wastelandalkaline soil active against bacteria, where thehuman activity is very less for agriculture or otherpurpose and these actinomycetes can be useful for many applications such as control of infectious diseases and drug discovery.

Table 1- Total number of actinomycetes isolates with antibacterial activity isolated at different temperatures

Area	Isolation temperature	Total strains isolated	No.of active Isolates against bacteria
Wasteland near Rokdiya Nagar	28 °C 37°C	15 15	4(27%) 2(13%)
Wasteland near BhairavChawk	28°C 37°C	15 15	2(13%) 1(6.66%)
Garden soil Chandralok Society Park	28°C 37°C	15 10	2(13%) 2(20%)
Garden soil SDMBC	28°C 37°C	15 8	3(20%) 2(25%)
Total		108	18(16.66%)

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Table 2- Culture characteristics of selective isolates on starch casein agar medium

Area	Culture code	Color	Pigment production	Gram's reaction
Wasteland near Rokdiya Nagar	WRN1	White	Red	+
	WRN2	Grey	Yellow	+
	WRN3	Green	Red	+
	WRN4	White	Red	+
Wasteland near BhairavChawk	WBC1	White	Red	+
	WBC2	Grey	Yellow	+
Garden soil Chandralok Society Park	GCS1	Green	Red	+
	GCS2	White	-	+
	GCS3	Grey	-	
Garden soil SDMBC	GSDMBC1	Yellow	Yellow	+
	GSDMBC2	White	Red	+

Table 3- Antibacterial activity of isolates (single line streak and Spot inoculation method)

Culture code	S.aureus	B.subtilis	E.coli
WRN1	+	+	+
WRN2	-	-	+
WRN3	+	+	-
WRN4	-	+	+
WBC1	-	+	-
WBC2	+	-	+
GCS1	+	+	-
GCS2	+	+	-
GCS3	-	+	+
GSDMBC1	-	-	-
GSDMBC2	+	+	+

Conclusion

Atotal of 18 Isolates showed activity against bacteria in which most of them from wasteland alkalinesoil where the less interference by human for agriculture or other purpose. Thesemicroorganisms produce some of the most important medicines ever developed. They arethe source of lifesaving treatments for bacterial and fungal infections. In spite of the tremendoussuccess of the past secondary metabolite research, the number of terrestrial antibioticsseems currently to approach a saturation curve with an apparent limit in the near future. Theincreasing number of duplications and the urgent demand for new leading antibiotics inpharmacology for the treatment of drug resistant infectious pathogens has enforced the search formetabolites in so far untouched habitats

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where the human activities are very less. Hence thewasteland alkaline soil is a goldmine of biodiversity has been amply justified by therichness of microbial diversity.

References

[1] Oskay M., Tamer A.U. and Azeri C. (2004) *African J Biotechnol.* 3 (9), 441 446.

[2] OkamiY. and Hotta K. (1988) editors. Goodfellow M., Williams S.T. and Mordarski M. *Academic Press Inc, NewYork*, 33-67.

[3] Pandey B., Ghimire P. and Agrawal V.P. (2004) *International Conference on theGreat Himalayas: Climate, Health,Ecology, Management and Conservation, Kathmandu. Organized by Kathmandu University and the Aquatic Ecosystem Health and Management Society, Canada.*

[4] Alanis A.J. (2005) *Archives Med Res*, 36, 697-705.

[5] Enright M.C. (2003) *Curr Opinion Pharmacol*, 3 (5), 474-479.

[6] Goodfellow M. and Haynes J.A. (1984) editors, Ortiz-Ortiz T.; Bojalil L.F. and Yakoleff V. *Academic Press, London*, 453-472.

[7] Butler M.S. and Buss A.D. (2006) *BiochemPharmacol*, 71, 919-929.

[8] Newman D.J. and Cragg G.M. (2007) *J Nat Prod*, 70, 461-477.

[9] Baltz R.H. (2005) *SIM News*, 55, 186- 196.

[10] Baltz R.H. (2007) *Microbe*. 2,125-131.

[11] Saadoun I. and Gharaibeh R. (2003) *J Arid Environ*, 53, 365-371.

[12] Williams S.T., Sharmeemullah M., Watson E.T. and Mayfield C.I. (1972) *Soil BiolBiochem*. 4, 215-225.

[13] Shomurat T., Yoshida J., Amano S., Kojina M. and Niida T. (1979) *J Antibiotic*. 32, 427-435.

[14] Duraipandiyan V., Sesi A.H., Islam V.I.H., Valanarasu M. and IgnacimuthuS. (2010) *J MycologieMédicale*. 20 (1), 15-20.

[15] Lemriss S., Laurent F., Couble A., Casoli E., Lancelin J.M. and Saintpierre-Bonaccio D. (2003) *Can J Microbiol*, 49, 669-674.

[16] Jiang C.L. and Xu L.H. (1996) *ApplEnviron Microbiol*. 62, 249-253.

[17] Thakur D., Yadav A., Gogoi B.K. andBora T.C. (2007) *J Mycol Med*, 17, 242-249.

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Synthesis and studies antimicrobial activity of 5-p-tolylthiocarbamido-1-naphthol

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ABSTRACT

Present research work deal with synthesis of 5-p-tolylthiocarbamido-1-naphtho and check their antimicrobial activity against four human pathogens. This molecule was synthesized by condensation of 5-amino-1-naphthol with p-tolyl isothiocynate in acetone medium. Recently here focus to assert antimicrobial activity of this molecule against gram positive and gram negative human pathogen bacteria such as E. coli, Proteus vulgaries, P. aeruginos and S. aureus. Comparatively L4 showed highly activity against E.Coli rather than remaining three pathogens. This antimicrobial activity relationship confirmed that this compound is a potential candidate for future drugs discovery and development.

Keywords: 5-p-tolylthiocarbamido-1-naphthol (L4), pathogenic bacteria, activity, disc diffusion method.

INTRODUCTION

Thiocarbamidonaphthol are molecules reveals most significant applications in medicinal as well as pharmaceutical sciences. Recently in laboratory synthesized were various substituted thiocarbamiamido-naphthol compounds (Tayade and Wadekar, 2016). Newly synthesis substituted thiocarbamidonaphthols molecule are studied and their synthetic applications were explained with the evidence of structural arrangement. As structural evidence of 5-amino-1-naphtitol having phenolic hydroxyl and amino group as a active side for reaction. Due to reactivity values of such kind of molecule, it is interesting task to synthesized various substituted thiocarbamido-naphthol compounds along with nitrogen, sulphure and halogen group in heterocyclic and heterocyclic compounds by the interaction of various thiouria and isothiocynates with 5-amino-1-naphthol molecule.

2020-21

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Assistant Professor in Environmental Science

SHRI.DNYANESHWAR MASKUJI BURUNGALE SCIENCE AND ARTS COLLEGE SHEGAON DIST-BULDANA 444203

Antimicrobial activity of substituted thiocarbamido-naphthol molecules was studied (Wadekar *et al.* [2016]. Antimicrobial activity studied by various researchers on time to time by against different human pathogen bacteria and various newly synthesized molecules (Tayade, 1996), Rudnitskaya *et al.*, 2010; Chigwada *et al.*, 2007; Hover *et al.*, 2017; Paranjpe, 1966; Rahman and Siddiqui, 2010; Boroumadi *et al.*, 2009). Barker (2006) investigated antibacterial drug discovery and structure-based design. Synthesis and antimicrobial activity evaluation of new 1,2,4-triazoles and 1,3,4-thiadiazole bearing imodazol [2,1-*b*] thiadiazole moiety was studied (Güzeldemirci and Küçükbasmacı, 2010). From antimicrobial study some of these compounds showed measurable pharmaceutical and biological activities (Neu, 1992).

From literature review was sure thiocarbamidonaphthol and their substitution has significant values in various science fields due to present of phenolic hydroxyl, thio and amino groups. Bearing all these things in mind designed this research scheme to synthesis of 5-*p*-tolylthiocarbamido-naphthol by interaction of 5-amino-1-naphthol with p-tolyl-isothiocynate in acetone medium and to check their antimicrobial activity against various human pathogens bacteria.

MATERIAL AND METHODS

All AR graded chemical are used through experiment. Paraffin bath used to determine the melting points of the all synthesized compounds. Carlo-Ebra 1106 analyzer used to find the carbon and hydrogen analysis. Colman-N-analyzer-29 was used to estimate Nitrogen. IR spectra were recorded on Perkin Elmer Spectrometer in range 4000-400 cm-1 in KBr pellets. PMR spectra were recorded on Brucker Ac 300 F Spectrometer with TMS as internal standard using $CDCl_3$ and DMSO-d6 as solvent. The purity of compound was checked on silica Gel-G Pellets by TLC with layer thickness of 0.3 mm.

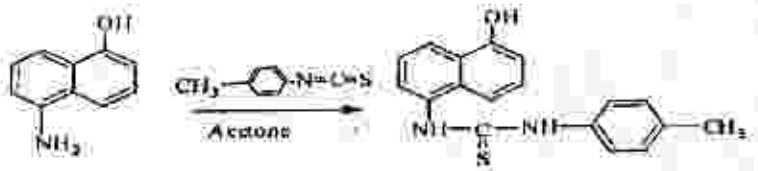
Synthesis of 5-p-tolylthiocarbamido-1-naphthol [L4]

5-amino-1-naphthol (L_1) and p-tolylisothiocynate mixture refluxed in acetone medium on water bath for 4 hours. Brown colour crystalline product was gradually separated out after four hrs, which on trituration with petroleum ether afforded brown crystals It was recrystallised by ethanol with aqueous ethanol to isolate 5-p-tolylthiocarbamido-1-naphthol. Yield is 84.41%, melting point is 218° C.

Properties: It is brown , crystalline solid having melting point 218°C. It gave positive test for nitrogen and sulphur. Desulphurised with alkaline plumbite solution. It formed picrate, melting point 210 ° C.

Elemental analysis: C [(Found 61.75%] calculated 62.09%], H[(found 3.21%] calculated 3.98%], N[(found 8.25%] calculated 8.59%], S[(found 8.94%] calculated 9.75%]

IR Spectrum: - The IR spectrum was carried out in KBr pellets. The important absorption can be correlated as (cm^{-1}):- 3363.17 (N-H-Stretching), 3304.14 (phenolic O-H stretching), 3045.16 (Aromatic C-H-stretching), 1689.30 (N-C-N stretching), 1596.11 (C-N-stretching), 1420.11(C-C stretching), 1373.6(C-O stretching), 1272.6(N-C=S stretching) and 1074.19 (C=S-stretching).



5-Amino-1-naphthol[L_1] 5-p-Tolylthiocarbamido-1-naphthol[L_4]

Table-1: Antimicrobial activity of 5-p-tolylthiocarbamido-1-naphthol

Compound	*E. coli* (mm)	*Proteus vulgaries* (mm)	*P. aeruginosa* (mm)	*S. aureus* (mm)
5-p-tolylthiocarbamido-1-napthol (L_4)	**15**	**11**	**12**	**11**

9825

PROFORMA – C

TEACHER WISE INFORMATION AS PER DECISION OF THE SELECTION COMMITTEE HAS DECIDED TO GIVE HIM PROMOTION WITH GRADE PAY

Name of the College :-Shri.DnyaneshwarMaskujiBurungale Science & Arts College, ShegaonTq.Shegaon, Dist.Buldhana.

Sr. No.	Name of Teacher	Subject and Designation	Basic and Grade Pay of Placement	With the effect from	Remark if any
01	**Dr.Dhammapal. L. Bhade**	Assistant Professor in Environmental Science	**L-13A 131400-217100 (AGP 9000)**		

Signature of the members present for the meeting.

01 Shri.Ramvijay Dnyaneshwar Burungale ----------

02 Dr.R.E.Khadsan ----------

04 Dr.U.S.Patil ----------

05. Dr.Ms.Vaishali Meshram ----------

06 Dr.N.H.Sahare ----------

07 Dr. Ku. V. U. Pocchi ----------

08 Dr.K.H.Wasnik ----------

Date :-

Place : Shegaon

NMR Spectrum:- The spectrum of compound was carried out in $CDCl_3$ and $DMSO-d_6$. This spectrum distinctly displayed phenolic –OH proton at δ 9.6566 ppm, signals due to Ar-H protons at δ 8.2072-6.6849 ppm, -NH protons of naphthalene ring at δ 5.4632-5.2534 ppm,-NH proton of benzene ring at δ 3.3708 ppm.

Antimicrobial Activities

Disc diffusion method was used to find out the antimicrobial activities of this newly synthesized compound, using standard Co-Trimazin 25 µg/ml against gram positive and gram negative bacteria such as *E. coli*, Proteus *vulgarizes*, *P. aeruginosa* and *S. aureus*.

Disc Diffusion Method

Hi-media medium with composition of Pepton- 5gm/lit., NaCl -5gm/lit. Yeast extract -1.5gm/lit, Agar powder - 20gm/lit. pH - 7.4 ± 0.1 used throughout present experiment. The medium for antibacterial activities were prepared [N-agar for bacterial] by dissolving 26 gms of ingredients in one liter of distilled water and sterilized in autoclave at 121° C at 15 lbs/inch pressure in an autoclave for 15 minutes.

Then microbes were inoculated with requisite quantity to the medium at temperature 40-50°C and immediately poured the inoculate medium in to sterilized petridishes to give a depth of 3-4 mm of uniform thickness. After solidification the commercial sterilized disc [HI-Media] loaded with 0.01 M concentration solution of 5-p-tolylthiocarbamido-1-napthol. Then it was kept at room temperature for 4 h as a pre-incubation and then plates of bacteria were incubated for 24 hrs. at 37°C. After the period of incubation period, zones of inhibition were recorded around the disc. The results are cited in

RESULTS AND DISCUSSION

Newly synthesized organic compound 5-p-tolylthiocarbamido-1-naphthol was characterized by various standard methods and check their antimicrobial activity against four mostly observed human pathogens. Presently Table-1 reveals that (L₄) showed measurable and significant antimicrobial activity against E. *coli*, Proteus vulgaries, P. *aeruginosa* and S. aureus. *Comparative trend of antimicrobial activity of L₄ like E. coli* > P. *aeruginosa* > Proteus *vulgaries* > S. *aureus*. While Table-1 was reveal that comparatively L_4 highly activity against *E.Coli rather than remaining three pathogens*. Consequently present studies open the door to understand biochemical and medicinal value of L_4. As newly synthesized L_4 showed remarkable and significant activities so this compound can be used as alternative for the treatment of diseases caused by the above mentioned pathogens only if they do not have toxic and other side effects after the details study. The potency of the drug is increased due to substitution.

Conflicts of Interest: The authors stated that no conflicts of interest.

REFERENCES

Tayade DT and Wadekar AB (2016). Green Synthesis Of Substituted thiocarbamidonaphthols. *Journal Of Medicinal Chemistry And Drug Discovery*, 2(10), 01-05.

Wadekar AB, Nagrale AP and Tayade DT (2016), Studies in The Antimicrobial Activities of Some Newly Synthesized Substituted Thiocarbamidonaphthol by Disc Diffusion Method. *MIRJ*, 4, 5-9.

Tayade DT (1996) Ph.D Thesis Amravati University, Amravati.

Rudnitskaya OV, Kultyshkina EK and Linko IV, Sergienko VS and Aleksandrov CG (2010). *Russian J of Co-ordination Chemistry*, 36, 137-142.

Chigwada TR, Chikwana E, Ruwona T, Olagunju O and Simoyi RH (2007). *J of Phys. Chemistry*, A III (45). 11552-11561.

Dover LG, Alahari A, Gratraud P, Gomes JM, Bhowruth V, Reynolds RC, Besra GS and Kremer LN (2017). Antimicrobial Agents and Chemotherapy, 519(3), 1055-1063.

Paranjpe MG (1966). *J Indian Chemical Society*, 42 - 45.

Rahman MA and Siddiqui AA(2010). Pyrazoline derivatives: a worthy insight into the recent advances and potential pharmacological activities. *Int. J.Pharm. Sci. Drug Research*, 02, 165-175.

Foroumadi A, Sorkhi M, Moshafi, Salavi M, Rineh AR, Shafiee A, Emami S.(2009). 2-Substituted-5-nitroheterocycles: In vitro ant helicobacter pylori activity and structure-activity relationship study. *Med. Chem.*, 5, 529-534.

Barker J (2006). Antibacterial drug discovery and structure-based design. Drug discover today, 11, 391-404.

Güzeldemirci NU and Küçükbasmaci (2010). Synthesis and antimicrobial activity evaluation of new 1, 2,4-triazoles and 1,3,4-thiadiazole bearing imodazol [2,1-b] thiadiazole moiety. *Eur. J. Med. Chem.* 45, 63-68.

Neu HC (1992). The crisis in antibiotic resistance. *Science*, 257, 1064–1073.

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C-9824

PROFORMA -B

SCREENING CUM EVALUATION COMMITTEE REPORT

(Career Advancement of teacher)

1. **Name of the College:** SHRI.DNYANESHWAR MASKUJI BURUNGALE SCIENCE AND ARTS COLLEGE SHEGAON DIST-BULDANA 444203

2. **Date of Selection Committee Meeting: -**

Following members of the Selection Committee were present for the meeting

Sr.No.	Name of the Members	Chairman/Member	Signature
01	Shri.Ramvijay Dnyaneshwar Burungale	Chairman of the committee	
02	Dr.R.E.Khedsan	Principal	
03	Dr.U.S.Patil	V.C. Nominee	
04	Dr.Ms.Vaishali Meshram	V.C. Nominee	
05	Dr.N.H.Sahare	Subject Expert	
06	Dr. Ku. V. U. Pocchi	Subject Expert	
07	Dr.K.H.Wasnik	Government Nominee	

Summary of API Scores:

Sr. No.	Criteria	2018-19	2017-18	2016-17	Total	Average	Remark
1	I	Good	145.56	92.75	238.19	119.09	
2	II	Good	59.1	25	74.8	37.4	
3	III	79	00	00	79	26.33	

Details of Orientation/ Refresher Courses

S.N.	Course	Duration	Organized by
01	Orientation	28 Days [03 /02/2010to 02/03/2010]	UGC- Academic Staff College, University Of Pune, Pune 411007
02	Refresher course	21 Days [01/03/2011to 21/03/2011]	UGC- Academic Staff College, University Of Pune, Pune 411007
03	Refresher course	21 Days [10/11/2014 to 30/11/2014]	UGC- Academic Staff College, University Of Pune, Pune 411007
04	Refresher course	13 days [18/11/2019 to 30/11/2019]	UGC- HRDC, BAMU, Aurangabad 431004

2020-21

Juni Khyat
(UGC Care Group I Listed Journal)

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PHYSICO-CHEMICAL ANALYSIS OF UNDERGROUND WATER OF JALGAON JAMOD REGION OF BULDANA DISTRICT, MAHARASHTRA, INDIA

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*[1]Department of Environmental Science,Shri.D.M.Burungale Science and Arts College,Shegaon, India
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ABSTRACT

Ground water samples were collected from different villages of Jalgaon-Jamod (India). These water samples from 25 sampling points of Jalgaon-Jamodwere analyzed for their physicochemical characteristics. Laboratory tests were performed for the analysis of samples for pH, Hardness, Chloride, Alkalinity, TDS etc. On comparing the results against drinking water quality standards laid by Indian Council of Medical Research (ICMR) and World Health Organization (WHO), it is found that some of the water samples are non-potable for human being due to high concentration of one or the other parameter. The usefulness of these parameters in predicting ground water quality characteristics were discussed. Thus an attempt has been made to find the quality of ground water in and around Jalgaon-Jamod, suitable for drinking purposes ornot.

***Key Words:** Water quality, physiochemical parameters, pollution study, drinking water, Hariharataluk.*

INTRODUCTION

Ground water is crucial, most suitable fresh water resource with nearly balanced concentration of the salts for human consumption.Surface water and ground water is the only available source for human being but due to industrializations, urbanization and agriculture practices the surface water resources are greatlypolluted. Relatively groundwater resources are much clean and usable water resources.

Today a large number of rural and urban populationsdepend upon groundwater. It is estimated that approximately one third of world's population depends upon ground water resources for drinking(**Nicksonet al.2005**).The greater part of state in India where more than 90% of population depends upon ground water for drinking(**Ramachandraiah2004**). Over burden of the population pressure, unplanned urbanization, unrestricted exploration policies and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water. Ground water occurs in weathered portion, along the joints and fractures of the rocks. In fact, industrial waste and the municipal solid waste have emerged as one of the leading cause of pollution of surface and ground water. In many parts of the country available water is rendered non-portable because of the presence of heavy metal in excess. The situation gets worsened during the summer season due to water scarcity and rain water discharge. Contamination of water resources available for household and drinking purposes with heavy metals, metal ions and harmful microorganisms is one of the serious major health problems.

In the Jalgaon-Jamod ground water is the main source of fresh water for major population

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Vol-10 Issue-6 No. 15 June 2020

Groundwater is usually extracted through hand dug shallow wells. Selected places of JalgaonJamod been taken for the present study. It lies adjacent to each other in the north of Buldhana district of Maharashtra.

MATERIALS AND METHODS

Study Area: Jalgaon-Jamod situated at the base of Satpura Range, about 20 km from Satpuda and its Coordinates are 21.0486°N 76.5344°E and the total population in Jalgaon-Jamodtahasil is 156,623 as per the survey of census during 2011 by Indian Government. Out of total population 128,347 people are living in the urban area and about 128,347 are living in rural areas. There are 33,861 House Holds in this sub district. There are 80,008 males (51%). There are 76,615 females (49%).It has an average elevation of 291 metres (955 feet).Purna is the largest river in the tehsil which is also largest in the District. There is the satpuda mountain ranges in the northern part of the tehsil.

Sampling location of study area is shown in the Table No:1.1

Sl. No.	Sample Number	Name of Village	Sl. No.	Sample Number	Name of Village
1	DW1	Bhon	14	BW14	Ukalgaon
2	DW2	Pesoda	15	BW15	Pimpari
3	DW3	Khiroda	16	BW16	Rudhana
4	DW4	Savali	17	BW17	Bhirkhed
5	DW5	Patonda	18	BW18	Kathargaon
6	DW6	Awar	19	DW19	Marod
7	BW7	Kavathal	20	BW20	Wakana
8	DW8	WaryatKhandermo	21	DW21	Wankhed
9	DW9	Jastagaon	22	DW22	Bodakha
10	DW10	Kalamkhed	23	BW23	Tamgaon
11	BW11	Takaleshwar	24	BW24	Nirod
12	BW12	Chondi	25	DW25	Ringanwadi
13	BW13	Kakoda			

BW:Borewell,DW:Dugwell

Samplecollection

The water samples were collected in pre-cleaned one liter capacity polyethylene containers of 2 litre capacity. The containers were pre-washed with chromic acid solution and rinse with distilled water several times

Physico-Chemical Analysis

The collected samples were analyzed for different physico-chemical parameters such as pH, Electrical conductivity (EC), Total Dissolved solids (TDS), Total hardness (TH), Total Alkalinity and Chloride as per the standard methods (APHA 1998), and the results were compared with the Indian Standards (ICMR) for potable water. The parameters present in the water sample can be calculated by using various methods. The pH of all the water samples was determined using a pH meter (Model no LI 127, Elico) Electrical conductivity was measured using a conductivity meter. The chloride, and total hardness were estimated by the standard methods of water

RESULTS AND DISCUSSION

A total of 25 water samples from hand pumps and bore wells of Jalgaon-Jamodwere collected in pre-cleaned one liter capacity polyethylene containers of 2 litre capacity, which were being used mainly for the purpose of drinking and cooking and are brought to the laboratory with proper

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Vol-10 Issue-6 No. 15 June 2020

care. The water quality analyses of different ground water samples have been carried out for pH, Electrical conductivity, Total Alkalinity,TDS, Total hardness and Chloride The samples were analysed using various analytical methods. APHA (1998), AWWA-WPCF (1995) Total hardness and calcium were measured by EDTA titrimetric method using EBT indicator respectively. Chloride was determined by Argentometric method using potassium chromate indicator. The chemical data were complied further to know location wise distribution. The data revealed that there were considerable variations in the examined samples from different sources with respect to their chemical characteristics. The results indicate that the quality of water considerably varies from location to location.

Hydrogen ion activity (pH):pH of water is an essential and prime parameters of groundwater Foran Table 1.2 reveals that pH values of samples ranged varied 8.15 to 9 in case of post monsoon season and Table 1.3 a revels that pH values of samples ranged between to 7.8 to 8.57 for pre-monsoon season.

Electrical conductivity (EC): From Table 1.2 shown that groundwater EC values are founds in ranged 412 to 7120 in post monsoonsession. Table 1.3 shown that groundwater EC values are ranged 312 to 6750 are found in pre-monsoon session.

Total Alkalinity (TA): From Table 1.2 shown that Total Alkalinity values are founds in ranged 203 to 821 in post monsoon session. Table 1.3 shown that Total Alkalinity values are ranged 160 to 720 are found in pre-monsoon session.

Total Dissolve Solid (TDS):512 to 9556 is the range of TDS inpre-monsoon session and in post monsoon session it varies from 400 to 9984

Total hardness (TH): Total hardness value range from 200 to 4412 in pre monsoon session and 112 to 4328 is the range of value for post monsoon session

Chloride (Cl-): From Table 1.2 shown that chloride values are founds in ranged 79 to 836 in post monsoon session. Table 1.3 shown that groundwater EC values are ranged 55 to 759 are found in pre-monsoon session.

CONCLUSION

In general ground water quality of Jalgaon-Jamod is not harmful to human beings, since the ground water which were taken from the various places of Jalgaon-Jamod were analyzed and the analysis reports that the water quality parameters like pH, Cl^- ,Total Alkalinity lies within the maximum permissible limit prescribed by WHO and ICMR. Except certain parameters like Total hardness, TDS, EC etc. As study area comes under the saline belt it is recommend to boil the water before use it minimize the temporary hardness of water.

Table 1.2: Physicochemical analysis of water from JalgaonJamod and Sangrampur region in Post Monsoon- 2015

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Vol-10 Issue-6 No. 15 June 2020

Table 1.3: Physicochemical analysis of water from Jalgaon Jamod and Sangrampur region in Pre Monsoon- 2016

S. No.	TA	Cl-	TH	TDS	E.C	pH	S. No.	TA	Cl-	TH	TDS	E.C	pH
DW1	445	355	252	2000	420	7.74	BW15	205	298	724	480	900	7.86
DW2	217	213	944	9874	460	8.53	BW16	550	355	4200	9984	2030	7.73
DW3	480	16	1096	5992	1340	7.9	BW17	169	92	208	400	5750	7.7
DW4	425	333	176	400	410	7.45	BW18	510	73	1520	5665	1460	8.45
DW5	168	146	323	800	6412	7.88	DW19	260	759	270	800	390	7.68

S. No	TA	Cl-	TH	TDS	E.C	pH	S. No	TA	Cl-	TH	TDS	E.C	pH
DW1	521	412	300	2112	523	8.0	BW15	327	325	811	512	458	8.2
DW2	318	300	1000	9526	564	9	BW16	572	412	4284	9556	2145	7.9
DW3	523	112	1721	4131	1320	8.2	BW17	203	173	312	521	7130	7.9
DW4	519	412	213	600	521	7.8	BW18	571	125	1614	4521	1524	8.45
DW5	345	250	428	958	6523	8.1	DW19	381	836	321	956	451	7.9
DW6	328	200	610	2152	852	8.2	BW20	521	112	1002	2314	1254	8.5
BW7	231	128	231	945	1452	8.2	DW21	523	679	4412	3952	4956	8.4
DW8	301	300	545	2314	412	7.9	DW22	247	789	714	2541	561	7.9
DW9	412	79	480	2564	456	8.1	BW23	352	378	1012	925	521	7.9
DW10	421	115	514	1745	845	7.8	BW24	821	215	800	2714	1625	8.3
BW11	326	89	310	1325	654	8.2	DW25	512	542	641	2141	565	7.7
BW12	362	230	200	956	521	8.5	**Max**	**821**	**836**	**4412**	**9556**	**7130**	**9**
BW13	429	724	550	1754	412	8.4	**Min**	**203**	**79**	**200**	**512**	412	7.7
BW14	251	156	645	1721	1652	8.2	**Average**	**408.52**	**327.4**	**927.16**	**2554.16**	**1515.48**	**8.15**
DW6	215	163	570	2060	740	7.97	BW20	450	69	928	9871	1150	8.37
BW7	185	71	202	800	1320	7.95	DW21	470	597	4328	9880	3850	8.02
DW8	195	322	480	2000	380	7.73	DW22	180	603	662	2400	420	7.72

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Vol-10 Issue-6 No.15 June-2020

BWS	300	55	156	3400	472	7.80	BW21	245	610	562	800	450	7.34
BW10	350	67	448	3600	518	8.13	BW24	220	104	448	3600	4580	8.04
BW11	290	59	236	3280	380	7.83	BW2C	145	84	580	2060	450	7.58
BW12	200	175	112	800	454	8.18	Max	320	350	1328	4083	6780	8.57
BW13	325	684	407	3500	412	7.92	Min	240	55	112	800	312	7.17
BW14	178	71	226	1900	1428	7.87	Average	3114	261.36	457.14	1114.60	1508.08	7.8

REFERENCES

1. APHA (1998) StandardMethodsforthe examinationofwaterandwastewater,Pg2-4,29-179, American Public Health Association.
2. Nickson, R.T., J.M. M cArthur, B. Shrestha, T.O. Kyaw-Nyint and D. Lowry, (2005) Arsenic and other drinking water quality issues, MuzaffargarhDistrict,Pakistan. Appl. Geochem., 20(1): 55-68.
3. Ramachandraiah, C. (2004) Right to drinking water in India, Centre for Economic and Social Studies: 50
4. Abimbola O. Adetoro, M.S. Lawal and AdetolaJenyo-Oni, *Advances in Applied Science Research*, **2011**, 2 (2):218-226
5. BishtShikha, Patra, B. A., Gupta N. C., AroraSaurabh, and R. A. Singh.(2007) Assessment of Drinking Water Quality of Delhi, India .In:12th ISMAS-WS-2007, March 25-30, Cidade de Goa, Dona Paula, Goa.
6. Garg VK, Chaudhary A, Deepshikha, Dahiya S, *Indian J Environ Prot*, 19(4) (1999), 267- 272
7. Gupta, B. K. and R. R. Gupta, (1999). *Poll. Res.* 18: 523-525.
8. Gupta, D.P., Sunita and Saharan, J.P. 2009. *Science pub.*1(2):1-5.
9. Harish Babu, K., Puttaiah, E.T. and Vijaya Kumara, 2006. *Journal of Living World*. 13(1):18-25.
10. IndrajitSen,AjayShandilandV.S.Shrivastava,*AdvancesinAppliedScienceResearch*,2011, 2 (2): 161-166
11. Obi, C.N. and Okocha, C.O.2007. *J. of Engg and App. Sci.*2(5):920-929.
12. Rajan M. R. and I. Paneerselvam. (2005). *Indian J. Environ. andEcoplan.* Vol. 10, No.3: 771-776.
13. Shyamala. R., Shanthi. M. and Lalitha, P. 2008. *E-Journal of Chemistry*.5(4):924-929.
14. Thakare S. B., A. V. Parvate and M. Rao. (2005). *Indian J. Environ. andEcoplan.* Vol. 10 No.3:657-661.
15. Yadav S.S. and Kumar Rajesh, *Advances in Applied Science Research*, 2011, 2 (2):197-201

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2020-21

International Journal of Disaster Recovery and Business Continuity
Vol.11, No. 2, (2020), pp. 1104-1109

Occurrence of Fluoride in Ground Water of Sangrampur Tahasil in Buldana District, Maharashtra, India

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[1]*Assistant Professor Shri D.M.Burungale Science and Arts College,Shegaon Dist:Buldana*
[2]*Assistant Professor in HPT Arts and RYK Science College,Nashik*
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Abstract

The concentration of fluoride in Ground Water influences the dental caries situation in the region. There are no studies reported determining the fluoride levels in Ground Water supplies of Sangrampur region. In India, Buldana district is a one of the part saline area. Considering this things in mind, in present work pay my attention to determination of fluoride in Ground Water at various villages of Sangrampur Region. The aim of this study is to determine the fluoride level in Ground Water samples from different areas of Sangrampur region. A total of 25 water subsamples were analyzed for fluoride content using SPADNS reagent and acid zirconium chloride by spectrophotometer at 570 nm. In this study, it was observed that the fluoride level in Ground Water of Sangrampur was below the recommended levels suggested by WHO and BIS.

Keywords: *Ground Water, Sangampur, Fluoride, Saline area*

1.0 Introduction

Water is the major element required by an individual for survival. The daily consumption of water from different sources exposes an individual to various elements present in water which can be either beneficial or harmful. Fluoride is widely distributed in nature in soil, water, air, vegetation, agricultural products and sea foods. It is found as fluorite, Cryolite and Fluoroapatite in rocks. Surface water seldom has fluoride more than 0.3 mg/L. Ground water sources such as dug well, shallow and deep hand pumps, especially tube well, may contain excess fluoride where minerals like Cryolites, Biotites and Fluoroapatite are present. This is mainly due to the dissolution of fluoride from fluoride bearing minerals.[8] The fluoride level in drinking water is an important parameter and has to be controlled to prevent dental and skeletal fluorosis.[1] Almost 200 million people from 25 countries are at risk of health problems for high concentration of fluoride in their drinking water.[2][3] Many epidemiological studies have shown that long-term consumption of drinking water with a high-fluoride concentration (>4 ppm or mg/L) leads to many adverse effects on human including dental and skeletal fluorosis, so that the World Health Organization (WHO) sets the desirable level of fluoride in potable water as 0.5–1.5 ppm.[2][4][5][6] It is also known that disposal of industrial

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effluents and sewage into fresh water cause ground water pollution [12]. Fluorspar is commonly known as an ore of mineral fluorite. Fluorite/Fluorspar occurs in many rocks in varied forms. The fluoride content of the rocks, due to repeated weathering, gets slowly dissolved in water, when the water acquires acidic nature. In this procedure, water gets contaminated by fluoride .Excessive intake of fluoride leads to serious effects on the teeth during tooth formation and abnormal hardening of bones, leading to a condition known as fluorosis that is exacerbated by poor diets deficient in calcium and vitamins. Many of the states of the Indian union have alarmingly high concentration of fluoride in their water resources[10]. Fluoride ion in traces in drinking water helps in growth and development of healthy, resistant teeth, and bones.[7] The concentration of fluoride in drinking water is one of the factors strongly influencing the dental caries situation globally. Fluoride levels are monitored in drinking water supplies to achieve the required safety.[3] Knowledge of fluoride level in potable water is important for health-care personnel and policymakers.[2] However, there are no studies on the level of fluoride in drinking water in Sangrampur region. We therefore planned this study to determine the fluoride concentration in drinking water from 25 different Ground water sources in Sangrampur region.

Study Area

In India, Sangrampur is a small beautiful town located in Buldana district of MaharashtraState. It lies to border of JalgaonJamod tehsil area of Buldana district in north side, the Shegaon tehsil of the Buldhana District in the south, the Telhara tehsil of the Akola District to the east and the Burhanpur District of the Madhya Pradesh State to the north. Its Coordinates are: 21.03°N 76.68°E. It has an average elevation of 273 metres (898 feet). Population of Sangrampur tehsil is 137092 as per the survey of census during 2011 by Indian Government. The tehsil has an area of 594 km^2 and consists of 105 villages, total population of around 97,000. Basically Agriculture is main occupation of people of Sangrampur tehsil.

Sampling location of study area is shown in the Table No:1.1

Sl. No.	Sample Number	Name of Village	Sl. No.	Sample Number	Name of Village
1	DW1	Bhan	14	BW14	Ukalgaon
2	DW2	Pesoda	15	BW15	Pimpari
3	DW3	Khiroda	16	BW16	Rudhana
4	DW4	Savali	17	BW17	Bhilkhed
5	DW5	Paturda	18	BW18	Kathargaon
6	DW6	Awar	19	DW19	Mared

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7	BW7	Kavathal	20	BW20	Wokana
8	DW8	Warvat Khanderao	21	DW21	Wankhed
9	DW9	Jastagaon	22	DW22	Bedakha
10	DW10	Kalamkhed	23	BW23	Tamgaon
11	BW11	Takaleshwar	24	BW24	Nirod
12	BW12	Chondi	25	DW25	Ringanwadi
13	BW13	Kalvada			

Symptoms

In dental fluorosis the common symptoms observed are discolouration of the teeth. It may start with white yellow and become brown to black. The discolouration may be in spots/ streaks, invariably horizontal in orientation; during its development, new layer of the matrix are added. Dental fluorosis is usually reversible if no permanent damage is done. The recovery has been observed in case of several patients using fluoride reduced water during treatment (Acharya & Mathi, 2010).

2.0 Material and Methodology

In the present study, deep tube well water samples were collected from different villages of Sangrampur region of Buldana District, Maharashtra, India. Samples were collected in the brown glass bottles without adding reagent and acid zirconium chloride by using spectrophotometer at 570 nm (Trivedy & Goel, 1983). The concentration of fluoride was determined in term of mg/L.

3.0 Result and Discussion:

The current WHO guideline value for fluoride in drinking water is 1.5 mg/L (WHO, 2011).[11] In temperate regions, where water intake is low, fluoride level up to 1.5 mg/L is acceptable. The Ministry of Health (MOH), Government of India (GOI), has prescribed 1.0 mg F/L and 2.0 mg F/L as the permissive and excessive limits, respectively.[12]
In the month of July to October 2019 average fluoride concentration found to be 1.148 mg/l and 1.5 mg/l maximum, 0.8 mg/l minimum fluoride concentration. In the month of November to January 2019 average fluoride concentration found to be 1.22 mg/l and 1.5 mg/l maximum, 0.9 mg/l minimum fluoride concentration. In the month of February to May 2020 average fluoride concentration found to be 0.864 mg/l and 1.1 mg/l maximum, 0.6 mg/l minimum fluoride concentration. The analysis revealed that during mean concentration of fluoride level in water samples from Sangrampur region was below the recommended levels by the WHO as well as the MOH, GOI.

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4.0 Conclusion:

The mean concentration of fluoride level in water samples from Sangrampur region of Buldana District, Maharashtra, India was 0.5 mg/L. The observed fluoride level in drinking water from all the sources was less than that recommended by the WHO as well as the MOH, GOI.

Table 1.2 Concentration of Fluoride in Ground water Samples of Sangrampur region of Buldana District, Maharashtra,India(2019-2020)

Sr.No	Abbreviated Form	Place of Sampling	*Concentration (mg/l)	**Concentration (mg/l)	***Concentration (mg/l)
1	DW1	Bhon	1.1	1.2	0.8
2	DW2	Pesoda	1.2	1.3	0.6
3	DW3	Khiroda	1.3	1.1	0.7
4	DW4	Savali	1.4	1.4	0.9
5	DW5	Paturda	1	0.9	1
6	DW6	Awar	1.2	1.3	1.1
7	BW7	Kavathal	1.3	1.1	0.7
8	DW8	Warvat Khanderao	0.9	1.1	0.9
9	DW9	Jashgaon	1.3	1.5	1
10	DW10	Kalamkhed	0.9	1.4	0.7
11	BW11	Takaleshwar	0.9	1.3	0.8
12	BW12	Chondi	1	1.2	0.9
13	BW13	Kakoda	1.4	1.2	1.1
14	BW14	Ukalgaon	1	1.2	0.8
15	BW15	Pimpari	0.9	1	0.9
16	BW16	Rodhana	0.9	1.1	0.7
17	BW17	Bhilkhed	1.3	1.1	0.9
18	BW18	Kathargaon	1.2	1.1	1.1
19	DW19	Marod	0.9	1.2	0.7
20	BW20	Wakana	0.8	1.3	0.8

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21	DW21	Wankhed	1.0	1.1	0.8
22	DW22	Bodukha	1.4	1.5	0.9
23	DW23	Tangaon	1.5	1.2	1.1
24	DW24	Nirod	1.5	1.3	0.8
25	DW25	Ringanwadi	1.4	1.4	0.9
		Average	1.148	1.22	0.864
		Max	1.5	1.5	1.1
		Min	0.8	0.9	0.6

*: Rainy Season (Month of July-October, 2019); **: Winter Season (Month of November-January, 2019-20); ***: Summer Season (Month of February-May, 2020)

References

1. APHA (1989) Standard Methods for the Examination of Water and Waste Waters. 17th ed. Washington, APHA AWWA, WBCF.
2. BIS (1991) Drinking Water-Specification, New Delhi, Bureau of Indian Standards (IS 10500-91), 2.1 ed. New Delhi, India.
3. Bulusu, K.R., and Nawlakhe, W.G. (1992) Defluoridation. Nagpur, National Environmental Engineering Research Institute (NEERI), p. 61.
4. Indian Standards, Revised (2003) Specification for Drinking Water, Bureau of Indian Standards, New Delhi (IS 10500-91).
5. Ceopalan, C. (2003) The Changing Epidemiology of Malnutrition in Developing Society. Current Science, 77, p. 1257.
6. Choubisa, S.L. (2001) Endemic flourosis in Southern Rajasthan, India. Fluoride, 34, pp. 61-70.
7. Indian Council of Medical Research (ICMR) (1975) New dimension of fluorosis in Andhra Pradesh, 5, Indian Council of Medical Research, pp. 1-5.
8. Kudesia, V.P. (2003) Environmental Chemistry. Pragati Prakashan, Meerut, 2nd ed. pp. 145-148.
9. Ministry of Work and Housing (MWH) (1975) Govt. of India: Nirman Aur Awas Mantralaya [Internet], New Dehli, Ministry of Work and Housing. Available from: < http://www.niua.org/mpd/Pages%20from%20MPD1962_n otifications_pages141-176.pdf > [25th June 2012].
10. Misra, A.K., and Mishra, A., and Premaj. (2006) Escalation of Ground Water Fluoride in the Ganga Alluvial Plains of India. **Fluoride**, 39, pp. 35-38.
11. NEERI (1978) Nalgonda technique for deflouridation, fill and draw type deflouridation plant. **National Environmental Engineering Research Institute Manual**, Nagpur, Technical Digest, p. 59.

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Copyright ©2020 SERSC

12. Oberoi, J., and Gupta, K.C. (2010) Occurrence of fluoride in ground water of various villages of district Ambala (Haryana). Poll. Res., 29(3), pp. 435-440.
13. Orissa Census (2001) District Statistics Hand Book, Balasore (2007). Directorate of Economics and Statistics, Govt. of Orissa, Bhubaneswar, India.
14. Susheela, A.K. (1987) Fluorosis in India, the magnitude and severity of the problem. Sci. Dev. Env., pp. 147-157.
15. Susheela, A.K. (1999) Fluorosis management programme in India. Curr. Sci., 77, pp. 1250-1256.
16. Susheela, A.K. (2007) Fluorosis management programme in India. Curr. Sci., 77, pp. 1250-1256.
17. Trivedy, R.K., and Goel, P.K. (1983) Chemical and Biological Methods for Water Pollution Studies, Karad, Environ. Media Publication, pp. 209.
18. Tiwari, S., and Pande, R.K. (2010) Atatus of fluoride in the waters of Uttrakhand, Poll. Res., 29(3), pp. 428-43
19. Amouei A, Mahvi AH, Mohammadi AA, Asghamia HA, Fallah SH, Khafajeh AA. Fluoride concentration in potable ground water in rural area of Khaf City, Razavi Khorasan Province, Northeastern Iran. Int J Occup Environ Med 2012;3:201-3
20. Ayoob S, Gupta AK. Fluoride in drinking water: A review on the status and stress effects. Crit Rev Environ Sci Technol 2006;36:433-87.
21. Meenakshi, Maheshwari RC. Fluoride in drinking water and its removal. J Hazard Mater 2006;137:456-63
22. WHO. Guidelines for Drinking-Water Quality, 4th ed. Geneva: World Health Organization; 2006
23. Singh B, Gaur S, Garg VK. Fluoride in drinking water and human urine in Southern Haryana, India. J Hazard Mater 2007;144:147-51.
24. Rajković MB, Novaković ID. Determination of fluoride content in drinking water and tea infusions using fluoride ion selective electrode. J Agric Sci 2007;52:155-68
25. Jagtap S, Yenkie MK, Labhsetwar N, Rayalu S. Fluoride in drinking water and defluoridation of water. Chem Rev 2012;112:2454-66.

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Research Article

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Assessment of Heavy Metal Concentration in groundwater of Shegaon City, Maharashtra, India

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ABSTRACT

Water is one of the most precious natural resource, essential for all activities of human beings as well as all life forms. Fresh water is consumed for domestic, industrial, agriculture, and commercial sectors. Use of water entirely depends on the quality of water. Polluted water affects health of human, plants and animal in different ways. Major sources of groundwater contamination include solid waste dumping, industrial effluents, domestic waste water and some natural sources. Heavy metals are usually discharged through waste materials from domestics, industries and agriculture too. From huge debris of solid waste dumping and sanitary landfill techniques, heavy metals get accessed to the groundwater through percolation and leaching. Percolating water carries a large amount of heavy metals and get accumulated in aquifers and contaminates groundwater. The consumption of heavy metal contaminated ground water causes a variety of disorders and disease to the human and plants. This study was carried out to investigate the pollution of bore well water in residential areas of Shegaon City, Dist. Buldana Maharashtra, India. In this research, five samples were taken from residential areas of Shegaon City, 1) SBI Colony, 2) Rajeshwar Colony, 3) Shriram Nagar, 4) Akot Road 5) Alasana Road and analyzed to find out concentration of Arsenic, Lead, Cadmium, and Mercury. Five Samples were analyzed using Atomic Absorption Spectrophotometer (AAS).

Keywords: Mercury, AAS, Aquifer, Groundwater, Shegaon, Sanitary Landfill, Arsenic, Lead, Cadmium.

INTRODUCTION

There is no specific definition of a heavy metal, but literature has defined it as a naturally occurring element having a high atomic weight and high density which is five times greater than that of water. Among all the

pollutants, heavy metals have received a paramount attention to environmental chemists due to their toxic nature (Fitzgerald and Lamberg, 2002). Heavy metals are usually present in trace amounts in natural waters but many of them are toxic even at very low concentrations. Metals such as arsenic, lead, cadmium, nickel, mercury, chromium, cobalt, zinc and selenium are highly toxic even in minor quantities (Mondal and Suzuki, 2002). Increasing the quantity of heavy metals in our resources is currently an area of greatest concern, especially since a large number of industries are discharging their metal containing effluents into fresh water without any adequate treatment. Heavy metals become toxic when they are not metabolised by the body and accumulate in the soft tissues. They may enter the human body through food, water, air or absorption through the skin when they come in contact with humans in agriculture, manufacturing, pharmaceutical, industrial or residential settings. Industrial exposure accounts for a common route of exposure for adults. Ingestion is the most common route of exposure in children. Natural and human activities are contaminating the environment and its resources, they are discharging more than what the environment can handle (Fribery et al., 1986).

Lead (Pb), a soft, silvery white or grayish metal in Group 14 (IVa) of the periodic table. Lead is very malleable, ductile, and dense and is a poor conductor of electricity. Known to antiquity and believed by the alchemists to be the oldest of metals, lead is highly durable and resistant to corrosion, as is indicated by the continuing use of lead water pipes installed by the ancient Romans. The symbol Pb for lead is an abbreviation of the Latin word for lead, *plumbum*.

Arsenic (As)

Arsenic appears in three allotropic forms: yellow, black and gray; the stable form is a silver-gray, brittle crystalline solid. It tarnishes rapidly in air, and at high temperatures burns forming a white cloud of arsenic trioxide. Arsenic is a member of group Va of the periodic table, which combines readily with many elements (Alexander 2002). The metallic form is brittle, tarnishes and when heated it rapidly oxidizes to arsenic trioxide, which has a garlic odor. The non-metallic form is less reactive but will dissolve when heated with strong oxidizing acids and alkalis (Reddy et al. (2012).

Mercury (Hg)

Mercury, also called **quicksilver**, chemical element, liquid metal of Group 12 (IIb, or zinc group) of the periodic table. A heavy, silvery, transition metal, mercury is one of five elements that are liquid at or near room temperature. Mercury is used in thermometers, barometers and other scientific apparatus, although the use of mercury in thermometers has been largely phased out in clinical and scientific environments (in favor of alcohol-filled, digital or thermistor-based replacements) due to concerns about the element's toxicity. Mercury, like lead, is a neurotoxin, and elevated blood mercury levels have led to retardation and abnormities in children (Ros and Slinff, 1907).

Entry of Heavy Metals in Environment

Heavy metals enter into the environment through various routes that can be manmade and/or natural. Metals are introduced in aquatic systems as a result of the weathering of soils and rocks from volcanic eruptions, and from a variety of human activities involving the mining, processing, or use of metals and/or substances that contain metal pollutants (Bhagure and Mirgane, 2010). The most common heavy metals pollutants are arsenic, cadmium, chromium, copper, lead and mercury. There are different types of sources of pollutants: point sources (localized pollution), where pollutants come from single, identifiable sources (Mridul and Prasad, 2013). The second type of pollutant sources are nonpoint sources, where pollutants come from dispersed (and often difficult to identify) sources. There are only a few examples of localized metal pollution, like the natural weathering of ore bodies and the little metal particles coming from coal-burning power plants via smokestacks in air, water and soils around the factory (CTCR,2010). The most common metal pollution in freshwater comes from mining companies (CTCR, 2012). They usually use an acid mine drainage system to release heavy metals from ores, because metals are very soluble in an acid solution (IS, 2002). After the drainage process, they disperse the acid solution in the groundwater, containing high levels of metals (Horton et al. 2013).

Interference to Water body

When the pH in water falls, metal solubility increases and the metal particles become more mobile (Green and Woodhead, 1910). That is why metals are more toxic in soft waters. Metals can become locked up in bottom sediments, where they remain for many years (Nalini,

2001). Streams coming from draining mining areas are often very acidic and contain high concentrations of dissolved metals with little aquatic life (Genles, 1990). Both localized and dispersed metal pollution cause environmental damage because metals are non-biodegradable (Stejskal and Gilbert, 2002). Unlike some organic pesticides, metals cannot be broken down into less harmful components in the environment. Campbell and Stokes (1985) described two contrasting responses of an organism to a metal toxicity with declining pH. If there is little change in speciation and the metal binding is weak at the biological surface, a decrease in pH will decrease owing to competition for binding sites from hydrogen ions (Ogutveren et al. 1994). Where there is a marked effect on speciation and strong binding of the metal at the biological surface, the dominant effect of a decrease in pH will be to increase the metal availability (Mercier and Pinnavaia, 1998). Generally, the ionic form of a metal is more toxic, because it can form toxic compounds with other ions (Cohen et al. (2001). Electron transfer reactions that are connected with oxygen can lead to the production of toxic oxy radicals, a toxicity mechanism now known to be of considerable importance in both animals and plants. Some oxy radicals, such as superoxide anion (O_2^-) and the hydroxyl radical (OH^-), can cause serious cellular damage (Jaber et al. (2005). Some inorganic pollutants are assimilated by organisms to a greater extent than others (Wang and Chen, 2006). This is reflected in the Bioconcentration factor (BFC), which can be expressed as follows: BCF=concentration of the chemical in the organism/concentration of the chemical in the ambient environment (Gautam, 2010). The ambient environment for aquatic organisms is usually the water or sediments. With inorganic chemicals, the extent of long-term bioaccumulation depends on the rate of excretion. Toxic chemicals can be stored into tissues of species, especially fat tissues (Gautam, 2013). Bioaccumulation of cadmium in animals is high compared to most of the other metals, as it is assimilated rapidly and excreted slowly (Sharma and Sangh, 2013). Also, the sensitivity of individuals of a particular species to a pollutant may be influenced by factors such as sex, age, or size. In general, the concentrations of metals in invertebrates are inversely related to their body mass. In fish, the embryonic and larval stages are usually the most sensitive to pollutants. Benthic organisms are likely to be the most directly affected by metal concentrations in the sediments, because the benthos is the ultimate repository of the particulate materials that are washed into the aquatic ecosystem (Campbell and Stokes, 2011).

MATERIAL AND METHOD

This was an observational study, conducted over a period of one-month January 2021, where five nearest and reachable residential areas in Shegaon city were selected. Five Houses were selected for borewell water analysis as samples randomly. The overall sample of five is selected for surface water and groundwater. This study was planned based on above sample criteria. The power supply to borewell was on and water was withdrawn and allowed to run from direct connection for fine minutes. The water sample was collected in five containers without contamination and labelled and lids were tightly closed. Within two hours of collection, samples were transported to the Laboratory. Atomic Absorption Spectrophotometry using Perkins Elmer AA 200 model was used to estimate the concentration of Arsenic, Lead, Cadmium and Mercury based on Indian Standards _ 3025 and results obtained.

Table 1: shows the levels Arsenic, Lead, Cadmium, Mercury of five tube wells from five houses

Sr. No.	Parameters	Location				
		SBI Colony	Rajeshwar Colony	Shriram Nagar	Akot Road	Alasana Road
1	Arsenic	0.0011 mg/l	0.001 mg/l	0.0014	0.006 mg/l	0.009 mg/l
2	Lead	0.0013 mg/l	0.001 mg/l	0.003 mg/l	0.008 mg/l	0.003 mg/l
3	Cadmium	0.005 mg/l	0.0001mg/l	0.006 mg/l	0.004 mg/l	0.0013 mg/l
4	Mercury	0.002mg/l	0.001 mg/l	0.001 mg/l	0.0002mg/l	0.0001mg/l

RESULTS

Table 1 shows the levels Arsenic, Lead, Cadmium, Mercury of five tube wells from five houses. All the samples contained heavy metals below 0.0016 mg/l. Result shows Lead is highly present in SBI colony bore well.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Alexander Zaporozec. Groundwater contamination inventory-A Methodological Guide, UNESCO-IHP-VI, Series on Groundwater No. 2, Paris. 2002.

Bhagure GR, Mirgane SR (2010) Heavy metal concentrations in groundwaters and soils of Thane Region of Maharashtra, India.

Campbell G C, Stokes P M, (2011) *Candian J. of Fisheries and Aquatic Sciences* 42 (12): 2034-2049 DOI: 10.1139/f85-251

Cohen Y et al. (2001) CRC Press, New York. 2001. ch. 8, pp. 321–353.

Environmental quality monitoring reports of 43 critically polluted areas- 2013, CPCB.

Fitzgerald W, Lamborg CH (2003) Geochemistry of mercury in the environment 107-148. In: Environmental Geochemistry, V. 9; Lollar, B.S. (ed.), Oxford, Elsevier.

Friberg L, Nordberg GF, Vouk VB, eds. (1986) Handbook of the toxicology of metals. Vol. II. Amsterdam, Elsevier, pp. 130-184.

Gautam RK et al. (2013), in Wastewater Reuse and Management, ed.

Gautam RK, (2010) Environmental Magnetism: Fundamentals and Applications, LAP Lambert Academic Publishing, Saarbrucken, 1st edn. 2010.

Genies EM, et al. (1990). 36 139. (1990).

Green A G and Woodhead A E. J. of Chem. Soc.97, 2388-2403, (1910).

Guidelines for Water Quality Monitoring, MINARS/27/2007-08, Central Pollution Control Board Parivesh Bhawan, East Arjun Nagar, Delhi-32.

Horton LM, et al. (2013) What Do We Know of Childhood Exposures to Metals (Arsenic, Cadmium, Lead, and Mercury) in Emerging Market Countries, *International J. of Pediatrics*. 2013; 2013:872596.

Indian Standard –Methods of sampling and test (physical and chemical) for water and wastewater, Part 48, Mercury, (First Revision), Second Reprint January 2002.

Jaber M et al. (2005). 17, 5275.

Mandal BK, Suzuki KT Arsenic round the world: a review. Talanta. 2002; 58:201-35.

Mercier L and Pinnavaia T J. Environmental Science Technol. 1998, 32, 2749.

Mridul B, Prasad SH (2013) A GIS Based Assessment of Lead, Arsenic, Cadmium and Aluminium Contamination of Ground Water in Dhemaji District of Assam, India, *International J. of Research in Chemistry and Environment*, 2013;3(4): (1-7) ISSN 2248-9649.

Nalwa HS (ed.), Gordon and Breach, Tokyo, Vol.3, p. 79, (2001).

Ogutveren UB, et al. (1994) *Int. J. Environ. Stud*, 1994, 45, 81.

Reddy TB, et al. (2012) Assessment of heavy metal study on ground water in and around Kapuluppada MSW site, Visakhapatnam, AP. *Int J Sci Nat.* 2012;3(2):168-71

Ros JPM, Slooff W, eds. (1987) Integrated criteria document. Bilthoven, National Institute of Public Health and Environmental Protection (Report No. 758476004).

Sharma SK and Sanghi R, (2013) Springer, London, 2013, ch. 10, pp. 305-332.

Stejskal, RG Gilbert, Pure Appl. Chem. 74, 857 (2002).

Toxicological profile for arsenic, U.S. Department of Health & Human Services, Public Health Service Agency for Toxic Substances and Disease Registry, 428 ATSDR (2000).

Wang J and Chen C. (2006) Biotech. Adv., 2006, 24, 427.

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Effect of Particulate Pollution on Roadside Plants

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Abstract:

Dust particles are constituents of air pollution, results from agricultural activities, automobile exhaust, thermal power plants, wildfire, open fire, construction and demolition activities, brick and cement industries and volcanic eruption. It has been evident that anthropogenic dust pollution is most dangerous than the natural dust pollution. Dust spread in the atmosphere not only affect the vegetation but also leads to reduced visibility and other environmental health effects related to human beings. Plants exposed to dust particles show responses, plants and other surfaces are receptors for the dust deposited through dry and wet deposition processes with the effect of gravitation. Due to this, plants suffer from diseases. Particulate matter including toxic and nontoxic settles on the plant leaves and other body parts of the plants. Major impact of settled dust on the leaves is the closure of stomatal opening leading to cell and tissue alteration, leaf necrosis, chlorophyll pigment loss and resultantly chlorosis. Due to the high velocity wind effect leaves abraxian have also been reported. On the basis of evaluation of air pollution caused by particulate matter, the paper conducts study on effect of dust on the plant and trees alongside of National Highway 161G, near Shegaon Dist. Buldana.

Keywords: particulate matter, dust pollution, NH 161G, Shegaon, plant response, deposition

Introduction:

Particle pollution, is general term used to indicate a mixture of solid and liquid droplets suspended in the air. Some particle such as dust, soot, or smoke can be seen by necked eyes. Dust particles are major form of air pollutants arising from variety of sources such as natural processes and anthropogenic activities. Size and chemical composition of any dust particle depends on the nature of source and the history of particle. Particles can be classed as coarse with a dimeter greater than 2.5 μm (PM_{10} – 10 μm) and fine particles less than 2.5 μm ($PM_{2.5}$). Air pollution, in India comprises up to 30-35 % dust particles arising from activities such as thermal power plants, mining and quarrying, transportation, stone crushing, construction and demolition, vehicular exhaust, cement industries and farming. Huge quantities of dust particles added into the environment. Dust deposition on plant leaves obstructs sunlight to be absorbed by the plant. When wind current blow, dust particles present in air parcel passes through a plant or tree, some amount of the dust particles tend to adhere to upper portion and lower portion of the plant leaves. And some fraction of particles also adheres to stems, buds and other plant's body parts. Atmospheric conditions like sunlight, high humidity, turbulence, temperature, wind speed and direction, precipitation affect the dust pollution in different ways. Under humid conditions many particles attract water vapor and grow to form small droplets. These droplets cling and

adhere to the leaf surface till they get washed off by the rain or shredding of the leaf itself and hinder the plant metabolic activities. Larger particles get introduced into the leaf interior as they dissolve in in water and carbonic acid discharged by stomata and particles having size less than stomatal aperture diameter enters in the sub-stomatal cavity and generates contact with the spongy parenchyma of leaf tissue.

Analysis of dust particles:

The dust measuring device PCE-RCM 05 (measuring range PM 2.5: 0-500 $\mu g/m^3$) is used to continuously measure the particulate matter content present in surrounding air at five different (200 M distance between each analysis point) locations on NH 161G, Shegaon-Jalgaon Jamod Highway (Table 1.1). Deposition test is carried out by placing Whatman filter paper undisturbed for 24 hours at each location. Concentration of dust particle near entry of Shegaon city found high as comparing to other locations. Particles that can be seen by necked eyes include soot particles, dirt and road sweepings. Dust particles observed include 1) Mineral dust: such as soil particles, crystalline silica, and cement dust. 2) Metallic dust: form automobile exhaust (leaded gasoline) such as lead, cadmium, beryllium and nickel. 3) Chemical dust: pesticides and bulk chemicals. 5) Organic and vegetation dust: pollens, viable particles, moulds and spores.

Table 1.1

Location	Particle concentration
L1 (0M)	6.207 $\mu g/m^3$
L2 (200M)	4.508 $\mu g/m^3$
L3 (400M)	5.039 $\mu g/m^3$
L4 (600M)	1.087 $\mu g/m^3$
L5 (800M)	1.009 $\mu g/m^3$

Analysis of effects on plants:

Road side wild plants of various taxonomic groups were studied namely 1) Cassia tora, 2) Celosia argentea L., 3) Tephrosia purpurea, 4) Ipomoea rubriflora, 5) Leonitis nepetiefolia (L.) R. Br., 6) Indigofera linifolia (L.f) Retz, 7) Taraxacum officinale, 8) Tridax procumbens, 9) Xanthium strumarium, and 10) Argemone Mexicana. More resistance has been seen in these plants against dust. Deposited dust on the leaf surfaces reduced synthesis of chlorophyll-a due to shedding effects. Solubility of dust particles in the cell sap prevailed alkaline condition, responsible for chlorophyll degradation and photosynthesis. Capability plant leaves for dust receptors depends on surface geometry, epidermal and cuticular characteristics of leaves and height & canopy of the tree. Phyllotaxy, leaf orientation and sessile or semi sessile nature of leaves also plays an important role by providing maximum area for dust deposition keeping leaves in a horizontal direction. Nearly natural and vertical orientation of leaves results in lesser dust deposition as in case of Leonitis nepetiefolia (L.) R. Br. Simple leaves have been shown to be better dust collectors than the plants having compound leaves.

Roll of particle size to affect plants:

It has also been demonstrated that at even very lower concentrations, fine dust particles are capable to produce effects whereas in case of coarse particles higher doses are required. As the chemical nature of the particulates is vary, a series of synergistic reactions may develop among these particles, which in turn, can affect the physiological functions of the plant in diverse

way. Inert dust particles can induce some mechanical injury or else if it contains certain soluble toxicants, it may produce necrotic spotting.

Effect on stomata:

Dust deposition also result in stomata clogging, which results in decreased rate of carbon dioxide exchange, carbon assimilation, transpiration, and therefore net photosynthesis. Rajchidambaram et al. (1980) observed clogging of stomata, loss of one or both guard cells or total destruction of stomata apparatus caused by cement dust pollution in all the five species of flowering plants studied by them. Yunus et al. noticed a conspicuous increase in frequency of stomata, percentage of abnormal stomata, larger stomatal openings and conspicuous circular striations in polluted population of Ricinus communis L. Leaves of Syzygium cumini L. showed marked decrease in epidermal cell size, increase in number of epidermal cells and stomata, necrotic lesions and death of epidermal cells. Few common avenue plants as A. indica and P. longifolia were found with dust particles embedded in the wax crust of the leaves. Cuticles were disorganized and broken at the outer stomata ledge. Papillae lost their identity completely. Peri-stomata rim was not well defined. The stomata ledges were entirely broken and large particles of dust and debris were present on the injured cuticular surfaces. Shamnughavel observed abnormalities such as stomata with single guard cell, with subsidiary cells and giant stomata. All the above injury focuses on dust induced mechanical stress on plants.

Conclusion:

Various morphologies of plants exhibit differences and show different resistance and tolerance to the air pollutant and dust particles. Stickier leaves perform better collection of air-borne particles; leaves possessing greater surface stiffness and coarseness, concerns their adhesiveness for the particulates. The morphological feature of the leaf is a determinant factor for the crown area. Selection of plant species along the roadside needs to address the followings issues, viz. meteorological suitability, height and coverage of the plant, canopy architecture, growth rate, straight undivided stem, foliage structure and makeup, attractive flower or inflorescence, pollution tolerance and plants ability to scavenge dust.

References

1. Grantz DA, Garner JHB, Jhonson DW. Ecological effects of particular matter. Environment International. 2003;29(2–3):213–239.
2. Das TM. Monitoring and control of air pollutants through plants. In: Ray M, et al, editors. Recent research in Ecology and pollution. Today's and Tomorrow's Printers and Publishers, India; 1980. p. 143–151.
3. Butz EL. Plants that will withstand pollution and reduce it. Health Guidance for Better Health. 2017. 4. Agrawal S, Tiwari S. Observation on Kiln dust pollution in Patrapalli region, Raigarh (MP). Flora and Fauna. 1997;3:131–133.
4. Somasekhar RK, Ravikumar R, Ramesh AM. Impact of granite mining on some. plant species around quarries of Bangalore district. Poll Res. 1999;18(4):445–451.
5. Singh RB. Monitoring of dust pollution by higher groups of plants around dust polluted habitats in Sonbhadra UP. Ind J Environ and Ecoplan. 2000;3:163–166.

6. Chatson K, Doley D. Mineral particulates and vegetation: Effect of coal dust, overburden and fly ash on light interception and leaf temperature. Clean Air and Environment Quality. 2006;40(1):40–44.
7. Chattopadhyay SP. The leaf surface effects of air pollution on certain tree species in Calcutta. Adv Plant Sci. 1996;9:1–14.
8. Garg SS, Kumar N, Das G. Effect of the Bansal Ramraj mill dust on vegetation and health at Jaitwara, District Satna. Indian Journal of Environmental Protection. 1999;20:326–328.
9. Shanmughavel P. Effect of air pollution of tobacco (Nicotiana tobacum) in agricultural fields. Eco Env Conser. 1997;2:173–174.
10. Prasad MSV, Inamdar JA. Effect of cement kiln dust pollution on plant of Psadium guajava. Ind J Env Health. 1990;22:231–237.
11. Chu TM, Aspinall D, Paleg LG. Stress metabolism: Salinity and proline accumulation in Barley. Aust J Plant Physiol. 1976;3:503–511.
12. Barnett NM, Naylor AW. Amino acid and protein metabolism in Bermuda grass during water stress. Plant Physiol. 1966;41(7):1222–1230.
13. Joshi VN, Arora SK, Luthra YP. Sulfur dioxide induced changes in CO2 fixation and photosynthetic pigments in sorghum (Sorghum bicolor L.) leaves. Annual Biology. 1993;9:102–108.
14. Hirano T, Kiyota M, Aiga I. Physical effects of dust on leaf physiology of cucumber and kidney bean plants. Environ Pollut. 1995;89(3):255–261.
15. Chaurasia B, Mahajan S, Chauhan SVS. Impact of automobile pollution on phenology and reproductive biology of Cassia siamea Lam. Indian J Environ Sci. 2002;6:85–90.
16. Srinivas N, Chandrapaul B, Rao P. Biomonitoring of dust pollution. Nature Env Pollu Techno. 2002;1:27–30.
17. Aftab A, Sakil A. Study of sulfur accumulation on plant foliage due to coal smoke pollution. Geobios. 2003;30(4):284–285.
18. Panichev N, Crindle Mc. The application of bioindicators for assessment of air pollution. J Environ Monit. 2004;6(2):121–123.
19. Singh RB. Monitoring of dust pollution by higher groups of plants around dust polluted habitats in Sonbhadra, UP. Ind J Environ and Ecoplan. 2000;3:163–166.
20. Kulshrestha A, Dixit CK, Verma S, et al. Evaluation of some air pollution tolerant plants in Agra city. Indian J Environ Protect. 2003;23:805–808.
21. Beckett KP, Freer-Smith PH, Taylor G. Urban Woodlands: Their role in reducing the effects of particulate pollution. Environ Pollut. 1998;99(3):347–360.
22. Choudri PR, Gajghate DG. Assessment of air pollution effects on plants: A review. Indian J Environ Protect. 2000;20:925–933.
23. Kumar RR, Sharma D. Impact of stone crusher dust on leaves of Mangifra indica L. and Psidium guajava L. in Jammu. J Env Zoo. 2001;15:75–79.
24. Rangarajan TN, Arjun MC, Ponnammal NR. Effect of automobile pollution on few ornamental plants. Eco Env Conserv. 1995;1:1–6.
25. Emberson LD, Ashmore MR, Murray F, et al. Impacts of air pollution on vegetation in developing countries. Water, Air and Soil Pollution. 2001;130(1–4):107–118.

26. Kaushik GC. Cytotoxicity of cement kiln dust on mitosis of root tip cells in Vicia faba. J Ecotoxico Environ Monit. 1996;6(1):53–57.
27. Kumar SR, Arumugam T, Anandakumar CR, et al. Use of plant species in controlling environmental pollution–A review. Bulletin of Environment Pharmacology and Life Sciences. 2013;2:52–63.
28. Pandey PC, Jain DK. Effect of SO2 and NO2 pollution on the growth of puum satgrum. Acta Botanica Ind. 1991;19:123–125.
29. Vijaywargiya A, Pandey GP. Effect of cement dust pollution on soybean: Physiological and biochemical. Ecol Env and Cons. 1996;2:143–145.
30. Gupta AK, Mishra RM. Effect of limekiln's air pollution on some plant species. Poll Res. 1994;13:1–9.
31. Darley EF. Studies on the effect of cement kiln dust on vegetation. J Air Pollut Contr Ass. 1966;16(3):145–150.
32. Borka G. Effect of cement kiln dust on Maize plant. Acta Agron Hung. 1981;30:289–295.
33. Singh M, Rao DN. The influence of ozone and sulfur dioxide on Cicer arientum L. J Ind Bot Soc. 1982;61:51–58.
34. Auclari D. Effect of dust on photosynthesis. I–effect of cement dust and coal dust on photosynthesis of Spruce. Ann Sci for. 1976;33:247–255.
35. Singh P, Sthapak J. Reduction in Protein contents in few plants as indicators of air pollution. Poll Res. 1999;18:281–283.
36. Treshow M. Terrestrial plants and plant communities. In: Bell JNB, editor. Air Pollution and plant life. Wiley Publishers, USA; 2002. p. 223–236.
37. Gunamani T, Gurusamy R, Swamynathan K. Effect of dust pollution on the dermal appendages and anatomy of leaves in some herbaceous plants. J Swamy Boli Club. 1991;8(3–4):79–85.
38. Pandey DD, Sinha CS, Tiwari MG. Impact of coal dust pollution on biomass, chlorophyll, nutrients and grain characteristics of wheat. J Ecobio. 1992;4:19–22.
39. Pandey DD, Sinha CS, Mishra CP, et al. Response of soils of agro ecosystem to coal; dust pollution. Env Eco. 1992;10:389–390.
40. Griffiths H. Effect air pollution on agricultural crops. Ministry of Agriculture, Food and rural Affairs, Ontario. Factsheet Order No. 85– 002, Canada; 2003.
41. Singh L, Siddiqui ZA. Effect of Alternaria triticina and foliar flyash deposition on growth, yield photosynthetic pigment, proteins and lysine contents of three cultivars of wheat. Bioresour Technol. 2003;86(2):189– 192.
42. Naik DP, Ushamani, Somasekhar RK. Reduction in protein and chlorophyll contents in some plant species due to some stone quarrying activity. Environ Polln Cont J. 2005;8:42–44.
43. Heerden PDR, Kruger GHJ, Louw MK. Dynamic Response of Photo system II in the Nalimb Desert shrub, Zygophyllum prismatocarpum, during and after foliar deposition of lime stone dust. Environmental pollution. 2007;146(1):34–45.
44. Krishna JR. Effect of coal dust pollution on the vegetation around Dhanbad Coalfield. Bio Journal. 1999;11:59–61.

48. Vijayvargiya S, Pandey DP. Effect of cement dust on soybean. Glycine max (L) merr. And Maize, Zea mays L on, Influences a study. Geobios. 2001 in 308-312.
46. Yunus M, Ahmed KJ. Use of epidermal resin objects in pollution monitoring. National Seminar on Environmental Pollution. A Status Review. National Environment Council India. 1974. p. 1–10.
47. Jabri S, Satyamma K, Ahmad KJ. Environmental pollution and epidermal structure in syzygium cumini (L. Skeels) Air Pollut Control. 1979 1:74–75.
48. Eid A, Kulshreshtha K, Ahmad KJ, et al. Changes in leaf surface structure of tree species caused by auto exhaust pollution. J Environ Biol. 2000;21(1):15–21.
49. W T, Wang X S, Liu Z R, Zhang Y H, Shen M, Cheng Q, Wu D Y, and Tian W Qinyang " Journal of Acta Scientiarum Naturalium Universitatis Pekinensis. 46(2): 258-264. (in Chinese).

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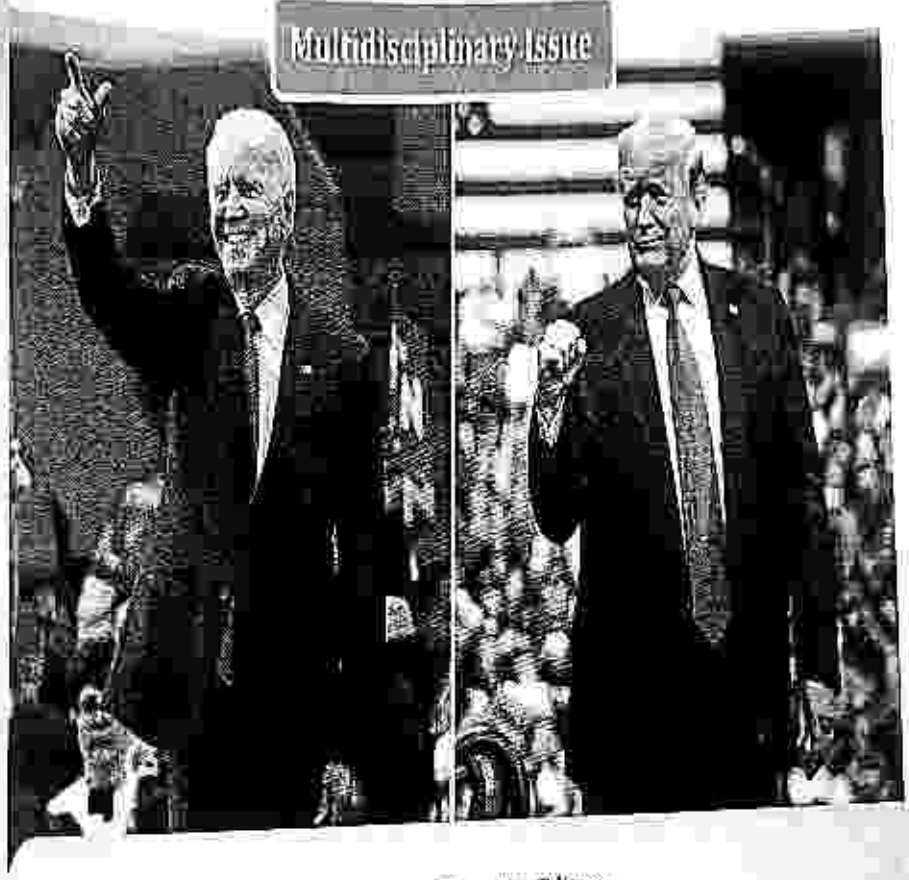
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Exploration of Fluoride Concentration from Various Villages belonging to Sangrampure Tehsil

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Abstract:

Fluoride plays crucial role in the quality of water. Current population growth and their demand toward water availability and its quality are emerging as a prime issue for the world. Fluoride concentration strongly influence on drinking water quality. Due to excess concentration of fluoride created various health issues for human population. All over the world most of the people were tackle with fluorosis like denial fluorosis or skeletal fluorosis due to consuming higher fluoride concentration drinking water. This research work gives special attention on investigation of fluoride concentrations of drinking water from various villages belonging to Sangrampur tehsil Dist. Buldhana, Maharashtra. Present research work revels that pre monsoon and post monsoon fluoride concentrations of drinking water from study areas (sampling villages) are belonging to Sangrampur tehsil Dist. Buldhana Maharashtra found in permissible limit. Spectrophotometer method used for determination of Fluoride concentration. Through this investigation fluoride concentration values founded for pre monsoon is 0.6 mg/L to 1.5 mg/L while for post monsoon is 0.7 mg/l to 1.4 mg/l. After the investigation of drinking water samples no any villages were found with higher concentration of fluoride than suggested by WHO and BIS.

Keywords: Sangrampur tehsil, Fluoride, Fluorosis, Spectrophotometer.

Introduction:

Water is a life. We can't imagine life without water. Basically water is an great gift by nature for all living organism. Day by day human population growth speedily rises up and along with population the need of water increases. Due to population growth two prime issues come out concern to drinking water such as water availability and water quality. Various parameters such as cationic, anionic and some other physical parameters closely related with mentioned issues. Bearing this all things in mind fluoride concentration is one of the crucial interfering component in drinking water quality. Soil, water, air, vegetation, agricultural products and sea foods are natural sources of fluoride. It is found as fluorite, Cryolite and Fluoroapatite in various rocks. Fluoride in the form of minerals like Cryolites, Biotites and Fluor apatite are found in ground water sources such as dug well, shallow and deep hand pumps, especially tube well (Kudesia, 2003). Usually in body fluoride found in bones and teeth, therefore Fluoride play role for normal mineralization of bones and formation of dental enamel (Ceopalan, 2003). Fluorites (like CaF2) is use as source of mineral at industrial level and also act as major source of fluoride contamination in water and soil. Contamination of river and other water bodies with fluoride

occurred due to dumping of industrial wastes and toxic materials and it reveals hazardous impact on water quality and fluoride concentration (ISO-10500) (BIS, 2003). Discharge of the municipal sewage, both domestic and industrial, is directly in to the water bodies cause to water pollution and also help to ascend in fluoride in water (Oberoi & Gupta, 2010). Naturally Fluorspar or mineral fluorite slowly dissolved in water from the various rocks due to weather and climatic change and acidic nature of water supportive for this dissolution process and fluoride contamination of water (Acharya & Mathi, 2010). Unnecessary extra consumption of fluoride leads to serious effects on the teeth during tooth formation and abnormal hardening of bones. Higher fluoride intake and deficiency of calcium and vitamins are leading to a fluorosis. Misra and Mishra, 2006 investigated that water resources belonging to many states of the India are have alarmingly found with high fluoride concentration. (Misra & Mishra, 2006). Panda et al investigated fluoride concentration from various villages belonging to Patripal Panchayat, Balasore District, Odisha. ICMR report reveals that ground water pollution from the various part of Andhra Pradesh lead to fluorosis disease (ICMR, 1975). Choubisa reported that prevalent fluorosis in Southern Rajasthan, India is becoming a risk for many people due to more fluoride concentration in ground water (Choubisa, 2001). The State wise percentage of fluoride in India is shown in Table 1 (Susheela, 1987; 1999 and 2007).

Table 1. State wise percentage of fluoride in India

Categories	Percentage	Name of States
I	30% of the Districts Affected	Jammu and Kashmir, Delhi, Kerala and Orissa
II	30-50% of the Districts Affected	Maharashtra, Karnataka and Bihar
III	50-100% of the Districts Affected	Uttar Pradesh, Rajasthan, Gujurat, Andhra Pradesh and Tamilnadu

Study Area:

In present research work, samples are collected from different villages of Sangrampur tehsil. It is surrounded by Purna River and lies in the north of Buldhana district of Maharashtra. It is situated at the base of Satpura Range, about 20 km. In India, Sangrampur is a small beautiful town located in Buldana district of Maharashtra State. It lies to border of jalgaon jamod tehsil area of Buldana district in north side, the Shegaon tehsil of the Buldhana District in the south, the Telhara tehsil of the Akola District to the east and the Burhanpur District of the Madhya Pradesh State to the north. Its Coordinates are: 21.03°N 76.68°E. It has an average elevation of 273 metres (898 feet). Population of Sangrampur tahsil is 137092 as per the survey of census during 2011 by Indian Government. The tehsil has an area of 594 km^2 and consists of 105 villages, totaling a population of around 97,000. Basically Agriculture is the main occupation of people of Sangrampur tehsil. Sangrampur has an Agricultural Produce Market Committee (APMC) (Krishi Utpann Bajar samiti), with a subcommittee at Paturda, Warwat Bakal and Sonala. This tehsil population also depends on ground water resources for fresh water. As per WHO (2004) guideline permissible limit of fluoride concentration in drinking water is up to 1.5 mg/L. Fluoride found in permissible limit in water and environment is a good sign but excessive amount of fluoride is created various health problems. The Credible effect of fluoride concentration in drinking water shown in Table 2 (WHO, 2004 and BIS, Revised 2003).

Table-2. Effect of Fluoride Concentration

Fluoride Concentration	Effect
Less than 1.5 (mg/L)	No Effect
1.5 to 3.0 (mg/L) 3.0 to 6.0(mg/L)	Dental Effect Mild skeletal fluorosis
More than 6.0(mg/L)	Crippling skeletal fluorosis

Materials And Methods:

During present study all water samples were collected from different villages belonging to Sangrampur tehsil dist. Buldhana (MS). Samples were collected in the brown glass bottles without adding any preservative on same time. Samples were collected with necessary precaution during May 2020 to June 2020. There were 20 samples collected from different villages of the study area. The samples were analyzed by using SPAND reagent and acid zirconium chloride with the help of spectrophotometer. Fluoride concentration measured in term of mg/L. According to APHA (1989), BIS (2003), WHO (2004) and Ministry of Works and Housing (1975) suggested standard permissible range of fluoride concentration use through analysis. Which are given in Table 3.

Table-3. Standard Permissible Range of Fluoride Concentration (Mg/l)

Different Standard	Min Acceptable Conc.	Max Allowable Conc.
International Standard	0.7	1.5
BIS, 2003	0.7	1.5
Ministry of Works and Housing , 1975	0.7	1.5
WHO, 2004	0.7	1.5

Results And Discussion:

Resultant values of fluoride concentrations values of 20 samples tabulated in table-4. Fluoride is essential for human health within permissible limit i.e. 0.7 to 1.5 mg/l. It is required for dental caries and when its amount goes above permissible limit then it causes disease like dental fluorosis, bone marro in childrens. It is observes that the concentration of fluoride during pre-post monsoon season was found to be within permissible limit in study area.

From table-4 shown that in pre-monsoon season all 20 villages were found in permissible limit and its ranges vary from values 0.6-1.5 mg/l. samples DW2, BW7 AND BW13 having lowest F concentration value i.e. 0.6 mg/l while BW11 having highest F concentration value i.e. 1.4 mg/l. Average value of fluoride concentration found to be 0.955 mg/l for 20 samples.

While in post-monsoon season all 20 villages were found to be in permissible limit and its ranges vary from values 0.7- 1.5 mg/l. in which sample DW2 having lowest F concentration value i.e. 0.7 mg/l while samples BW11 and BW18 having highest F concentration value i.e. 1.5 mg/l. Average value of fluoride concentration found to be 1.085 mg/l for 20 samples.

Table-4. Fluoride Concentration from 20 villages belonging to Sangrmapur tehsil, Buldhana (2019-20)

SN	Code	Village Name	Fluoride conc. Post monsoon	Fluoride conc. pre monsoon
1)	DW1	Bhon	1.2	1.1
2)	DW2	Pesoda	0.7	0.6
3)	DW3	Khiroda	1.3	1.2
4)	DW4	Savali	0.9	0.7
5)	DW5	Paturda	1.3	1.2
6)	DW6	Awar	0.8	0.7
7)	BW7	Kavathal	0.9	0.6
8)	DW8	Warvat Khanderao	0.9	0.8
9)	DW9	Jastagaon	1.3	1.2
10)	DW10	Kalamkhed	1	0.9
11)	BW11	Takleshwar	1.5	1.4
12)	BW12	Chondi	1	0.9
13)	BW13	Kakoda	0.8	0.6
14)	BW14	Ilkalgaon	1.1	0.9
15)	BW15	Pimpari	0.8	0.7
16)	BW16	Rudhana	1.3	1.1
17)	BW17	Bhilkhed	1.1	1.3
18)	BW18	Kathargaon	1.5	1.3
19)	DW19	Marod	1.2	1
20)	BW20	Wakana	1.1	0.9
	Max		**1.5**	**1.4**
	Min		**0.7**	**0.6**
	Avg		**1.085**	**0.955**

Conclusion:

During pre-monsoon and post-monsoon fluoride concentration was found in permissible limit while average value of fluoride concentration was found to be greater degree in post-monsoon as compare to pre-monsoon.

Overall all 20 samples were found in between permissible limits of World Health Organization (WHO, 2004) i.e. up to 0.7-1.5 mg/L. In present study no any samples were found beyond the permissible limit hence drinking water does not responsible for any fluorosis diseases found in present study area.

But those villages were found with 1.5 mg/l fluoride concentration values they have take care to maintain this range below the permissible limit otherwise in future they will move toward the problem of flourosis.

References :

1. Acharya, G.D., and Mathi, M.V. (2010) Fluoride contamination in ground water sources of Modasa Tehsil of Sabarkantha district, Gujrat, India. Poll. Res., 29(1), pp. 43-45.
2. APHA (1989) Standard Methods for the Examination of Water and Waste Waters. 17th ed. Washington, APHA AWWA, WBCF.

3. BIS (1991) Drinking Water-Specification. New Delhi, Bureau of Indian Standards (IS 10500-91). 2.1 ed. New Delhi, India.
4. Bulusu, K.R., and Nawlakhe, W.G. (1992) Defluoridation. Nagpur, National Environmental Engineering Research Institute (NEERI), p. 61.
5. Indian Standards, Revised (2003) Specification for Drinking Water, Bureau of Indian Standards. New Delhi (IS 10500-91).
6. Geopalan, C (2003) The Changing Epidemiology of Malnutrition in Developing Society. Current Science, 77, p. 1257
7. Choubisa, S.L. (2001) Endemic flourosis in Southern Rajasthan, India. Fluoride, 34, pp. 61-70
8. Indian Council of Medical Research (ICMR) (1975) New dimension of fluorosis in Andhra Pradesh. 5, Indian Council of Medical Research, pp. 1-5.
9. Kudesia, V.P. (2003) Environmental Chemistry, Pragati Prakashan, Meerut, 2nd ed. pp. 145-148.
10. Ministry of Work and Housing (MWH) (1975) Govt. of India: Nirman Aur Awas Mantralaya [Internet], New Dehli, Ministry of Work and Housing. Availabale from: < http://www.niua.org/mpd/Pages%20from%20MPD1962_notifications_pages141-176.pdf > [25th June 2012].
11. Misra, A.K., and Mishra, A., and Premaj. (2006) Escalation of Ground Water Fluoride in the Ganga Alluvial Plains of India. Fluoride, 39, pp. 35-38.
12. Kausik Kumar Das1 , Tanuja Panigrahi2 and Dr. R.B. Panda3 (2012). Occurrence of Fluoride in Ground Water of Patripal Panchayat in Balasore District, Odisha, India Journal of Environment Vol. 01, Issue 02, pp. 33-39.
13. NEERI (1978) Nalgonda technique for defluoridation, fill and draw type defluoridation plant. National Environmental Engineering Research Institute Manual, Nagpur, Technical Digest, p. 59.
14. Oberoi, J., and Gupta, K.C. (2010) Occurrence of fluoride in ground water of various villages of district Ambala (Haryana). Poll. Res., 29(3), pp. 435-440.
15. Orissa Census (2001) District Statistics Hand Book, Balasore (2007). Directorate of Economics and Statistics, Govt. of Orissa, Bhubaneswar, India
16. Susheela, A.K. (1987) Fluorosis in India, the magnitude and severity of the problem. Sci. Dev. Env., pp. 147-157.
17. Susheela, A.K. (1999) Fluorosis management programme in India. Curr. Sci., 77, pp. 1250-1256.
18. Susheela, A.K. (2007) Fluorosis management programme in India. Curr. Sci., 77, pp. 1250-1256.
19. Trivedy, R.K., and Goel, P.K. (1983) Chemical and Biological Methods for Water Pollution Studies. Karad, Environ. Media Publication, pp. 209.
20. Tiwari, S., and Pande, R.K. (2010) Atatus of fluoride in the waters of Uttrakhand. Poll. Res., 29(3), pp. 428-430.

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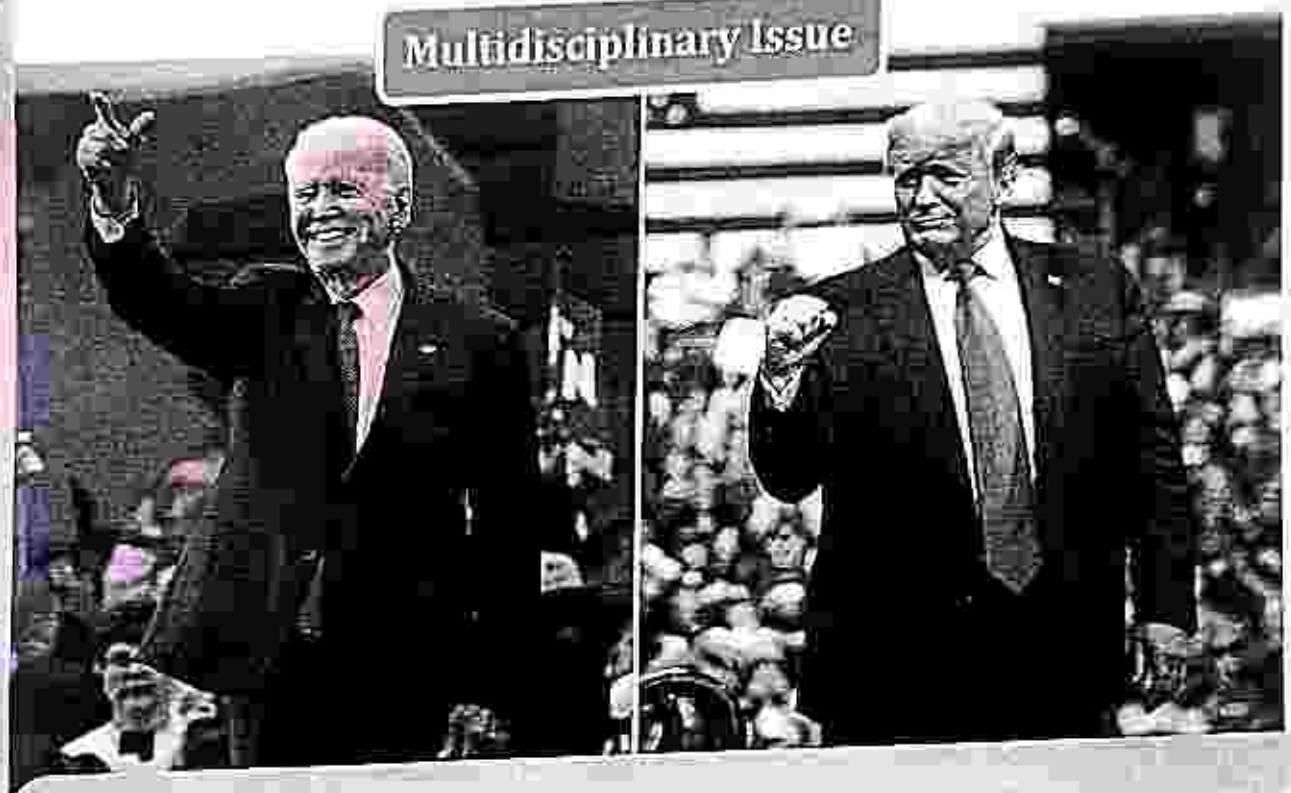
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EFFECT OF DIFFERENT TEMPERETURES AND SUBSTITUTION ON SUBSTITUTED THIOCARBAMIDONAPHTHOL IN 90% ETHANOL WATER MIXTURE CONDUCTOMETRICALLY

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ABSTRACT

Temperature and substitution closely concern to conductometric properties and thermodynamic parameter of electrolytic solution. Present research scheme deal with conductometrically studies effect of different temperatures and substitutions on substituted thio-carbamidonaphthol i.e.,5-phenylthiocarb amido-1-naphthol (L2), 5-p-chlorophenylthiocarbamido-1-naphthol (L3)at 0.01M, 0.005M, 0.0025M and 0.0012M concentrations in 90% ethanol-water mixture and298 K and 308 K temperatures. During this investigation G, k, μ values as well as thermodynamic parameters such as ΔG, ΔH and ΔS were determined. This work helps to understand effect of substitutions, temperature variation and different concentrations. In this investigation it is found thatmolar conductance values of L2 are greater than L3 in 298K as well as 308 K respectively, but it shows more values at 308K. This investigation reveals that L2 will show good pharmacodynamic and pharmacokinetic effect than L3.

Keywords: *3-phenylthiocarbamidonaphthol (L2), 5-p-chlorophenylthiocarbamidonaphthol(L3), conductometric properties, thermodynamic parameter.*

Introduction

Pharmacodynamic and pharmacokinetic study of drug molecules has significant role in pharmaceutical and medicinal sciences. Drug ionization and diffusion crucially interfere in this study. These terms are closely concern to solubility of drugs. Now days it becomes challenging task for researcher to developed and enhance solubility of drug. Solubility of drug can be determined from conductivity data. Accordingly, conductometric investigation becomes more significant. Conduction of solution depend on number on ions and ion formation depend on ioninsation and solubility of solute and their interaction with solvent during salvation Conductometric investigation plays effective role to understand these all. Now a day many researchers had remarkably attracted toward conductometric measurement due to its significances. Conductometric properties and thermodynamic parameters are so crucial in the physic-chemical study of newly synthesis molecules. Solubility, association, dissociation investigation of these molecules becomes crucial because these properties and parameters are closely concern with conductivity of electrolytic solution.

conductometric properties, thermodynamic behavior and Walden product of 3-(2-hydroxy-3-nitro-5-methyl) phenyl-6-amino-1,2,5-thioxazine in 50% ethanol-water mixture at different temperatures keeping the concentration constant (01M) investigated by Waghmare *et al*[1]. Assessment of thermodynamic parameters of substituted thiocarbamidonaphthol was studied by Padhe*et al*[2]. Mohammed Al Bratty *et al*[3] carried outconductometric determination of the antihistaminic diphenhydramine hydrochloride using silver nitrate as a titrant. Elwy *et al*[4] was investigated dropropizine and tizanidine hydrochloride in their pharmaceutical formulation by conductometric analysis. Certain pharmacological drugs studies using silver and bismuth conductometrically investigated by Mervat Mohamed Hosny Ali Abdelmoniem[5]. Marwa *et al*[6] was carried out conductometric and spectroscopic determination of mebeverine hydrochloride and the solubility products of its ion recognition thermodynamic characterization of dexamethasone sodium phosphate and its complex with DNA as studied by Shah *et al*[7] with the help of conductometric and spectroscopic techniques complex formation between Cu(II) Ion and 4-Amino-3-Ethyl-1,2,4-Triazol-5-Thione In Binary Ethanol + Water mixtures was conducto -metrically investigated by Hakimi *et al*[8]. Some conductometric titration methods have been reported for determination

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of some drugs[9-13].

Present work designed to conductometrically studies effect of different temperatures and substitutions on substituted thiocarbamidonaphthtol i.e. 5-phenylthiocarb amido-1-naphthol (L_2), 5-p-chlorophenylthiocarbamido-1-naphthol (L_3) at 0.01M, 0.005M, 0.0025M and 0.0012M concentrations in 90% ethanol-water mixture and 298 K and 308 K temperatures.

Materials and Methods

Experimental

Standard method used for purification of chemical and solvent. All fresh solutions prepared through experiment by using analytical grade chemical. First upon were prepared 0.1 M solutions of L2 and L3 90% ethanol-water mixture respectively then prepared 0.01M, 0.005M,0.0025M and 0.0012M solutions of L2 and L3 by using 90% ethanol-water mixture through serial dilution. During experiment thermal equilibrium was maintain with the help of thermostat and after attaining thermal equilibrium by solutions carried out their conductometric analysis.

Result and Discussion

Conductivity bridge use to determine conductance for each concentration solutions of L2 and L3 in 90% ethanol-water mixture at 298K and 308 K. In present work specific conductance (k) and molar conductance (μ) was determined form observe conductance (G) values. These conductometric properties of L2 and L3 were used to determined thermodynamic parameters for same solutions. Observed conductance (G), specific conductance (k) and molar conductance (μ) were determined by known literature method and calculated data tabulated in following Table-1

TABLE –1 CONDUCTOMETRICMEASUREMENTS i.e., G, k and μ AT DIFFERENT CONCENTRATIONS AND % COMPOSITIONS

Ligand	Temperature	Conc. (M)	Observed conductance (G)	Specific conductance (k) 10^{-6}	Molar conductance (μ)
L3 in 90% E-W mixture	298 K	0.01	0.01764	2.05802	0.20380
		0.005	0.01218	1.46637	0.29327
		0.0025	0.01114	1.41857	0.56742
		0.0012	0.01133	1.44922	1.20768
	308 K	0.01	0.0212	2.50741	0.250741
		0.005	0.0144	1.77256	0.354511
		0.0025	0.01318	1.69167	0.676667
		0.0012	0.01231	1.54916	1.290964
L2 in 90% E-W mixture	298 K	0.01	0.03256	3.79867	0.379867
		0.005	0.01692	2.03703	0.407406
		0.0025	0.01098	1.39819	0.559277
		0.0012	0.00833	1.06549	0.887908
	308 K	0.01	0.03519	4.16207	0.416207
		0.005	0.01886	2.32156	0.464311
		0.0025	0.01239	1.59027	0.636108
		0.0012	0.01015	1.27733	1.064442

Table-1 revel that the observed conductance (G), specific conductance (k) and molar conductance (μ) for L2 greater than L3 at 298 K as well as 308 Kin 90% ethanol-water mixture. Observed conductance and specific conductance decreases along with decrease concentrations form 0.01M to 0.012 M for L2 at both temperatures while molar conductance increases respectively. Molar conductance values greater for L2 rather than L3 also simultaneously they were found greater at 308 K than 298K.

Calculated values the specific constant (Ksp), log (Ksp) and thermodynamic parameters viz. (ΔG), (ΔS) and (ΔH) of L3 and L2 tabulated in Table 2

TABLE - 2 -THERMODYNAMIC PAPAMETERS DETERMINATION OF Ksp, LogKsp, ΔG,ΔH AND ΔS AT DIFFERENT CONCENTRATIONS AND % COMPOSITIONS AT 303 K

SYSTEM: LIGAND					Temperature: - 303 K		
		Conc. [M]	Ksp	Log Ksp	ΔG	ΔH	ΔS
L3 in 90% E-W mixture	298K	0.01	763.0803	2.88257	-16447.5	-52860.9	122.1926
		0.005	741.5247	2.875933	-16409.7	-51882.3	119.0355
		0.0025	401.5148	2.603703	-14856.3	-46970.5	107.7657
		0.0012	184.6696	2.266374	-12931.6	-40883.7	93.79908
	308K	0.01	658.0633	2.818268	-16620.2	-54285.5	122.2899
		0.005	658.3989	2.818489	-16621.5	-54287.3	122.2916
		0.0025	361.4339	2.558029	-15085.5	-49271.2	110.9924
		0.0012	206.8757	2.315709	-13656.5	-44604.9	100.4819
L2 in 90% E-W mixture	298K	0.01	407.9967	2.610657	-15395.9	-50290.9	113.2955
		0.005	381.0976	2.581036	-15221.2	-49714.4	111.9969
		0.0025	339.7893	2.53121	-14927.4	-48753.8	109.8261
		0.0012	320.2019	2.505428	-14775.3	-48258.8	108.7128
	308K	0.01	399.0423	2.601019	-14841	-46923.3	107.6587
		0.005	375.9398	2.575118	-14693.2	-46451.6	106.5718
		0.0025	329.8163	2.518271	-14368.9	-45424.5	104.2135
		0.0012	216.263	2.334982	-13323.1	-42117	96.62395

Table-2 revel that the values of Ksp, log Ksp, and ΔS decreases along with decreases concentrations from 0.01 to 0.0012M while ΔG and ΔH values increases for L3 and L2 respectively. The values of Ksp, log Ksp, ΔH and ΔS decreases when temperature increase from 208K to308 K in 90% ethanol-water mixture while ΔG values increases. The values of Ksp, log Ksp and ΔS greater for L3 than L2 and ΔG and ΔH values for L2 greater than L3. Phenyl is electron withdrawing group substituted with terminal nitrogen this is bulkier and electron withdrawing group in L2 while in L3 this terminal nitrogen is substituted by chloro-phenyl ring. Cholro group substituted at para position of substituted phenyl ring. This chlorine atom created –I and +R effect. Carbanion of L2 has more stable than L3. This investigation showed that conductance, specific conductance, molar conductance, Ksp, ΔH, ΔS and ΔG values of these drugs are influence by different functional group such as electronic realizing, electron withdrawing. These thermodynamic parameters are directly affected by constituent as well as nature of drug.

Conclusion

L2 shows good ionization and conductance rather than L3 because Phenyl group substitution support for more ionization of L2 rather than L3. Thus,Conduction properties and thermodynamic parameters for L2 and L3 variedalong with increasing temperature from 208K to 308K as well as along increasing molar concentrations. Ionization, substitution of molecules and various molecular interactions between solute and solvent in solution influence thermodynamic parameters. Molar conductance values of L2 are greater than L3 in 208K as well as 308 K respectively, but it shows more values at 308K. This investigation reveals that L2 will show good pharmacodynamic and pharmacokinetic effect than L3.

References

1. Waghmare S.A.,Tayade D.T., Padhen S.S., Wadekar A.B.,(2015), "Conductometric Measurementsof 3-(2-Hydroxy-3-Nitro-5-Methyl) Phenyl-6-Amino-1,2,5-Thioxazine In 50% Ethanol–Water Mixture at Different Temperatures", International Journal of Ayurvedic Pharmaceutical Chemistry,3(2),87-91.
2. Padhen S.S., Wadekar A.B., Pund D.A., NaikA.B. ,(2019), "Assessment of Thermodynamic parameters of Substituted

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Original Article

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Synthesis and studies antimicrobial activity of 5-p-tolylthiocarbamido-1-naphthol

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ABSTRACT

Present research work deal with synthesis of 5-p-tolylthiocarbamido-1-naphtho and check their antimicrobial activity against four human pathogens. This molecule was synthesized by condensation of 5-amino-1-naphthol with p-tolyl isothiocynate in acetone medium. Recently here focus to assert antimicrobial activity of this molecule against gram positive and gram negative human pathogen bacteria such as E. coli, Proteus vulgaries, P. aeruginos and S. aureus. Comparatively L_4 showed highly activity against E.Coli rather than remaining three pathogens. This antimicrobial activity relationship confirmed that this compound is a potential candidate for future drugs discovery and development.

Keywords: 5-p-tolylthiocarbamido-1-naphthol (L_4), pathogenic bacteria, activity, disc diffusion method.

INTRODUCTION

Thiocarbamidonaphthol are molecules reveals most significant applications in medicinal as well as pharmaceutical sciences. Recently in laboratory synthesized were various substituted thiocarbamiamido-naphthol compounds (Tayade and Wadekar, 2016). Newly synthesis substituted thiocarbamidonaphthols molecule are studied and their synthetic applications were explained with the evidence of structural arrangement. As structural evidence of 5-amino-1-naphthtol having phenolic hydroxyl and amino group as a active side for reaction. Due to reactivity values of such kind of molecule, it is interesting task to synthesized various substituted thiocarbamido-naphthol compounds along with nitrogen, sulphure and halogen group in heteroacyclic and heterocyclic compounds by the interaction of various thiouria and isothiocynates with 5-amino-1-naphthol molecule.

Antimicrobial activity of substituted thiocarbamido-naphthol molecules was studied (Wadekar *et al.* (2016). Antimicrobial activity studied by various researchers on time to time by against different human pathogen bacteria and various newly synthesized molecules (Tayade, 1996); Rudnitskaya *et al.*, 2010; Chigwada *et al.*, 2007; Diver *et al.*, 2017; Paranjpe 1966; Rahman and Siddiqui, 2010; Foroumadi *et al.*, 2009). Barker (2006) investigated antibacterial drug discovery and structure-based design. Synthesis and antimicrobial activity evaluation of new 1,2,4-triazoles and 1,3,4-thiadiazole bearing imodazol [2,1-*b*] thiadiazole moiety was studied (Güzeldemirci and Küçükbasmaci, 2010). From antimicrobial study some of these compounds showed measurable pharmaceutical and biological activities (Neu, 1992).

From literature review was sure thiocarbamidonaphthol and their substitution has significant values in various science fields due to present of phenolic hydroxyl, thio and amino groups. Bearing all these things in mind designed this research scheme to synthesis of 5-p-tolylthiocarbamic-naphthol by interaction of 5-amino-1-naphthol with p-tolyl-isothiocynate in acetone medium and to check their antimicrobial activity against various human pathogens bacteria.

MATERIAL AND METHODS

All AR graded chemical are used through experiment. Paraffin bath used to determine the melting points of the all synthesized compounds. Carlo-Ebra 1106 analyzer used to find the carbon and hydrogen analysis. Colman-N-analyzer-29 was used to estimate Nitrogen. IR spectra were recorded on Perkin Elmer Spectrometer in range 4000-400 cm-1 in KBr pellets. PMR spectra were recorded on Brucker Ac 300 P Spectrometer with TMS as internal standard using CDCl3 and DMSO-d6 as solvent. The purity of compound was checked on silica Gel-G Pellets by TLC with layer thickness of 0.3 mm.

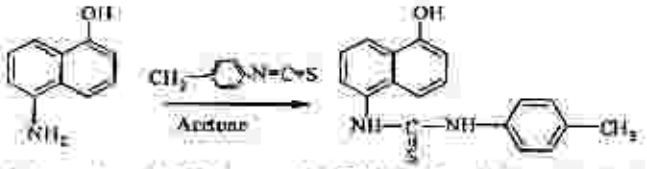
Synthesis of 5-p-tolylthiocarbamido-1-naphthol [L4]

5-amino-1-naphthol (L_1) and p-tolylisothiocynate mixture refluxed in acetone medium on water bath for 4 hours. Brown colour crystalline product was gradually separated out after four hrs, which on trituration with petroleum ether afforded brown crystals It was recrystallised by ethanol with aqueous ethanol to isolate 5-p-tolylthiocarbamido-1-naphthol. Yield is 84.41%, melting point is 218° C.

Properties: It is brown , crystalline solid having melting point 218°C. It gave positive test for nitrogen and sulphur. Desulphurised with alkaline plumbite solution. It formed picrate, melting point 210 ° C.

Elemental analysis: C [(Found 61.75%) calculated 62.09%], H[(found 3.21%) calculated 3.98%], N[(found 8.25%) calculated 8.59%], S[(found 8.94%] calculated 9.75%]

IR Spectrum: - The IR spectrum was carried out in KBr pellets. The important absorption can be correlated as (cm^{-1}) - 3363.17 (N-H-Stretching), 3304.14 (phenolic O-H stretching), 3045.16 (Aromatic C-H-stretching), 1689.30 (N-C-N stretching), 1596.11 (C-N-stretching), 1420.11(C-C stretching), 1373.6(C-O stretching), 1272.6(N-C=S stretching) and 1074.19 (C=S-stretching).



5-Amino-1-naphthol[L_1] 5-p-Tolylthiocarbamido-1-naphthol[L_4]

Table-1: Antimicrobial activity of 5-p-tolylthiocarbamido-1-naphthol.

Compound	E. coli (mm)	Proteus vulgaries (mm)	P. aeruginosa (mm)	S. aureus. (mm)
5-p-tolylthiocarbamido-1-napthol (L_4)	15	11	12	11

NMR Spectrum:- The spectrum of compound was carried out in $CDCl_3$ and DMSO-d_6. This spectrum distinctly displayed phenolic -OH proton at δ 9.6566 ppm, signals due to Ar-H, protons at δ 8.2072-6.6549 ppm, -NH protons of naphthalene ring at δ 5.4632-5.2534 ppm,-NH proton of benzene ring at δ 3.3708 ppm.

Antimicrobial Activities

Disc diffusion method was used to find out the antimicrobial activities of this newly synthesized compound, using standard Co-Trimazin 25 µg/ml against gram positive and gram negative bacteria such as *E. coli*, Proteus *vulgarizes*, *P. aeruginosa* and *S. aureus*.

Disc Diffusion Method

HI-media medium with composition of Pepton- 5gm/lit, NaCl -5gm/lit, Yeast extract -1.5gm/lit, Agar powder - 20gm/lit, pH - 7.4 ± 0.1 used throughout present experiment. The medium for antibacterial activities were prepared [N-agar for bacterial] by dissolving 26 gms of ingredients in one liter of distilled water and sterilized in autoclave at 121° C at 15 lbs/inch pressure in an autoclave for 15 minutes.

Then microbes were inoculated with requisite quantity to the medium at temperature 40-50°C and immediately poured the inoculate medium in to sterilized petridishes to give a depth of 3-4 mm of uniform thickness. After solidification the commercial sterilized disc [HI-Media] loaded with 0.01 M concentration solution of 5-p-tolylthiocarbamido-1-napthol. Then it was kept at room temperature for 4 h, as a pre-incubation and then plates of bacteria were incubated for 24 hrs, at 37°C. After the period of incubation period, zones of inhibition were recorded around the disc. The results are cited in

RESULTS AND DISCUSSION

Newly synthesized organic compound 5-p-tolylthiocarbamido-1-naphthol was characterized by various standard methods and check their antimicrobial activity against four mostly observed human pathogens. Presently Table-1 reveals that (L_4) showed measurable and significant antimicrobial activity against *E. coli*, Proteus vulgaries, *P. aeruginosa and S. aureus*. *Comparative trend of antimicrobial activity of* L_4 *like E. coli* > *P. aeruginosa* > Proteus *vulgaries* = *S. aureus*. While Table-1 was reveal that comparatively L_4 highly activity against *E.Coli rather than remaining three pathogens*. Consequently present studies open the door to understand biochemical and medicinal value of L_4. As newly synthesized L_4 showed remarkable and significant activities so this compound can be used as alternative for the treatment of diseases caused by the above mentioned pathogens only if they do not have toxic and other side effects after the details study. The potency of the drug is increased due to substitution.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Tayade DT and Wadekar AB (2016). Green Synthesis Of Substituted thiocarbamidonaphthols. *Journal Of Medicinal Chemistry And Drug Discovery*, 2(10), 01-05.

Wadekar AB, Nagrale AP and Tayade DT (2016). Studies In The Antimicrobial Activities of Some Newly Synthesized Substituted Thiocarbamidonaphthol by Disc Diffusion Method. *MRJ*, 4, 5-9.

Tayade DT (1996) Ph.D Thesis Amravati University, Amravati.

Endnitskaya OV, Kutyshkina EK and Linko IV, Sergienko VS and Aleksandrov CG (2010) *Russian J of Co-ordination Chemistry*, 36, 137-142.

Chigwada TR, Chikwana E, Ruwona T, Olagunju O and Simoyi RH (2007). *J of Phys. Chemistry*, A III (45), 11552-11561.

Dover LG, Alahari A, Gratraud P, Gomes JM, Bhowruth, V, Reynolds RC, Besra GS and Kremer LN (2017). Antimicrobial Agents and Chemotheraphy, 519(3), 1055-1063.

Paranjpe MG (1966). *J Indian Chemical Society*, 42 - 45.

Rahman MA and Siddiqui AA(2010). Pyrazoline derivatives: a worthy insight into the recent advances and potential pharmacological activities. *Int. J.Pharm. Sci. Drug Research*, 02, 165-175.

Foroumadi A, Sorkhi M, Moshafi, Safavi M, Rineh AR, Shafiee A, Emami S.(2009). 2-Substituted-5-nitroheterocycles: In vitro ant helicobacter pylori activity and structure-activity relationship study. *Med. Chem.*, 5, 529-534.

Barker JJ (2006). Antibacterial drug discovery and structure-based design. Drug discover today, 11, 391-404.

Güzeldemirci NU and Küçükbasmacı (2010). Synthesis and antimicrobial activity evaluation of new 1, 2,4-triazoles and 1,3,4-thiadiazole bearing imodazol [2,1-b] thiadiazole moiety. *Eur. J. Med. Chem*, 45, 63-68.

Neu HC (1992). The crisis in antibiotic resistance. *Science*, 257, 1064–1073.

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Ultrasonic Velocity Measurements in Binary Mixtures of 1-Phenyl-3-[4-(2-Hydroxy-4-Phenylbenzoyl)-2,5-Dihydroxy-3-Thienyl]-2-Propen-1-One in 1,4-Dioxane at 303 K

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ABSTRACT:

Ultrasonic velocity measurements have significant role in understanding molecular interaction in liquid. Recently the research scheme was designed and developed for molecular interaction studies for 1-phenyl-3-[4-(2-hydroxy-4-phenyl benzoyl)-2,5-dihydroxy-3-thienyl]-2-propen-1-one in various organic solvent by keeping constant temperature. In this work we have measured the ultrasonic velocity using pulse echo method at 2.0 MHz frequency in the range of 303 K. Knowing this work results in the study of specific solvent-solute interaction in the concentration range 0.1 M to 0.01 M. Results have helped to understand solute-solute and solute-solvent interactions in solution. This work helps to predict information about molecular and pharmacokinetics of drugs.

KEYWORDS: Ultrasonic velocity, Viscosity measurements, 1-phenyl-3-[4-(2-hydroxy-4-phenylbenzoyl)-2,5-dihydroxy-3-thienyl]-2-propen-1-one, Substituted chalcones.

INTRODUCTION

The ultrasonic behavior of heterocyclic compounds are very widely distributed in nature and very essential in living organisms. In biochemical, agricultural, pharmaceutical, medicinal and industrial and drug research (Sahadev A. and Thakur L. 2007) (Sharma P. 2008) viscosity measurements play a crucial role. Viscosity is one of the important physical properties of liquid. Due to the flowing effect in the liquid which is the movement of liquid layer over each other on surface layer as a result of stress (Bhat B. A., 2008). Viscometric measurements provides important information regarding solute-solute and solute-solvent interaction in an aqueous and non aqueous solutions. Drug behavior like absorption, accumulation and its effect are directly related to its viscosity. Experimental and theoretical investigation of the liquid mixtures with (Vibhute Y. B. and Bichile G. K., 2006).

Chalcones are known for various therapeutic activity (Sahu P. K. and Saraf S. 2009) and Biochemical applications as antimicrobial and cytotoxic agents, analgesic and anti-inflammatory, antidiabetic and antiplatelet. Heterocyclic compound having 1,3-dithiolane nucleus is widely used in medicinal, fundamental, biochemical and pharmaceutical sciences (Sahadev A. and Thakur L. 2007) (Sharma P., 2008) (Bhat B.A., 2008). These compounds showed anti-hypertensive, antifungal, antiviral, anti-bacterial and anti-schistosomiasis properties (Vibhute Y. B. and Bichile G.K., 2006). Chalcones are found to be effective in treatment of cancer (Wan Z.Y., 2007) and their pharmacological importance is very due to the presence of reactive keto-ethylenic moiety (Sahu P. K. and Saraf S. 2009). 1-phenyl-3-[4-(2-hydroxy-4-phenylbenzoyl)-2,5-dihydroxy-3-thienyl]-2-propen-1-one is prepared by varying temperature (Sahadev A. and Thakur L. K. 2007) and it study will be helpful to drug environment (Thakur L. K., Sharma A. L. 2007) (Sahadev A. and Thakur L. 2007) (Bose A. K. 2007).

EXPERIMENTAL

All the chemicals used were of analytical grade and were used for all types of analysis. Weighing was carried out using Electronic Digital balance (Model make Contech CA-204) to an accuracy of ± 0.0001 gm. Ultrasonic velocity was measured at 303 K ± 0.1 K using multi frequency ultrasonic interferometer (Model No. F-81) operating at 2 MHz frequency. The solutions were prepared in dry conditions and kept in dry bottles to avoid contact with moisture. The temperature was maintained at 303 K ± 0.1 K for each experiment by circulating water from a constant thermostat water bath. Solutions were prepared by weight (Contech CA-204) balance. Solutions were prepared in 1,4-dioxane and the concentration range was 0.1 M to 0.01 M.

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Exploration of Fluoride Concentration from Various Villages belonging to Sangamner Tehsil

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Abstract:

Fluoride plays crucial role in the quality of water. Current population growth and their demand toward water availability and its quality are emerging as a prime issue for the world. Fluoride, the necessary strongly influence on drinking water quality. Due to excess concentration of Fluoride, caused serious health issue for human population. All over the world most of the people were facing with fluorosis like dental fluorosis or skeletal fluorosis due to consuming higher fluoride concentration of drinking water. This research work gives special attention on the Presence of fluoride concentration of drinking water from various villages belonging to Sangamner tehsil, Dist. Ahmednagar, Maharashtra. Present research work result that, get Permissible and also Maximum fluoride concentrations of drinking water from study area. Different industries are functional in Sangamner tehsil, Dist. Ahmednagar, Maharashtra found in groundwater. Spectrophotometer method used for determination of fluoride concentration. Through this investigation fluoride concentration values founded for the minimum is 0.6 mg/L to 1.2 mg/L with, for maximum is 0.7 mg/L to 1.4 mg/L. After the investigation of drinking water samples in this villages were found with higher concentration of fluoride than suggested by WHO and BIS.

Keywords: Groundwater, Fluoride, Fluorosis, Spectrophotometer

Introduction:

Water is a life. We can't imagine life without water. Basically water is an element for all living organism. Day by day human population growth specially most up and along with population the need of water increases. Due to population growth two prime issues come out concern to drinking water such as water availability and water quality. Various parameters such as physical, chemical and other water physical parameters directly related with mentioned issues. Besides this all things in mind fluoride concentration is one of the crucial issue being component in deciding water quality. Soil, water, air, vegetation, agricultural products and tea leaves are natural sources of Fluoride. It is found in Fluorite, Cryolite and Fluorapatite in various rocks. Fluoride in the form of inorganic like Cryolites, Fluorites and Topaz easily are found in ground water sources such as dug well, shallow and deep bore points especially for well (Kashma, 2006). Usually in body fluoride found in bones and teeth. Fluoride plays role for normal mineralization of Bones and formation of dental enamel (Ozsvath, 2009). Fluorite (CaF2) is use as source of fluorine at industrial level and also act as major source of fluoride concentration in water and soil. Contamination of river and other water bodies with fluoride

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occurred due to [illegible]

[illegible] SO[illegible] Discharge of the [illegible] and also due to [illegible] Generally Fluoride [illegible] and many times of [illegible] consumption of [illegible] consumption of water [illegible] [illegible] or serious effects [illegible] higher fluoride intake and [illegible] and Mishra, 2006 [illegible] and [illegible] strikingly found with high [illegible] [illegible] Mishra & Murray 2006). Rural [illegible] groundwater fluoride concentration [illegible] Balasore District, Odisha (KMD, [illegible] on Andhra Pradesh, India [illegible] Fluoride in [illegible] [illegible] concentration in ground water [illegible] shown in Table 1 (Gulsen's, 1997 [illegible]

Table 1: State wise occurrence of fluoride in India

Categories	Percentage	Name of States
I	30% of the Districts Affected	Jammu and Kashmir, Delhi, Kerala and Goa
II	30-50% of the Districts Affected	Maharashtra, Karnataka and Bihar
III	50-100% of the Districts Affected	Uttar Pradesh, Rajasthan, Gujarat, Andhra Pradesh and Tamil Nadu

Study Area:

In present research work, samples are collected from different villages of Sangamner tehsil, it is surrounded by Purna River and lies in the north of Ahmednagar district of Maharashtra. It is situated at the base of Sahyadri Ranges, about 50 km. to Nashik. Sangamner is a small beautiful town located in Ahmednagar district of Maharashtra State. It lies in border of region joined with area of Malegaon district in north side, the Shirpur tehsil of the Dhuliya District in the north, the Yeotmal tehsil of the Akola District to the east and the Parbhani District of the Maharashtra State to the south. It is [illegible] 19.57°N 74.48°E. It has an average elevation of 579 metres (1,900 ft). Population of Sangamner tehsil is 337933 as per the survey of census during 2011 by Indian Government. The tehsil has an area of [illegible] km² and contains [illegible] villages, totaling a population of around 97,000. Basically Agriculture is the main occupation of people of Sangamner tehsil. Sangamner has an Agricultural Produce Market Committee (APMC) [illegible] Opens Page [illegible] with 4 subcommittees at Dhandar Pavna, Rahul and Sonata. The rural population also depends on ground water resources for their water needs. As per WHO (2004) guideline permissible limit of fluoride concentration in drinking water is up to 1.5 mg/L. Fluoride found in groundwater through water and soil pollutant is a good source of excessive amount of fluoride in various Indian territories. The Chronic effect of fluoride concentration in drinking water shown in Table 2 (WHO, 2004 and BIS, Revised 2012)

Table-2: Effect of Fluoride Concentration

Fluoride Concentration	Effect
Less than 0.5 mg/Lit	No Effect
0.5 to 1.0 mg/Lit	Dental Effect
1.0 to 3 mg/Lit	Mild skeletal fluorosis
More than 3 mg/Lit	Crippling skeletal fluorosis

Materials And Methods

Drinking (source may be water sample were collected from different villages belonging to Sangareppan Taluk dist. Buldhana (MS). Samples were collected in the known plastic bottles without soaking and pre-rinsing the same. Samples were collected with necessary precaution during May 2020 to June 2020. There were 20 samples collected from Different Taluk of the study area. The samples were analyzed by using SPANDS method and sold ammonium chloride with the help of spectrophotometer. Fluoride concentration measured in mg/L. According to APHA (1985), BIS (1991), WHO (2004) and Ministry of Water and Housing (1992) suggested standard permissible range of fluoride concentration for drinking purpose which are given in Table-3.

Table-3: Standard Permissible Range of Fluoride Concentration (Mg/l)

Different Standard	Max acceptable Conc.	Max Allowable Conc.
Department of Standard	0.6	1.2
BIS, 1991	0.6	1.5
Ministry of Water and Housing 1992	0.5	1.5
WHO, 2004	0.5	1.5

Results And Discussion

Summary values of fluoride concentration values of 20 samples of Taluka in 2020-21. Fluoride is essential for human health within permissible limit i.e. 0.5 to 1.5 mg/L. It is essential for dental caries and when its amount goes above permissible limit then it causes harmful like dental fluorosis, bone issues in children. It is observed that the concentration of fluoride having presence in water sources was found to be with in permissible limit in study area.

From table—1 observed that, in the common sources 20 villages were found in permissible limit i.e. in ranges vary from values 0.0 to 1.5 mg/l. samples BW1, BW2 AND BW15 having lowest concentration values i.e. 0.6 mg/l while BW11 having high i.e. Fluoride values i.e. 1.5 mg/l, average value of fluoride concentration found to be 0.955 mg/l for 20 samples.

Water in pre-monsoon season all 20 villages were found to be in permissible limit and its ranges vary from values 0.5 to 1.5 mg/l. samples BW2 having lowest F concentration value i.e. 0.5 mg/l while samples BW11 and BW10 having highest F concentration value i.e. 1.5 mg/l. Average value of Fluoride concentration found to be 1.065 mg/l for 20 samples.

Table-4: Fluoride Concentration from 20 villages of Buldhana (MS) (2019-20)

Sr.	Code	Village Name	Fluoride concentration	Fluoride conc. per standard
1	BW1	Bara	0.6	1.5
2	BW2	Pimpla	0.5	0.8
3	BW3	Khamali	0.8	1.7
4	BW4	Sawali	0.9	1.3
5	BW5	Pahurli	0.6	0.7
6	BW6	Adgaon	0.8	0.7
7	BW7	Kinakha	1.0	
8	BW8	Mahore Bhandarpa	1.2	0.6
9	BW9	Jaulkheda	1.3	0.8
10	BW10	Kalyankhed	1.5	1.5
11	BW11	Tarkheda	1.5	0.6
12	BW12	Chondi	0.6	0.6
13	BW13	Kalgaon	0.8	0.9
14	BW14	Dhotrakhed	1.1	1.1
15	BW15	Pimpalgaon	0.8	0.7
16	BW16	Rudhana	1.1	1.5
17	BW17	Bhalkheda	1.4	1.5
18	BW18	Kalmegaon	1.1	1.1
19	BW19	Mahod	1.0	0.8
20	BW20	Wadala	1.3	1.4
		Max	1.5	1.5
		Min	0.5	0.6
		Avg	1.065	0.955

Conclusion:

The pre-monsoon and post-monsoon fluoride concentration was found in permissible limit while average value of fluoride concentration was found to be greater in post-monsoon as compare to pre-monsoon.

Overall in 20 samples were found permissible limits as World Health Organization (WHO, 2004) i.e. 0.5 to 1.5 mg/l. while only samples were found beyond the permissible limit have more than 1.5 mg/l i.e. non-permissible, in any diseases were found in present study area.

But those villages were found with 1.5 mg/l fluoride concentration value, they are also in permissible limit range below, be careful that otherwise in future they will have to face the problem of fluorosis.

References:

1. Acharya, D.D. and Mishra, M.K. (2011). Fluoride content studies in ground water of Madhya Tehsil of Satna District, Madhya Pradesh, India. Poll. Res., 30 (1), pp. 41-43.
2. APHA (1985) Standard Methods for the Examination of Water and Wastewater. 16th ed. Washington: APHA AWWA WPCF.

5. BIS (2003) Drinking Water Specification, New Delhi: Bureau of Indian Standards, IS 10500:2003 2 nd Rev New Delhi India

6. Handa, B.K. and Haldorai, W.U. (1973) Defluoridation Progress Mineral Res. (Geological Survey) Research (Indian) 35(4) pp. 1-84

7. Indian Standards, Revised (2003) Specification for Drinking Water, Bureau of Indian Standards, New Delhi (IS:10500:91)

8. Jolliffe, I.T. (2002) Principal Component Analysis, Springer Series in Statistics, Springer Verlag, pp. 487

9. Chandra, S. (2010) Indirect Reuse of Sewage Effluent for Irrigation, India Electric 36 (12) pp 1-5

10. Indian Council of Medical Research (ICMR) (1975) New approaches to diagnosis in human fluorosis, Indian Council of Medical Research, pp. 1-6.

11. Sankar, K.B., Sahai Environmental Chemistry, Pragati Prakashan Meerut, 2nd ed. pp 140-149

12. Ministry of Water and Housing (MOWH) (1975) Govt. of India, Ministry for Water Resources (Revised), New Delhi, Ministry of Work and Housing, Available from: < http://www.mowr.gov.in/index2.asp?slid=620&sublinkid=...&langid=1 >, Accessed 12-19 pp. 2 [25th June 2013].

13. Meera, A.K., and Meera, S., and Pawan, Gupta Estimation of Ground Water Fluoride in the Geogenic Alluvial Plains of Delhi, Harold, 40, pp. 29-38

14. Rajesh Kumar Dar1 , Tanuja Pandeya2 and Dr. S.N. Pandey3 (2012) Occurrence of Fluoride in Ground Water of Rampur Panchayat in Balrampur District, Uttar, India Journal of Environmental Vol II, Issue 12, pp 53-56

15. Raju et al (1979) Nalgonda technique for defluoridation: Fit and affordable defluoridation plant, National Environmental Engineering Research Institute Nagpur, Technical Digest, p. 5-6

16. Sharma, L. and Sharma, R.K. (2008) Occurrence of fluoride in ground water of various villages of district Ajmer (Rajasthan), Poll. Res., 27(3) pp 455-459

17. Trivedy, Goel (1986) Chemical and Biological Methods for Water Pollution Studies, Karad, Environ. Media Publication, pp. 251

18. Tripathi, S., and Poonia, P.K. (2010) Levels of Fluoride in the Waters of Umaid Sagar, Poll. Res., 29(1), pp. 427-430

19. Tripathi, S., and Poonia, P.K. (2010) Levels of Fluoride in the Waters of Umaid Sagar, Poll. Res., 29(1), pp. 427-430

20. Tripathi, S., and Poonia, P.K. (2010) Levels of Fluoride in the Waters of Umaid Sagar, Poll. Res., 29(1), pp. 427-430

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To study water quality of Shegaon town of Buldana district in Maharashtra, India

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ABSTRACT

In the present study, physico-chemical and microbiological characteristics of different sources of surface and ground waters in Shegaon town were determined during winter 2020. The objective of the study was to assess the suitability of water for human consumption and other domestic purposes. Water samples from three different densely populated localities were collected and analyzed for various parameters using standard methods. The physico-chemical parameters of home well water were satisfactory whereas bore well water exhibited all the values as exceeding maximum permissible limit with a few exceptions of sulphate and dissolved oxygen in bore well water. The microbiological analysis revealed that with the exception of bore well water, all other waters fail to satisfy the prescribed standards set for drinking water. Therefore, the study revealed that the entire water samples investigated in the present study failed to qualify the prescribed standards for drinking water either in the physico-chemical aspects or in the microbiological aspects or both. In conclusion, effective preventive measures are to be taken immediately to save these water resources of Shegaon as it is an area of faster development and dense population.

Keywords: water quality, ground water, physico-chemical parameters, Drinking water standards.

INTRODUCTION

Water is one of the essential natural resources for existence and development of life on the earth. Surface and ground waters are the major sources to meet out the entire requirement. However, several factors like industrial and domestic wastes, discharge from agricultural practices, land use practices, rainfall pattern and infiltration rate, geological formation, etc. can affect water quality in a region (APHA 1975). The quality of water is getting vastly deteriorated mainly due to unscientific waste disposal, improper water management and carelessness towards the environment.

2020-21

This has led to the scarcity of potable water affecting human health (Agarkar & Thombre 2005). Increased anthropogenic activities in and around the water bodies can damage aquatic systems and ultimately microbiology and the physico-chemical properties of water. According to WHO (1984) 30 to 80% human diseases occurred due to impurities in water. Traditionally, the microbiological quality of drinking water is assessed by monitoring non-pathogenic bacteria of faecal origin (Rompre et al. 2002). Before water can be described as potable, it has to comply with certain physical, chemical and microbiological standards to ensure that it is palatable and safe for drinking and other domestic purposes (Tebutt 1983).

Shegaon is a densely populated city in Buldana district in Maharashtra, which is reeling under acute shortage of potable water, especially during summer season, despite having a number of surface and groundwater resources. The present situation in Shegaon attracts the attention to the urgency for investigating the causes and suggestion remedies. In the present study, an attempt has been made to analyse the physico-chemical as well as the micro-biological parameters of different water resources available in Shegaon, to see whether these water bodies are suitable for drinking and for other beneficial purposes.

MATERIAL AND METHODS

Sampling:
The water samples were collected from three different selected regions of Shegaon during winter 2020. The location and source of water samples are given in Table 1.

Table 1: The Location, Source code of water collected from Shegaon.

Sl. No.	Location	Sample code & Source	
		W1	W2
1	GM Temple area	Home well	Bore Well
2	Bus stand area	Home well	Bore Well
3	Old city area	Home well	Bore Well

The water samples were collected in high grade plastic bottles of one liter capacity. Before collection, the plastic bottles were rinsed with distilled water and then thrice with respective water sample. During collection, care was taken to avoid trapping of air within the bottle by completely immersing the bottle within the respective water sample until the bottle is completely filled in with the water sample.

Parameters analyzed:
The samples collected were brought to the laboratory and analyzed for pH, electrical conductivity (EC), dissolved oxygen (DO) and total dissolved solids (TDS) immediately. Other physico-chemical parameters like colour, odour, taste, turbidity, total hardness (TH), total alkalinity, biochemical oxygen demand (BOD), calcium, chloride, fluoride, magnesium, sulphates, iron and nitrates were analyzed within 36 hrs of collection. Standard methods were adopted for the analysis of water samples (APHA-AWWA-WPCF 1989).

For microbiological examination, samples were collected in 250 ml. sterile bottles, and analysis was carried out within 6 hours of sample collection using standard methods outlined in BIS (1981). The parameters studied include total plate count (TPC), total coliform bacteria and faecal coliforms *(E. coli)*.

Comparison with BIS and WHO standards:
The physico-chemical parameters analysed for water samples were compared with BIS (2012) for drinking water and microbiological parameters with WHO standards (1996) for drinking and bathing water. The data provided in Tables 2 and 3 is an average of three samples collected from three different areas under study.

RESULTS AND DISCUSSION

Colour, taste and odour:
All the water samples were found to be colourless. Regarding taste, water sample W2 tasted salty. The odour of all the samples was not objectionable.

pH:
As the pH is related to a variety of different parameters, it is not possible to determine whether pH has a direct relationship with human health, but it is argued that pH has an indirect effect as it can affect water treatment processes (Aramini et al. 2009). In the present study the range of pH of different water samples was from 7.2 to 7.8 (Table2).

Table 2: Physico - chemical characteristics of water samples collected from various sources in Shrigaon of Buldana district for comparison with drinking water specifications of IS: 10500, BIS (2012).

Sr.no.	Parameters	BIS 1992		Water samples	
		DL	ML	W1-Home well	W2-Bore well
1	Colour	5	15	3	3.67
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	agreeable	salty
4	Turbidity	1	5	1	4.28
5	PH	6.5-8.5	No relaxation	7.2	7.8
6	Total Hardness	200	600	85	5600
7	Iron	0.3	No relaxation	0.4	0.7
8	Chlorides	250	1000	80.22	9700.50
9	Fluoride	1	1.5	0.04	0.15
10	Calcium	75	200	20.1	2100.33
11	Magnesium	30	100	1.95	233.09
12	Sulphates	200	400	12.01	4.98
13	Nitrates	45	No relaxation	1.86	.27
14	EC	-	-	154.66	3376
15	Total Alkalinity	200	600	13.63	6.4
16	BOD	-	-	2.57	17.96
17	DO	-	-	6.5	15.2
18	TDS	500	2000	180	2540

Total hardness:

Total hardness of different water samples in the present study varied from 85 mg/L to 5600 mg/L. Generally, the hardness of water bodies increases as the concentration of calcium and magnesium salt in water increases, especially during summer season due to excessive evaporation. The maximum hardness was observed in water sample collected from bore well (W2) which was 5600 mg/L. This value is much higher than the maximum permissible limit prescribed by BIS (2012). The remaining water sample WI showed hardness level well within the desirable limit.

Turbidity:

According to BIS (2012), the desirable limit of turbidity in drinking water is 1 NTU and a maximum permissible limit is extended up to 5 NTU. The study showed that turbidity value range from 1 NTU to 4.28 NTU. Therefore, all the water samples were well within the desirable limit. The minimum value of turbidity was recorded in water samples collected from home well, whereas the maximum in bore well water.

Iron:

The concentration of iron (as Fe) in different water samples varied from 0.4 mg/L to 0.7 mg/L (Table 2). With the exception of sample WI, all the water samples have iron concentration much above the maximum permissible limit for consumable water, whereas WI has a value within the maximum permissible limit but above the desirable limit (0.41 mg/L). The intake of large amount of iron through drinking water can cause hemochromatosis, a condition in which normal regulatory mechanisms do not operate effectively, leading to tissue damage as a result of the accumulation of iron (Dillman et al. 1987). Besides this, when iron concentration in the domestic water supply exceeds permissible limit, it becomes objectionable for a number of reasons that are indirectly related to health (Cohen et al. 1960).

Chloride:

Chloride is one of the important indicators of water pollution. The value of chloride concentration in water samples W2 under study was too much higher than the maximum permissible limit. It was 9750.50 mg/L in W2.

With respect to water samples W1 the chloride concentration was satisfactory as it lies within the desirable limit of BIS drinking water specification, and were 80.22 mg/L. Sources of chloride pollution in water include fertilizers, sewage, effluents, farm drainage, salt and human and animal wastes. High chloride content can cause high blood pressure in people.

Nitrates:
The high concentration of nitrates in drinking water is toxic (Gilli et al. 1984). It is regulated in drinking water primarily because high levels can cause methaemoglobinaemia or "blue baby" disease (Mccasland et al. 1985).

Desirable limit (DL); maximum limit (ML). All parameters are expressed in mg/L with the exception where colour in hazen units, turbidity in NTU and electrical conductivity in mhos/cm.

It is reported that groundwater is often contaminated due to nitrogenous fertilizers and manures, and also often accompanied by pesticides used in agriculture (Munsuz & Unver 1995). It is also reported that nitrate concentration depends on the activity of nitrifying bacteria which in turn get influenced by presence of dissolved oxygen. In the present study values of nitrates indicate that with the exception of water sample W2, all other water samples have nitrate content well within the desirable limit. W2 sample exhibited a value of 70.27 mg/L which is many times higher than the maximum permissible BIS guideline value of 100 mg/L.

Sulphate:
Sulphate content of water samples varied from 12.01 to 4.98 mg/L, all the samples were within the desirable limit. Sulphate above the permissible limit may cause gastrointestinal disorders and diarrhoea in human beings (Prasad et al. 2008).

Fluoride:
The desirable limit for fluoride in drinking water is 1mg/L and the maximum permissible limit is 1.5 mg/L (BIS 2012). The excessive amount of fluoride in drinking water can cause fluorosis having disfigurement of teeth and deformities of bones (Kulshreshtha et al. 2004). The concentration of fluoride in the water samples varied from 0.04 mg/L to 0.15 mg/L. Therefore, all the water samples have fluoride well within the desirable limit.

Calcium and magnesium:
The values of calcium and magnesium in the water samples varied from 20.12 mg/L to 2100.33 mg/L and 1.95 mg/L to 233.09 mg/L respectively. Water samples W1 have acceptable value. Venkata et al. (2006) reported high positive correlation between TDS-Mg, TH-Ca and TH-Mg. The present study also supports this observation, as there is a positive correlation between the values of magnesium, calcium, TDS and total hardness in different samples.

Total alkalinity:
Alkalinity of water is related to the actual number of base components and can be thought of as the intensity of the pH. Alkalinity values were recorded in the range of 13.63 mg/L to 6.4 mg/L. Minimum was noticed in bore well water. As per the BIS standards all the values were well within the desirable limit (Table 2). If the alkalinity is low it indicates that even a small amount of acid can cause a large change in the pH.

Total dissolved solids (TDS):
Total dissolved solids of the water samples were in the range of 180 to 2540 mg/L. TDS is an important parameter for drinking water and water to be used for other purposes. According to BIS (2012), water containing TDS value up to 500 mg/L is considered desirable and a maximum permissible limit of 2000 mg/L under unavoidable situations. In the present investigation the water sample W1 showed a range satisfactory and within the desirable limit. The water sample W2 recorded maximum TDS value which is too higher than the maximum permissible limit and are not at all suitable for human consumption.

Biochemical oxygen demand (BOD):
BOD is the amount of oxygen required by the living organisms engaged in utilization and ultimate destruction or stabilization of organic matter in water (Hawkes 1963). It is an important indicator of water pollution. BOD value of water samples in the present study varied from 2.57 to 17.96 mg/L. As per BIS the maximum desirable limit of BOD for drinking water is 5 mg/L. Here, it is observed that the BOD value of water sample W2 is above the maximum desirable limit, and are 17.96 mg/L. The higher BOD

values of the samples clearly indicate pollution and imply high demand for oxygen to support life processes which may be attributed to the percolation of wastewater loaded with biodegradable material.

Dissolved oxygen (DO):

Generally, an increased values of BOD and COD indirectly indicate decrease in DO values. Deficiency of DO gives bad odour to water due to anaerobic respiration of organic matter (Sallar 1974). In the present investigation, with the exception of bore well water (W2), DO values of W1 water sample were comparatively lower and the higher value of DO in water sample W2 may be because of comparatively low organic matter content.

Electrical conductivity (EC):

EC measures the ability of water to conduct an electrical current, and it is directly related to TDS (Aydin 2007). The present study showed that EC values of various samples range from 154.66 to 3376 µmhos/cm. Water samples W1 and W2 exhibited a reasonable values. The higher values of these samples may be due to high TDS value and the higher concentration of ionised substances present in the samples due to pollution by industrial effluents, domestic wastes, agricultural water, etc. (Aramini et al. 2009). It clearly indicates that samples W2 is unfit for human consumption.

Microbial status:

An estimation of bacterial production is a crucial step in understanding quantitatively the function and contribution of bacteria in material cycling within the given aquatic habitats (Azam et al. 1990). Assessment of indicator bacteria namely coliform bacteria is a convenient way to evaluate potability and sanitary condition of water bodies. *E. coli* and *Enterococcus* species are traditionally used as hygiene indicator bacteria, and methods for their detection are essential for drinking water regulations all over the world.

As per the results of the present study shown in Table 3, the total bacterial load as evident from total plate count (TPC), bore well water (27×10^2/ml) and home well water (10×10^2/ml). The total coliform count per 100 ml of different water samples ranged from 0 to 113 MPN/100ml. Coliform bacteria will not likely cause illness. However, their presence in drinking water indicates that disease-causing organisms could be in the water system. The water samples collected from bore well showed no coliform count of other water samples, home well were found to fall in higher range than the standard limit for drinking water. Water sample W1 were identified as having the presence of faecal coliform bacteria *E. coli*. There was no count for *Escherichia coli* in water sample W2. Confirmation of faecal coliform bacteria or *E. coli* in a water sample indicates recent faecal contamination of either human or animal origin, which may pose an immediate health risk to anyone consuming the water (Okonko et al. 2008). Therefore, water sample W1 give clear indication of poor water quality as they are exceeding the drinking water permissible microbiological counts suggested as per BIS (2012) and WHO (1996) standards.

Table 3: Microbiological data variation in the total plate count (TPC/mL), total coliform (MPN/100 mL) and faecal coliform (MPN/100 mL) of different water samples.

Sr. no.	Sample	Total plate count(CFU/ml)	Total coliforms (MPN/100ml)	Faecal coliform (E.coli)(MPN/100ml)
1	W1	$10x10^2$	113	2.00
2	W2	$27x10^2$	0.00	0.00
3	Limit as per BIS(2011)/WHO(1996)	100/ml	0/100ml	0/100ml

Table 4: Water quality requirements for bathing waters of the European Economic Community suggested by WHO (1996 & 1998)

Sr.no.	Microbiological parameters	Guide value	Mandatory value
1	Total coliform/100ml	500	10,000
2	E.coli/100ml	100	2,000

As per the suggested WHO (1996,1998) values of total coliform bacteria and *E. coli* per 100 mL water for the purpose of bathing and swimming (Table 4), the water samples W1 and W2 are safe for bathing purposes as their microbial values are lying within the guide value. Both total coliform and *E. coli* count exceeded guide value but lying within the mandatory value.

CONCLUSION

The high level of many physico-chemical characteristics of water sample (W2) or microbiological parameters (W1) or both together render all the water samples unfit for human consumption though they can be used for other purposes. The water should meet the different quality specifications depending on the particular use. The microbiological and physico-chemical quality adversely affected the quality of various water sources of Shegaon. The sources of pollution include agricultural practices, infiltration of irrigation water, infiltration of sewage effluents, construction activities, farm animals, septic tank, etc. Therefore, people in these areas have high potential risk of getting waterborne or sanitization related diseases under situations when they are forced to use these resources. Therefore, it is recommended that water from these sources is to be used for drinking only after pretreatment like boiling, chlorine disinfection, filtration, reverse osmosis, electrodialysis, etc. based on the situation demand. In conclusion, effective preventive measures are to be taken immediately to save these water resources of Shegaon as it is an area of faster development and dense population.

Conflicts of Interest: The author stated that no conflicts of interest.

REFERENCES

Agarkar VS and Thombre BS (2005) Status of drinking water quality in schools in Buldhana district of Maharashtra. *Nature Environment and Pollution Technology*, 4(1): 495-499.

APHA (1975) Standard Methods for the Examination of Water and Wastewater. 14th Edition. American Public Health Association, Washington DC.

APHA-AWWA-WPCF (1989) Standard Methods for the Examination of Water and Wastewater. American Public Health Association, Washington DC.

Aramini JM, McLean M, Wilson J, Holt J, Copes R, Allen B and Sears W (2009) Drinking Water Quality and Health Care Utilization for Gastrointestinal Illness in Greater Vancouver. Environmental and Workplace Health Reports and Publications.

Azam R, Cho BC, Smith DC and Simon M (1990) Bacterial cycling of matter in the pelagic zone of aquatic ecosystems in large lakes. In: M.M. Tylzer and Surraya (eds.) Ecological Structure and Function. Springer-Verlag, Berlin, pp. 477-88.

Aydin, A. 2007. The microbiological and physico-chemical quality of groundwater in West Thrace, Turkey. *Polish J Environ. Stud.*, 16(3): 377-383.

BIS (2012) Methods of Sampling and Microbiological Examination of Water. IS: 10500. Bureau of Indian Standards, New Delhi.

Cohen JM, Lamphake LJ, Harris EK and Woodward RL (1960) Taste threshold concentrations of metals in drinking water. *J. Am. Water Works Assoc.*, 52: 660.

Dillman E, Gale C, Green WE, Johnson DG, Mackler B and Finch C (1987) Hypothermia in iron deficiency due to altered iryodo-thyro-nine metabolism. Am. J. of Physiol.

Gelli G, Corrao G and Favilli S (1984) Concentration of nitrate in drinking water and incidence of gastric carcinomas, first descriptive study of the Piermonte region, Italy. Sci. Total Environ., 34: 34-57.

Kulshreshtha S, Sharma S and Singh RV (2004) Impact of domestic and industrial effluent on water and soil quality of Sanganer, heritage city Jaipur. Int. J. Chem. Sci., 2: 27-36.

Meeusland M, Trautmann T, Porter KS and Vagenet RJ (1985) Nitrate: Health Effects in Drinking Water. Natural resources Cornell cooperative extension.

Munsuz N and Unver I (1995) Water Quality (In Turkish). No. 1389. Ankara University Agriculture Faculty Publishing, Ankara, p. 168.

Okonko Ifeanyi Omezuruike, Adejoye Oluseyi Damilola, Ogunmusi Tolulope Adeola, Fajobi, Ennbong, A. and Shittu Olufunke, B (2008) Microbiological and physicochemical analysis of differem water samples used for domestic purposes in Abeokuta and Ojota, Lagos State, Nigeria. African Journal of Biotechnology, 7(5): 617-621.

Prasad RN, Ram Chandra and Tiwari KK (2008) Status of groundwater quality of Laisot urban area in Dausa district, Rajasthan. Nature Environ. Poll. Tech. 7(3): 327-38.

Rompre A, Servais P, Baudart J, De Roubin MR and Laurent P (2002) Detection and enumeration of coliform in drinking water: Current methods and emerging approaches. J. Microbiol. Methods, 49-31.

Sallae AJ (1974) Water-born diseases. In: Fundamental Principles of Bacteriology, Seventh Edition. Tata McGraw Hill Publishing Company Ltd., New Delhi.

Tyler, Tilly (1983) Principles of Quality Control. Pergamon, England, pp.2-35.

Venkata Subramani, R., Meenambal, T. and Livingston Peter Gobbayn (2006) Correlation study on physico-chemical characteristics of groundwaters in Coimbatore District. Poll.Res. 5(2): 371 -374.

WHO (1996) Guidelines for Drinking Water Quality, Second Edition, Vol. 2, Health Criteria and Other Supporting Information, World Health Organization, Geneva.

WHO (1984) International Standards for Drinking Water, 3rd Edn., World Health Organization, Geneva.

WHO (1998) Guidelines for Safe Recreational Water Environments, Vol. 1, Coastal and Fresh waters, Draft for Consultation, World Health Organization, Geneva, WHO/EOS/98.

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EXAMINING THE EFFECTS OF FOREST FIRE ON TERRESTRIAL ECOSYSTEM – A COMPREHENSIVE REVIEW OF LITERATURE

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ABSTRACT

Forest fire is very common in all the ecosystems and the forests of India are at risk of it due natural as well as anthropogenic interventions in these areas. Not all types of fires affect the forest ecosystems adversely, especially the larger ones have the potential to affect the ecosystems for a substantially longer period of time for many cases the partial recovery also took more than a decade). In view of the above, this study was carried out to systematically assess the past research efforts in the focused area i.e. impact of forest fire on the forest ecosystem. For this study literature was collected from SCI journals and has been reviewed by following standard methodology. The review showed that more efforts are needed to control the large forest fires so that smaller fire incidences could allow the natural recovery processes to enhance biological diversity and sustainable development.

Keywords: *Forest fire, ecosystems, risk, biological diversity, sustainable development*

Introduction

Not just in India, but all over the world forest fire is very common to all the ecosystems. It affects both vegetation and soil. In certain instances it is also helpful in maintaining diversity and stability of ecosystems along with nutrient recycling. However, effect of forest fire and prescribed fire on forest soil is very complex as it (fire) affects soil organic matter, macro and micro-nutrients, and also the physical properties of soil like texture, colour, pH, Bulk Density as well as soil biota. Moreover, the incidences of forest fire are likely to increase in the future due to the climate warming. This also poses a serious challenge as there is very little understanding of the likely severity of such fire incidences. In addition to above, the uncertainty associated with the consequences of forest fire on the soil microbial communities would also have large scale complications thereby affecting the soil nutrient dynamics, which would pose a threat to the existing biodiversity. In view of the above, it was necessary to carry out a systematic study to understand the various efforts researchers have taken so far to gain knowledge of the implications of forest fires on the forest ecosystems.

Methodology

In the context of the aim and objectives of this study, a literature review was carried out to study the previous research efforts. For this review we considered following aspects, such as the research question posed in the previous studies; the theoretical background, methodology, findings, suggestions and recommendations, etc. moreover, the review was used to identify the research gaps and it (review) was used for synthesizing and gaining a new perspective of the issues concerning the litter decomposition under normal circumstances as well as during the forest fire and its impact on microbial biomass present in the soil. The discussion is presented in a chronological order, so that it also indicates the underlying pattern of evolution of thoughts and ideas in the focused domain. Similarly, to the extent possible, care was taken to reproduce the original terminology used by the authors, to preserve the originality of the views. The discussion is presented in the following section.

Discussion

In order to assess the influence of change in land use on microbial activity, Behera and Sahani (2003) conducted a systematic review and reported that soluble organic N and microbial N pools in terrestrial ecosystems have been less studied than those of inorganic

N. Therefore, cross-system variation in their pool sizes and seasonal dynamics, both absolute and relative to inorganic N pools, needs to be quantified so that their ecological importance in different ecosystems can be evaluated. Zhu and Carreiro (2004) through their field based study reported that the extractable soil organic nitrogen and microbial biomass nitrogen dynamics are affected as a function of various seasons and further stated that the spring microbial biomass nitrogen increase could be an important retention mechanism for conserving soil inorganic N when plant N uptake may be low.

Pietikainen et al., (2000) has stated that the wildfires produce a charcoal layer, which has an adsorbing capacity resembling activated carbon. moreover, after the fire a new litter layer starts to accumulate on top of the charcoal layer, which liberates water-soluble compounds that percolate through the charcoal and the unburned humus layer. In view of this the author hypothesized that since charcoal has the capacity to adsorb organic compounds it may form a new habitat for microbes, which decompose the adsorbed compounds. Arunachalam and Arunachalam (2000) through his study of soil microbial biomass dynamics (in the humid subtropical broadleaved forest in north-east India) reported that canopy gaps had low soil moisture and low microbial biomass suggesting that belowground dynamics accompanied changes in light resources after canopy opening. Moreover, the study results indicate that fluctuation in microbial biomass related nutrient cycling processes in conjunction with the associated microclimate variation may affect the pattern of regeneration of tree seedlings in the gaps and hence be related with their size.

Michelsen et al., (2004) studied the seasonal changes and spatial distribution of soil total, dissolved organic C and microbial biomass C in relation to the fire frequency in dry vegetation types grassland, woodland and dry forest in Ethiopia. Based on the study results author reported that C release from burning organic matter may have strong implications for C and nutrient cycling in seasonally dry tropical ecosystems. In order to study the soil respiration and its spatial and temporal variation at boreal forest sites in central Canada, Singh et al., (2008) collected soil respiration, soil temperature, and organic layer thickness measurements from 100 points in a grid pattern and reported that soil respiration was positively related to the fine root biomass stated that variation in root biomass has a larger effect than differential forest floor organic layers on variation in soil respiration in young boreal post fire forests.

Kondapani et al., (2008) used a combination of remote sensing data and GIS techniques to determine the burnt areas and reported that temporal trends suggest increasingly short fire-return intervals in the landscape and further found that forest fires had significant adverse impacts on species diversity and regeneration in the tropical dry deciduous forests. However, Somashekar et al., (2008) monitored the burnt areas of Western Ghats (a biodiversity hot spot) using March 2000 and 2004 IRS LISS — III data and found that an area of 2.15 km^2 and 4.46 km^2 was affected by fire in 2000 and 2004 respectively. Author reports the reasons for these wild fires were repeated drought, followed by mass flowering and dying of bamboo, which accelerated the spread of fire from ground to canopy in areas with high bamboo density.

Meigs et al., (2009) quantified the short-term effects of low, moderate, and high-severity fire on carbon pools and fluxes in the Eastern Cascades of Oregon. The study results show that though soil C, soil respiration, and fine root net primary productivity were conserved across severity classes, net ecosystem production declined with increasing severity, driven by trends in aboveground net primary productivity. Based on the data related to effect of a severe wildfire 10 years after burning Sullivan et al., (2010) determined decadal-scale changes in soil gas fluxes following fire incident and found that there was less carbon available at the burned site for respiration by plants and microbes.

Verma and Jayakumar (2012) reviewed the effect of forest fire on various properties of soil, which are important in maintaining healthy ecosystem and based on this review reported that it (forest fire) affects soil organic

matter, macro and micro-nutrients, physical properties of soil like texture, colour, pH, Bulk Density as well as soil biota. However, the impact of fire on forest soil depends on various factors such as intensity of fire, fuel load and soil moisture. Holden and Treseder (2013) conducted a review to test the hypothesis that soil microbial biomass would decline following forest disturbances, but that abiotic disturbances would elicit greater reductions in microbial biomass than biotic disturbances. Author found that changes in microbial abundance following disturbance were significantly positively correlated with changes in microbial respiration. Altogether, the study results suggest that abiotic forest disturbances may significantly decrease soil microbial abundance, with corresponding consequences for microbial respiration.

Jhariya et al., (2014) identified the fire prone areas (of Tropical Deciduous forests of Bhoramdeo Wildlife Sanctuary) on the basis of historical ground fire data in conjunction with satellite remote sensing data provided by NRSA, based on the frequency of forest fire damage. Author also investigated the biomass and carbon storage pattern of the same area and observed that forest fires are driving factor in shaping forest vegetation, biomass accumulation and carbon storage. Kittur et al., (2014) assessed the effect of four levels of historic wildland fire frequency (high, medium, low, and no-fire) on regeneration of seedlings in fire affected areas of moist deciduous forests of Chhattisgarh. Based on the study results, author reported that the major contributing components of fuel load included duff litter and small woody branches and twigs on the forest floor and repeated fires, however, slowly reduced stand stability.

Chandra (2015) had stated that forest fire is very common in all the ecosystems and plays an important role in ecosystem dynamics, biodiversity, soil and microbes. Author further stated that the low intensity fire results in combustion of litter and soil organic matter, increases nutrients availability which supports regeneration of herbs and growth of post fire community. However, the higher intensity fire results into complete loss of soil organic matter and volatilization of nitrogen, phosphorus and potassium but very high temperature is required for complete burning of Mn, Mg, Cu and other micronutrients. Satish and Reddy (2015) aimed to integrate satellite derived forest burnt areas over a multi-decadal scale to understand fire frequencies in Silent Valley National Park, Kerala, India and found that overall, there is a declining trend of forest fires, which indicates management effectiveness in this area.

Using a combination of remote sensing and GIS technology Ajin et al., (2015) developed the Fire Risk Index model to prepare forest fire risk map of Nenmara Forest Division has classified the area into five risk zones: very high, high, moderate, low and very low. Maksimova et al., (2017) analyzed the state of microbial communities in gray-humus soils (Eutric Fluvic Arenosols (Ochric) of pine stands after forest fires of 2010 and found that it (fire) exert negative effects on the structure and metabolic activity of microbial communities in the postpyrogenic soils. The maximum content of the carbon of microbial biomass carbon and the maximum intensity of microbial respiration have been found in the subsurface and horizons two–three years the fire.

Singh et al., (2017) explored influence of wildfires on microbial biomass carbon, microbial respiration, and on representatives of hydrolytic (acid and alkaline phosphatase, β-glucosidase and dehydrogenase) and oxidative enzymes (phenol oxidase; Phenox and peroxidase; Perox) in tropical dry forest. The study results indicate that the role of oxidative enzymes in tropical dry forest is very critical for the ecosystems functioning and concluded that the wildfire resulted in a significant effect on soil microbial properties, and that these changes may exist for short-period, though it may lead to some critical changes in ecosystem functioning. Sharma et al., (2017) also supported the above mentioned observations and added that the forest fire also affect the soil nitrogen mineralizatioin and microbial biomass.

Verma and Jayakumar (2018) studied how repeated fires affect physical and chemical properties of soil in a tropical dry deciduous

forest and alter soil fertility and health and found that specifically, NO_3 N slightly decreased with high fire frequencies but NH_4 N decreased significantly with increasing fire frequency. Dhiman (2018) studied the effect of fire on bacterial population and their enzymatic activity by comparing the soil samples of burnt and unburnt site. The study indicated Bacillus was dominant genera in both the samples but their abundance was higher 41% in burnt soil than unburnt soil i.e. 26%, while the enzymatic study revealed that bacteria showed 94% cellulase and 65% protease activity in burnt were as 86% cellulase and 43% protease activity in unburnt soil and concluded that fire affects not only the bacterial abundance but also their enzymatic properties.

Verma et al., (2019) recently studied the recovery of soil properties after fire incident and reported that soil organic carbon was lower in burned plots than unburned plots. Total N, available P, and extractable K were lower 2-years and 5-years after the fire but are higher than unburned plot after 15-yearsa and reported that the response of soil properties varied with years after fire and soil depth. Sannigrahi (2020) assessed the impacts of forest fires on terrestrial ecosystem productivity in India during the period of 2003–2017 using spatiotemporal changes observed from satellite remote sensing data. The data showed that the spatial correlation between the burn indices and net primary productivity were mainly negative (−0.01 to −0.89) for the fire-prone states as compared to the other neighbouring regions. Authors stated that this approach has the potential to quantify the loss of ecosystem productivity due to forest fires.

Conclusions

Based on the review of existing literature, it is evident that there are certain studies that were carried out in the Indian context vis-à-vis impacts of the forest fires on the ecosystems. Among other studies that are carried out, the major focus of these studies was on the nutrient dynamics and microbial abundance in view of the forest fire incidences. Additionally, the review also showed that the remote sensing and GIS technology based data was majorly used to identify the extent of effect of the forest fire on spatial scale. Also the temporal data was used to identify the incidences of forest fires in a geographic area and its severity has been studied to classify these areas into various zones with respect to the risk of forest fires. Altogether, the literature shows that the forest fires have severe impact on the abiotic as well as biotic factors of the forest ecosystem, which may significantly affect the sustainability of these ecosystems, unless serious efforts are taken by the communities as well as the Governing bodies and departments. In developing countries, apart from natural forest fires, protected forests experience extensive anthropogenic disturbance due to mane induced fire, grazing, extraction of fuel wood and collection of non-wood forest products are also major issues that pose threat to these ecosystems. Moreover, the existing body of knowledge pertaining to the impact of forest fire incidences on various environmental compartments needs to be assessed and for this further focused studies are needed.

References

1. Ajin, R.S., Ciobotaru, A.M., Vinod, P.G and Jacob, M. K.(2015). Forest and wild land fire risk assessment using genspatial techniques: A case study of Nemmara forest division, Kerala, India, Journal of Wetlands Biodiversity, 5, pp 29-37.
2. Arunachalam, A and Arunachalam, K. (2000). Influence of gap size and soil properties on microbial biomass in a subtropical humid forest of north-east India, Plant and Soil, 223, pp 187-195.
3. Behera, N and Sahani, U. (2003). Soil Microbial Biomass and Activity in Response to Eucalyptus Plantation and Natural Regeneration on Tropical Soil, Forest Ecology and Management,174(1), pp.1-11.
4. Chandra K.K. and Bhardwaj A.K. (2015). Incidence of Forest Fire in India and Its Effect on Terrestrial Ecosystem Dynamics, Nutrient and Microbial Status of Soil,

International Journal of Agriculture and Forestry, 5(2), pp. 69-78.

5. Dhiman, P., Mehta, J. P., Singh, P., Shafil, S and Baldotra1, S. (2018). Effect of prescribe fire on Bacterial abundance and their enzymatic activity in burnt and unburnt soil of chilla forest Raja Ji National Park, Uttarakhand, India. Plant Archives, 18 (1), pp.1125-1128.
6. Holden, S. R and Treseder, K.K.(2013). A meta-analysis of soil microbial biomass responses to forest disturbances., Department of Ecology and Evolutionary Biology, University of California, Irvine, CA, USA.
7. Jhariya, M. K., Bargali, S. S., Swamy, S. L., Kittur, B., Bargali, K and Pawar, G.V.(2014). Impact of forest fire on biomass and carbon storage pattern of tropical deciduous forests in Bhoramdeo Wildlife Sanctuary, Chhattisgarh, International Journal of Ecology and Environmental Sciences, 40(1), pp 57-74.
8. Kittur, B.H., Swamy, S. L., Bargali, S.S and Jhariya, M. K.(2014).Wildland fires and moist deciduous forests of Chhattisgarh, India: divergent component assessment, Journal of forestry Research., 25, pp. 857-866.
9. Kodandapani, N., Cochrane, M. A and Sukumar, R.(2008). A comparative analysis of spatial, temporal, and ecological characteristics of forest fires in seasonally dry tropical ecosystems in the Western Ghats, India., Forest Ecology and Management, 256(4), pp. 607-617.
10. Maksimova, E.Yu., Kudineva, A.G and Abakumov, E.V. (2017). Functional activity of soil microbial communities in post-fire pine stands of Tolyatti, Samara oblast, Eurasian Soil Science, 50, pp 239-245.
11. Meigs, G.W., Donato, D.C., Campbell, J. L., Martin, J.G and Law B.E. (2009). Forest Fire Impacts on Carbon Uptake, Storage, and Emission: The Role of Burn Severity in the Eastern Cascades, Oregon, Ecosystem, 12, pp. 1246-1267.
12. Michelsen A., Andersson M., Jensen M., Kjoller A and Gashew M. (2004). Carbon stocks, soil respiration and microbial biomass in fire-prone tropical grassland, woodland and forest ecosystems, Soil Biology and Biochemistry, 36(11), pp. 1707-1717.
13. Pietikainen J., Kiikkila O and Fritze Hannu., (2000). Charcoal as a habitat for microbes and its effect on the microbial community of the underlying humus, Wiley Online Library, 89(2), pp. 231-242.
14. Sannigrahi, S., Pilla, F., Basu, B., Basu, A.S., Sarkar, K., Chakraborti, S., Joshi, P.K., Wang, Q. Y., Bhatt, S., Bhatt, A., Jha, S., Keesstra, S and Roy, P.S. (2020). Examining the effects of forest fire on terrestrial carbon emission and ecosystem production in India using remote sensing approaches. Science of The Total Environment, 725, pp. 773-787.
15. Satish, K.V and Reddy, S.C. (2015). Long Term Monitoring of Forest Fires in Silent Valley National Park, Western Ghats, India Using Remote Sensing Data, Journal of the Indian Society of Remote Sensing, 44, pp.207–215.
16. Sharma, U., Sharma, G and Devi, M.(2017). Effect of Forest fire on soil nitrogen mineralizatioin and microbial biomass: A review, Journal of Pharmacognosy and Phytochemistry, 6(3), pp. 682-685.
17. Singh, A. K., Kushwaha, M., Rai, A and Singh, N. (2017). Changes in soil microbial response across year following a wildfire in tropical dry forest, Forest Ecology and Management, 391, pp 458-468.
18. Singh, S., Amiro, B. D and Quideau, S.A. (2008). Effects of forest floor organic layer and root biomass on soil respiration following boreal forest fire, Canadian Journal of Forest Research, 38(4), pp.647-655.
19. Somashekar, R.K., Nagaraja, B. C and Kavya, U. (2008). Monitoring of forest fires in Bhadra wildlife sanctuary, Journal of the Indian Society of Remote Sensing, 36, pp. 99-104.
20. Sullivan, B.W., Kolb, T.E., Hart, S.C., Kaye, J.P., Hungate, B.A., Dore, S and Helu M. M. (2010) Wildfire reduces carbon dioxide efflux and increases methane uptake in ponderosa pine forest soils of the southwestern USA, Biogeochemistry, 104, pp. 251-265.

[10] Verma, S., Singh, S., Singh, K.K. and Sreedhar, S. (2018). Fungicidal and bactericidal potential in a polyherbal dry formulation based on Ayurvedic system of Medicine. Indian Forest Pathologist 4(1): pp. 1-8.

[11] Verma, S. and Sreedhar, S. (2018). Effect of common dyes on soil microbial diversity. In: 3rd International Dry Ayurvedic Medicine Conference of Western Ghats, India. Journal of Pharmacognosy and Phytochemistry 7(1): pp. 1716-1720.

[12] Verma, S. and Sreedhar, S. (2018). Impact of Lemon Tea on physical, chemical and biological properties of soil: A review. Proceedings of the International Academy of Ecology and Environmental Sciences, 2(3): pp. 148-154.

[13] Zhao, M. and Chalmers, M. M. (2004). Variations of soluble organic nitrogen and microbial nitrogen in Amphibian forest soils along an urban-rural gradient. Soil Ecology and Environment, 94(2): pp. 279-284.

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To study the effect of industrial wastewater irrigation and rain water irrigation on the soil characteristic of Vidarbha region.

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ABSTRACT

Safe disposal of industrial wastewater has become a challenge for industrial managers and for scientists also. Rapidly increasing industrialization and urbanization have resulted into the generation of huge quantities of wastewater. Use of untreated industrial wastewater for crop irrigation is a common practice by the farmers. The immediate solution that seems to the problem of water shortage is the reuse of wastewater generated from industrial operations and domestic usage after the suitable treatment in agriculture and related activities. The present research work deals with the study of effects of industrial wastewater irrigation on the soil characteristics of nearby area in Buldana District of Maharashtra. The data obtained in present study indicates that EC, Phosphate, TS, TDS, TSS, Ca,Mg etc., values in fertilizer wastewater whereas pH,TA,TH,Cl_2 values are maximum in sewage water of Khamgaon MIDC. At Sugar Industry sites, EC, Temp., phosphate, TDS, Ca, Mg, Cl2 values in wastewater are maximum. Organic Carbon, Available N, K, P, Na, SO_4, Cl, Mg, Fe, Cu, Zn and Mn were comparatively higher in wastewater irrigated soils than the tube well irrigated soil.

Keywords: Wastewater, Soil Characteristics, Physico-Chemical Study.

INTRODUCTION

The requirement of water is increasing day by day due to tremendous increase in our demands on account of increasing domestic and industrial activities. Rapidly increasing industrialization and urbanization have resulted into the generation of higher quantities of wastewater. Use of untreated industrial wastewater for crop irrigation is a common practice by the farmers. Irrigation with sewage and pulp paper mill effluent had enriched the soil mainly with respect to N, P, K and enhances the crop yields considerably (Nan and Chung, 2001). Wastewater application for crop irrigation increases the zinc concentration in soil and sugarcane

2020 - 21

(Tervia *et al*., 2002). Increase in the organic carbon is beneficial for crops as it increases the update of potassium. Tannery and textile industrial wastewater contain appreciable amounts of plant nutrients such as N, P, K, Ca, Mg and S. These nutrients can be used for plant growth after proper treatment. Enrichment of soil organic carbon in soil due to addition of industrial wastewater is reported is reported by Chhonkar *et al.* (2002). The use of paper mill wastewater has favourably influenced the crop production. Its continuous application for a number of years may results in enrichment of heavy metals in the top layers of soil (Gupta *et al*., 1990). Untreated industrial effluents contains higher amounts of Cd, Pb, Zn, Cu, Mn and Fe enhances the concentration of heavy metals in surface at irrigated soil (Xiog *et al*., 2001). Higher amounts of heavy metals like Cu, Zn, Fe and Mn is recorded in irrigated soil near in industrial complex (Barman, 2001). Long term and indiscriminate application of raw sewage effluent result in the accumulation of heavy metals in surface and sub-surface soils (Datta *et al*., 2001). Excessive accumulation of heavy metals such as Cd, Pb, Cr and Ni in the soil and the resultant phytotoxicity reported by Tsakou and Peralta (2001).

MATERIAL AND METHODS

Wastewater and soil samples were collected from Khamgaon Industrial area of Buldana District, Maharashtra. At Khamgaon industrial site, soap unit is discharging wastewater into common drainage, which is being used for crop irrigation by local farmers. Wastewater samples were collected from the identified sites during the different seasons,i.e.,premonsoon, monsoon and post monsoon. Tube well water samples (control) were also collected for comparative studies. Samples were processed for the analysis of various physico-chemical parameters viz., pH, EC, DO, BOD, COD, TS, TSS, TDS, TH, Ca cations, Mg anions, Cl2 as per the standard methods of APHA-AWWA-WPCF (1985). The heavy metal analysis samples were processed by acid digestion with 1:4 mixture of HCLO4 and HNO3 and measured by atomic absorption Spectrophotometer.

Composite soil samples, irrigated with industrial wastewater were collected in three different seasons at depth of 0-15 and 15-30 cm. Samples were air dried and processed for the measurement of physico-chemical parameters viz., pH, EC by pH meter and conductivity meter (Piper, 1950), organic carbon (Walkely and Black, 1934), available Phosphorus (Olsen, 1964), available K and Na (Jackson, 1973).

RESULTS AND DISCUSSION

Wastewater characteristics:

Wastewater and control samples analysis was characterised for pH, EC, organic carbon, total solid, hardness, alkalinity and heavy metals. Result of analysis of waste water and soil presented in table 1 and 2. of both sides and heavy metals of wastewater and soil presented in fig.2 and 3. pH value of Khamgaon industry site was slightly alkaline in nature (7.1-8.2). EC values (1.3-4.0) were high in wastewater at Khamgaon site than control (1.0-2.0). EC values low in monsoon season in all sites than premonsoon and postmonsoon season due to dilution by rainwater.

Dissolved oxygen (DO) values were low in industrial and sewage water than control. it could be due to high organic load in wastewater. BOD values were high in industrial and sewage wastewater (42-89) in comparison to control (0.98-1.8). COD values similarly high in wastewater at Khamgaon and Sugar mill sites than control. Average values of BOD and COD of wastewater were high in comparison to control the permissible limit (30 and 250 mg/l resp.) prescribed for the discharge of the effluent into inland surface water (EPR,1993). Temperature values marginally vary from site to site. Average values (176-374) of total alkalinity (TA) were high in wastewater in premonsoon and postmonsoon season than control (183-348). Phosphate values were comparatively high in industrial wastewater(1.8-5.6) than control. Total solid (TS) values including total dissolve and total suspended solid average values were high in waste water (1432-1903) than control (643-1730). In comparison to prescribed values of total suspended solid (TSS) for discharging waste water was (100mg /l). High concentration of suspended solid were found in monsoon season, it could be due to addition of loose soil particles from the adjacent land along with runoff water. Total hardness values were high in waste water. Ca and Mg cation values were high in wastewater than control.

Chloride values (251-596) low in control than wastewater (348-880). Average values of chloride were below maximum tolerance limit (600mg /l) for irrigation quality standard except Khamgaon industries and common drainage wastewater at sugar industries site. Heavy metals such as Cu, Zn, Fe and Mn concentration were high in wastewater than control, whereas Fe values were high in control at Khamgaon Industries. Concentration of heavy metals were below the maximum recommended limit (100mg/l) prescribed for irrigation water (Pratt, 1972).

Soil Characteristics:

Results of the different parameters of soil analysis at both the sites are presented in Table No.3 and 4. Data indicates that pH values were high (7.4-9.0) in wastewater irrigated soil than control (7.1-8.5). The negative impact on soil pH can be attributed to wastewater irrigation, higher Na concentration increases pH of the soil. EC values were high in wastewater irrigated soil (0.4-3.0) than control values (0.25-0.6). High values of EC indicate that it could be due to availability of salt components K, Na, Mg, Cl and SO_4 in higher concentration in wastewater. EC values increases during the period of wastewater irrigation (Singh *et al.*, 2001). Values of EC were comparatively low in monsoon season than premonsoon and postmonsoon seasons due to dilution by rainwater. Moisture content values (0.32-6.3) were high in control soil in monsoon season than wastewater irrigated soil (0.37-6.0). Porosity values were low in wastewater irrigated soil (43.4-58.4) than control (49.8-59.3) it could be due to accumulation of salts in surface layer soil. Higher concentrations of Na, Ca, Mg salts and heavy metals affect the soil properties due to decrease in porosity after irrigation with wastewater. Organic Carbon values (0.37-0.94) were comparatively high in wastewater irrigated soil than control (0.11-0.79), due to high organic load in wastewater. Nutrient content N, P, K values high in wastewater irrigated soil in premonsson and postmonsson season than control. Increase in N, P, K concentration after wastewater irrigation without any significant negative impact has been reported by Vindhya *et al.* (2001). Na and Mg values were high in wastewater irrigated soil in monsoon season at Sugar Industry site. Observations indicates that the soil infested with moderate sodicity problem because of long term application of wastewater. Wastewater contains Na, Ca and Mg salts in higher concentration affects soil by direct accumulation of large quantities, as well as the interaction Na with exchange complex, which causes the deflocculation of soil particles (Mitra and Gupta, 1999). Cl_2 and SO_4 values were low in control than wastewater irrigated soil. Carbonate content in soil layer was not detectable because of its possible conversion in $CaCO_3$. However, HCO_3 values (0.23-0.67) were high in wastewater irrigated soil in comparison to control (0.24-0.50). Analyzed values were high in premonsoon and postmonsoon than monsoon season. Concentration of Cu, Fe, Zn and Mn were comparatively high in wastewater irrigated soil than control. Heavy metal concentration increases in soil after wastewater irrigation (Tyagi and Joshi, 2001). Long term application sewage sludge containing higher Zn and Cr content exerts adverse effect on plant growth (Wong, 2001). Analysis of heavy metal indicates that the long term and indiscriminate application of wastewater may causes accumulation of heavy metals in surface soil and it will be harmful for plants and animals. Therefore, extensive research is required for the long term assessment of heavy metals accumulation in soil, crops and consumers due to wastewater irrigation.

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REFERENCES

APHA, AWWA AND WPCF,1985 Standard Methods for the Examination of Water and Wastewater.16th Ed.APHA Inc.,New York pp.1268.

Nan J and Chung G, 2001. Accumulation of Cd and Pb in spring wheat (tritticum aesti-vum L.) grown in calcareous soil irrigated with wastewater. *Bull. Environ. Contam. Toxicol* ,66: 748-754.

Terras C, Navarro M., Martin-lagos, F. Gimineze R., Olalla M., Lopez H. and Lopez M., 2002. Influence of pH and industrial activity on total zinc concentrations in agricultural soils sewage sludge and beach sands: relation with plant availability .*Bull. Environ. Contam. Toxicol* .68:224-229.

Chhonkar PK, Datta SP, Joshi HC and Pathak H, 2000.Impact of industrial effluents on soil health and agriculture ,part II – Tannery and Textile Industrial effluents. *J of Scientific and Industrial Research*, 59:446-454.

Gupta SK, Mitra A and Adhikari S (1990) Proc. Natn. Symp on Protec. of Environ. of city Wat.Fronts.Central Water Commission, New Delhi IV-7

Xiog X, Stagnitti F, Peterson J, Allinson G and Turoczy N, 2001. Heavy metal contamination of pasture soils by irrigated municipal sewage. *Bull.Environ.Contam.Toxicol.* 67: 535-540

Barman SC, Kisku GC, Saive PR, Mishra D, Sahu RK, Ramteke PW and Bhargava SK, 2001. Assessment of industrial effluent and its impact on soil and plants. *J. Environ Biol* 22,4 : 251-256.

Datta SP, Biswas DR, Sharon N, Ghose SK and Rattan RK, 2000. Effect of long term application of sewage effluents on organic carbon, available phosphorus, potassium and heavy metal status and content of heavy metals in crops grown theron. *J Indian Soc. Sci.*48,4:836-839

Tsakou A, Roulia M and Christodoulakis NS, 2001. Growth of cotton plant (Gossypium hirsutum) as affected by water and sludge from sewage treatment plant , plant pathology and plant development.Bull. Environ. Contam. Toxicol. 66:735-742.

Piper CS, 1950.Soil and Plant Analysis, Interscience publishers, Univ. adelaide Australia.

Walkley AC and Black TA, 1934.Estimation of soil organic carbon by the chromic acid filtration method. *Soil Sci.* 47:27-38.

Olsen SR, Cole CL, Watnabe FC and Dean DD,1964. Estimtion of available phosphorus in soils by extraction with sodium bicarbonate. USDA Circ.939.

Jackson CS, 1973.Soil Chemical Analysis. Prentice Hall of India, New Delhi.

EPR, 1993. In the Gazette of India, Extraordinary (Part –II Sec.3), Min.Environ. Forest Govt.of India.

Pratt PF, 1972. Quality criteria for trace elements in irrigation waters. Publications of Univ. California Expt. Stn. Riverside, California, USA.

Singh G, Bala N, Ramod TR and Singh B, 2001. Effect of Textile effluent on tree plantation and soil chemistry. *J. Environ Biol.*, 22,1:59-66.

Vindhya V, Ramesh Babu, Kale CK, Kathenderman V, Manivell U, Jayabaiou R and Subramanian YV, 2001. Irrigation water soil quality with reference to operation of a small scale chemical industry. *I.J.E.P.*,21,5:409-415.

Mitra A and Gupta SK, 1999. Effect of sewage water irrigation on essential plant nutrient and pollutant element status in a vegetable growing area around Calcutta. *J. of Indian Soc.Soil.*, 47,1:99-105.

Tyagi P and Joshi N, 2001. Acomparative study of some physico-chemical parameters of soil irrigated with recycled and tube well water.*I.J.E.P.*,21,6:5125-528.

Wong JWC, Lai KM, Su DS and Fang M,2001. Availability of heavy metals for Brassica Chinensis Grown in an acidic loamy soil amended with a domestic and an industrial sewage water sludge water. *Water,Air and Soil Pollution*,128,3-4:339-353

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Original Article

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IoT Application in Healthcare system

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ABSTRACT

The Internet of Things is a methodology towards making an existence where all things, people, and services are interconnected with one another through the Internet and can connect and work together with one another to contribute towards collection, storage, exchange and monitoring of data. In the advancement of healthcare monitoring systems, the Internet of Things has become a vital factor. The goal of an effective IoT healthcare system is to provide remote monitoring of patient health conditions in real time, to avoid critical patient conditions and to improve the quality of life through intelligent IoT environments. This paper deals with the Internet of Things (IoT) and its applications in the healthcare. The main objective of this paper is to simplify the concept of IoT and aware the reader to the present trends used in IoT healthcare.

Keywords: Internet of things (IoT), IoT technology, medical applications, smart devices

INTRODUCTION

Internet of thing (IoT) is a framework for interconnecting edge computer devices sensors smart phones and cloud computing platform for seamless interaction (Wortmann & Flüchter (2015). IoT means "The internet of things" means interconnection of thing-to-thing to internet that is also called as networks of sensors which are embedded with sensor, software, electronics devices and network connectivity that help to retrieve and exchange the information. In IoT there is advanced connectivity among the electronic device and system. In that all things are connected to the internet with strong connectivity that gives machine-to-machine relation means they can exchange the information and they can communicate without human interaction or without human instruction. In last few year IoT is very popular and spreads widely in the world, due to its advance technology it can control the almost surrounding objects with computerized them parking sensors, weather checking mobile, healthcare application.

2020-21

Internet of things is network of interconnected electronic computing devices, mechanical object that are provide unique identification and ability to transfer data over the network without human to computer interaction. In IoT all the devices are connected to the internet they are classified into mainly three types which are as follows.

- Devices are used for collecting information and send it.
- Devices that are received the information and take action on it.
- Devices that are perform both operations.

The internet of things (IoT) is also called sensors of network. It is a communication of devices with help of internet.

Recently, personalized & connected health reformed the attention trade, where a person with effort will monitor & tracks his health with IoT smart sensible wearable. Now patients will capture their health records on mobile applications as IoT wearable devices has incorporated itself creating it a major facilitate as shown in Fig.-1. The newest registrations predict that the National Health Service (NHS) of Great Britain will conserve just about seven billion pounds annually, reducing visits to the hospital (Alam & Hamida, 2014).

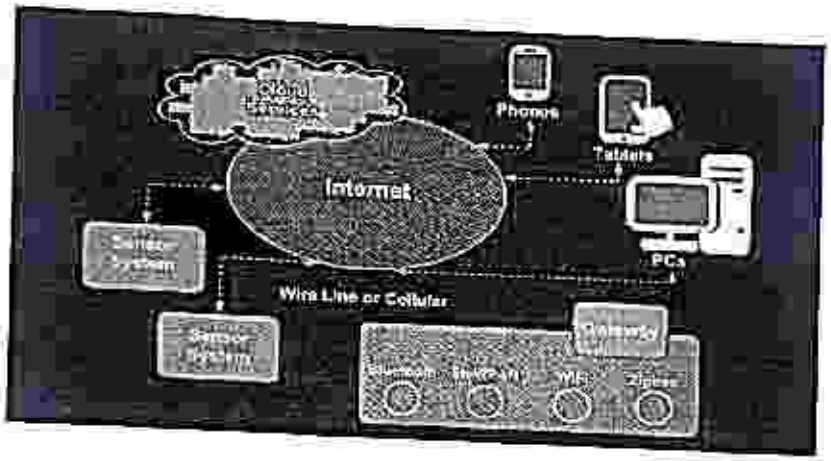


Figure1: Working of IoT wearable devices

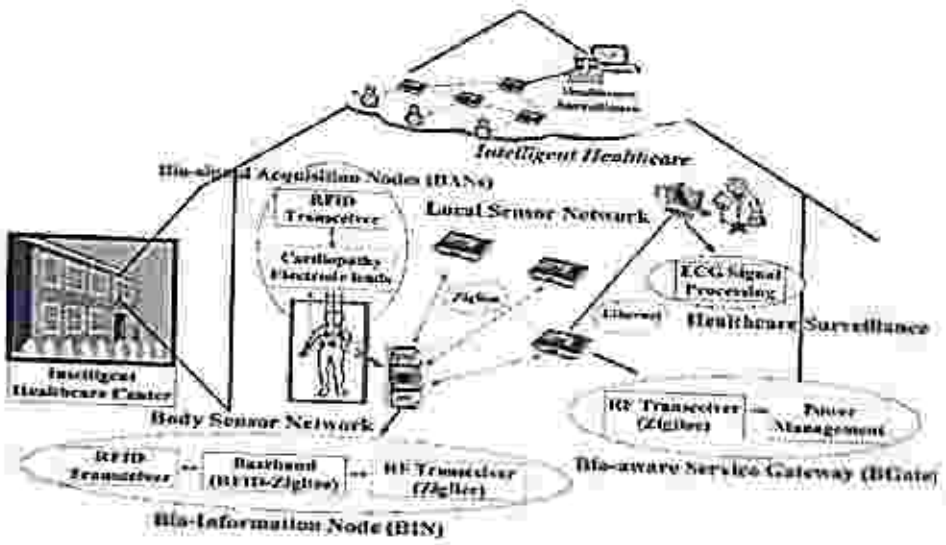


Figure 2: Architecture of Intelligent Healthcare Network

INTELLIGENT HEALTHCARE NETWORK

One of the main features of the Internet is the Intelligent Healthcare Network, called "IoThNet", shown in fig.-2 (Madhu and Kanagotari (2017)). It is mainly used for the sending and receiving of information.

Following are some important terms used in Intelligent Healthcare Network:

A. Topology in IoThNet

The way of arranging nodes (devices) is called topology. Where the positioning of various components, devices of IoThNet that smartly inspects on set of protocol for collecting information. Sensor and medical devices is working together to receive medical information from the patient (Alam & Hamida (2014),Islam et al. (2015).

B. Architecture of IoThNet

IoThNet is IoT network for healthcare is a functioning organization for presenting blueprint of "IoThNet". It shows the however working processor of intelligence healthcare network receive the information & monitor using medical service getaway & healthcare surveillance to the main "IoThNet" Data center.

IoT TECHNOLOGIES FOR HEALTHCARE

In Healthcare systems, to use IoT, we require various electronic devices and number of technologies for collects data from various object, for medical sensors, cloud computing, Wi-Fi, Radio Frequency Identification (RFID), Bluetooth etc.

A. Radio Frequency Identification (RFID)

RFID technology is radio frequency identification technology. It is used for identification of objects and collects data automatically. In this case RFID is used for collect information of object. RFID consist of three components namely RFID reader, RFID card, RFID tag that compute with specific database created. RFID card allows the transfer of data from the card to reader over distance about 10 meters depending upon card used. Here information is transfer using radio waves and many number of tags read simultaneously. RFID technology has already found usage in person identification shopping malls finding lost pets etc. Madhu and Kanagotari (2017)).

B. Medical Sensors

The sensor is used to identify monitor or treat the diseases in medical domain are known as medical sensor. Sensor means small devices used for collect and sense data or information. Medical sensor perform vital role in part of IoT in medical system. They are gather data location, blood pressure, Oximeter, Glucometer, Electrocardiogram sensor, ECG etc.

C. Cloud Computing

Cloud computing means on demand availability resources data and information distributed over multiple location from central server. Cloud computing perform important role in IoT in Healthcare system. Data and information send and received over the cloud network. It provides Internet services and enabling users to perform common operation.

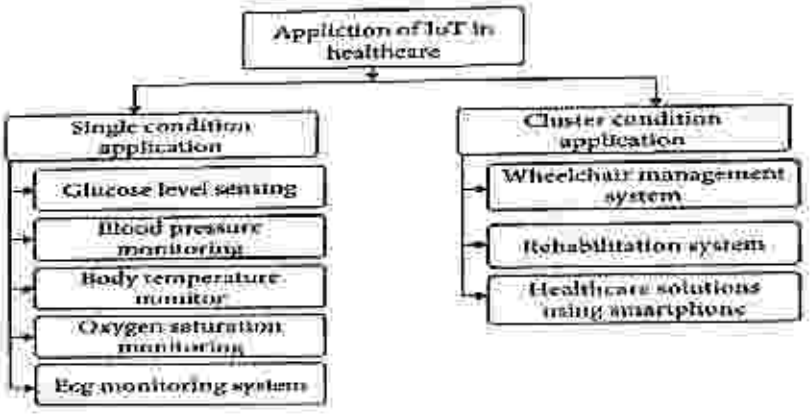


Figure 3. Application of IoT in healthcare (Pawar and Ghumabre, 2016)

APPLICATION OF IoT IN HEALTHCARE

Healthcare IoT devices is fastest growing sector in IoT market value for this sector is increasing which some time called the Internet of Medical Things (IoMT). The combination of IoT with medical sector improves the quality of life by controlling real-time illness and user interaction. Applications used in the medical sector based IoT can be generalized into two conditions types: Single Condition and Clustered Condition, as shown in following fig-3:

1) Single Condition Application:

Single condition application is used for particular or selective disease.

a) Glucose Level Monitoring

Glucose level monitoring is not easy but using IoT application it can done. Some of diabetes patients need to regularly checkup of glucose in his blood. The use of mobile application keeps the eye on the diabetic patients. Glucose monitoring devices eliminate the need to keep records manually, and they can alert patients when glucose levels are problematic (Sreekanth & Nitha (2016).

b) ECG Monitoring

The Electrocardiography (ECG) is used for analyzing the electrical activity of the heart using IoT sensor it use to check the functions and status of hearts. Using mobile application it's providing regular information to doctor as well as patients itself. Patient did not go to hospital without emergency, using this advance technology we save the time as well as health assurance (Sahal et al. 2019).

c) Monitoring the blood pressure

Blood pressure monitoring is important function in human body the patient suffering from blood pressure when the blood flow pumping out from heart is not normal rate. PPT method is used to estimate blood pressure along with the heart rate on small device result will display on mobile. Now days, various Internet of medical things devices based devices capable for blood pressure measuring.

d) Body Temperature Monitoring

In corona virus pandemic most widely used application is smart thermometer it used to monitor human body temperature using appropriate methods. The accurate body temperature is obtained with accurate measurements. An inaccurate measurement leads to incorrect treatment it may harmful to patient (McCallum & Higgins (2012).

2. Clustered Condition Application

Clustered condition application used to find more than one illness at time. It's capability to address more than one illness simultaneously.

a) Rehabilitation system for human being

A rehabilitation system not only resides to be a place for the needy, but it also changes your lifestyle for good, thereby IoT aims to mitigate issues relevant to the growing population and health expert unavailability. The Body Sensor Network (BSN) is proposed to create a strategy and reconstruct medical resources according to patients 'requirements quickly and automatically (Sahal *et al.*, 2019).

b) Management in Medication system

In the past, patients facing problem for their daily checkups and even taking their prescribed medicines on time (Khanna & Misra, 2014). Eventually, doctors found problems to search out improved medication for chronic diseases like HIV, cancer, etc. and provided low technology facilities like reminders through messages and mails to patients. Evolution of IoT with medical devices contributed in reducing the medical adherence downside. Currently patients understand that their activities area unit being caterpillar-tracked in each single moment and there's a continual examination of their habits.

c) Management of wheelchair

A smart chair is an automatic chair specifically designed for impaired kinsmen. The motions of the chair square measure connected through Bluetooth with the Raspberry Pi processor that encompasses a WLAN network connected to the cloud (Khanna & Misra, 2014). A processed system has been started to watch the patients through sensors to live integral pointers and sends the info to a standby doctor across the WLAN network. It permits the user to enhance his quality and quality of life (Sahal et al. 2019).

CONCLUSION

Internet of Things perform important role in Healthcares system it providing facility to used machine for human

purpose or for taking decision. IoT devices provide intelligence in machine for work that more efficiently than a human for IoT application in healthcare system. Various electronic devices use in IoT for communication, data collections, identification and various sensors are used for sense data collected. This makes complex healthcare system in simple way. IoT in healthcare system make change way of treatment tradition way to modern way using smart devices and sensors. IoT smart devices with healthcare system has promoted in living a better quality of life. IoT application in healthcare system perform important role in our life.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Alam M & Hamida E. (2014). Surveying wearablehuman assistive technology for life and safety critical applications: Standards, challenges andopportunities. Sensors, 14(5), 9153-9209.

Ankush B Pawar Dr. Shashikant Ghumabre ,2016 International Conference on Computing, Analytics and Security (CAST), College of Engineering Pune, India. Dec 19-21, 2016 (978-1-5090-1338-8/16/$31.00 ©2016 IEEE.

Gayatri Sahal & Richa Singh Sonia saini(2019) A survey paper on the impact of "Internet of things in Healthcare "'India Proceedings of the Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019] IEEE Conference Record # 45616; IEEE Xplore ISBN: 978-1-7281-0167-5

Islam SR, Kwak D, Kabir MH, Hossain M & Kwak KS (2015). The internet of things for health care: a comprehensive survey. IEEE Access, 3, 678-708.

Khanna A & Misra P. (2014). The Internet of things for medical devices-prospects, challenges and the way forward. TCS White Papers.

Madhu BM, Kavya Kanagotari, (2017) "IoT based automatic Attendance Management System", International conference on currents Trends in Computer, Electrical and Electronic and Communication (ICCTCEEC-2017)

McCallum L & Higgie, D. (2012). Measuring body temperature. Nursing times, 108(45), 20-22. Proceedings of the Third International Conference on Electronics Communication and Aerospace Technology [ICECA 2019], IEEE Conference Record # 45616; IEEE Xplore ISBN: 978-1-7281-0167-5978.

Sreekanth KU & Nitha KP. (2016). A study on health care in Internet of Things. International Journal on Recent and Innovation Trends in Computing and Communication, 4(2), 44-47.

Wortmann F & Flüchter K. (2015). Internet of things. *Business & Information Systems Engineering*, *57*(3), 221-224.

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Original Article

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An overview of information extraction methods, techniques and tools for the contents in chemical document

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ABSTRACT

The amount of electronic documents has speedily increased and the information over the internet is increasing day by day too. The web is continuously growing because the new information is added over it a day. These massive documents contain substantial information, but it has to be retrieved and managed in a constructive and useful way. Extracting the information from these documents is useful for many applications such as text categorization, summarization, clustering, topic tracking etc. Information Extraction (IE) is the field of extracting useful information using different methods and approaches. In this paper, the concept of information extraction (IE) is discussed, as well as presents overview of techniques used for information extraction from chemical documents.

Keywords - Information Extraction, NLP, ChemEx, IR

INTRODUCTION

The World Wide Web is the largest, popular and most widely used information source. It is much popular among users because it can easily accessible and searchable. The information over the internet is increasing day by day. The web is continuously growing because the new information is added over it a day, due to the web, users not only allow to look needed information on the web, but also easily share the information and knowledge with others (Agarkar *et al.*, 2020). The information available on the web is in the form of web pages. The contents of web pages may include texts, images, audios, videos, links, lists, charts, tables etc. Analyzing such data can help to extract meaningful information from web. In fast moving academic world, new conferences, journals and other publications are rapidly comes into existence and are expanding the already vast repository of scientific knowledge (Patil and Mahajan, 2012). E-Journals are an important source for the scientific research and development. Researchers and other users are widely used to carry out day-to-day qualitative research, education and knowledge.

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Scientific documents are the main source of current information for researchers. Usually, this textual data is available either in semi-structured or unstructured form. Today most of the scientific documents are available in Portable Document Format (PDF). Extracting the Knowledge from these documents is beneficial for several applications like text categorization, summarization, clustering, topic tracking etc. Information extraction (IE) is the task of automatically extracting structured information from unstructured and/or semi-structured machine-readable documents and other electronically represented sources. In past decades, IE system development has grown rapidly, gaining attention from a lot of researchers. Information extraction tools make it possible to pull information from text documents, databases, websites or multiple sources. Usually, however, IE is used in natural language processing (NLP) to extract structured from unstructured text. IE systems are developed to extract information from differing types of text such as unstructured, semi-structured and structured text. The differences between the three types of text documents are:

Unstructured data

According to Sint *et al* (2009) unstructured data (or unstructured information) refers to information that either does not have a predefined data model or does not fit into relational tables. Unstructured information is typically text-heavy, but may contain data such as dates, numbers, and facts as well. This result in irregularities and ambiguities that make it difficult to understand using traditional computer programs as compared to data stored in fielded form in databases or annotated in documents.

Semi-structured data

The term semi-structured data is a form of structured data that does not conform to the formal structure of data models associated with relational databases or other forms of data tables, but nonetheless contains tags or other markers to separate semantic elements and enforce hierarchies of records and fields within the data (Sukanya and Biruntha, 2012).

Structured text data:

Structured data includes mainly text, these data are easily processed. These data are easily entered, stored and analyzed. Structured data are stored in the form of rows and columns which is easily managed with the language called "structured query language" (SQL). Relational model is a data model that supports structured data and manages it in the form of row and table and process the content of the table easily. XML also Support structured data. Most of the content of the web pages are in the XML forms (Praveen and Chandra, 2017).

This paper discusses some important aspects of IE concepts, together with the methods, techniques and tools which are used to extract information from chemical documents.

Information Extraction

Information Extraction (IE) is a process that analyses natural language in order to extract specific data. The process takes texts (and sometimes speech) as input and produces fixed-format, unambiguous data as output. This data may be used directly for display to users, or may be stored in a database or spreadsheet for later analysis, or may be used for indexing purposes in Information Retrieval (IR) applications such as Internet search engines like Google search engine (Cunningham, 2006). Early work in information extraction from documents is based on two major machine learning techniques. The first is Hidden Markov models (HMM) and second is Support Vector Machine (SVM).

Information extraction is an important research area, and many research efforts have been made so far. Among these research work, rule learning based method, classification -based method, and sequential labeling based method are the three state-of-the-art methods (Jie *et al.*, 2007).

1) Rule Learning based Extraction Methods

Numerous information systems have been developed based on this method, which can be grouped into three categories: dictionary-based method, rule-based method, and wrapper induction.

a) Dictionary based method

Traditional information extraction systems first construct a pattern (template) dictionary, and then use the dictionary to extract needed information from the new untagged text. These extraction systems are called as dictionary- based systems (also called pattern-based systems).

b) *Rule based method*

The rule based method use several general rules instead of dictionary to extract information from text. The rule based systems have been mostly used in information extraction from semi-structured web page. Two main rule learning algorithms of these systems are: bottom-up method which learns rules from special cases to general ones, and top-down method which learns rules from general cases to special ones.

c) *Wrapper induction*

Wrapper induction is another type of rule based method which is aimed at structured and semi-structured documents such as web pages. A wrapper is an extraction procedure, which consists of a set extraction rules and also program codes required to apply these rules. Wrapper induction is a technique for automatically learning the wrappers. Given a training data set, the induction algorithm learns a wrapper for extracting the target information (Jie *et al.*, 2007).

2) Classification based method

In this method, information extraction is done using supervised machine learning approach. The basic idea is to cast information extraction problem as that of classification. Support Vector Machines (SVMs) is one of the most popular methods for classification (Jie *et al.*, 2007).

3) Sequential labeling based method

Information extraction can be cast as a task of sequential labeling. In sequential labeling, a document is viewed as a sequence of tokens, and a sequence of labels are assigned to each token to indicate the property of the token. For example, consider the nature language processing task of labeling words of a sentence with their corresponding Part-Of-Speech (POS). In this task, each word is labeled with a tag indicating its appropriate POS. Hidden Markov Model, Maximum Entropy Markov Model, and Conditional Random Field are widely used sequential labeling models (Jie *et al.*, 2007).

Table 1: Comparison of some chemical related IE methods for information extraction

Approach used	Dataset tested	Extracted Information	Reference
Lexical and syntactic aspects	American Chemical Society journals	Facts about chemical reactions	Zamora and Blower (1984)
nearest neighbour KNN	300 datasets	Protein names form biological information	Mani and I Zhang (2003)
NLP	Free-text documents in a patients (EMR) Electronic Health Record	potential medical problems	Meystre and Haug (2006)
Searching with key Words and Dictionary based Systems	Scientific Literature from web	Protein	Ono *et al.*, (2001)
Rule-based IE system	Hospital records of diabetic Patients and Reports	Useful information from Polish medical texts	Mykowiecka *et al.*, (2009)
Hybrid approach that combines a Conditional Random Field (CRF) with a dictionary	any natural language texts and documents of bioinformatics	Identifying chemical names that are mentioned in natural language texts	Rocktaschel *et al.*, (2012)

Applications of IE

There are several applications of IE, such as news extraction, literature extraction, text extraction, pharmaceutical, healthcare, bioinformatics, and so forth. The development happens in Natural Language Processing and its applications increase so as to involve the extraction methods in different areas. In the areas of chemical, biomedical and other related areas, a lot of IE methods have been developed (Elsadig *et al.*, 2015). Some of well-known applications are discussed here:

IE Methods and Techniques for Chemical Documents

Recently, the method of automatically extracting knowledge and information from text data has become one of the most relevant and active fields of study. In this regards, particularly the IE techniques used to extract information from chemical and biomedical literature. The common documents that contain chemical information are Journal Literature and Conference Papers, Reports, Dissertations, Books, Research papers, patents, drug description, scientific articles, online articles, and so forth. Many IE techniques including various tools and methods have been developed for chemical document domain. Following table Table-1 shows some of the IE methods that are proposed for information extraction from chemical and related domain. This table contains four columns namely: author, approach used, dataset tested, extracted information and references.

Tools for information extraction in Chemical Documents

Following are some of the important tools that are used for information extraction from chemical documents:

1) TICA

TICA (Postma et al, 1990) is a program for the analysis of short texts, such as abstracts. It is particularly used for the extraction of factual and methodological data from abstract-like texts on analytical chemical methods. The system consists of a parser/interpreter (which performs a parallel analysis based on requests) and a frame-based reasoning system (script-applier). This program is capable of analyzing short abstract-like texts containing declarative and imperative simple sentences and complex sentences with participle clauses. Inorganic substance names are translated to their formulas and the program can handle various kinds of quantifiers.

2) Chem Data Extractor

Matthew and Jacqueline (2016) presented a complete toolkit ChemDataExtractor for the automated extraction of chemical entities and their associated properties, measurements, and relationships from scientific documents that can be used to populate structured chemical databases. This system provides an extensible, chemistry-aware natural language processing pipeline for tokenization, part-of-speech tagging, named entity recognition and phrase parsing. This toolkit uses of unsupervised word clustering based on a massive corpus of chemistry articles to improve the performance for chemical named entity recognition. Also for phrase parsing and information extraction, the multiple rule-based grammars are used in this toolkit. They also described document-level processing to resolve data interdependencies, and show that this is particularly necessary for the auto-generation of chemical databases since captions and tables commonly contain chemical identifiers and references that are defined elsewhere in the text. The performance of the toolkit to correctly extract various types of data was evaluated, a affording an F-score of 93.4%, 86.8% and 91.5% for extracting chemical identifiers, spectroscopic attributes, and chemical property attributes, respectively. All tools have been released under the MIT license and are available to download.

3) Chem Ex

Tharatipyakul *et al.* (2012) have developed ChemEx, a chemical information extraction system. ChemEx processes both text and images in publications. Text annotator is able to extract compound, organism, and assay entities from text content while structure image recognition enables translation of chemical raster images to machine readable format. A user can view annotated text along with summarized information of compounds, organism that produces those compounds, and assay tests. ChemEx facilitates and speeds up chemical data curation by extracting compounds, organisms, and assays from a large collection of publications. This software and corpus can be downloaded from web.

CONCLUSIONS

This paper discusses some of the important extraction methods, techniques and tools that are proposed for medication and chemical documents. Various researchers

extracted information by analyzing natural text, and extracted information like chemical names, facts, potential medical problems, structured medication information, protein information etc from scientific documents or reports with good accuracy. Extraction approaches are based on traditional machine learning techniques, rule based algorithm, hybrid techniques and some newly applied techniques. The automation process of IE needs to be implemented in different domains. Numerous methods and techniques are being proposed in the IE field to automate these processes.

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REFERENCES

Agarkar VV, Ajmire PE, Bodkhe PS (2020) "Web Mining: An Application of Data Mining", Aayushi International Interdisciplinary Research Journal, Special Issue No.66, pp 56-59.

Atima Tharatipyakul, Somrak Numnark, Duangdao Wichadakul, Supawadee Ingsriswang (2012) ChemEx: information extraction system for chemical data curation", From Asia Pacific Bioinformatics Network (APBioNet) Eleventh International Conference on Bioinformatics, (InCoB2012), Bangkok, Thailand.

Cunningham H (2006) Information Extraction, Automatic", Encyclopaedia of Language and Linguistics, 2nd Edition, 5:665-677.

Elsadig Muawia, Ahmed Ali & Himmat, Mubatak (2015) "Information Extraction methods and extraction techniques in the chemical document's contents: Survey", ARPN Journal of Engineering and Applied Sciences. 10. 1060-1073.

Jie Tang, Mingcai Hong, Duo Zhang, Bangyong Liang, and Juanzi Li, (2007)"Information Extraction: Methodologies and Applications", Emerging Technologies of Text Mining: Techniques and Applications. 10.4018/978-1-59904-373-9.ch001.

Manl. and J Zhang. (2003), "kNN approach to unbalanced data distributions: a case study involving information extraction," in Proceedings of Workshop on Learning from Imbalanced Datasets, 2003.

Meystre S and Haug PJ (2006), "Natural language processing to extract medical problems from electronic clinical documents: performance evaluation." Journal of biomedical informatics, vol. 39, pp. 589-599.

Mykowiecka, M. Marciniak, and A. Kupsc. (2009), "Rule-based information extraction from patients' clinical data," Journal of biomedical informatics, vol. 42, pp. 923-936.

Ono T, Hishigaki H, A. Tanigami, and T Takagi (2001) "Automated extraction of information on protein-protein interactions from the biological literature," Bioinformatics, vol. 17, pp. 155-161, 2001.

Patil SR and Mahalan SM (2012) Optimized summarization of research papers as an aid for research scholars using data mining techniques", International Conference on Radar, Communication and Computing (ICRCC), IEEE, pp 243 – 249.

Postma GJ, van der Linden R, Smits JR, Kateman G (1990) TICA: A System for the Extraction of Data from Analytical Chemical Text. Chemometrics and Intelligent Laboratory Systems 9, 65-74.

Praveen Shagufta and Chandra Umesh, (2017), "Influence of Structured, SemiStructured, Unstructured data on various data models", International Journal of Scientific & Engineering Research Volume 8, Issue 12.

Rocktaschel T, M. Weidlich, and U. Leser (2012), "ChemSpot: a hybrid system for chemical named entity recognition," Bioinformatics, vol. 28, pp. 1633-1640, 2012.

Sint R, Shaffert S, Stroka S and Ferstl R, (2009) Combining unstructured, fully structured and semi-structured information in semantic wikis", Paper presented at the Semantic Wikis.

Sukanya M and Biruntha S (2012), "Techniques on Text Mining", IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), pp. 269-271.

Swain Matthew C and Cole Jacqueline M (2016), "ChemDataExtractor: A Toolkit for Automated Extraction of Chemical Information from the Scientific Literature", J. Chem. Inf. Model. 56, 1894-1904.

Zamora EM and Blower Jr PE (1984), "Extraction of chemical reaction information from primary journal text using computational linguistics techniques. 1. Lexical and syntactic phases," Journal of chemical information and computer sciences, vol. 24, pp. 176-181, 1984.

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USE OF INFORMATION COMMUNICATION TECHNOLOGY (ICT) IN LIBRARY

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Abstract

This paper discusses the different dimension of the ICTs. It gives an awareness of technology in library and why there is a need to understand the use of ICT in the library for rendering enhanced library services and information to users. The current study highlights the areas where ICT can be applied. Basically, the paper explains different technologies and their use in the library operation. Library professionals need distinct information tools (Information Communication Technology) for daily routine tasks as well as for research and academic activities. The latest devices for information communication technology have resulted in the rapid circulation of knowledge and have transformed the information handling activities in research and academic libraries in India. Research and academic libraries, mostly associated with universities and research institutions as centres of library services, have enormously improved with the expeditious changes in information communication technology. The emergence of modern library advances in ICT has opened up new ways of accumulating, regulating and disseminating scientific and technical information.

Keywords- *Information Technology, Use of ICT*

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Introduction

Information and Communication Technology (ICT) plays a vital role in bringing about changes in our society. In a specific sense, ICT means communication of information through technology, in which information is transmitted through electronic gadgets and signals. In this process, the information or message such as spoken words, photographs, five sens and sounds is first converted into signals and then transmitted through electronic links. The processing of ICT involves sending, receiving and processing information in electronic form. ICT permeats the library environment, it underpins the success of modern era, and it provide college with efficient infrastructure libraries must be able to benefit from technological development. To be able to do so, librarians have to be educated with hand with ICT background, ICT development lead to change in library work. ICT plays an important role as a link between users and librarian. ICT contributes to sustainable growth of library and their role in the shift towards knowledge

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What are ICT?

Information Communication Technology ICT are the hardware and software that enable society to create, collect, consolidate and communicate information in multimedia formats and for various purposes.

Advantages of ICT to Library:

1] ICT has provided new media, new modes of storing and communicating information.

2] ICT brought many services to library to speed up their activities.

3] It helps to remove barrier of communication, distance and time. The advances in technology will continue to improve the effectiveness of libraries. Help to transfer data to communication network like internet anywhere. It provides enormous search speed and facilities. It helps to strengthen communication and collaboration among research, government and educational institutions.

4] The world wide librarians made their catalogues available online which have online public catalogues (OPAC) generally available free of cost these are useful for finding books not available locally to identify and select books for local acquisition, bibliography data verification and to search holding of periodical and monographs. These can be access through, gopher, and the World Wide Web. Tele net

Use of ICT Tools

The emergence of the information revolution as championed by information and communication technology (ICT) has enabled libraries to devise viable strategies for improved service delivery (Igwe, 2010). Library uses various technologies to provide information to its users. Followings are the some of the ICT tools which are basically used for different communication purposes:

Collection Development: ICT has made it possible to acquire information sources such as books, journals, newspaper, etc. easily and speedily. Most of publishers have their websites on the internet and their websites on the internet and their catalogues can be searched from the library for new publications. Librarian can place their order online and clarify doubts if any through e-mail easily. Some of the reputed publishers also provide online access to their publication.

Circulation : Due to new technology user can check his documents easily. If the documents are available, the same can be issued to users. If not available then it may be reserved. The document can be issued electronically by making use of barcode strips pasted externally on the documents.

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Reference and Information Services :

Reference section is backbone of any library. A well organized library will always provide reference service with prompt and accuracy. Large number of primary and secondary information sources are also available on the internet, which can be used in providing information to the users.

Resource sharing :- Due to increasing cost of the documents and non availability of enough funds, libraries are unable to provide each and every material to its users. But due to ICT library solved this problem. The use himself / herself can search the OPAC of other libraries or he / she may ask the librarian to provide the desired document. Once he / she is able to search it, he / she can request that library to give the document on inter-library loan.

E-Journals :- Because of modern technology library can provide recent information within a short period of time as it is easier to update the issue of a journal on the internet as soon as it is published.

Periodical Control :- Electronic mail is becoming most useful way of communication. This service can be used to send and receive messages easily and speedily.

Other Services :- A modern library provides internet and CD-ROM facilities and document supply, CAS, SDI services, telecommunication technologies, telephone, video text, facsimile or fax, library networks, online retrieval services etc. In short information communication technology will help to remove barrier of distance, time and drudgery of repeated manual efforts in library routines. The advancement in technology will continue to improve upon the effectiveness of the libraries and is indispensable for handling message between libraries and library users.

Use of Library Automation Software:

Library automation is the excellent way of reducing the human involvement for library services. The aims of the current automation technology is to provide maximum services in minimum time and lowest cost. Library automation is the application of ICTs to library operations and services. Many library automation softwares are available for library operation such as Libsys, Koha, SLIM21, etc. The functions of the software are to automate the library systems which covers acquisition, cataloguing, circulation, serials management, stock verification, etc. ICT is used in various library housekeeping operations as well as for different library activities and services. The details use of ICTs are as follows

On-Line Public Access Catalogue (OPAC): ICT has revolutionized the practice of cataloguing in the library. Using OPAC users can see the holdings of the library collections. It

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reduces the cost of maintaining a library catalogue. It also eliminates pen and paperwork. along with it helps in the preparation of union-catalogue. OPAC is the easiest way to get the information of collection, weekly new arrivals and other recent addition to the libraries.

Translation Service: Mechanical translation is carried out with the help of ICT. For this purpose, various online tools like Bablefish translator and Google translator can be used to make translation from foreign languages to English and vice-versa.

Database Search Guide: At present, databases have become the central focus for exploration of varieties of the research problem. Researchers are using databases hugely for their research work. Searching and retrieving the online resources or data from the database has become very easy in the ICT environment. Generally, libraries provide the database searching guidance through the library website. The search guidance helps to researchers and faculties for their research and learning.

Conclusion : Information communication technology is not only a technology but also it manages with the library objectives with the adoption of ICT. libraries can face the new and modern information techniques. ICT has greatly affected the information environment. Librarians must have the knowledge, skills and tools in handling digital information and that will be the key success factor in enabling the library to perform its role as an information support system for society.

REFERENCES

Kumar, Illiot, Narendra (2017) Use of Information Communication Technology (ICT) and Library Operation: An Overview . Proceedings International Conference on Future Libraries: From Promises to Practices

Khute, Gajanan (2019) Role of Information Communication Technology in Library. Re-Engineering of College Library Services. P.70-73

Emezie, Nkeiru A.(2013) Federal University of Technology,Owerri,

Omeluzor, Saturday U.(2013) The relevance of a library in the 21st century: Students' perception . International Journal of Library and Information Science.

Deshmukh, Vijay. M. 2010 'ICT and College Library. Role of College Librarian in the Information Network Era proceedings. UGC sponsored state level conference, Nagpur : V.M.V. Commerce. J.M.T. Arts & J.J.P. Science College, 6th September.

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13. Static Solutions of F(R) Theory in Spherically Symmetry

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Abstract

In present paper we have studied the f(R) theory by replacing f(R,T) theory by f(R) in the work of Solanke and Karade [7], we have studied the electromagnetic field and perfect fluid in static spherically symmetric line element by considering the general case of $f(R) = \lambda R$. It is observed that convergent and non-singular solution is evolved.

1. Introduction

Cosmological data have indicated that our universe is undergoing an accelerated expansion [2]. To explain this fact, two alternative theories are proposed: one concept of dark energy and other the amendment of general relativity leading to f(R) and f(R,T) theories [3], where R is Ricci scalar and T is trace of energy momentum tensor. We observed rich contribution in f(R,T) theory such as those of Harko [4], Bijan Saha [6] studied interaction of scalar field and electromagnetic field in f(R,T) theory. This work further extended by Solanke and Karade [7]. Replacing f(R,T) by f(R) in the work of Solanke and Karade we have studied static spherically symmetric line element in the electromagnetic field and perfect fluid. Solanke and Karade [8] have studied plane symmetric universe filled with combination of perfect fluid and scalar field with electromagnetic fields in $f(R,T)$ theory of gravity. Mete and Mule [9] studied Bianchi-VI$_0$ magnetized cosmological model in $f(R)$ gravity.

2. Field equation

The field equations of $f(R,T)$ theory due to Harko [4] are deduced by varying the action

$$S = \int f(R,T)\sqrt{-g}d^4x + \int L_m\sqrt{-g}d^4x, \qquad (2.1)$$

where L_m is lagrangian, R is Ricci scalar given by $R = g^{ij}R_{ij}$ and T is trace of energy momentum tensor given by $T = g^{ij}T_{ij}$.

Mete and Mule [9] are deduced as

$$\partial R_{ij} + \frac{1}{2}\chi T g_{ij} = \chi T_{ij} \qquad (2.2)$$

Academic Year 2019-20

Replacing Synthetic Food Preservatives with Natural Antimicrobial Food Preservatives – A Feasibility Study for Small Scale Industries.

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Abstract

It has been reported that the naturally occurring antimicrobial compounds could be applied as food preservatives to not only protect food quality but also extend the shelf life of foods and beverages. Since these compounds are naturally produced and isolated from various sources, including plants, animals and microorganisms (to which they constitute part of host defence systems), they are often considered naturally occurring compounds, such as nisin, plant essential oils, and natamycin, have been widely studied and are reported to be effective in their potential role as antimicrobial agents against spoilage and pathogenic microorganisms. However their utility as well as use in the food products manufactured by the small scale industries is not known. Since, this is an unorganized sector, which is not governed with stringent rules, there appears a higher risk of food borne diseases as function of consumption of these products. In view of above, a feasibility study was carried out to know the existing use of synthetic as well as natural antimicrobial preservatives by the small scale industries in the study area. The data collection was carried out by following survey methodology. Though some of these natural antimicrobials are commercially available and applied in food processing, their efficacy, consumer acceptance and regulation are not well defined with respect to the study area. The results indicate that there is very low awareness amongst the small scale industries regarding the use of natural antimicrobial preservatives.

Keywords: natural antimicrobial compounds, food preservatives, food quality, shelf life of foods

Introduction:

Food is an essential thing for human survival. Except our own garden plants, all the food used today has some preservatives. Preservatives are the substances, which are used to prevent food spoilage from microorganism. Food preservation is used from the ancient times. This will inhibit the growth of microorganisms like bacteria and fungi. Food preservatives becomes an essential thing nowadays, this plays an important role during food transportation. This will preserve the food for a long duration from the spoilage.

Food products can be subjected to microbial contamination that is mainly caused by bacteria, yeasts, and fungi. Many of these microorganisms can cause undesirable reactions that deteriorate the flavor, odor, color, and textual properties of foods Vermeiren *et al.* 2002; Devlieghere *et al.* 2004a; Han 2005; Rupika *et al.* 2005; Davidson and Taylor 2007; Gutierrez *et al.* 2008. Microbial growth in food products is a major concern because some microorganisms can potentially cause food-borne illness Natrajan and Sheldon 2000; Cha and Chinnan 2004; Davidson *et al.* 2005; de Oliveira *et al.* 2007. In packaged foods, the growth and survival of common spoilage and pathogenic microorganisms such as*Listeria monocytogenes ,Escherichia coli* O157: *Salmonella ,Staphylococcus aureus ,Bacillus cereus ,Campylobacter, Clostridium perfringens, Aspergillus niger* , and*Saccharomyces cerevisiae* are affected by a variety of intrinsic factors such as pH, water activity, and the presence of oxygen or by extrinsic factors associated with storage conditions including temperature, time, and relative humidity Singh 2003; López-Malo *et al.* 2005; Rydlo *et al.* 2006. To prevent the growth of spoilage and pathogenic microorganisms on foods, various traditional preservation techniques such as heat treatment, salting, acidification, and drying are used in the food industry Ozdemir and Floros 2004; Davidson and Taylor 2007. In recent years, a rise in consumer demand for safe, fresh, and minimally processed foods has led to the development of new preservation techniques. Active packaging (AP) technologies, for example, can provide safe food products with longer shelf lives Vermeiren *et al.* 2002; Fitzgerald *et al.* 2003; Gutierrez *et al.* 2008. In the past few decades, various synthetic AM agents have been investigated and developed into food packaging materials Weng and Hotchkiss 1992Weng and Hotchkiss 1993. Many of these agents including various organic acids and salts have been approved by regulatory agencies and have since been used for the preservation of food products Davidson and Taylor 2007. Synthetic AM agents that have demonstrated inhibitory activity against different microorganisms include sodium benzoates and propionates, potassium sorbates, sulfites, chlorides, nitrites, triclosan, fungicides (for example, benomyl, imazalil) and various metal ions including silver zeolites, quaternary ammonium salts, and copper ions Devlieghere *et al.* 2000a; Quattara *et al.* 2000; Cooksey 2005. Other AM agents such as acetic acid from vinegar and benzoic acid from cranberries are found in nature, but are classified as synthetic AM agents when produced synthetically Davidson and Taylor 2007. In recent years, natural AM agents have attracted much attention in the food and packaging industries as a replacement for synthetic ones for food preservation. According to Davidson and Zivanovic 2003, natural AM agents are classified by their sources: AM agents derived from plant EOs (for example, basil, thyme, oregano, cinnamon, clove, and rosemary); animal sources (for example, lysozyme,

lactoferrin), microbial sources (nisin, natamycin), and naturally occurring polymers (chitosan). The EOs extracted from plant sources consist of various mixtures including terpenoids, esters, aldehydes, ketones, acids, and alcohols Dorman and Deans 2000. These plants EOs are volatile and generally possess relatively strong odors Hakkali
et al. 2008.

Materials and methods

Organisms and growth conditions

Micro-organisms were isolate in the department while some of the organisms obtained from the culture collections center. Organisms were as follows: *Candida albicans* ATCC 10231, *Enterococcus faecalis* NCTC 8213, *Escherichia coli*, *Klebsiella pneumoniae* , *Pseudomonas aeruginosa* , *Salmonella typhimurium* and *Staphylococcus aureus*. Organisms were maintained on blood agar (BA). Overnight cultures were prepared by inoculating approximately 2 ml Mueller Hinton broth (MHB) with 2–3 colonies of each organism taken from BA. Broths were incubated overnight at 35 °C with shaking. Inocula were prepared by diluting overnight cultures in saline to approximately 10^6 cfu ml^{-1} for bacteria and 10^5 cfu ml^{-1} for *C. albicans*. These suspensions were further diluted with saline as required.

Essential oils

Plant oils and extracts were obtained from PKV lab Akola where it is extracted by distillation method. All oils were diluted v/v in both agar and broth dilution method.

Agar dilution method

The agar dilution method followed that approved by the NCCLS with the following modification a final concentration of 0.5% (v/v) Tween-20 (Sigma) was incorporated into the agar after autoclaving to enhance oil solubility. Briefly, a series of twofold dilutions of each oil, ranging from 2% (v/v) to 0.03% (v/v), was prepared in Mueller Hinton agar with 0.5% (v/v) Tween-20. Plates were dried at 35 °C for 30 min prior to inoculation with 1–2 µl spots. Mueller Hinton agar, with 0.5% (v/v) Tween-20 but no oil, was used as a positive growth control. Inoculated plates were incubated at 35 °C for 48 h. Minimum inhibitory concentrations (MICs) were determined after 24 h for the bacteria and after 48 h for *C. albicans*. The MICs were determined as the lowest concentration of oil inhibiting the visible growth of each organism on the agar plate. The presence of one or two colonies was disregarded.

Results

By using agar dilution method minimum inhibitory concentration of selected essential oils and microbial products against 7 different microorganisms were studied and the results were noted in table 1. As, Lemongrass inhibited all organisms at ≤2.0% (v/v). Coriander inhibited all organisms except *Ps. aeruginosa* at ≤2.0% (v/v). Fixed oil pumpkin failed to inhibit any organisms at the highest concentration, which was 2.0% (v/v). While carrot inhibited Gram-positive bacteria and *C. albicans* only. None of the oils inhibited Gram-negative bacteria only. *Pseudomonas aeruginosa* was inhibited by the lowest number of extracts (two). *Candida albicans* and *Staph. aureus* were the most susceptible organisms, inhibited at ≤2.0% (v/v) by 8 and 7 extracts, respectively.

Table 1 Minimum inhibitory concentrations (MICs) of selected essential oils (%v/v), microbial products against 7 different microorganisms

Sr No.	Details of plant oils and extracts				Test organisms						
	Plant species	Common name	Extract type	Source	*Candida albicans*	*Enterococcus faecalis*	*Escherichia coli*	*Klebsiella pneumoniae*	*Pseudomonas aeruginosa*	*Salmonella typhimurium*	*Staphylococcus aureus*
1	*Citrus sinensis*	Orange	EO	PEEL	1.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
2	*Citrus limon*	Lemon	EO	PEEL	2.0	2.0	>2.0	>2.0	>2.0	>2.0	2.0
3	*Citrus paradisi*	Grape fruit	EO	PEEL	2.0	2.0	2.0	>2.0	>2.0	>2.0	>2.0
4	*Coriandrum sativum*	Coriander	EO	SEED	0.25	0.25	1.0	1.0	1.0	>2.0	0.25
5	*Cucurbita pepo*	Pumpkin	FO	SEED	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0

7	[illegible]	[illegible]	EO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	EO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	EO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EO- Essential oil, FO- Fixed oil, M.O-Microorganism

Discussion

Historically, many plant oils and extracts, such as tea tree, myrrh and clove, have been used as topical antiseptics, or have been reported to have antimicrobial properties Hoffman 1987, Lawless 1995. It is important to investigate scientifically those plants which have been used in traditional medicines as potential sources of novel antimicrobial compounds Mitscher *et al.* 1987. Also, the resurgence of interest in natural therapies and increasing consumer demand for effective, safe, natural products means that quantitative data on plant oils and extracts are required. Comparison of the data obtained in this study with previously published results is problematic. First, the composition of plant oils and extracts is known to vary according to local climatic and environmental conditions Janssen *et al.* 1987, Sivropoulou *et al.* 1995. Furthermore, some oils with the same common name may be derived from different plant species Wendholz *et al.* 1993, Reynolds 1989. Secondly, the method used to assess antimicrobial activity, and the choice of test organisms, varies between publications Janssen *et al.* 1987. A method frequently used to screen plant extracts for antimicrobial activity is the agar disc diffusion technique Morris *et al.* 1979, Smith-Palmer *et al.* 1998. this study confirms that many essential oils and plant extracts possess *in vitro* antibacterial and antifungal activity. However, if plant oils and extracts are to be used for food preservation or medicinal purposes, issues of safety and toxicity will need to be addressed.

Conclusion

Food processing and some preservation techniques, such as heating, may alter food's nutritional or organoleptic properties. Microbial resistance to current antimicrobial compounds has increased in recent years worldwide, therefore, alternative compounds must be investigated and developed. Consumer demand for more natural products and the growing need for alternative preservatives to ensure food safety, it is imperative that plant-derived antimicrobial compounds be fully assessed for their feasibility for food application. This new field of research has great potential for more evaluation to meet regulatory requirements and to fully elucidate the possibility of employing antimicrobials from the extensive source of plants worldwide. Naturally occurring antimicrobial compounds could be applied as food preservatives to protect food quality and extend the shelf life of foods and beverages. These compounds are naturally produced and isolated from various sources, including plants, animals and microorganisms, in which they constitute part of host defense systems. Many naturally occurring compounds, such as nisin, plant essential oils, and natamycin, have been widely studied and are reported to be effective in their potential role as antimicrobial agents against spoilage and pathogenic microorganisms. Although some of these natural antimicrobials are commercially available and applied in food processing, their efficacy, consumer acceptance and regulation are not well defined.

All these natural antimicrobial agents are easily available and cheap with no side effects will increase shelf life of the products produced by small scale industries mainly in urban and rural areas.

References

1) *Rakholiya K, Kaneria M, Chanda S. 2011. Basil: a natural source of antioxidants and its therapeutic applications. In: Microbial Activity in the Spices. Springer, Berlin, Heidelberg. pp. 189-202.*
2) *Burt S. 2004. Essential oils: their antibacterial properties and potential applications in foods—a review. International journal of food microbiology, 94(3), 223-253.*
3) *Bakkali F, Averbeck S, Averbeck D, Idaomar M. 2008. Biological effects of essential oils–a review. Food and chemical toxicology, 46(2), 446-475.*
4) *Tiwari BK, Valdramidis VP, O'Donnell CP, Muthukumarappan K, Bourke P, Cullen PJ. 2009. Application of natural antimicrobials for food preservation. Journal of agricultural and food chemistry, 57(14), 5987-6000.*
5) *Davidson PM, Taylor TM, Schmidt SE. 2013. Chemical preservatives and natural antimicrobial compounds. Food microbiology: fundamentals and frontiers, 4, 765-801.*

Davidson PM, Taylor MT. 2007. Chemical preservatives and natural antimicrobial compounds. In: Doyle P, Beuchat LR, Montville TJ, editors. Food microbiology: fundamentals and frontiers. Washington, DC: American Society for Microbiology Press. p. 713–34.

de Oliveira TM, de Fátima Ferreira Soares N, Magela Pereira R, de Freitas Fraga K. 2007. Development and evaluation of antimicrobial melamine-incorporated film in gorgonzola cheese conservation. Packag Technol Sci. 20(2): 147–53.

Devlieghere F, Vermeiren L, Bockstal A, Debevere J. 2000a. Study on antimicrobial activity of a food packaging materials containing potassium sorbate. Acta Aliment. 29(2): 137–46.

Devlieghere F, Vermeiren L, Debevere J. 2004a. New preservation technologies: possibilities and limitations. Int Dairy J. 14(4): 273–85.

Dorman HJD, Deans SG. 2000. Antimicrobial agents from plants: antibacterial activity of plant volatile oils. J Appl Microbiol. 88(2): 308–16.

Fitzgerald DJ, Stratford M, Narbad A. 2003. Analysis of the inhibition of food spoilage yeasts by vanillin. Int J Food Microbiol. 86(1–2): 113–22.

Gutierrez J, Barry-Ryan C, Bourke P. 2008. The antimicrobial efficacy of plant essential oil combinations and interactions with food ingredients. Int J Food Microbiol. 124(1): 91–7.

Han J, Castell-Perez ME, Moreira RG. 2005. Antimicrobial films as a potential technology to increase pathogen radiation sensitivity. Proceedings of IFT Annual Meeting. New Orleans, La. July 15–20.

Hoffman, D.L. (1987) The Herb User's Guide. Wellingborough, UK: Thorsons Publishing Group.

Janssen, A.M., Scheffer, J.J.C. and Baerheam Svendsen, A. (1987) Antimicrobial activity of essential oils: a 1976–86 literature review. Aspects of the test methods. Planta Medica 53, 395–398.

Lawless, J. (1995) The Illustrated Encyclopedia of Essential Oils. Shaftesbury, UK: Element Books Ltd.

López-Malo A, Marrs Alzamora S, Palou E. 2005. Aspergillus flavus growth in the presence of chemical preservatives and naturally occurring antimicrobial compounds. Int J Food Microbiol. 99(2): 119–28.

Muscher, L.A., Drake, S., Gollapudi, S.R. and Okwute, S.K. (1987) A modern look at folkloric use of anti-infective agents. Journal of Natural Products 50, 1025–1040.

Morris, J.A., Khettry, A. and Seitz, E.W. (1979) Antimicrobial activity of aroma chemicals and essential oils. Journal of the American Oil Chemists' Society 56, 595–603.

Natrajan N, Sheldon BW. 2000. Efficacy of nisin-coated polymer films to inactivateSalmonella typhimuriumon fresh broiler skin. J Food Protect. 63 (9): 1189–96.

Quattara B, Simard RE, Piette G, Bégin A, Holley RA. 2000. Inhibition of surface spoilage bacteria in processed meats by application of antimicrobial films prepared with chitosan. Int J Food Microbiol. 62(1–2): 139–48.

Ozdemir M, Floros JD. 2004. Active food packaging technologies. Crit Rev Food Sci Nutr. 44(3): 185–93.

Reynolds, J.E.F. (1996) Martindale – the Extra Pharmacopoeia. 31st edn. London: Royal Pharmaceutical Society of Great Britain.

Rupika LAS, Somweld K, Multz J, Bogger SW. 2005. Development and evaluation of low density polyethylene-based antimicrobial food packaging polymers containing thymol and carvacrol. Proceedings of 22nd IAPRI Symposium on Packaging, Campinas, Brazil, May 22–24.

Rydlo T, Miltz J, Mor A. 2006. Eukaryotic antimicrobial peptides: promises and premises in food safety. J Food Sci. 71(9): R125–35.

Singh TK, Drake MA, Cadwallader KR. 2003. Flavour of Cheddar cheese: a chemical and sensory perspective. Comp Rev Food Sci Food Safety. 2(4): 139–62.

Sivropoulou, A., Kokkini, S., Lanaras, T. and Arsenakis, M. (1995) Antimicrobial activity of mint essential oils. Journal of Agricultural and Food Chemistry 43, 2384–2388.

Smith-Palmer, A., Stewart, J. and Fyfe, L. (1998) Antimicrobial properties of plant essential oils and essences against five important food-borne pathogens. Letters in Applied Microbiology 26, 118–122.

Vermeiren L, Devlieghere F, Debevere J. 2002. Effectiveness of some recent antimicrobial packaging concepts. Food Addit Contam. 19(suppl.): 163–71.

Weng Y-M, Hotchkiss JH. 1992. Inhibition of surface molds on cheese by polyethylene film containing the antimycotic imazalil. J Food Protect. 58(5): 367–9.

Weng Y-M, Hotchkiss JH. 1993. Anhydrides as antimycotic agents added to polyethylene films for food packaging. Packag Technol Sci. 6(3): 125–8.

Windholz, M., Budavari, S., Blumetti, R.F. and Otterbein, E.S. (1983) The Merck Index, an Encyclopedia of Chemicals, Drugs and Biologicals. 10th edn. Rahway, NJ: Merck and Co. Inc.

Web Mining: An Application of Data Mining

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Abstract–
The World Wide Web is the largest, popular and most widely used information source, which is increasing day by day. The information over the web is available in the form of web pages, the content of web pages may include texts, images, audios, videos, lists, charts, tables, hyperlinks etc.Web page structure, users' navigation on the web sites and server logs also provides useful information. To extract meaningful information from the web and discover knowledge, web mining techniques are used. Web mining uses data mining techniques to extract knowledge from web. This paper presents the study of web mining and its types.

Keywords–Web mining, Web Content Mining, Web Structure Mining, Web Usage Mining.

I. INTRODUCTION

The World Wide Web is the largest, popular and most widely used information source. It is much popular among users because it can easily accessible and searchable. The information over the internet is increasing day by day.The web is continuously growing as the new information is added over it every day.Because of the web, users not only allow to search needed information on the web, but also easily share the information and knowledge with others.The information available on the webis in the form of web pages. The contents of web pages may include texts, images, audios, videos, links, lists, charts, tables etc. Analyzing such data can helps to extract meaningful information from web.

The web has number of applications like e-commerce,communication, social networking, etc. E-commerce is an important wayto performonline business; users can buy anything from large number of online stores.Users can search the needy items by selecting the appropriate options on e-commerce web sites.Theseselectionsor users navigation on these sites is an important data. Analyzing such data can help theonline stores to determine the choice, trend and demand of clients. That will not only helps these stores to decide the business strategies, user behaviour, services, campaigns, and predict future trends but also guides to provide more personalized content to particular visitors.The web also provides a handy way for users to communicate with each other through e-mail, and express the views through blogs and social sites.Analyzing and obtaining relevant information from large data available on web, which is not possible manually, for this automated extraction tools are required to extract targeted information.

Data mining is a method of discovering knowledge from huge centralized database calleddata warehouse, where the entire data is stored in a single huge database.[1].

II. OVERVIEW OF WEB MINING

Basically data mining technique are employed in web mining. Web mining is the applications of data mining methods to find out pattern from the WWW.Web mining is also known as text mining. It is extended version of data mining. Data mining is works upon off-line data whereas web mining is works upon on-line data. It is helpful to extract the information, image, text, audio, video, documents and multimedia. Web mining are often viewed as the use of data mining techniques to automatically retrieve, extract and determine information for knowledge innovation from web documents and services [2].It is the method of using data mining techniques and algorithms to take out information from the web by extracting it from web documents, web content, hyperlinks and server logs, etc.The main objective of web mining is to look for useful patterns in web data by collecting and analyzing information.The basic initiative of web mining is to aid users or site owners in finding relatively useful information[3].

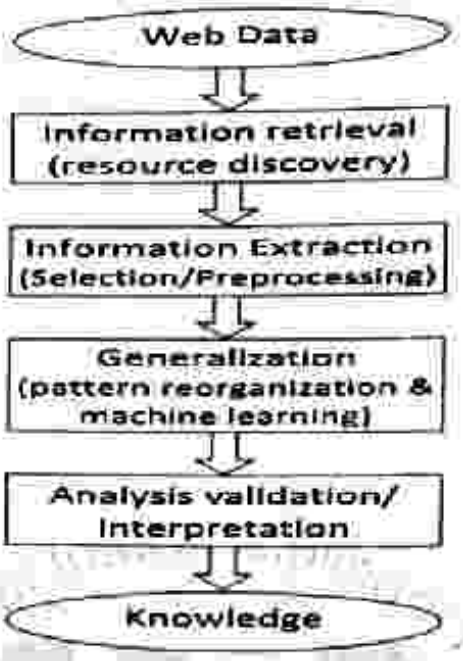


Fig.1: Subtasks of Web Mining

Web mining has various applications such that it helps to improve searching power of search engines and used to predict users behaviour. The four subtasks of web mining are shown in the Figure 1.

II. Web Mining Categories

Web mining can be broadly classified into three different types as shown in Fig. 2[4]:

- Web Content Mining (WCM)
- Web Structure Mining (WSM)
- Web Usage Mining (WUM)

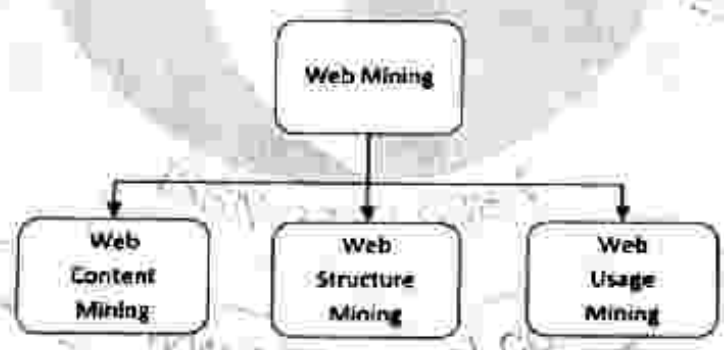


Fig. 2: Types of Web Mining

Web Content Mining

Web Content Mining is the method of extractingvaluable information from the contents of web cuments. Web content consists of different type of data such as text, image, video and audio [5].

Web content mining uses two approaches: Agent based approach and database approach [6,7]. The ent based approach looked for appropriate information and helps in organizing the searched information. ere are three types of agents [8] intelligent search agents which automatically searches for information cording to a particular query using domain characteristics and user profiles, information filtering,categorizing nt uses number of methods to filter data as per the predefine information, and personalized web agents learn r preferences and determine documents related to those user profiles [6,7].The database approach aids in ieving the semi-structured data from web documents. web content mining has the following approaches to ract data:

Unstructured text mining,
Structured mining,
Semi-structured text mining, and
Multimedia mining.[9]

There are various web content mining tools that helpfor downloading the crucial information. Some of them areweb Info Extractor, Mozenda, Screen-Scrapper, Rapid Miner,Web Content Extractor, Automation Anywhere v6.1[5].

2. Web Structure Mining

Web structure mining is a process to discover useful knowledge from the hyperlink of www. It analyzes the out-links and in-links of web pages. Generally it is used in ranking of web pages [4].It basically discovers the relationships between web pages linked by link connection.Four steps are required to perform in web structure mining [10]. The first step is data collection, in which hyperlinks are collected from web pages associated with seed URLs from various servers. The second step is preprocessing, in which data cleaning, link validation, link identification etc is performed. The third step is knowledge discovery, in which various data mining techniques such as statistical explication, association, clustering, pattern analysis etc are applied for processing data. The forth step is knowledge analysis, in which irrelevant information is filtered and interesting patterns are find out [10].Different algorithms are used in Web Structure Mining to rank the relevant pages, two well known algorithms are: PageRank algorithmand HITS [11].

3. Web Usage Mining

Web usage mining is required to process web data for guessing and recognizing accessed information. It is the type of web mining that helps in automatically finding out user access pattern [12].Web usage mining seeking to use the data produced by the users' session or behaviours. It mines the data which is drawn fromthe users'interactions with the web. The data used in the Web usage mining includes the data from the web server access logs, proxy server logs, browser logs, user profiles, user sessions, cookies,bookmark data, mouse clicks and navigations, and any other data [13].

Web Usage Mining applications are worked on data gathered from three key sources [15].

(i) Web servers: This gathers huge information in their log files and the databases log files. These logs typicallyinclude basic information like the IP address of clients, the access time, web page requested, etc. [13]

(ii) Proxy servers: Thiscollectsnavigation data at the proxy level is basically the similar as collecting data at the server level[15], and

(iii) Web clients: Thistracks client side data by using Java Script or java applets. This data avoid the problems of users' sessionidentification and provide detailedinformation about actual user behaviours [13].

There are various current web mining applications. Figure 3 shows fraction of web usage mining application [14].

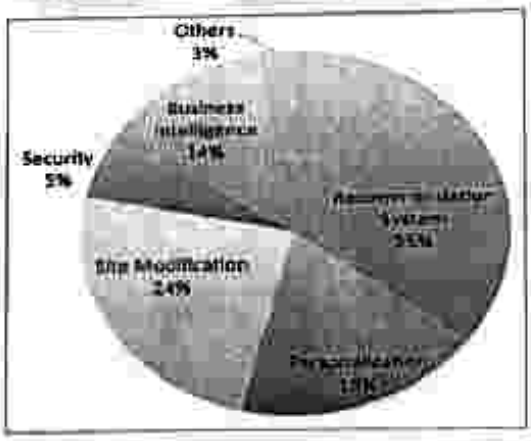


Fig. 3: Web Usage Mining Applications

IV. Conclusion

This paper deals with the study of web mining. Web mining is a powerful technique used to retrieve the online data from web.Web Content Mining is the process of extracting useful information from the multimedia contents of web documents. Web structure mining is a process to discover useful knowledge from the hyperlink of web and web usage mining is a process that discoversinformation from user access pattern, web server access logs, browser logs, user profiles, user sessions, cookies, etc.

REFERENCES

[1] Claus Pahl and Dave Donnellan, "Data Mining Technology for the Evaluation of Web-based Teaching and Learning Systems", 7th Int. Conference on E-Learning in Business, Government and Higher Education, October 2002.

[2] K. Sharma, G. Shrivastava and V. Kumar, "Web Mining: Today and Tomorrow", IEEE 3rd International Conference on Electronics Computer Technology (ICECT), pp. 399-4032011.

[3] Anurag Kumar and Ravi Kumar Singh, "Web Mining Overview, Techniques, Tools and Applications: A Survey," International Research Journal of Engineering and Technology (IRJET), vol. 03, no. 12, pp. 1543-1547, December 2016.

[4] P. M. Bharti and T. J. Raval, "Improving Web Page Access Prediction using Web Usage Mining and Web Content Mining", 3rd International conference on Electronics, Communication and Aerospace Technology (ICECA), Combatore, India, 2019, pp. 1268-1273.

[5] Anuragkumar and Kumar Ravi Singh, "A Study on Web Content Mining," International Journal Of Engineering And Computer Science, vol. 6, no. 1, pp. 20003-20006, January 2017.

[6] J. M. Kleinberg, "Authoritative sources in a hyperlinked environment", In Proc. of ACM-SIAM Symposium on Discrete Algorithms, pages 668–677, 1998.

[7] R. Cooley, B Mobasher, J.Srivastava, "Web mining: information and pattern discovery on the World Wide Web", In Proceedings of Ninth IEEE International Conference, pp. 558 – 567, 3-8 Nov. 1997.

[8] Inamdar SA and shindeGN, "An Agent Based Intelligent Search Engine System for Web Mining", International Journal on Computer Science and Engineering, Vol. 02, No. 03, pp 759-763, 2010.

[9] Johnson, F., Gupta, S.K., "Web Content Minings Techniques: A Survey," International Journal of Computer Application. Volume 47 – No.11, p44, June (2012).

[10] Suvam Sharma and AmitBhagat, "Data preprocessing algorithm for Web Structure Mining", Fifth International Conference on Eco-friendly Computing and Communication Systems (ICECCS), IEEE, 2016.

[11] Yeqing Li, "Research on Technology, Algorithm and Application of Web Mining", 2017

[12] Monika Dhandi and Rajesh Kumar Chakrawarti, "A Comprehensive Study of Web Usage Mining", Symposium on Colossal Data Analysis and Networking (CDAN), IEEE, Indore, 2016, pp. 1-5, 2016.

[13] S. P. Nina, M. Rahman, K. I. Bhuiyan and K. E. U. Ahmed, "Pattern Discovery of Web Usage Mining," 2009 International Conference on Computer Technology and Development, Kota Kinabalu, IEEE, pp. 499-503, 2009

[14] L. H. Sundan, "A survey on web usage mining techniques and applications," 2014 International Conference on Information Technology Systems and Innovation (ICITSI), IEEE, Bandung, pp. 39-43, 2014.

[15] Facca, Federico &Lanzi, Pier Luca, "Recent Developments in Web Usage Mining Research," Vol. 2737, pp 140-150, 2003.

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12. Water Quality and Potency of Kidney Stone Formation from Sangrampur Tehsil Area

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Abstract

Water quality is crucial aspect in front of human society. It influence on various facet o national development. All national and international aspect gets affected by water quality. Wate quality checked from various physico-chemical parameters. These parameters were evaluated b using various literature methods. Present research work regarding to the evaluation of variou physico-chemical parameters such as pH, EC, total hardness, alkalinity, chloride, fluoride sulphate, phosphate, calcium and magnesium of drinking water. These evaluation helps t understand the potency of kidney stone formation in population belong to Sangrampur Tahs area.

Introduction

Now a day world population continuously increases simultaneously increase in deman of fresh water. Today only the Ground water resources are available to effectively complete th demand of pure water of rural and urban populations. Most of the world population depends o ground water resources for the fresh water for drinking purpose. Approximately one third of th world population depends on ground water resources. Life on Earth widely influence by a water and various minerals, if any one influencing factor defected from their range it will show negative effect on human health. In India contaminated water immerge as a great proble Hydro-geochemical conditions influence the ground water quality. Kidney stone formati disease became a great disaster in front of world human society. Usually formation of stone the kidney (nephrolithiasis), ureter (ureterolithiasis), or urinary bladder(cystolithiasis) these sto produced due to the successive physicochemical events of supersaturation, nucleati aggregation and finally retention[1]. Calcium oxalate, calcium phosphate, calcium carbona

magnesium-ammonium phosphate, uric acid and cystine are the basic components observed in kidney stone[2] Different world portion having different probability of stone formation and it is estimated as 1% - 5% in Asia, 5% - 9% in Europe and 13% in North America[3] In India, 5-7 million patients are facing this trouble that is approximately 15%.[4] Kidney stone disease took a long time to cure and it accountably influence on other body function like epidemiological, biochemical, metabolic, and genetic risk factors. It is a multifactorial disease[5] Stone formation closely influence by drinking water quality. Water quality decides from various physicochemical parameters. Those parameters are determined from the known literature methods[6-10] Although there was some controversy observed in between to water quality and stone formation issue. No one devoted toward investigation of pre and post monsoon season water quality with respect to kidney stone formation in population belong to Sangrampur area. Therefore in present research scheme designed with title as water quality evaluation and potency of kidney stone formation from Sangrampur Tehsil area.

Materials and Methods

Selection of Patients

Subjected patients are selected from Saibai mote government hospital shegaon, PHC from sangrampur during April 2000 to April 2014 Patients belonging to study area reliably responded and they were consent for patient interaction and were provided proper and details information about their stone problem and daily life routine.

Collection of water samples

Denser kidney stone patient area specifically selected for sampling. Collection of samples was carried out from selected study areas on the same time. Water samples are selected from those water bodies used by population for drinking purpose from more than last 15 years. Sample was collected in 500-mL high-density, clean and sterile polyethylene bottles from those particular places where we got a maximum number of patients (case areas). Sampling were collected twice yearly in pre monsoon and post monsoon season. Before a sample was collected, the water was initially released for some time to ensure fresh water. Then the bottle was filled with water having no acid or air bubbles and was capped immediately to prevent atmospheric contamination[5]. Before analysis of sample, carefully labelled it and maintain temperature in cooling condition for next 24 hrs.

Analysis of water samples

After passing 24 hrs water samples were analyzed for pH, EC, TA, TDS, Total Hardness, calcium, magnesium, chloride, fluoride, phosphate and sulphate pH determination received more values because it indicate the acidic nature and pollutant contaminants status. The EC evaluation informed the mineral content and salinity of water, also revels the morganic pollution from of water.TDS study help to understand the total amount of morganic like potassium, calcium, sodium, bicarbonates, chlorides, magnesium, sulfatesas well as organic minerals contamanants from water. Titration method methods are used to examine the total alkalinity and hardness of water. All standard literature methods were used for physicochemical analysis of water[5].

Results and Discussion

This research work carried out in three parts. In first part preliminary information regarding to kidney stone patients was collected from different villages belong to sangrampur tehsil regions, from these study select the specific water sampling areas on the basic of patients density. It is the second part and in third part concern to determination of water quality form the analysis of physic-chemical parameters of sampling water. Analysis carried out by various standard methods. During present work total 1100 patients of kidney stone subjected for preliminary data. They are belonging to aged 10-75 years old and admitted in the Saiba Mote government hospital shegaon, PHC belong to Sangrampur region from 2000 to 2014. Out of 1100 kidneys stone patients 715 patients (i.e. 65%) were man and remaining 385 patients (i.e. 35%) were women and man to women sex ratio become approximately 2:1. Preliminary data tabulated in table no -1, table no. 2 represent physic-chemical analysis of water.

Twenty five highly kidney prone sampling station were selected for pH, Electrical conductivity, TDS, Total hardness, T.A., Ca^{2+}, Mg^{2+}, Chloride, fluoride, sulphate and phosphate. Total alkalinity and Acidity analyzed by using standard method as prescribed by APHA. The status of drinking water quality of study area and correlation is tabulated in Table 2 and Table 3 respectively for pre and post monsoon seasons.

Table 1: Characteristics of the patients (n=1100)

Characteristic	Value	Characteristic	Value
Age (y)	46.58±8.74	**Food habit**	
Gender		Vegetarian	375 (34.09%)
Male	715 (65%)	Non-vegetarian	725 (65.90%)

Female	385 (35%)	**Average stone size (cm)**	1–3
Daily water intake (L)		**Stone location**	Left and right kidney, ureter and urinary bladder
Less than 3	652 (59.3%)	Major constituent of stone (%)	
<2	103 (9.4%)	Calcium oxalate	~60 to 70
2–3	345 (31.4%)	Calcium phosphate	~5 to 10
More than 3	526 (47.8%)	Uric acid	~5 to 10
3–4	362(32.9%)	Struvite	~10 to 20
4–5	200(18.18%)	Symptoms	Flank and back pain, hematuria, nocturia, burning sensation during urine passage
>5	12 (1.09%)	**Lifestyle**	
Residence		Sedentary	399 (36.27)
Urban	00(0%)	Non-sedentary	701 (63.72)
Rural	1100 (100%)		

Table-2 Water parameters (Post sampling (Winter2012))

	Sample No.	TA	Ca^{2+}	Mg^{2+}	Cl	TH	TDS	E.C	SO_4^{2-}	F	PO_4^{3-}	pH
Akoli Khurd	DW1	521	213	65	412	300	2112	523	512	1.2	0.008	8.1
Asalgaon	DW2	314	216	198	300	1000	9526	564	345	0.7	0.002	9
Awar	DW3	523	400	330	112	1721	4131	1320	352	1.3	0.03	8.2
Bavanbir	DW4	519	280	36	412	213	600	521	524	0.9	0.024	7.8
Bhendwal	DW5	245	256	78	250	428	956	6523	302	1.3	0.011	8.1
Bhilkhed	DW6	329	199	107	200	610	2152	852	452	0.8	0.012	8.2
Bhoo	BW7	231	269	48	128	231	945	1452	545	0.9	0.033	8.2
Bodakha	DW8	301	220	127	390	545	2314	412	321	0.9	0.022	7.9
Chungephal	DW9	412	180	79	79	480	2564	456	345	1.3	0.024	8.1
Chavara	DW10	421	102	95	115	514	1745	845	546	1	0.02	7.8
Chondi	BW11	326	196	76	89	319	1325	654	382	1.5	0.01	8.2

Jalgaon	BW15	327	134	169	325	811	512	456	412	0.8	0.025	8.2
Jamod	BW16	572	512	936	412	6284	9556	2145	456	1.1	0.001	7.9
Jamgaon	BW17	203	214	51	175	312	521	7120	396	1.1	0.012	7.9
Kayagaon	BW18	571	301	135	125	1614	4921	1524	321	1.5	0.014	8.45
Kshirsvada	BW19	381	98	71	830	321	956	451	312	1.2	0.045	7.9
Kshoda	BW20	521	270	192	112	1662	2714	1254	356	1.1	0.012	8.5
Kukarda	BW21	523	681	662	670	4412	3952	4956	485	0.9	0.012	8.4
Kalamkhed	BW22	247	168	145	780	714	2541	561	685	0.9	0.011	7.9
Kalkhed	BW23	352	231	252	378	1012	923	521	314	0.9	0.021	7.9
Kathargaon	BW24	821	280	70	215	600	2784	1625	352	1	0.023	8.3
Kathol	BW25	512	288	142	542	641	2141	565	402	0.8	0.027	7.7
	Max	921	681	936	830	4412	9556	7120	685	1.5	0.049	9
	Min	203	84	50	70	200	512	412	302	0.7	0.001	7.7
	Average	416	260	230	557	1029	2237	1682	393.8	1.0	0.020	8.37

Table -3:- water parameters (Pre sampling (Summer 2013))

	Sample No.	TA	Ca^{2+}	Mg^{2+}	Cl	TH	TDS	E.C	SO_4^{2-}	F	PO_4^{3-}	pH
Akoli Khurd	BW1	445	145	52	355	252	2500	450	450	1.1	0.009	7.74
Antgaon	BW2	212	109	181	213	644	0674	440	295	0.8	0.002	8.89
Asni	BW3	490	378	120	96	1696	5502	1240	275	1.4	0.028	7.9
Bawaner	BW4	425	201	50	333	170	490	430	424	0.7	0.022	7.45
Bhendwal	BW5	165	196	66	146	323	900	0412	255	1.2	0.012	7.88
Bhilkhed	BW6	215	168	97	193	570	2000	750	350	0.9	0.011	7.97
Bhoti	BW7	185	241	84	71	202	800	1320	280	0.6	0.033	7.95
Bodakha	BW8	195	200	90	122	488	2000	980	200	0.8	0.022	7.73
Chanegaon	BW9	390	90	62	55	336	2400	512	290	1.2	0.027	7.89
Chavara	BW10	344	93	65	97	444	1600	718	488	0.9	0.022	7.83
Chendi	BW11	250	80	54	69	270	1200	590	294	1.1	0.060	7.89
Dhamangaon	BW12	204	75	35	177	312	900	425	244	0.9	0.221	8.10
Dhanora	BW13	325	123	85	484	302	1600	512	296	0.6	0.020	7.92
Godegaon	BW14	125	203	51	71	276	1000	1578	284	0.9	0.044	7.86
Jalgaon	BW15	205	80	154	298	734	900	590	335	0.7	0.029	7.66
Jamod	BW16	350	498	316	455	4200	5684	2000	523	1.1	0.052	7.14
Jamgaon	BW17	180	153	56	92	208	400	0250	250	1.1	0.032	7.7
Kayagaon	BW18	531	278	501	71	1520	3665	1400	285	1.1	0.054	8.45
Kshirsvada	BW19	260	915	51	159	270	800	592	302	1	0.045	7.68
Kshoda	BW20	450	221	170	49	725	1851	1150	279	0.8	0.032	8.37
Kukarda	BW21	470	634	892	597	4328	5989	3540	490	0.8	0.089	8.02
Kalamkhed	BW22	180	152	125	360	692	2400	420	356	0.6	0.02	7.72

Kalkhed	BW23	245	200	212	303	982	800	450	206	0.7	0.021	7.34
Kathangaon	BW24	720	275	62	163	534	2600	1580	204	0.9	0.021	8.14
Kathol	DW25	315	214	128	445	586	2080	420	300	0.6	0.027	7.54
	Max	720	634	912	759	4328	9984	6750	599	1.4	0.221	8.50
	Min	160	50.5	31	55	112	400	312	200	0.6	0.001	7.13
	Avg	323	214	194	274	958	3269	1528	325	0.92	0.034	7.849

Conclusions

Table 1 reveals the preliminary information about the 1100 patients belong to study area This information's depicted about the density and intensity of kidney stone disease This knowledge helps to selection of study area from Sangrampur region **Table-2** and **Table -3** reveals the current trends of physicochemical parameter of drinking water in post-monsoon (2012) and pre-monsoon (2013) season respectively

Table- 2 reveal that, **Total Alkalinity** values of drinking water from DW5, DW7, DW8, DW14, BW17, DW22 were found to be below the permissible limit while BW observed beyond permissible limit of TA value. **Total Hardness values** of drinking water from DW2, DW3, DW6,BW15, BW16, BW18, BW20,BW23,DW21 and DW25were found to be beyond permissible limit and their total average 1029.2 mg/l **Total dissolve solid values** of drinking water from DW1,DW2,DW3,DW6, DW8,DW9, DW21, DW22,DW25, BW16,BW18,BW20,BW24 were found to be beyond permissible limit and their total average is 2737.8 mg/l **Electric conductivity values of drinking water from** DW3,DW5,DW6,DW7,DW10,BW14,BW16, BW17,BW18,BW20,DW21, BW24 were found to be beyond permissible limit and their total average is 1682 1mg/l **Ca^{2+} values of drinking water from** DW1,DW2,DW3,DW4,DW5,BW7,DW8,BW14,BW16, BW17,BW18, BW20,DW21,BW23, BW24, DW25 were found to be beyond permissible limit and their total average is 260.01mg/l. **Mg^{2+} values** of drinking water belong to DW2,DW3,DW6,DW8, DW15, BW16, BW18,BW20, DW21,DW22, DW23,DW25 were found to be beyond permissible limit and their total average is 210mg/l **Cl** values of drinking water belong to DW3, DW6,BW7, DW9, DW10,DW11,BW14, BW17,BW18, BW20 were found to be below permissible limit and their total average 337mg/l **$SO4^{-2}$** values of drinking water belong to DW1, DW4, DW6, DW10, DW21, DW22, DW25, BW15, BW16 found to be beyond permissible limit and their total average is 403.81mg/l **F values** of all drinking water samples were found in within permissible limit and their total average is 1.05 mg/l. **$PO4^{-3}$** values of drinking all water samples

Kalkhed	BW23	245	200	212	303	982	800	450	206	0.7	0.021	7.34
Kathangaon	BW24	720	275	62	163	534	2600	1580	204	0.9	0.021	8.14
Kathol	DW25	315	214	128	445	586	2080	420	300	0.6	0.027	7.54
	Max	720	634	912	759	4328	9984	6750	599	1.4	0.221	8.50
	Min	160	50.5	31	55	112	400	312	200	0.6	0.001	7.13
	Avg	323	214	194	274	958	3269	1528	325	0.92	0.034	7.849

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are found in permissible limit and their total average is1682.1mg/l **pH** value of all drinking water samples were found within permissible limit excepting DW2

Table-3 reveals that **Total alkalinity** value of drinking water found to be within permissible limit excepting BW24 water sample And their total average is 323.1mg/l **TH:** DW2, DW3, BW15, BW16, BW18, BW20, DW21, DW22, BW23 found beyond permissible limit Average is 958.2mg/l **Total Dissolved Solid** values of drinking water of DW2, DW3, DW9, BW16, BW18, BW20, DW21, DW22, DW24 found to be beyond permissible limit and their total average is 3269 mg/l **Electric conductivity** values of drinking water from DW3,DW5,BW7,BW14,BW16,BW17, BW18, BW20,DW20,DW21,BW24 were found to be beyond permissible limit and their total average is 1528.3 mg/l. Ca^{2+} values of drinking water from DW3,DW4,BW7,DW8,BW14,BW16,BW18, BW20, BW21,BW24,DW25 found to be beyond permissible limit Mg^{2+} values of drinking water belong to DW2,DW3,BW15,BW16,BW18,BW20,BW21,DW21,DW22,BW23,DW25 were found to be beyond permissible limit and their average is 194.6 mg/l. **Cl** values of drinking water of DW1, DW2, DW4,DW8,BW13,BW15,BW16,DW19,DW21, DW22, BW23,DW25 were found to be beyond permissible limit and their average is 274.2 mg/l. $SO4^{-2}$ values of drinking water belong to DW1, DW4, DW5, DW10, DW22 were found to be beyond permissible limit and their total average is 325mg/l. **F** values found in permissible limit for all water samples and their total average is 0.9148mg/l. $PO4^{-3}$ values of all water samples were found to be in permissible limit and their average is 0.034mg/l. Total average of **pH** values for all water samples found to be 7.85

It is observed that those water samples parameters values beyond to permissible limit which is responsible to low quality of water. Due to higher values of total hardness, EC, Calcium and magnesium increases the risk of kidney stone formation. It is advice to villagers to boil water cool and filter it to minimize the risk of kidney stone diseases. Kidney stone may occur due to continuous use of hard water.

References

1) Robertson WG, Peacock M, Baker M, Marshall DH, Pearlman B, Speed R, et al. Studies on the prevalence and epidemiology of urinary stone disease in men in Leeds. Br J Urol. 1983; 55:595–598.

2) Hussain M, Lal M, Ali B, Ahmed S, Zafar N, Naqvi A, et al. Management of urinary calculi associated with renal failure. J Pak Med Assoc. 1995; 45:205–208.
3) Biradar AN, Patil SB, Yadawe MS, Kundargi VS. Influence of water quality on urolithiasis. World J Pharm Res. 2014;3:483–487.
4) Kleiner SM. Water: an essential but overlooked nutrient. J Am Diet Assoc. 1999;99:200–206.
5) Khan S, Shahnaz M, Jehan N, Rehman S, Shah MT, Din I. Drinking water quality and human health risk in Charsadda district, Pakistan. J Clean Prod. 2013;60:93–101.
6) Borghi L, Meschi T, Schianchi T, Briganti A, Guerra A, Allegri F, et al. Urine volume: stone risk factor and preventive measure. Nephron. 1999;81(Suppl 1):31–37.
7) World Health Organization. Guidelines for drinking-water quality, health criteria and other supporting information. 2nd ed. Vol 2. Geneva: World Health Organization; 1997.
8) Indian Council of Medical Research. Manual of standards of quality for drinking water supplies. Indian Counc Med Res. 1975;Spl. Rep No 44:27.
9) Kumar M, Puri A. A review of permissible limits of drinking water. Indian J Occup Environ Med. 2012;16:40–44.
10) Garg VK, Suthar S, Singh S, Sheoran A, Garima, Meenakshi, et al. Drinking water quality in villages of southwestern Haryana, India: assessing human health risks associated with hydrochemistry. Environ Geol. 2009;58:1329–1340.

2019-20

OCCURRENCE OF FLUORIDE IN GROUND WATER OF SANGRAMPUR TAHASIL IN BULDANA DISTRICT, MAHARASHTRA, INDIA

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ABSTRACT

The concentration of fluoride in Ground Water influences the dental caries situation in the region. There are no studies reported determining the fluoride levels in Ground Water supplies of Sangrampur region. In India, Buldana district is a one of the part saline area. Considering this things in mind, in present work pay my attention to determination of fluoride in Ground Water at various villages of Sangrampur Region. The aim of this study is to determine the fluoride level in GroundWater samples from different areas of Sangrampur region. A total of 25 water subsamples were analyzed for fluoride content, using SPADNS reagent and acid zirconium chloride by spectrophotometer at 570nm. In this study, it was observed that the fluoride level in Ground Water of Sangrampur was below the recommended levels suggestedbyWHOandBIS.

Keywords:*Ground Water, Sangampur, Fluoride, Saline area.*

Introduction

Water is the major element required by an individual for survival. The daily consumption of water from different sources exposes an individual to various elements present in water which can be either beneficial or harmful. Fluoride is widely distributed in nature in soil, water, air, vegetation, agricultural products and sea foods. It is found as fluorite, Cryolite and Fluoroapatite in rocks. Surface water seldom has fluoride more than 0.3 mg/L. Ground water sources such as dug well, shallow and deep hand pumps, especially tube well, may contain excess fluoride where minerals like Cryolites, Biotites and Fluoroapatite are present. This is mainly due to the dissolution of fluoride from fluoride bearing minerals.[8]The fluoride level in drinking water is an important parameter and has to be controlled to prevent dental and skeletal fluorosis.[1] Almost 200 million people from 25 countries are at risk of health problems for high concentration of fluoride in their drinking water.[2][23] Many epidemiological studies have shown that long-term consumption of drinking water with a high-fluoride concentration (>4 ppm or mg/L) leads to many adverse effects on human including dental and skeletal fluorosis, so that the World Health Organization (WHO) sets the desirable level of fluoride in potable water as 0.5–1.5 ppm.[2][4][5][6]It is also known that disposal of industrial effluents and sewage into fresh water cause ground water pollution.[12] Fluorspar is commonly known as an ore of mineral fluorite. Fluorite/Fluorspar occurs in many rocks in varied forms. The fluoride content of the rocks, due to repeated weathering, gets slowly dissolved in water, when the water acquires acidic nature. In this procedure, water gets contaminated by fluoride. Excessive intake of fluoride leads to serious effects on the teeth during tooth formation and abnormal hardening of bones, leading to a condition known as fluorosis that is exacerbated by poor diets deficient in calcium and vitamins. Many of the states of the Indian union have alarmingly high concentration of fluoride in their water resources[10]. Fluoride ion in traces in drinking water helps in growth and development of healthy, resistant teeth, and bones.[7] The concentration of fluoride in drinking water is one of the factors strongly influencing the dental caries situation globally.Fluoride levels are monitored in drinking water supplies to achieve the required safety.[8] Knowledge of fluoride level in potable water is important for health-care personnel and policymakers.[2] However, there are no studies on the level of fluoride in drinking water in Sangrampur region. We therefore planned this study to determine the fluoride concentration in drinking water from 25 different Ground water sources in Sangrampur region.

Study Area

In India, Sangrampur is a small beautiful town located in Buldana district of Maharashtra

state. It lies to border of Jalgaon Jamod tehsil area of Buldana district in north side, the Shegaon tehsil of the Buldhana District in the south, the Telhara tehsil of the Akola District to the east and the Burhanpur District of the Madhya Pradesh State to the north. Its Coordinates are: 21.03°N 76.68°E. It has an average elevation of 273 metres (898 feet). Population of Sangrampur tehsil 137092 as per the survey of census during 2 by Indian Government. The tehsil has an a of 594 km^2 and consists of 105 villages. It population of around 97,000. Basic Agriculture is main occupation of people Sangrampur tehsil.

Sampling location of study area is shown in the Table No:1.1

Sl. No.	Sample Number	Name of Village	Sl. No.	Sample Number	Name of Village
1	DW1	Bhon	14	BW14	Ukalgaon
2	DW2	Pesoda	15	BW15	Pimpari
3	DW3	Khiroda	16	BW16	Rudhana
4	DW4	Savali	17	BW17	Bhilkhed
5	DW5	Paturda	18	BW18	Kathargaon
6	DW6	Awar	19	DW19	Marod
7	BW7	Kavathal	20	BW20	Wakana
8	DW8	Warvat Khanderao	21	DW21	Wankhed
9	DW9	Jastagaon	22	DW22	Bodakha
10	DW10	Kalamkhed	23	BW23	Tamgaon
11	BW11	Takaleshwar	24	BW24	Nirod
12	BW12	Chondi	25	DW25	Ringanwadi
13	BW13	Kakoda			

Symptoms

In dental fluorosis the common symptoms observed are discolouration of the teeth. It may start with white yellow and become brown to black. The discolouration may be in spots/ streaks, invariably horizontal in orientation; during its development, new layer of the matrix are added. Dental fluorosis is usually reversible if no permanent damage is done. The recovery has been observed in case of several patients using fluoride reduced water during treatment (Acharya&Mathi, 2010).

Material and Methodology

In the present study, deep tube well water samples were collected from different villages of Sangrampur region of Buldana District, Maharashtra, India. Samples were collected in thebrown glass bottles without addingreagent and acid zirconium chloride by using spectrophotometer at 570 nm (Trivedy & Goel 1983). The concentration of fluoride was determined in term of mg/L.

Result and Discussion

The current WHO guideline value for fluoride in drinking water is 1.5 mg/L (WHO, 2011).[1][2] In temperate regions, where water intake is low, fluoride level up to 1.5 mg/L is acceptable. The Ministry of Health (MOH), Government of India (GOI), has prescribed 1.0 mg F/L and 2.0 mg F/L as the permissive and excessive limits, respectively.[1][2] In the month of July to October 2019 average fluoride concentration found to be 1.148 mg/l and 1.5 mg/l maximum, 0.8 mg/l minimum fluoride concentration. In the month of November to January 2019 average fluoride concentration found to be 1.22 mg/l and 1.5 mg/l maximum, 0.9 mg/l minimum fluoride concentration. In the month of February to May 2020 average fluoride concentration found to be 0.864 mg/l and 1.1 mg/l maximum, 0.6 mg/l minimum fluoride concentration. Theanalysis revealed that during mean concentration of fluoride level in water samples from Sangrampur region was below the recommended levels by the WHO as well as the MOH, GOI.

Conclusion

The mean concentration of fluoride level in water samples from Sangrampur region of Buldana District, Maharashtra, India was 0.5 mg/L. The observed fluoride level in drinking water from all the sources was less than that recommended by the WHO as well as the MOH, GOI.

Table 1.2 Concentration of Fluoride in Ground water Samples of Sangrampur region of Buldana District, Maharashtra,India(2019-2020)

Sr.No	Abbreviated Form	Place of Sampling	Concentration (mg/l)	Concentration (mg/l)	Concentration (mg/l)
1	DW1	Bhon	1.1	1.2	0.8
2	DW2	Pesoda	1.2	1.3	0.6
3	DW3	Khiroda	1.3	1.1	0.7
4	DW4	Savali	1.4	1.4	0.9
5	DW5	Paturda	1	0.9	1
6	DW6	Awar	1.2	1.3	1.1
7	BW7	Kavathal	1.3	1.1	0.7
8	DW8	Warvat Khanderao	0.9	1.1	0.9
9	DW9	Jastagaon	1.3	1.5	1
10	DW10	Kalamkhed	0.9	1.4	0.7
11	BW11	Takaleshwar	0.9	1.3	0.8
12	BW12	Chondi	1	1.2	0.9
13	BW13	Kakoda	1.4	1.2	1.1
14	BW14	Ukalgaon	1	1.2	0.8
15	BW15	Pimpari	0.9	1	0.9
16	BW16	Rudhana	0.9	1.1	0.7
17	BW17	Bhilkhed	1.3	1.1	0.9
18	BW18	Kathargaon	1.2	1.1	1.1
19	DW19	Marod	0.9	1.2	0.7
20	BW20	Wakana	0.8	1.3	0.8
21	DW21	Wankhed	1.0	1.1	0.8
22	DW22	Bodakha	1.4	1.5	0.9
23	BW23	Tamgaon	1.5	1.2	1.1
24	BW24	Nirod	1.5	1.3	0.8
25	DW25	Ringanwadi	1.4	1.4	0.9
		Average	**1.148**	**1.22**	**0.864**
		Max	**1.5**	**1.5**	**1.1**
		Min	**0.8**	**0.9**	**0.6**

:RainySeason(MonthofJuly-October,2019);**:WinterSeason(MonthofNovember-January,2019-20);:SummerSeason(MonthofFebruary-May,2020)***

References

1. APHA (1989) Standard Methods for the Examination of Water and Waste Waters. 17th ed. Washington, APHA AWWA, WBCF.
2. BIS (1991) Drinking Water-Specification. New Delhi, Bureau of Indian Standards (IS 10500-91) 2 1 ed. New Delhi, India.
3. Bulusu, K.R., and Nawlakhe, W.G. (1992) Defluoridation Nagpur, National Environmental Engineering Research Institute (NEERI), p 61.
4. Indian Standards, Revised (2003) Specification for Drinking Water.

Bureau of Indian Standards, New Delhi (IS 10500-91).

5. Ceopalan, C. (2003) The Changing Epidemiology of Malnutrition in Developing Society. Current Science, 77, p. 1257
6. Choubisa, S.L. (2001) Endemic flourosis in SouthernRajasthan, India. Fluoride, 34, pp. 61-70
7. Indian Council of Medical Research (ICMR) (1975) New dimension of fluorosis in Andhra Pradesh. 5, Indian Council of Medical Research, pp. 1-5.
8. Kudesia, V.P. (2003) Environmental Chemistry. PragatiPrakashan, Meerut, 2nd ed. pp. 145-148.
9. Ministry of Work and Housing (MWH) (1975) Govt. of India: NirmanAurAwasMantralaya [Internet], New Dehli. Ministry of Work and Housing. Availabale from: <http://www.niua.org/mpd/Pages%20from%20MPD1962_notifications_pages141-176.pdf > [25th June 2012].
10. Misra, A.K., and Mishra, A., and Premaj. (2006) Escalation of Ground Water Fluoride in the Ganga Alluvial Plains of India. Fluoride, 39, pp. 35-38.
11. NEERI (1978) Nalgonda technique for deflouridation, fill and draw type deflouridation plant. National Environmental Engineering Research Institute Manual, Nagpur, Technical Digest, p. 59.
12. Oberoi, L., and Gupta, K.C. (2010) Occurrence of fluoride in ground water
15. Susheela, A.K. (1999) Fluorosis managementprogramme in India. Curr. Sci., 77, pp. 1250-1256.
16. Susheela, A.K. (2007) Fluorosis managementprogramme in India. Curr. Sci., 77, pp. 1250-1256.
17. Trivedy, R.K., and Goel, P.K. (1983) Chemical and Biological Methods for Water Pollution Studies. Karad, Environ. Media Publication, pp. 209.
18. Tiwari, S., and Pande, R.K. (2010) Atatus of fluoride in the waters of Uttrakhand. Poll. Res., 29(3), pp. 428-43
19. Amouei A, Mahvi AH, Mohammadi AA, Asgharnia HA, Fallah SH, Khafajeh AA. Fluoride concentration in potable ground water in rural area of Khaf City, RazaviKhorasan Province, Northeastern Iran. Int J Occup Environ Med 2012;3:201-3
20. Ayoob S, Gupta AK. Fluoride in drinking water: A review on the status and stress effects. Crit Rev Environ SciTechnol 2006;36:433-87.
21. Meenakshi, Maheshwari RC. Fluoride in drinking water and its removal. J Hazard Mater 2006;137:456-63
22. WHO. Guidelines for Drinking-Water Quality. 4th ed. Geneva: World Health Organization; 2006
23. Singh B, Gaur S, Garg VK. Fluoride in drinking water and human urine in Southern Haryana, India. J Hazard Mater 2007;144:147-51.
24. Rajković MB, Novaković ID. Determination of fluoride content in drinking water and tea infusions using

3.3.5 Bibliometrics of the publications during the last academic year based on the average citation index in the scopus /web of science or pub

Title of the Paper	Name of author	Title of Journals	Year Of Publication	Citation Index	Institutional affilation as mentioned in the	No. of citation Excluding
Bianchi Type-III universe scalar with electromagnetic filed Theory of Gravity with declaration parameters	K.R.MULE ,V.G METE AND S.W.BAWANE	Ayusi Inter.Journal and I.D journal	2020	0	NIL	0
Homogeneous Bianchi Type –III Bulk viscos Model in presence G & ^ in Scalar Tensor Theory of Gravitation	K.R.MULE ,V.G METE	Int.res.J. of science & engineering	2020	0	NIL	0
Water Quality Assessment and Kidney stone formation from Jalgaon Jamod Area of Buldana District Maharashtra	Dhammapal L. Bhade, mahendra d. dhande	Research Journey	Nov.2019	0	NIL	0
Replacing Synthetic Food Preservatives with Natural Antimicrobial Food Preservatives – A Feasibility Study for Small Scale Industries (PN 176-179)	Rahul Bahadur Barabde	Aayushi International Interdisciplinary Research Journal Peer Reviewed Journal www.aiirjournal.com	24-Jan-20	0	NIL	0
Replacing Synthetic Food Preservatives with Natural Antimicrobial Food Preservatives – A Feasibility Study for Small Scale Industries (PN 176-179)	DR YAMINI SADASHIVRAO PATIL	Aayushi International Interdisciplinary Research Journal Peer Reviewed Journal www.aiirjournal.com	24-Jan-20	0	NIL	0

08

Resource Sharing In Role Of Libraries

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ABSTRACT

In the recent past, Resource sharing concept has become prime factor and playing vital role in libraries because of innovative developments in Information, Communication and Technology(ICT). ICT has made easy to establish networks among libraries and share their information resources quickly and instantly. Resource sharing has become prime reason for establishing cooperation between libraries without any geographical barriers. The various reasons for resource sharing are might be cost benefits, non-availability of resources, insufficient library funds, lack of skills etc. In this paper, the attempt has been made to understand the various aspects of resource sharing in modern library technological environment

Key words: Resource Sharing, Computer Networking, Libraries

1. Introduction:

In the modern world, especially in the world of science, the information is endless and ever changing. Every day newer concepts are replacing the older systems and new findings are being made. Every those changes are recorded or stored as information in libraries. Every library is a social institution and such it is the primary duty of the librarian to meet the need of the users. The needs of the users are diverse and growing day-by-day. It is almost impossible for any libraries to self-sufficient to fulfil the information requirements of the users. Libraries are considered as service oriented organizations hence they doesn't have much revenue to procure resources. To overcome this problem, libraries can go for the concepts of Networking and Resource Sharing.

WHY RESOURCE SHARING?

The famous information scientist Allen Kent said that "the success and survival of big libraries will depend on how much and to what extent libraries co-operative with each other in future" A single library cannot offer and meet the requirements of users due to many constraints such as resources, funds, space, man power etc. Hence, resource sharing play a vital role to overcome from these constraints. For instance, a library may have a book which is needed for the user of other library and this case can be a visa-versa. The sharing of resources is prime factor due to limited library budget and will reduce the operational cost of libraries. Another way this could help us to ensure the optimum level of utilization of resources with minimal cost without any duplication and easy access to resources in any format as well.

The necessity of resource sharing is mentioned as below;

- For better use of Library Resources in low prices.
- Faster cooperation and Communication among the member libraries.
- For the pooling, sharing and electronically accessing the library resources.
- To provide High level literature/ resources for its users of College Libraries.
- To optimize the best usage of available library resources

The colleges can subscribe to a particular journals or e-journals and get the benefits of membership

The same way the other pool member can subscribe for some other journal and share them.

The following factors are caused for establishing resource sharing among libraries.

- Information explosion and various methods of information and publications

Limited funding
Verity needs of students
Increase in number of users
Steep increase in literature, growth of publications and also the cost of publications.
Raise of new subjects and specialization
In earlier days only printed resources were available, but in present world digital resources are available in variety of electronic forms and can easy to access and share

'ary Consortium Model for Resource ring:-

Many thousand type of possibility of ssortia in the world which organized in ferent ways. During the last three decades, raries have formed a variety of organization odels to obtain different kinds of supportive easures for the participants. The consortium odel depends upon the needs and equirements of member's participant. herefore, consortia models are not well defined nd vary in nature. The consortia models which sed in India are generally based on participations', affiliation and funding sources The important consortia models are as below:

i. Open Consortium

This type of consortium is very flexible and it is the wish of members of consortia can join and leave any they please INDEST Consortium is an example to this.

ii. Closed Group Consortium

It is within defined group This kind of consortia emerges either by affiliation and collaboration among them like CSIR, DAE, IIM Consortium. And the formation and operation of the consortia guidelines and its administration are fairly simple and easy.

iii. Centrally Funded Model

In this model, consortium will solely depend on the parent body. A few examples are INFONET by UGC, ICMR, CSIR and DSIR

iv. Shared- budget Model

"In this model the participating libraries take the lead and form the consortium. IIM and FORSA are examples of this model"

v. Publisher Initiatives

The Emerald Full Text Library published by the Emerald Publishing Group (formerly MCB University Press) is recent example. Here, the consortium members will get deep discount price to the participating libraries

Need for Library Consortium:

The consortium is needed for libraries because of

1. Information explosion
2. Diversity of user needs
3. Financial crunch
4. Impossibility of self sufficiency

5 Advantages of Consortia

Other Resource Sharing

A consortium may also share other resources in the following manner for their mutual benefit of the participating libraries [3]

- Sharing the storage facilities, thereby minimizing expenditure on space
- Sharing of human resources at local, regional and national levels
- Pooling of expert manpower and promoting professional development
- Assist member libraries in creating information technology infrastructure
- Facilitating joint preservation and archiving activities for print and digital materials
- Initiating and supporting research projects of common interest
- Collectively promoting, marketing and publicizing the library services

Library Networking:

Library network means interlinked libraries or a system in which many library points stretched across a locality, city, state, region, nation or world are linked with each other for information communication. Networking implies putting together sub-sets of information centres or libraries in order to act in a co-operative manner with the pre-determined obligation. It offers increased access to larger resources and for a greater measure of service than the sum of all the constituents' parts. According to National Commission on Libraries and Information Science (NCLIS) in the context of

Library and Information Service a network is defined as "two or more libraries and/or other organizations engaged in a common pattern of information exchange, through communication for some functional purpose".

Need for Library Networking

- To improve flow of information
- To improve contact among individuals, groups or organizations
- To improve collection and mobility of data/information
- To maximize utilization of resources
- To facilitate the planning and implementing of policies and activities
- To avoid duplication in research and development

Network based Library Services:

All the libraries which are rich in collection provide more and effective services to the user preciously. The result is not satisfying all the clients due to increase of user needs and lack of manpower in libraries. But this scenario now changed by information explosion. Information technology has given many useful changes in the libraries especially in the past ten years. Now a day's most of the libraries are providing IT based services to its clients. Network based services are very cost effective and offer many opportunities provided to the users through network which are not possible to provide manually.

Roles of Library and Librarian in information resource sharing via ICT facilities

The library is expected to provide the following and librarians are equally expected to harness the following to offer services: Provide access to information resources

• through online catalogue, indexes and databases including full text e-resources;

• through connections to local, regional and global networks; and

• by securing materials for students, academics and staff through interlibrary loan and other resource sharing arrangements powered by ICT and internet connectivity . · Provide state of the art ICT infrastructure: in hardware and software, sufficient bandwidth and responsive network management system. Expert and professional support to facilitate thorough and accurate use of all library resources; Easy access to library information resources and services through web.

Conclusion

Information and Communication Technologies infrastructure refers to in this study constitutes the provision of necessary hardware - software - communication channels and the Internet platform to connect telecommunication lines. The availability of sound ICT infrastructure and effective ICT policy framework is essential to provide system security, reliability and durability which will enhance the performance of knowledge sharing in digital environment

Reference

1. Muhammed, Rabiu .Aliyu. (2012) The Roles of Library and Librarian in Information Resource Sharing in the Emerging Information Society. Information and Knowledge Management Vol 2, No.7.

2. Verma, Manoj Kumar.(2016) Role of Library Consortia in Resource Sharing and Its Benifits for Academic Library with Special Reference to UGC_Infonet Digital Library Consortium for Academic Library with Speci... Conference Paper August https://www.researchgate.net/publication/311233738.

3. Chatterjee,Amitabha. Resource Sharing Among Libraries In Digital Era: Role Of Consortia

4. NARASIMHAN (G N). Resource sharing focus on history ILL and document delivery, cooperative collection development – assumptions, problems, solutions. National Conference on Information Management in E-libraries, Kharagpur, 2002. Proceedings. p. 556-564.

5. Ejedafiru Efe Francis.(2011) Resource Sharing Activities In Academic Librariesservices: Result Ofa Survey. Journal of Information Management vol. 2[1]

6. Chinnasamy, K.& Venkatachalam A.M. Networking And Resource Sharing Among Libraries.

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(Vol- I)

Sahakar Maharshi Late Bhaskaarrao Shingne
Smruti Arogya and Shikshan Prasarak Mandal's

SAHAKAR MAHARSHI LATE BHASKARRAO SHINGE ARTS COLLEGE,

KHAMGAON, DIST.BULDHANA (M.S.)

(Affiliated to Sant Gadge Baba Amravati University, Amravati.)

Index

01) Library Consortia: Need and Advantage
Atul D. Vikhe, Patur ||15

02) Ngugi Thiong'o and Unheard Voices
Dhaygude Kakasaheb Dhondiba, Jalna ||18

03) Indian Sports Culture
Dr. Shrikant Aloney, Yavatmal ||21

04) Significance of Subaltern History
Dr. Balram Baghel, Barwani ||24

05) Significant of Sports Cultures
Ganesh Vishwakarma, Buldhana ||27

06) Ragging: Need to Control in Current Scenario
Dr.Nilima Dawane, Wani ||30

07) Role of Music in human life
Dr.Anirudha Mukund Khare, Akola ||33

08) Resource Sharing In Role Of Libraries
Ranjana K. Jawanjal, Shegaon ||36

09) Dalit Literature: The Voice of the Voiceless
Rajendra Vithal Waghmare, Khamgaon ||39

10) Knowledge Management system in academic Library
Varsha M. Meshram, Bhandara ||41

11) Social Media For Academic Libraries
Mr. Mayuresh Ingole, Mr. Nayan Khode, Amravati ||44

12) Electronic Resource Management Systems
Dr. P.S.Mohe, Librarian, Akola ||48

13) The Comparative Study of Cardiovascular Endurance of Age Groups ...
Dr. Khaire Pramod B., Ahmednagar ||52

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Replacing Synthetic Food Preservatives with Natural Antimicrobial Food Preservatives – A Feasibility Study for Small Scale Industries.

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Abstract

It has been reported that the naturally occurring antimicrobial compounds could be applied as food preservatives to not only protect food quality but also extend the shelf life of foods and beverages. Since, these compounds are naturally produced and isolated from various sources, including plants, animals and microorganisms for which they constitute part of host defence systems, they are safer. Many naturally occurring compounds, such as nisin, plant essential oils, and actinomycin, have been widely studied and are reported to be effective in their potential role as antimicrobial agents against spoilage and pathogenic microorganisms. However, their utility as well as use in the food products manufactured by the small scale industries is not known. Since, this is an unorganized sector, which is not governed with stringent rules, there appears a higher risk of food borne diseases as function of consumption of these products. In view of above, a feasibility study was carried out to know the existing use of synthetic as well as natural antimicrobial preservatives by the small scale industries in the study area. The data collection was carried out by following survey methodology. Though some of these natural antimicrobials are commercially available and applied in food processing, their efficacy, consumer acceptance and regulation are not well defined with respect to the study area. The results indicate that there is very low awareness amongst the small scale industries regarding the use of natural antimicrobial preservatives

Keywords: natural antimicrobial compounds, food preservatives, food quality, shelf life of foods.

Introduction:

Food is an essential thing for human survival. Except our own garden plants, all the food used today has some preservatives. Preservatives are the substances, which are used to prevent food spoilage from microorganism. Food preservation is used from the ancient times. This will inhibit the growth of microorganisms like bacteria and fungi. Food preservatives becomes an essential thing nowadays, this plays an important role during food transportation. This will preserve the food for a long duration from the spoilage.

Food products can be subjected to microbial contamination that is mainly caused by bacteria, yeasts, and fungi. Many of these microorganisms can cause undesirable reactions that deteriorate the flavor, odor, color, and textual properties of foods Vermeiren *et al.* 2002; Devlieghere *et al.* 2004a; Han 2005; Rupika *et al.* 2005; Davidson and Taylor 2007; Gutierrez *et al.* 2008. Microbial growth in food products is a major concern because some microorganisms can potentially cause food-borne illness Natrajan and Sheldon 2000; Cha and Chinnan 2004; Davidson *et al.* 2005; de Oliveira *et al.* 2007. In packaged foods, the growth and survival of common spoilage and pathogenic microorganisms such as*Listeria monocytogenes* ,*Escherichia coli* O157, *Salmonella* ,*Staphylococcus aureus* ,*Bacillus cereus* ,*Campylobacter*, *Clostridium perfringens*, *Aspergillus niger* , and*Saccharomyces cerevisiae* are affected by a variety of intrinsic factors such as pH, water activity, and the presence of oxygen or by extrinsic factors associated with storage conditions including temperature, time, and relative humidity Singh 2003; López-Malo *et al.* 2005; Ryllo *et al.* 2006. To prevent the growth of spoilage and pathogenic microorganisms on foods, various traditional preservation techniques such as heat treatment, salting, acidification, and drying are used in the food industry Ozdemir and Floros 2004; Davidson and Taylor 2007. In recent years, a rise in consumer demand for safe, fresh, and minimally processed foods has led to the development of new preservation techniques. Active packaging (AP) technologies, for example, can provide safe food products with longer shelf lives Vermeiren *et al.* 2002; Fitzgerald *et al.* 2003; Gutierrez *et al.* 2008. In the past few decades, various synthetic AM agents have been investigated and developed into food packaging materials Weng and Hotchkiss 1992Weng and Hotchkiss 1993. Many of these agents including various organic acids and salts have been approved by regulatory agencies and have since been used for the preservation of food products Davidson and Taylor 2007. Synthetic AM agents that have demonstrated inhibitory activity against different microorganisms include sodium benzoates and propionates, potassium sorbates, sulfites, chlorides, nitrites, triclosan, fungicides (for example, benomyl, imazalil) and various metal ions including silver zeolites, quaternary ammonium salts, and copper ions Devlieghere *et al.* 2000a; Quattara *et al.* 2000; Cooksey 2005. Other AM agents such as acetic acid from vinegar and benzoic acid from cranberries are found in nature, but are classified as synthetic AM agents when produced synthetically Davidson and Taylor 2007. In recent years, natural AM agents have attracted much attention in the food and packaging industries as a replacement for synthetic ones for food preservation. According to Davidson and Zivanovic 2003, natural AM agents are classified by their sources: AM agents derived from plant EOs (for example, basil, thyme, oregano, cinnamon, clove, and rosemary); animal sources (for example, lysozyme,

lactoferrin); microbial sources (nisin, natamycin); and naturally occurring polymers (chitosan). The EOs extracted from plant sources consist of various mixtures including terpenoids, esters, aldehydes, ketones, acids and alcohols Dorman and Deans 2000. These plants EOs are volatile and generally possess relatively strong odors Bakkali *et al.* 2008.

Materials and methods

Organisms and growth conditions

Micro-organisms were isolate in the department while some of the organisms obtained from the culture collections center. Organisms were as follows: *Candida albicans* ATCC 10231, *Enterococcus faecalis* NCTC 8213, *Escherichia coli*, *Klebsiella pneumoniae* , *Pseudomonas aeruginosa* , *Salmonella typhimurium* and *Staphylococcus aureus* . Organisms were maintained on blood agar (BA). Overnight cultures were prepared by inoculating approximately 2 ml Mueller Hinton broth (MHB) with 2–3 colonies of each organism taken from BA. Broths were incubated overnight at 35 °C with shaking. Inocula were prepared by diluting overnight cultures in saline to approximately 10^8 cfu ml^{-1} for bacteria and 10^7 cfu ml^{-1} for *C. albicans*. These suspensions were further diluted with saline as required.

Essential oils

Plant oils and extracts were obtained from PKV lab Akola where it is extracted by distillation method. All oils were diluted v/v in both agar and broth dilution method.

Agar dilution method

The agar dilution method followed that approved by the NCCLS with the following modification: a final concentration of 0·5% (v/v) Tween-20 (Sigma) was incorporated into the agar after autoclaving to enhance oil solubility. Briefly, a series of twofold dilutions of each oil, ranging from 2% (v/v) to 0·03% (v/v), was prepared in Mueller Hinton agar with 0·5% (v/v) Tween-20. Plates were dried at 35 °C for 30 min prior to inoculation with 1–2 µl spots. Mueller Hinton agar, with 0·5% (v/v) Tween-20 but no oil, was used as a positive growth control. Inoculated plates were incubated at 35 °C for 48 h. Minimum inhibitory concentrations (MICs) were determined after 24 h for the bacteria and after 48 h for *C. albicans*. The MICs were determined as the lowest concentration of oil inhibiting the visible growth of each organism on the agar plate. The presence of one or two colonies was disregarded.

Results

By using agar dilution method minimum inhibitory concentration of selected essential oils and microbial products against 7 different microorganisms were studied and the results were noted in table 1. As, Lemongrass inhibited all organisms at ≤2·0% (v/v). Coriander inhibited all organisms except *Ps. aeruginosa* at ≤2·0% (v/v). Fixed oil pumpkin failed to inhibit any organisms at the highest concentration, which was 2·0% (v/v). While carrot inhibited Gram-positive bacteria and *C. albicans* only. None of the oils inhibited Gram-negative bacteria only. *Pseudomonas aeruginosa* was inhibited by the lowest number of extracts (two); *Candida albicans* and *Staph. aureus* were the most susceptible organisms, inhibited at ≤2·0% (v/v) by 8 and 7 extracts, respectively.

Table 1. Minimum inhibitory concentrations (MICs) of selected essential oils (%v/v), microbial products against 7 different microorganisms

Sr. No	Details of plant oils and extracts				Test organisms						
	Plant species	Common name	Extract or Oil	Source	Candida albicans	Enterococcus faecalis	Escherichia coli	Klebsiella pneumoniae	Pseudomonas aeruginosa	Salmonella typhimurium	Staphylococcus aureus
1	*Citrus aurantium*	Orange	Oil	PKV	1.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
2	*Citrus limon*	Lemon	Oil	PKV	2.0	2.0	>2.0	>2.0	>2.0	>2.0	2.0
3	*Citrus grandis*	Chapa Dan	Oil	PKV	2.0	1.0	2.0	>2.0	>2.0	>2.0	>2.0
4	*Coriandrum sativum*	Coriander	Oil	PKV	0.25	0.25	1.0	1.0	1.0	>2.0	0.25
5	*Cucurbita spp.*	Pumpkin	Oil	PKV	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0

6	Cymbopogon citratus	Lemongrass	EO	LEAF	0.05	0.04	>20	0.25	0.04	0.25	>20
7	Cinnamomum verum	Cinnamon	EO	SEED	>20	>20	10	>20	>20	20	>20
8	Eucalyptus globulus	Eucalyptus	EO	LEAVES & TWIGS	40	20	10	20	20	20	20
9	Neem	–	–	MO	20	>20	>20	20	10	10	20
10	Tulsi	–	–	MO	>20	20	20	20	10	20	>20

EO- Essential oil, FO- Fixed oil, M.O-Microorganism

Discussion

Historically, many plant oils and extracts, such as tea tree, myrrh and clove, have been used as topical antiseptics, or have been reported to have antimicrobial properties Hoffman 1987; Lawless 1995. It is important to investigate scientifically those plants which have been used in traditional medicines as potential sources of novel antimicrobial compounds Mitscher *et al.* 1987. Also, the resurgence of interest in natural therapies and increasing consumer demand for effective, safe, natural products means that quantitative data on plant oils and extracts are required. Comparison of the data obtained in this study with previously published results is problematic. First, the composition of plant oils and extracts is known to vary according to local climatic and environmental conditions Janssen *et al.* 1987, Sivropoulou *et al.* 1995. Furthermore, some oils with the same common name may be derived from different plant species Windholz *et al.* 1983, Reynolds 1996. Secondly, the method used to assess antimicrobial activity, and the choice of test organisms, varies between publications Janssen *et al.* 1987. A method frequently used to screen plant extracts for antimicrobial activity is the agar disc diffusion technique Morris *et al.* 1979 ; Smith-Palmer *et al.* 1998 . this study confirms that many essential oils and plant extracts possess *in vitro* antibacterial and antifungal activity. However, if plant oils and extracts are to be used for food preservation or medicinal purposes, issues of safety and toxicity will need to be addressed.

Conclusion

Food processing and some preservation techniques, such as heating, may alter food's nutritional or organoleptic properties. Microbial resistance to current antimicrobial compounds has increased in recent years worldwide, therefore, alternative compounds must be investigated and developed. Consumer demand for more natural products and the growing need for alternative preservatives to ensure food safety, it is imperative that plant-derived antimicrobial compounds be fully assessed for their feasibility for food application. This new field of research has great potential for more evaluation to meet regulatory requirements and to fully elucidate the possibility of employing antimicrobials from the extensive source of plants worldwide. Naturally occurring antimicrobial compounds could be applied as food preservatives to protect food quality and extend the shelf life of foods and beverages. These compounds are naturally produced and isolated from various sources, including plants, animals and microorganisms, in which they constitute part of host defense systems. Many naturally occurring compounds, such as nisin, plant essential oils, and natamycin, have been widely studied and are reported to be effective in their potential role as antimicrobial agents against spoilage and pathogenic microorganisms. Although some of these natural antimicrobials are commercially available and applied in food processing, their efficacy, consumer acceptance and regulation are not well defined.

All these natural antimicrobial agents are easily available and cheap with no side effects will increase shelf life of the products produced by small scale industries mainly in urban and rural areas.

References

1) *Bakkali F, Averbeck S, Averbeck D, Idaomar M. 2008. Biological effects of essential oils – a review. Food Chem Toxicol 46(2): 446–75*
2) *Cha DS, Chinnan MS. 2004. Biopolymer-based antimicrobial packaging: a review. Crit Rev Food Sci Nutr 44(4): 223–37*
3) *Cooksey K. 2005. Effectiveness of antimicrobial food packaging materials. Food Addit Contam 22(10): 980–7*
4) *Davidson PM, Zivanovic S. 2003. The use of natural antimicrobials. In: Tomlins P, Bogh-Sorensen L, editors. Food preservation techniques. Boca Raton, Fla.: Woodhead Publishing Limited and CRC Press LLC. p. 3–30*
5) *Davidson PM, Sofos JN, Branen AL. 2005. Antimicrobials in foods. Boca Raton, Fla.: CRC Press, Taylor & Francis Group. p. 706*

6) Davidson PM, Taylor MT. 2007. Chemical preservatives and natural antimicrobial compounds. In: Doyle P, Beuchat LR, Montville TJ editors. Food microbiology: fundamentals and frontiers. Washington, DC: American Society for Microbiology Press. p. 713–74

7) de Oliveira TM, de Fátima Ferreira Soares N, Magela Poletto S, da Fonseca Viuga K. 2007. Development and evaluation of antimicrobial coatings incorporated film in gorgonzola cheese conservation. Packag Technol Sci 20(5): 347–53.

8) Devlieghere F, Vermeiren L, Bockaert A, Debevere J. 2004a. Study on antimicrobial activity of a food packaging material containing potassium sorbate. Acta Aliment 29(2): 117–46.

9) Devlieghere F, Vermeiren L, Debevere J. 2004b. New preservation technologies: possibilities and limitations. Int Dairy J 14(4): 273–85.

10) Dorman HJD, Deans SG. 2000. Antimicrobial agents from plants: antibacterial activity of plant volatile oils. J Appl Microbiol 88(2): 308–16.

11) Fitzgerald D, Stanford M, Narbad A. 2003. Analysis of the inhibition of food spoilage yeasts by nisaplin. Int J Food Microbiol 86(1–2): 113–22.

12) Gutierrez J, Barry-Ryan C, Bourke P. 2008. The antimicrobial efficacy of plant essential oil combinations and interactions with food ingredients. Int J Food Microbiol 124(1): 91–7.

13) Han J, Castell-Perez ME, Moreira RG. 2005. Antimicrobial films as a potential technology to increase pathogen radiation resistivity. Proceedings of IFT Annual Meeting, New Orleans, LA, July 15–20.

14) Hoffman, D.L. (1987) The Herb User's Guide. Wellingborough, UK: Thorsons Publishing Group.

15) Jansen, A.M., Scheffer, J.J.C. and Baerheim Svendsen, A. (1987) Antimicrobial activity of essential oils: a 1976–86 literature review. Aspects of the test methods. Planta Medica 53, 395–398.

16) Lawless, J. (1995) The Illustrated Encyclopedia of Essential Oils. Shaftesbury, UK: Element Books Ltd.

17) López-Malo A, Alzamora S, Palou E. 2005. Aspergillus flavus growth in the presence of chemical preservatives and naturally occurring antimicrobial compounds. Int J Food Microbiol 99(2): 119–28.

18) Mitscher, L.A., Drake, S., Gollapudi, S.R. and Okwute, S.K. (1987) A modern look at folkloric use of anti-infective agents. Journal of Natural Products 50, 1025–1040.

19) Morris, J.A., Khettry, A. and Seitz, E.W. (1979) Antimicrobial activity of aroma chemicals and essential oils. Journal of the American Oil Chemists' Society 56, 595–603.

20) Natrajan N, Sheldon BW. 2000. Efficacy of nisin-coated polymer films to inactivate Salmonella typhimurium on smooth surfaces of eggs. J Food Protect 63 (9): 1189–96.

21) Ouattara B, Simard RE, Piette G, Bégin A, Holley RA. 2000. Inhibition of surface spoilage bacteria in processed meats by application of antimicrobial films prepared with chitosan. Int J Food Microbiol 62(1–2): 139–48.

22) Quintavalla S, Vicini L. 2002. Antimicrobial food packaging in meat industry. Crit Rev Food Sci Nutr 42(3): 183–93.

23) Reynolds, J.E.F. (1996) Martindale – the Extra Pharmacopoeia. 31st edn. London: Royal Pharmaceutical Society of Great Britain.

24) Rupika LAS, Somerset S, Mohr J, Hoggard SJ. 2005. Development and evaluation of low-density polyethylene based antimicrobial food packaging polymers containing thymol and carvacrol. Proceedings of 22nd IAPRI Symposium on Packaging, Campinas, Brazil, Nov 22–24.

25) Rydlo T, Miltz J, Mor A. 2006. Eukaryotic antimicrobial peptides: promises and premises in food safety. J Food Sci 71 (9): R125–35.

26) Singh TK, Drake MA, Cadwallader KR. 2003. Flavor of Cheddar cheese: a chemical and sensory perspective. Comp Rev Food Sci Food Safety 2(1): 139–62.

27) Sivropoulou, A., Kokkini, S., Lanaras, T. and Arsenakis, M. (1995) Antimicrobial activity of mint essential oils. Journal of Agricultural and Food Chemistry 43, 2384–2388.

28) Smith-Palmer, A., Stewart, J. and Fyfe, L. (1998) Antimicrobial properties of plant essential oils and essences against five important food-borne pathogens. Letters in Applied Microbiology 26, 118–122.

29) Vermeiren L, Devlieghere F, Debevere J. 2002. Effectiveness of some recent antimicrobial packaging concepts. Food Addit Contam 19(Suppl.): 163–71.

30) Weng Y-M, Hanlon JF. 1992. Inhibition of surface molds on cheese by polyethylene film containing the antimycotic imazalil. J Food Protect 58(5): 567–9.

31) Weng Y-M, Hanlon JF. 1993. Imidazoles as antimycotic agents added to polyethylene films for food packaging. Packag Technol Sci 6(3): 133–8.

32) Windholz, M., Budavari, S., Blumetti, R.F. and Otterbein, E.S. (1983) The Merck Index: an Encyclopedia of Chemicals, Drugs and Biologicals. 10th edn. Rahway, NJ: Merck and Co. Inc.

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Bianchi Type-XIII Universe with Scalar and Electromagnetic Field in Lyra's Geometry with Deceleration Parameter

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Abstract:

I. Introduction

3. FRW Metric and Field Equations

[illegible]

[illegible] (2.2)

[illegible] (2.3)

[illegible] (2.4)

(4.15d)

(4.16a)

(4.16b)

(4.16c)

(4.16d)

(4.16e)

Solution of Field Equations:

(5.1a)

(5.2b)

(5.3c)

(5.4a)

(5.4b)

(5.5)

(5.6)

(5.7a)

(5.7b)

(5.8)

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ABSTRACT

In the present paper, we investigate Homogeneous Bianchi Type-III bulk viscous fluid cosmological model with variable gravitational and cosmological constant Λ in the framework of Saez Ballester scalar tensor theory of gravitation. In order to find exact solutions of the Einstein's field equations, we assume i) the expansion scalar 'θ' is proportional to shear scalar 'σ', which leads to $C = B^n$, where B and C are functions of time and ii) the coefficient of bulk viscosity is a power function of the energy density and iii) the cosmic fluid obeys the barotropic equation of state. The nature of the model is discussed in the presence of variable gravitational and cosmological constant. Some physical and kinematical aspects of the model are also discussed.

Keywords: Bianchi Type III Cosmology, Bulk viscosity, Variable G and Λ.

INTRODUCTION

Einstein's general theory of relativity has been successful in describing gravitational phenomena. It has also served as a basis for models of the universe. However since Einstein first published his theory of gravitation, there have been many criticisms of general relativity because of the lack of certain desirable features in the theory. For example Einstein himself pointed out that general relativity does not account satisfactorily for inertial properties of matter, i.e. Mach's principle is not substantiated by general relativity. So in recent years there has been lot of interest in several alternative theories of gravitation.

[illegible] Dirac's scalar tensor theories of gravitation formulated by Brans and Dicke ([1961], [1970]) and Saez and Ballester ([1985]). All versions of the scalar tensor theories are based on the [illegible] scalar field ϕ into the formulations of general relativity, this scalar field together with the metric [illegible] field becomes a source field representing the gravitational field.

[illegible] the matter is coupled with a dimensionless scalar field in a simple manner. This coupling [illegible] weak fields and suggested a possible way to solve missing matter problem in [illegible] Sandage's

[illegible] (1985) field equations are

$$[illegible] \phi^{;k}_{;k} - \frac{1}{3+2\omega}\left(R + 2\Lambda\frac{d\omega}{d\phi} - \frac{\omega}{\phi^2}\phi_{;k}\phi^{;k}\right) = -\frac{8\pi}{3+2\omega}T \quad (1)$$

$$\nabla^k\phi_{;k} = \frac{1}{3+2\omega}\left(R\frac{d\omega}{d\phi} - \frac{\omega}{\phi^2}\phi_{;k}\phi^{;k}\right) = 0 \quad (2)$$

[illegible] T is the stress energy tensor of the matter in

[illegible] denotes partial and covariant differentiation respectively.

[illegible] conservation relation

$$T^{ik}_{;k} = 0 \quad (3)$$

[illegible] equations (1) and (2).

[illegible] general solutions in connection to the work of Saez [illegible] and [illegible] Nariai (1968), Bekenstein and Meisels (1977), Singh and Rai (1983), Rosquist-Aguirre et al. (2007), [illegible] and Dicke (1968), Bekenstein and Meisels (1977), Singh and Rai (1983), Rosquist-Aguirre et al. (2007) [illegible] and Saez-Ballester (1986).

[illegible] important role in the early development of the universe. There are many [illegible] investigate the evolution of the universe in which bulk viscosity could arise. The bulk viscosity [illegible] to reduce the magnitude of the cosmic stress relative to the pressure. Belinski and Sanyal (1987) [illegible] equilibrium conditions for viscous fluid in the presence of an axial magnetic field. Also [illegible] that cosmological models universe have been extensively investigated by many [illegible] Barrow (2001), Odintsov et al. (2006), M.S. Berman and Som Raw (2011), Kamalakar et al (2022) [illegible] the gravitational constant G are two parameters present in the Einstein's field [illegible] Λ plays the role of a coupling constant between geometry and matter or [illegible] cosmological constant in the theories of general relativity in which G varies with [illegible] provide solutions to gravitation and elementary particle physics so as to incorporate [illegible] principle of conservation of energy. The Λ term is interpreted in terms of Higgs scalar field. Wagoner [illegible] made $\Lambda \propto \phi^4$ proportional to the Λ term is a function of temperature and reminiscent to the process of broken [illegible] The cosmological constant problem related to the existence of Λ have been discussed in the literature. A [illegible] of authors e.g. Kalligas et al. (1995), Arbab (1997), Abdussattar and Vishwakarma (1997) presented [illegible] and Λ within the framework of general relativity. Verma et al (2011) investigate [illegible] with variable gravitational and cosmological constant. Recently, Use of [illegible] cosmological models of interacting dark energy fields with cosmic string in general theory [illegible].

[illegible] we investigated Bianchi type-I bulk viscous fluid cosmological models with variable G and Λ in [illegible] theory of gravitation proposed by Saez and Ballester [illegible] as follows. We present in section 2 and 3 metric and Einstein's field [illegible] are considered. In section 4, we [illegible] with solutions of the field equations and we [illegible] that (i) the coefficient of bulk viscosity ζ is proportional to [illegible] scalar θ (ii) coefficient of bulk viscosity is a power function of the energy density and (iii) the cosmic

...the Hartle-Hawking equation of state. The stability of the model in the presence of variable gravitational and cosmological constant for special and reasonable properties of the model have also been discussed.

2.The metric and field equations

We consider the spatially homogeneous and anisotropic Bianchi type-III metric in the form

$$ds^2 = dt^2 - A^2(t)dx^2 - B^2(t)e^{-2x}dy^2 - C^2(t)dz^2 \tag{1}$$

where A, B, C are functions of the proper time t.

The energy momentum tensor for a bulk viscous fluid distribution given by

$$T_{ij} = (\rho + \bar{p})v_i v_j + \bar{p}g_{ij} \tag{2}$$

where

$$\bar{p} = p - \xi\theta \tag{3}$$

$\rho = \rho(t)$, $p = p(t)$ are the energy density with thermal energy pressure, effective pressure and bulk viscosity coefficient $\xi = \xi(t)$ respectively. Here v_i is the velocity vector satisfying the following

$$v_i v^i = 1 \tag{4}$$

where $\xi(t)$ is the coefficient of bulk viscosity and θ is the expansion such that

$$\theta = v^i_{;i} = \frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^i}\left(\sqrt{-g}\,v^i\right) \tag{5}$$

where a semicolon stands for the covariant differentiation.

Using (1)-(5) and (3) for the metric (1) with the help of (2) and (3) we have the Einstein field equations as

$$\frac{B_{44}}{B} + \frac{C_{44}}{C} + \frac{B_4 C_4}{BC} - \frac{m^2}{2}\phi^2\phi_1^2 = -8\pi\xi(\rho - \Lambda) \tag{6}$$

$$\frac{A_{44}}{A} + \frac{C_{44}}{C} + \frac{A_4 C_4}{AC} - \frac{m^2}{2}\phi^2\phi_2^2 = -8\pi\xi(\rho - \Lambda) \tag{7}$$

$$\frac{A_{44}}{A} + \frac{B_{44}}{B} + \frac{A_4 B_4}{AB} - \frac{m^2}{2}\phi^2\phi_3^2 = -8\pi\xi(\rho - \Lambda) \tag{8}$$

$$\frac{A_4}{A}\left(\frac{B_4}{B} + \frac{C_4}{C}\right) - \frac{1}{B^2} + \frac{m^2}{2}\phi^2\phi_4^2 = 8\pi\xi(\rho + \Lambda) \tag{9}$$

$$\frac{A_4}{A}\left(\frac{B_4}{B} + \frac{C_4}{C}\right) + \frac{1}{B^2} + \frac{m^2}{2}\phi^2\phi_5^2 = 8\pi\xi(\rho + \Lambda) \tag{10}$$

$$\frac{B_4}{B}\left(\frac{A_4}{A} + \frac{C_4}{C}\right) + \frac{m^2}{2}\phi^2\phi_6^2 = 8\pi\xi(\rho + \Lambda) \tag{11}$$

$$\frac{\phi_{44}}{\phi} + \left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right)\frac{\phi_4}{\phi} = 0 \tag{12}$$

$$\phi_{44} + \phi_4\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right) + m\phi\left(\frac{\phi_4}{\phi}\right) = 0 \tag{13}$$

where $\frac{1}{A}$ or the symbols A, B, C and ϕ denote ordinary differentiation with respective to t. An equation for time change of G and Λ established by the divergence of Einstein tensor

$$R^{ij} - \frac{1}{2}Rg^{ij} = -8\pi G T^{ij} - \Lambda g^{ij}$$ which leads to $\left(8\pi G T^{ij} - \Lambda g^{ij}\right)_{;j} = 0$, which gives

$$8\pi\left[\dot{\rho}G + \rho\dot{G} + (\rho + p)G\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right)\right] - \dot{\Lambda} = 0 \tag{14}$$

we assume the energy equation of state $p = \gamma\rho$ where γ is the equation of state parameter.

$$[illegible] \left\{ \frac{A_1}{A}, \frac{B_1}{B}, \frac{C_1}{C} \right\} = 0 \tag{15}$$

and

$$8\pi G\rho_1 + \Lambda_1 = 8\pi G_0 \left\{ \frac{A_1}{A} + \frac{B_1}{B} + \frac{C_1}{C} \right\} \tag{16}$$

The average scale factor R for the metric (1) is defined by

$$R = [illegible] \tag{17}$$

The volume scale factor V is given by

$$V = R^3 = [illegible] \tag{18}$$

The mean Hubble parameter H is given by

$$H = \frac{1}{3}(H_1 + H_2 + H_3) \tag{19}$$

[illegible]

The expansion scalar θ and shear scalar σ^2 are given by

$$\theta = u^i{}_{;i} = \left(\frac{A_1}{A} + \frac{B_1}{B} + \frac{C_1}{C} \right) \tag{20}$$

and

$$\sigma^2 = \frac{1}{2}\left[\left(\frac{A_1}{A} \right)^2 + \left(\frac{B_1}{B} \right)^2 + \left(\frac{C_1}{C} \right)^2 - \frac{A_1 B_1}{AB} - \frac{B_1 C_1}{BC} - \frac{A_1 C_1}{AC} \right] \tag{21}$$

The dimensionless dimensionless quantity in cosmology is the deceleration parameter q, which is defined as

$$q = -\frac{R\ddot{R}}{\dot{R}^2} \tag{22}$$

[illegible] The positive sign corresponds to the standard Friedmann model whereas the negative sign indicates inflation.

3. Solution of the field equations

Equations (8) are six independent equations in seven unknowns $A, B, C, \rho, H, \Lambda$ and ϕ for the complete solution of the system, we need one more condition. We consider the equation (12) yielding

$$A = kB \tag{23}$$

where k is a constant. For a cosmic space-time with Bianchi type III, we have $k = 1$ by taking $k = 1$, without loss of generality, equation (23) yields

$$A = B \tag{24}$$

Using equation (24) the field equations (8)-(11) becomes,

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} - \frac{\omega}{2}\phi^2\phi_1^2 = -8\pi G\rho + \Lambda \tag{25}$$

$$2\frac{\dot{B}\dot{C}}{BC} + \left(\frac{\dot{C}}{C}\right)^2 + \frac{\omega}{2}\phi^2\phi_1^2 = -8\pi G p + \Lambda \tag{26}$$

$$\frac{\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} + \frac{\dot{B}\dot{C}}{BC} - \frac{\omega}{2}\phi^2\phi_1^2 = -8\pi G p + \Lambda \tag{27}$$

[illegible]

(28)

(29)

(30)

(31) which can

(32)

(33)

(34)

(35)

(36)

(37)

(38)

(39)

(49)

(50)

(51)

(52) and,

(53)

(54)

Some physical and Kinematical Properties

The scalar volume of the model given by (49) shows that the universe expands with time. The model expansion scalar θ and shear scalar σ^2 both tend to zero as $T \to \infty$. The constant value of deceleration parameter indicates the model behaves in the standard way.

CONCLUSION

In this paper, we investigated Bianchi type III bulk viscous fluid cosmological model with variable cosmological constant. Under the observational [illegible] we have assumed the relation between metric potential and shear viscosity is proportional to the scalar expansion. It is observed that the spatial volume is zero at $T = 0$. At this epoch the energy density ρ, expansion θ, shear scalar σ and the bulk viscosity coefficient ξ are all infinite. Therefore the model (35) starts evolving with a big-bang at $T = 0$. For large T energy density becomes zero, the rate of expansion in the model shows down, tending to zero as $T \to \infty$. The cosmological constant term Λ is infinite at the beginning of the model and decreases as time increases. The gravitational constant G is zero initially tends to

REFERENCES

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SYNTHESIS AND CHARACTERISATION OF *S*-HEPTA-*O*-BENZOYL LACTOSYL-1-ARYLDITHIOCARBAMATES

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ABSTRACT

Several S-hepta-O-benzoyl lactosyl aryldithiocarbamates have been synthesized by the interaction of hepta-O-benzoyl lactosyl bromide with ammonium aryldithiocarbamates. The structure of these newly synthesized compounds have been established on the basis of usual chemical transformations, IR, ^{1}H NMR and Mass spectral studies. Antimicrobial activities of these compounds were evaluated.

Keywords: *Lactosyl bromide, Ammonium aryldithiocarbamates, Lactosyl aryldithiocarbamate*

Introduction

S-lactosides are those compounds in which Lactosyl group or its derivatives are attached to the sulphur of sulphur derivatives exhibiting antifungal[1], antitumor[2], anticancer[3], antiviral[4] and antimalarial activity[5]. Benzoyl derivatives of carbohydrate are interestingly becoming important in medicinal chemistry, industries and in many other ways[6-7].

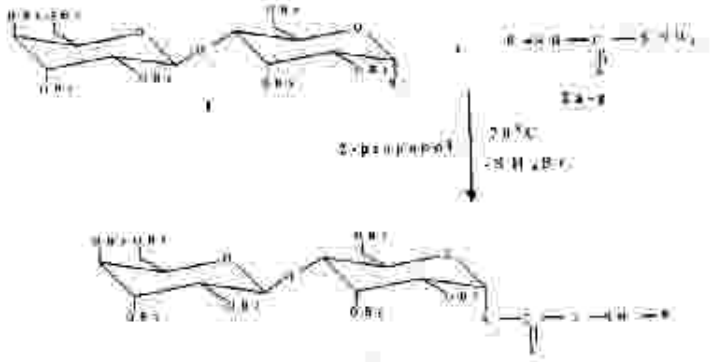
The present work deals with the synthesis of several *S*-hepta-*O*-benzoyl lactosyl aryldithiocarbamates. These were prepared by the interaction of *S*- hepta-*O*-benzoyl lactosyl bromide (**1**) and ammonium aryldithiocarbamates (**2a-g**).

Result and discussion

Isopropanolic (40 ml) suspension of hepta-*O*-benzoyl lactosyl bromide and ammonium phenyldithiocarbamate was heated on water bath at about 70°C and kept at room temperature for 20 hrs. solid thus obtained was identified ammonium bromide. Clear filtrate on dilution with distilled water afforded a solid, which was purified by ethanol and water. It gave clearing and was desulphurisable with alkaline plumbite. Its specific rotation was found $[\alpha]_D^{27}$ -182.28 (c, 0.98) in $CHCl_3$.

The IR, ^{1}H NMR and mass spectral analysis[8-11] and elemental analysis (Table 1) clearly indicated the product and were assigned the structure as *S*-hepta-*O*-benzoyl lactosyl-1-phenyl dithiocarbamate (**3a**).

When the interaction of hepta-*O*-benzoyl lactosyl bromide[14] was extended to other aryldithiocarbamates[15], the related *S*-hepta-*O*-benzoyl lactosyl 1-aryldithiocarbamates (**3b-g**) were isolated.



[3a-g]

Where, Bz = COC_6H_5

R = a) phenyl, b) *o*-tolyl, c) *m*-tolyl, d) *p*-tolyl, e) *o*-Cl-phenyl, f) *m*-Cl-phenyl, g) *p*-Cl-phenyl

Experimental

All the melting points recorded are found uncorrected. IR Spectra were recorded on Perkin-Elmer spectrum RX1 FTIR Spectrometer. ^{1}H NMR was obtained on Bruker DRX-300 NMR Spectrometer. Samples were prepared in $CDCl_3$ with TMS as an internal reference. The mass spectra were obtained on Thermo Fennigan LCQ Advantage max ion trap mass spectrometer. Optical rotations $[\alpha]_D^{31}$ were measured on the Equip-Tronics EQ-800 Digital Polarimeter at 31^{0}C in $CHCl_3$.

Synthesis of S-hepta –O-benzoyl lactosyl -1-phenyldithiocarbamate (3a-g)

Isopropanolic (40 ml) suspension of *S*-hepta-*O*-benzoyl lactosyl bromide (0.01M, 11.32g) and ammonium phenyldithiocarbamate (0.01M, 1.73g) was heated on water bath at about 70^{0}C until the suspension gets cleared. The clear solution was kept at room temperature for 20 hours.The solid formed was filtered off and identified as NH_4Br. The reaction mixture was mixed with 100 mL distilled water. It afforded solid (3a-g) The products were crystallized by ethanol-water. Purity was checked by TLC (Table 2).

Spectral data

3a. IR (KBr) : ν 3458 cm^{-1} (N-H), 1728 cm^{-1} (C=O), 2973 (C-H Ar-stretching), 1453 cm^{-1} (C-N), (characteristic of lactose unit) and 710 cm^{-1} (C-S); ^{1}HNMR ($CDCl_3$): δ 8.05- 7.18 (40 H, m, Ar-H); δ 5.79 -5.39 (14 H, m, lactose ring protons); δ 7.16 (1H, s, N-H) MS (*m/z*): 1221 (M^+), 1100, 1053, 976, 948, 932, 918, 579. Anal. Found : C, 66.40; H, 4.72, N, 1; S, 5.84 Calcd. For $C_{68}H_{55}O_{17}NS_2$ C, 66.83; H, 4.5; N, 1.1; S, 5.24 %

3b. IR (KBr) : ν 3483 cm^{-1} (N-H), 2976 (C-H Ar stretching), 1452 cm^{-1} (C-N), 1271 cm^{-1} (C-O), 1026 (characteristic of lactose unit) and 710 cm^{-1} (C-S), ^{1}HNMR ($CDCl_3$):δ 8.07-7.18 (39 H, m, Ar-H); δ 5.74 -5.43 (14 H, m, lactose ring protons); δ 6.1 (1H, s, N-H). MS (*m/z*): 1253 (M^+), 1134, 1053, 976, 932, 579. Anal. Found : C, 64.88; H, 4.01; N, 1 S, 5 Calcd. for $C_{68}H_{54}O_{17}NS_2Cl$: C, 65.01; H, 4.37; N, 1.1; S, 5.09 %

3c. IR (KBr) : ν3481 cm^{-1} (N-H), 2972 (C-H Ar stretching), 1452 cm^{-1} (C-N), 1271 cm^{-1} (C-O), 1068 (characteristic of lactose unit) and 710 cm^{-1} (C-S), ^{1}HNMR ($CDCl_3$):δ 8.05- 7.18 (39 H, m, Ar-H); δ 5.79 -5.39 (14 H, m, lactose ring protons); δ 2.9 (3H, s, Ar-CH_3) δ 6.8-6.7(1H, s, N-H). MS (*m/z*): 1235 (M^+), 1114, 1053, 976, 948, 932, 918, 579. Anal. Found : C, 66.88; H, 4.2, N, 1.1 S, 5.1 Calcd. For $C_{68}H_{53}O_{17}NS_2$: C, 67; H, 4.6, N, 1.13; S, 5.1 %

Table 2:- Characterization data of *S*-hepta-*O*-benzoyl lactosyl-1-aryldithiocarbamate (3a-g)

Reactants: - 1) Hepta-*O*-benzoyl lactosyl bromide (**1**) [0.01M]

2) Ammonium aryldithiocarbamate (**2a-g**) [0.01M].

Sr. No.	Product	Yield (%)	m. p. (°C)	$[\alpha]_D^{31}$ (c in $CHCl_3$)	Analysis (%): Found(Required)	
					N	S
1.	3a	70	124	-182.28° (c 0.980)	1 (1.1)	5.84 (5.24)
2.	3b	64	118	-188° (c 0.693)	1 (1.1)	5.0 (5.9)
3.	3c	76	98	-190° (c 0.986)	1 (1.1)	5.0 (5.9)

4	3d	71	137	-202° (c, 0.786)	1	(1.1)	5.0	(5.9)
5	3e	67	150	-218° (c, 0.966)	1.1	(1.13)	5.1	(5.0)
6	3f	62	176	-136° (c, 1.006)	1.1	(1.13)	5.1	(5.0)
7.	3g	72	120	-169° (c, 1.040)	1.1	(1.13)	5.1	(5.0)

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References

1. Quing-Li Wei, Shu-Sheng Zhang, Jun Gao, Wei-hua Li, Liang-Zhang Xu and Zhi-Gang Yu, Bioorg. Med. Chem., (2006) 14, 7146.
2. K. Taujihara, M. Ozeki, T. Morikawa, M. Kawamori, Akaike and Y.Arai, J. Med. Chem., (1982) 25, 441.
3. Haung Shu-Ting, Hsei I-Jen and Chen-Chinpiao, Bioorg. Med. Chem., (2006) 14, 6106.
4. P.C Tome Joao, G. Neves Maria, A. Tome, A. S. Gavaleiro Jose, F. Mendonka Ana, I. N. Pegado, R. Duarte and M. L. Valdeira, Bioorg. Med. Chem., (2005),14, 3878.
5. S. Hout, N. Azas, A. Darque, M. Robin, C. Di. Giorgio, M. Gasquet, J. Galy and Timon-Savid, P. Parasitology, (2004) 129, 525.
6. D. V. Mangte and S. P. Deshmukh, Int. J. Chem. Sci., (2004) 2, 159-163.
7. I. Goodmann, Adv. Carbohydr. Chem. Biochem., (1958) 13, 215-236.
8. J. J. Garcia-Lopez, F. Hernandez-Mateo, J. Isac-Garcia, J. M. Kin, R. Roy, F. Santoyo-Gonzalez and A. Vargas-Berengual, J. Org. Chem., (1999) 64, 522-531.
9. A. S. Dandale, D. V. Mangte and S. P. Deshmukh, Carbohydr. Res., (2007) 342, 753-756.. 10. R.M.Silverstain and G.C Bassler and T. C Morrill "Spectrometric Identification of Organic Compounds", 5th ed., John Wiley & sons, Inc, New York, 1991.
11. J.R.Dyer, "Applications of Absorption Spectroscopy of Organic Compounds", 8th ed., Prentice hall, 1991.
12. S. A. Barker, J. Homer, M. C. Keith and L. F. Thomas, J. Chem. Soc., (1963) 1538-1543.
13. R. Verma, S. Y. Kulkarni, C. I. Jose and V. S. Pansare, Carbohydr. Res., (1984)133, 25-32.
14. P. C. Scheuzer and F. Smith, J.Am.Chem.,Soc.,(1954) 76,3234.
15. A. I. Vogel, A Text Book of Practical Organic Chemistry, Vol. V, ELBS, Longman (1989)967

EFFECT OF INDUSTRIAL WASTEWATER IRRIGATION ON THE SOIL CHARACTERISTICS OF NEARBY AREA IN BULDANA DISTRICT OF MAHARASHTRA.

[redacted]
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RACT :-

Safe disposal of industrial wastewater has become a challenge for industrial managers and for scientists. Rapidly increasing industrialization and urbanization have resulted into the generation of huge quantities wastewater. Use of untreated industrial wastewater for crop irrigation is a common practice by the farmers. mediate solution that seems to the problem of water shortage is the reuse of wastewater generated from trial operations and domestic usage after the suitable treatment in agriculture and related activities.

The present research work deals with the study of effects of industrial wastewater irrigation on the soil teristics of nearby area in Buldana District of Maharashtra. The data obtained in present study indicates Phosphate,TS,TDS,TSS,Ca,Mg etc., values in fertilizer wastewater whereas pH,TA,TH,Cl- values are in sewage water of Khamgaon MIDC. At Sugar Industry sites, EC,Temp.,phosphate,TDS,Ca,Mg,Cl- in wastewater are maximum. Organic Carbon ,Available N,K,P,Na,SO4,Cl, Mg,Fe,Cu,Zn and Mn were ntly higher in wastewater irrigated soils than the tube well irrigated soil.

WORDS :- Wastewater, Soil Characteristics, Physico-Chemical Study, Buldana District.

DUCTION :- The requirement of water is increasing day by day due to tremendous increase in our on account of increasing domestic and industrial activities. Rapidly increasing industrialization and ation have resulted into the generation of higher quantities of wastewater. Use of untreated industrial ater for crop irrigation is a common practice by the farmers.

Irrigation with sewage and pulp paper mill effluent had enriched the soil mainly with respect to N,P,K hances the crop yields considerably[1]. Wastewater application for crop irrigation increases the zinc tration in soil and sugarcane[2]. Increase in the organic carbon is beneficial for crops as it increases the of potassium. Tannery and textile industrial wastewater contain appreciable amounts of plant nutrients N,P,K,Ca,Mg and S. These nutrients can be used for plant growth after proper treatment. Enrichment of anic carbon in soil due to addition of industrial wastewater is reported is reported by Chhonkar et al[3]. of paper mill wastewater has favourably influenced the crop production, its continuous application for er of years may results in enrichment of heavy metals in the top layers of soil[4]. Untreated industrial s contains higher amounts of Cd,Pb,Zn,Cu,Mn and Fe enhances the concentration of heavy metals in at irrigated soil[5]. Higher amounts of heavy metals like Cu,Zn,Fe and Mn is recorded in irrigated soil industrial complex[6]. Long term and indiscriminate application of raw sewage effluent result in the lation of heavy metals in surface and sub-surface soils[7]. Excessive accumulation of heavy metals such as e and Ni in the soil and the resultant phytotoxicity reported by Tsakou and Peralta[8].

RIALS AND METHODS :- Wastewater and soil samples were collected from Khamgaon Industrial Buldana District,Maharashtra. At Khamgaon industrial site, soap unit is discharging wastewater into drainage , which is being used for crop irrigation by local farmers. Wastewater samples were collected e identified sites during the different seasons,i.e.,premonsoon,monsoon and postmonsoon. Tube well mples (control)were also collected for comparative studies. Samples were processed for the analysis of physico-chemical parameters viz., pH, EC, DO, BOD,COD,TS, TSS, TDS, TH, Ca cations, Mg anions,

Cl- as per the standard methods of APHA-AWWA-WPCF (1985) The heavy metal analysis samples were processed by acid digestion with 1:4 mixture of $HCLO_4$ and HNO_3 and measured by atomic absorption Spectrophotometer

Composite soil samples , irrigated with industrial wastewater were collected in three different seasons at depth of 0-15 and 15-30 cm. Samples were air dried and processed for the measurement of physico-chemical parameters viz., pH, EC by pH meter and conductivitymeter[9], organic carbon[10], available Phosphorus[11],available K and Na[12].

RESULTS AND DISCUSSION

Wastewater characteristics :

Wastewater and control samples analysis was characterised for pH, EC, organic carbon, total solid, hardness, alkalinity and heavy metals. Result of analysis of waste water and soil presented in table 1 and 2.of both sides and heavy metals of wastewater and soil presented in fig.2 and 3.pH value of khamgaon industry site was slightly alkaline in nature (7.1-8.2). EC values (1.3-4.0) were high in wastewater at Khamgaon site than control(1.0-2.0). EC values low in monsoon season in all sites than premonsoon and postmonsoon season due to dilution by rainwater.

Dissolved oxygen(DO) values were low in industrial and sewage water than control,it could be due to high organic load in wastewater.BOD values were high in industrial and sewage wastewater (42-89) in comparison to control(0.98-1.8).COD values similarly high in wastewater at Khamgaon and Sugar mill sites than control.Average values of BOD and COD of wastewater were high in comparison to control the permissible limit (30 and 250 mg/l resp.) prescribed for the discharge of the effluent into inland surface water(EPR,1993)[13].Temperature values marginally vary from site to site.Average values (176-374) of total alkalinity (TA) were high in wastewater in premonsoon and postmonsoon season than control(183-348).Phosphate values were comparatively high in industrial wastewater(1.8-5.6) than control.Total solid (TS) values including total dissolve and total suspended solid average values were high in waste water (1432-1903) than control (643-1730). In comparison to prescribed values of total suspended solid (TSS) for discharging waste water was (100mg /l). High concentration of suspended solid were found in monsoon season, it could be due to addition of loose soil particles from the adjacent land along with run off water. Total hardness values were high in waste water. Ca and Mg cation values were high in wastewater than control. Chloride values (251-596) low in control than wastewater (348-889). Average values of chloride were below maximum tolerance limit (600mg /l) for irrigation quality standard except Khamgaon industries and common drainage wastewater at sugar industries site. Heavy metals such as Cu, Zn, Fe

And Mn concentration were high in wastewater than control,whereas Fe values were high in control at Khamgaon Industries. Concentration of heavy metals were below the maximum recommended limit (100µg/l) prescribed for irrigation water[14].

Soil Characteristics :- Results of the different parameters of soil analysis at both the sites are presented in Table No.3 and 4.Data indicates that pH values were high (7.4-9.0) in wastewater irrigated soil than control(7.1-8.5).The negative impact on soil pH can be attributed to wastewater irrigation. higher Na concentration increases pH of the soil. EC values were high in wastewater irrigated soil(0.4-3.0) than control values(0.25-0.6) High values of EC indicate that it could be due to availability of salt components K,Na,Mg,Cl and SO_4 in higher concentration in wastewater. EC values increases during the period of wastewater irrigation[15] Values of EC were comparatively low in monsoon season than premonsoon and postmonsoon seasons due to dilution by rainwater.Moisture content values (0.32-6.3) were high in control soil in monsoon season than wastewater irrigated soil(0.37-6.0) Porosity values were low in wastewater irrigated soil (43.4-58.4) than control (49.8-59.3) it could be due to accumulation of salts in surface layer soil.Higher concentrations of Na,Ca,Mg salts and heavy metals affect the soil properties due to decrease in porosity after irrigation with wastewater.Organic Carbon values (0.37-0.94)were comparatively high in wastewater irrigated soil than control(0.11-0.79),due to high organic load in wastewater.Nutrient content N,P,K values high in wastewater irrigated soil in premonsson and postmonsson season than control.Increase in N,P,K concentration after wastewater irrigation without any significant negative impact has been reported by Vindhya et.al.2001[16].Na and Mg values were high in wastewater irrigated soil in monsoon season at Sugar Industry

site.Observations indicates that the soil infested with moderate sodicity problem because of long term application of wastewater.Wastewater contains Na,Ca and Mg salts in higher concentration affects soil by direct accumulation of large quantities , as well as the interaction Na with exchange complex,which causes the deflocculation of soil particles[17].Cl_2 and SO_4 values were low in control than wastewater irrigated soil.Carbonate content in soil layer was not detectable because of its possible conversion in $CaCO_3$.However HCO_3 values(0.23-0.57) were high in wastewater irrigated soil in comparison to control(0.24-0.50).Analyzed values were high in premonsoon and postmonsoon than monsoon season.Concentrationa of Cu,Fe,Zn and Mn were comparatively high in wastewater irrigated soil than control.Heavy metal concentration increases in soil after wastewater irrigation[18].Long term application sewage sludge containing higher Zn and Cr content exerts adverse effect on plant growth [19].Analysis of heavy metal indicates that the long term and indiscriminate application of wastewater may causes accumulation of heavy metals in surface soil and it will be harmful for plants and animals. Therefore ,extensive research is required for the long term assessment of heavy metals accumulation in soil, crops and consumers due to wastewater irrigation.

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REFERENCES :

APHA,AWWA AND WPCF,1985 Standard Methods for the Examination of Water and Wastewater.16th Ed.APHA Inc.,New York pp.1268.

1. Nan J. and Chung G.,2001.Accumulation of Cd and Pb in spring wheat(Iritticum aesti-vum L.) grown in calcareous soil irrigated with wastewater.Bull.Environ.Contam.Toxicol,66: 748-754.

2. Terras C , Navarro M., Martin-Iagos, F. Gimineze R., Olalla M., Lopez H. and Lopez M., 2002. Influence of pH and industrial activity on total zinc concentrations in agricultural soils, sewage sludge and beach sands: relation with plant availability .Bull.Environ.Contam.Toxicol.68:224-229.

3. Chhonkar P.K., Datta S.P., Joshi H.C. and Pathak H., 2000.Impact of industrial effluents on soil health and agriculture ,part II – Tannery and Textile mdustrial effluents. J.of Scientific and Industrial Research ,59:446-454.

4. Gupta S.K.,Mitra A. and Adhikari S., 1990.Proc.Natn.Symp.on Protec.of Environ. of city War.Fronts.Central Water Commission , New Delhi ,IV-7.

5. Xiog X., Stagnitri F., Peterson J., Allinson G. and Turoczy N., 2001. Heavy metal contamination of pasture soils by irrigated municipal sewage .Bull.Environ.Contam.Toxicol, 67: 535-540.

6. Barman S.C., Kisku G.C., Salve P.R., Mishra D., Sahu R.K.,Ramteke P.W. and Bhargawa S.K., 2001. Assessment of industrial effluent and its impact on soil and plants. J. Environ Biol.22,4 251-256.

7. Datta S.P. , Biswas D.R.,Sharon N.,Ghose S.K. and Rattan R.K., 2000. Effect of long term application of sewage effluents on organic carbon ,available phosphorus, potassium and heavy metal status and content of heavy metals in crops grown theron. J Indian Soc. Sci.48,4:836-839.

8. Tsakou A., Roulia M. and Christodoulakis N.S.,2001. Growth of cotton plant (Grossipium hirstum) as affected by water and sludge from sewage treatment plant , plant pathology and plant development Bull. Environ.Contam. Toxicol 66:735-742.

9. Piper C.S., 1950.Soil and Plant Analysis ,Interscience publishers, Univ.adelaide,Australia.

10 Walkely A.C.and Black T.A., 1934.Estimation of soil organic carbon by the chromic acid filtration method. Soil Sci., 47:27-38.

11.Olsen S.R.,Cole C.L.,Watnabe F.C. and Dean D.D.,1964.Estimtion of available phosphorus in soils by extraction with sodium bicarbonate.USDA.Circs,939.

12. Jackson C.S. 1973.Soil Chemical Analysis .Prentice Hall of India ,New Delhi.

13. EPR 1993.In the Gazette of India :Extraordinary (Part –II Sec.3), Min.Environ. Forest Govt.of India.

14. Pratt P.F., 1972.Quality criteria for trace elements in irrigation waters. Publications of Univ.Californi Expt.Stn.Riverside,California , USA.

Singh G., Bala N., Rathod T.R. and Singh B., 2001. Effect of Textile effluent on tree plantation and soil nistry. J. Environ Biol., 22,1:59-66.

Vindhya V.,Ramesh Babu,Kale C.K., Kothanderman V.,Manivell U., Jayabaiou R. and Subramanian Y.V., I. Irrigation water soil quality with reference to operation of a small scale chemical industry. P.,21,5:409-415.

Mitra A. and Gupta S.K., 1999. Effect of sewage water irrigation on essential plant nutrient and pollutant ient status in a vegetable growing area around Calcutta. J. of Indian Soc.Soil., 47,1:99-105.

Tyagi P. and Joshi N., 2001. Acomparative study of some physico-chemical parameters of soil irrigated recycled and tube well water.I.J.E.P., 21,6:5125-528.

Wong J.W.C., Lai K.M.,Su.D.S. and Fung M.,2001. Availability of heavy metals for Brasica Chinensis vn in an acidic loamy soil amended with a domestic and an industrial sewage water sludge water.Water,Air Soil Pollution,128,3-4:339-353.

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STUDIES IN ADDITIVE PROPERTIES OF SOME SUBSTITUTED DRUGS SUCH ASDEXAMETHASONE AND PHENYTOIN WITH DIFFERENT CONCENTRATION IN VARIOUS MEDIA.

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ABSTRACT

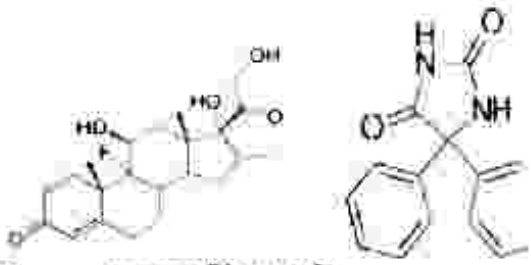
The additive properties such as Refractive index, Molar polarizibility and molar refractivities of some heterocyclic drugs such ***Dexamethasone*** *i.e. 9-fluro-11β,17,21 trihydroxy-16α methyl pregna-1,4-diene, 3,20 dion* ***Phenytoin*** *5,5 diphenylimidazolidine-2,4-dione, have been studied in DMSO, DMF and THF media at 27±0.1°C temperature and concentration. The values of molar refractivity(R) and molar polarizibility (α) are found to be decreased with decreasing the concentration of solute.*

Keywords: *property, Phenytoin, Dexamethasone, DMSO, DMF,Additive*

Introduction

Refractive index is one of the important additives properties of liquid. When a ray of light passes from one medium to another, it suffers to refraction, that is a change of direction. If it passes from less dense to more dense medium, it is reflected towards the normal to form angle of refraction (r) which is less then angle incidence (i).The refractive index is the ratio of the velocity of light in vacuum to that in the medium and it depends upon the temperature and wave length of light. The properties of liquid such as refractive index, viscosity and ultrasonic velocity of binary mixtures are studied by many workers[1-5]. Mahajan[4] has studied molar refraction and polarizability constant of 2-amino-5-chloro benzene sulphonic acid in different percentage of dioxane-water mixture. Burghate[5] and Agrawal[6] studied the refractive indices in mixed solvents. Oswalet al[7] have studied dielectric constants and refractive indices of binary mixtures.Ikhe[8] has studies molar refraction and polarisability constant of pyrazoles and isoxazoles in different percentage of dioxane-water mixtures. Meshram et al[9] studied the molar refraction and polarizibility constant of Al(III), Ce(III) and Fe(III) complexes with some substituted isoxazolines, pyrazole and pyrazolinerefractometrically.

However study of molar refractivity and molar polarizibility constant of novel compounds such as **Dexamethasone** i.e. 9-fluro-11β,17,21 trihydroxy-16α methyl pregna-1,4–diene, 3,20 dion.**Phenytoin** 5,5-diphenylimidazolidine-2,4-dione in non aqueous solvent such as THF,DMF and DMSO under identical set of experimental conditions which could cover manifold aspect of solute-solvent interaction is scanty.



DexamethasonePhenytoin

Therefore the present work is undertaken to make the systematic study of above novel compounds refractometrically at 27°C temperature.

Experimental

Above novel compound are extensively used as drugs in pharmaceutical. These compounds provide the photographic material with good storage stability even at high temperature and high humidity. The compounds are synthesized by standard method and purity is checked by M.P, TLC, IR, and NMR etc.

The solution of the compounds are prepared in different solvents (THF,DMF,DMSO etc.) by dissolving an appropriate amount by weight. All the weighing are made on MechanikiZactadyPrecyzying Gdansk balance

made in Poland (±0.001gm).The accuracy of density measurements is within 0.1Kg/m^{-3}.

The refractive index of solvent and solutions are measure at different concentrations by Abbe's refractometer having accuracy with (±0.01unit) .The temperature of prism box maintained constant by circulating water form thermostat at 27± 0.1^{0}C.Refractometer is initially calibrated with glass piece (n=1.5220) provided with the instrument.

The molar refraction of solvent and solution mixtures are determined from

$$Rm = \left(\frac{n^2-1}{n^2-1}\right) \frac{M}{d}$$

$$Rm_{(solute)} = X_1Rm_1 + X_2Rm_2$$

Rm ⟶ molar refraction, n ⟶ refractive index, d ⟶ density of solution,

No ⟶ Avogadro's number, ⟶ α polarizibility constant,

Rm1 & Rm2 ⟶ molar refractivity of solvent and solute and

X1 & X2 ⟶ mole fraction of solvent and solute in solution.

The molar refraction represents actual or true volume of the substances molecules in mole. The molar refraction of solute can be calculated as:

Rm (solute) =R (mixture)-R (solvent)

The refractive index of solvent and solution at different concentration are measured from Abbe's refractometer and the values of molar refraction and polarizibility constants are evaluated and presented in tables 1 to 4 for different systems.

Table

Molar refraction and polarizibility constant for Ligand 1 (Dexamethasone) in DMF

Molarity (M)	R.I.	Rm (cm^3 mole^{-1})	α x 10^{-23} cm^3
0.01	1.417	0.06509	0.002582
0.005	1.416	0.032591	0.001288
0.0025	1.414	0.016390	0.0006503
0.00125	1.4135	0.00820	0.0003252
0.000625	1.413	0.00408	0.0001618

Molar refraction and polarizibility constant for Ligand 1(Dexamethasone) in THF

Molarity (M)	R.I.	Rm (cm^3 mole^{-1})	α x 10^{-23} cm^3
0.01	1.418	0.1069	0.004241
0.005	1.414	0.0539	0.002138
0.0025	1.413	0.0270	0.001071
0.00125	1.412	0.0136	0.000539
0.000625	1.411	0.00682	0.000270

Molar refraction and polarizibility constant for Ligand 1(Dexamethasone) in DMSO

Molarity (M)	R.I.	Rm (cm^3 mole^{-1})	x 10^{-23} cm^3
0.01	1.415	0.06800	0.002698
0.005	1.413	0.03427	0.001359
0.0025	1.4135	0.01718	0.000681
0.00125	1.412	0.00861	0.000341
0.000625	1.411	0.00431	0.000171

Molar refraction and polarizibility constant for Ligand2(Phenytoin) in DMF

Molarity (M)	R.I.	Rm (cm^3 mole^{-1})	x 10^{-23} cm^3
0.01	1.415	0.06261	0.002484
0.005	1.414	0.03140	0.001245
0.0025	1.4135	0.01571	0.000623
0.00125	1.413	0.00826	0.000327
0.000625	1.412	0.00415	0.000164

Molar refraction and polarizibility constant for Ligand 2(Phenytoin) in THF

Molarity (M)	R.I.	Rm (cm^3 mole^{-1})	α x 10^{-23} cm^3
0.01	1.416	0.08372	0.003321
0.005	1.413	0.04224	0.001675
0.0025	1.412	0.02123	0.0008423
0.00125	1.411	0.01065	0.0004225
0.000625	1.399	0.00545	0.000216

Molar refraction and polarizibility constant for Ligand 2(Phenytoin) in DMSO

Molarity (M)	R.I.	Rm (cm^3 mole^{-1})	α x 10^{-23} cm^3
0.01	1.414	0.1224	0.004856
0.005	1.413	0.0613	0.002432
0.0025	1.412	0.0308	0.001222
0.00125	1.411	0.01545	0.000613
0.000625	1.410	0.000774	0.0000307

Result and discussion

It could be seen from above tables (1 to 4) thatmolar refractivity and polarizibility constants decrease with decreasing the concentration of solution. It is also observed that the values of Rm and α are found to be grater in polar solvents, .THF and DMF. Polar solvents involve H-bonding, may from complex with solute and non polar solvent does not involve H-bonding and does not associate with solute. This may also be attribute to the fact that the dipole in the compound lies perpendicular to the longer axis of the molecules considerable dipole association (inter molecular attraction) takes place which would be accompanied by increase in polarizibility constants (α) as well as molar refractions (Rm) with increasing the concentration because of mutual compensation of the dipoles.

Acknowledgement

Authors are thankful to the principal of **D M Burungale College, Shegaon**for providing necessary facilities.

References

1. Raikar S.K., Aminabhavi T.M., Harogoppad S.B. :Ind. J. Tech., **31**, 581 (1993). and Balundgi, R.H.
2. Kapila V.P., Gupta C.M. and Jauhar S.P. :Ind. J. Chem., **30**, 711 (1991).
3. Verma R.P., Kumar V. and Sangal P.:Asian J. Chem., **12**(3), 659 (2000).
4. Mahajan D.T.: Ph.D. Thesis in Chemistry submitted to Amravati University, Amravati (1997).
5. Burghate A.S., Agrawal : Oriental J. Chem. ,**16**(3). (2000). P.B.andKedar R.M.
6. Agrawal P.B., Burghate A.S., Idrees M. and : Oriental J. Chem., 17(1). 147(2001). Narwade M.L.
7. Oswal S.L and Rathnam M.V. :Ind. J. Chem., **26**, 29 (1987).
8. Ikhe S.A .: Ph.D. Thesis in Chemistry submitted to Amravati University, Amravati (2004).

STUDIES OF INTERACTION OF LIGHT WITH DIFFERENT CONCENTRATION OF LIGANDS IN VARIOUS MEDIA BY REFRACTROMETRY.

G.D.Lambhate

Department of Chemistry, Shri D.M Burungale Science & Arts College, Shegaon – 444 203,

Dist: BULDHANA (Maharashtra) INDIA.

ABSTRACT

The additive properties such as Refractive index, Molar polarizibility and molar refractivities of some heterocyclic drugs such as **Chlorothalidon** -2-chloro-5-(1-hydroxy-3-oxo-1,2-dihydroisoindol-1-yl)-benzenesulfonamide,. **Doxycycline** i.e 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12a octahydro 3,6,10,12,12a Pentahydroxyl-1,11-dioxo naphthacence-2-carboxamide have been studied in DMSO, DMF and THF media at 27±0.1°C temperature and concentration

The values of molar refractivity(R) and molar polarizibility (α) are found to be decreased with decreasing the concentration of solute.

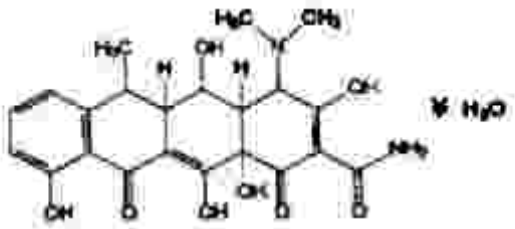
Key wards: Additive property, Doxycycline

INTRODUCTION-

Refractive index is one of the important additives properties of liquid. When a ray of light passes from one medium to another, it suffers to refraction, that is a change of direction. If it passes from less dense to more dense medium, it is reflected towards the normal to form angle of refraction (r) which is less then angle incidence (i).The refractive index is the ratio of the velocity of light in vacuum to that in the medium and it depends upon the temperature and wave length of light. The properties of liquid such as refractive index, viscosity and ultrasonic velocity of binary mixtures are studied by many workers[1-3]. Mahajan[4] has studied molar refraction and polarizability constant of 2-amino-5-chloro benzene sulphonic acid in different percentage of dioxane-water mixture. Burghate[5] and Agrawal[6] studied the refractive indices in mixed solvents. Oswal et al[7] have studied dielectric constants and refractive indices of binary mixtures Ikhe[8] has studies molar refraction and polarisability constant of pyrazoles and isoxazoles in different percentage of dioxane-water mixtures. Meshram et al[36] studied the molar refraction and polarizibility constant of Al(III), Ce(III) and Fe(III) complexes with some substituted isoxazolines, pyrazole and pyrazoline refractometrically.

However study of molar refractivity and molar polarizibility constant of novel compounds such as **Chlorothalidon**-2-chloro-5-(1-hydroxy-3-oxo-1,2-dihydroisoindol-1-yl)-benzenesulfonamide and **Idoquinol** -

5 7 di-iodo-8 – quinolinol in non aqueous solvent such as THF,DMF and DMSO under identical set of experimental conditions which could cover manifold aspect of solute-solvent interaction is scanty.



Chlorothalidon **Doxycycline** Therefore the present work is undertaken to make the systematic study of above novel compounds refractometrically at 27°C temperature.

EXPERIMENTAL: Above novel compound are extensively used as drugs in pharmaceutical. These compounds provide the photographic material with good storage stability even at high temperature and high humidity. The compounds are synthesized by standard method and purity is checked by M.P, TLC, IR, and NMR etc.

The solution of the compounds are prepared in different solvents (THF,DMF,DMSO etc.) by dissolving an appropriate amount by weight. All the weighing are made on Mechaniki Zactady Precyzying Gdansk balance made in Poland (±0.001gm).The accuracy of density measurements is within 0.1Kg/m^3.

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$$Rm_{(solute)} = X_1Rm_1 + X_2Rm_2$$

Rm → molar refraction, n → refractive index, d → density of solution,

No → Avogadro's number, α → polarizibility constant,

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0.00125	1.413	0.00826	0.000327
0.000625	1.412	0.00415	0.000164

Molar refraction and polarizibility constant for Ligand 2(Doxycycline) in THF

Molarity (M)	R.I	Rm (cm^3 $mole^{-1}$)	□□x10^{-2} cm^3
0.01	**1.468**	**0.08094**	**0.003118**
0.005	**1.467**	**0.04058**	**0.001563**
0.0025	**1.467**	**0.02003**	**0.0007827**
0.00125	**1.466**	**0.01018**	**0.0003940**
0.000625	1.464	**0.005201**	**0.00006570**

Molar refraction and polarizibility constant for Ligand 2(. Doxycycline) in DMSO

Molarity (M)	R.I.	Rm (cm3 mole-1)	□□x 10-23 cm3
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Result and discussion: it could be seen from above tables (1 to 4) that molar refractivity and polarizibility constants decrease with decreasing the concentration of solution. It is also observed that the values of Rm and α are found to be grater in polar solvents, THF and DMF. Polar solvents involve H-bonding, may from complex with solute and non polar solvent does not involve H-bonding and does not associate with solute. This may also be attribute to the fact that the dipole in the compound lies perpendicular to the longer axis of the molecules considerable dipole association (inter molecular attraction) takes place which would be accompanied by increase in polarizibility constants (α) as well as molar refractions (Rm) with increasing the concentration because of mutual compensation of the dipoles.

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REFERENCES:

1. Raikar S.K., Aminabhavi T.M., Harogoppad S.B. and Balundgi, R.H. : *Ind. J. Tech.*, **31**, 581 (1993).
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7.	Oswal S.L. and Rathnam M.V.	:	*Ind. J. Chem.*, **26**, 29 (1987)
8.	Ikhe S.A.	:	Ph.D. Thesis in Chemistry submitted t Amravati University, Amravati (2004)
9.	Meshram U.P., Khobragade B.G., Narwade M.L. and Yaul A.R.	:	*J. Chem. Pharm. Res.* **3**(3) (2011) 77

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RESEARCH ARTICLE

SJIF Impact Factor 6.68

OPEN ACCESS

Homogeneous Bianchi Type III Bulk Viscous Model In Presence of χ and Λ In Scalar Tensor Theory of Gravitation

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ABSTRACT

In the present paper, we investigate Homogenious Bianchi Type-III bulk viscous fluid cosmological model with variable gravitational and cosmological constant Λ in the framework of Sear Ballester scalar tensor theory of gravitation. In order to find exact solutions of the Einstein's field equations, we assumed i) the expansion scalar θ is proportional to shear scalar σ, which leads to $C = B^n$, where B and C are functions of time and ii) the coefficient of bulk viscosity is a power function of the energy density and iii) the cosmic fluid obeys the barotropic equation of state. The nature of the model is discussed in the presence of variable gravitational and cosmological constant. Some physical and kinematical aspects of the model are also discussed.

Keywords: Bianchi Type-III Cosmology, Bulk viscosity, Variable G and Λ.

INTRODUCTION

Einstein's general theory of relativity has been successful in describing gravitational phenomena. It has also served as a basis for models of the universe. However since Einstein first published his theory of gravitation, there have been many criticisms of general relativity because of the lack of certain desirable features in the theory. For example Einstein himself pointed out that general relativity does not account satisfactorily for inertial properties of matter, i.e. Mach's principle is not substantiated by general relativity. So in recent years there has been to a interest in several alternative theories of gravitation.

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The most important among them are scalar tensor theories of gravitation formulated by Brans and Dicke(1961), Nordtvedt (1970) and Saez and Ballester (1985). All version of the scalar tensor theories are based on the introduction of a scalar field ϕ into the formulation of general relativity, this scalar field together with the metric tensor field then forms a scalar tensor field representing the gravitational field.

In Saez-Ballester theory the metric is coupled with a dimensionless scalar field in a simple manner. This coupling gives a satisfactory description of weak fields and suggest a possible way to solve missing matter problem in non-flat FRW cosmologies.

The Saez-Ballester (1985) field equations are

$$G_{ij} - \omega\phi^{n}\left[\phi_{,i}\phi_{,j} - \frac{1}{2}g_{ij}\,\phi_{,k}\phi^{,k}\right] = -8\pi T_{ij}, \tag{1}$$

$$2\phi^{,i}_{;i} + \omega n\phi^{n-1}\phi_{,k}\phi^{,k} = 0 \tag{2}$$

where $R_{ij} = -G_{ij} = -\left(R_{ij} - \frac{1}{2}Rg_{ij}\right)$ is the Einstein tensor, T_{ij} is the stress energy tensor of the matter, ω and n are constants and semicolon (;) and semicolon (,) denotes partial and covariant differentiation respectively.

The energy conservation equation

$$T^{ij}_{;j} = 0 \tag{3}$$

is the consequence of field equations (1) and (2).

A detailed discussion of Saez-Ballester cosmological models is contained in the work of Saez (1985), Sing and Agrawal (1991), Singh and Rai (1998), Reddy and Venkateswara Rao (2001). Recently Adhav et al. (2007) investigated Axially symmetric non-static domain wall in scalar-tensor theories formulated by Brans and Dicke (1961) and Saez-Ballester (1985).

Bulk viscosity is supposed to play a very important role in the early evolution of the universe. There are many circumstances during the evolution of the universe in which bulk viscosity could arise. The bulk viscosity coefficient determines the magnitude of the viscous stress relative to the expansion. Ribeiro and Sanyal (1987) studied Bianchi type-III models containing the viscous fluid in the presence of an axial magnetic field. Also non-tilted perfect fluid and viscous fluid cosmological models in early universe have been extensively investigated by many authors like Ram and Tiwari (2001), Adhav et al. (2008), M.K. Verma and Shiv Ram (2011), Kandalkar et al (2012).

The cosmological constant Λ and the gravitational constant G are two parameters present in the Einstein's Field equations. The Newtonian constant G plays the role of coupling constant between geometry and matter in Einstein's field equations. There have been numerous modifications of general relativity in which G varies with time in order to achieve possible unification of gravitation and elementary particle physics or to incorporate Mach's principle in general relativity. The Λ term have been interpreted in terms of Higg's scalar field. Wagoner (1970), Linde (1974) proposed that the Λ term is a function of temperature and related it to the process of broken symmetry. The cosmological constant problem related to the existence of Λ have been discussed in the literature. A number of authors e.g. Kalligas et al. (1992), Arcadi (1997), Abdussattar and Vishwakarma (1997), proposed various possibilities of variations of G and Λ within the framework of general relativity. Verma et al.(2011) investigate bianchi type-I bulk viscous fluid models with variable gravitational and cosmological constant. Recently, Deo et al. (2013) discussed bianchi type-III cosmological model in electromagnetic field with cosmic string in general theory of relativity.

In this paper we investigated Bianchi Type III bulk viscous fluid cosmological model with variable G and Λ in Saez-Ballester theory of gravitation. The paper is organized as follows: We present the metric and Einstein's field equations for viscous fluid with time dependent G and Λ. We deals with solution of the field equations and we obtain a class of the exact solutions under the assumption that 1) the expansion scalar θ is proportional to shear scalar σ 2) the coefficient of bulk viscosity is a power function of the energy density and 3) the cosmic

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fluid obeys the barotropic equation of state. The nature of the model is discussed in the presence of variable gravitational and cosmological constant. The physical and kinematical properties of the model have also been discussed.

2.The metric and field equation

We consider the spatially homogeneous and anisotropic Bianchi type-III metric in the form

$$ds^2 = -dt^2 + A^2(t)dx^2 + B^2(t)e^{-2mx}dy^2 - C^2(t)dz^2 \tag{4}$$

Where m is nonzero constant and A, B, C are functions of the proper time t.

The energy momentum tensor for a bulk viscous fluid distribution is given by

$$T_{ij} = (p + \bar{p})v_i v_j + \bar{p}g_{ij} \tag{5}$$

where

$$\bar{p} = p - \xi\theta \tag{6}$$

Here ρ, p, $\bar{p}$ and ξ are the energy density of matter, thermodynamic pressure, effective pressure and bulk viscosity coefficient respectively and v_i is the flow vector satisfying the relations

$$g_{ij}v^i v^j = -1$$

we choose the coordinates to be comoving so that

$$v^1 = 0 = v^2 = v^3, \quad v^4 = 1 \tag{7}$$

The semicolon stands for the covariant differentiation.

The field equations (1), (2) and (3) for the metric (4) with the help of (5) and (7) can be written as

$$\frac{B_{44}}{B} + \frac{C_{44}}{C} + \frac{B_4C_4}{BC} = \frac{\omega}{2}\phi^{-2}\phi_4^2 = -8\pi G\bar{p} + \Lambda \tag{8}$$

$$\frac{A_{44}}{A} + \frac{C_{44}}{C} + \frac{A_4C_4}{AC} - \frac{\omega}{2}\phi^{-2}\phi_4^2 = -8\pi G\rho + \Lambda \tag{9}$$

$$\frac{A_{44}}{A} + \frac{B_{44}}{B} + \frac{A_4B_4}{AB} - \frac{m^2}{A^2} = \frac{\omega}{2}\phi^{-2}\phi_4^2 = -8\pi G\bar{p} + \Lambda \tag{10}$$

$$\frac{A_4B_4}{AB} + \frac{B_4C_4}{BC} + \frac{A_4C_4}{AC} - \frac{m^2}{A^2} - \frac{\omega}{2}\phi^{-2}\phi_4^2 = 8\pi G\rho + \Lambda \tag{11}$$

$$\phi_{44} + \phi_4\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right) + \frac{\omega}{2}\left(\frac{\phi_4^2}{\phi}\right) = 0 \tag{12}$$

and

$$\phi_{44} + \phi_4\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right) + \frac{\omega}{2}\left(\frac{\phi_4^2}{\phi}\right) = 0 \tag{13}$$

where suffix 4 at the symbols A, B, C and ϕ denotes ordinary differentiation with respective to t. An additional equation of four unknowns θ, G, and Λ is obtained by the divergence of Einstein tensor.

i.e. $\left[R^i_j - \frac{1}{2}Rg^i_j\right]_{;j} = 0$ which leads to $\left(8\pi GT^i_j - \Lambda g^i_j\right)_{;j} = 0$ which gives

$$8\pi G_4\rho^4 - \Lambda_4 = -8\pi G\left[\rho_4 + (\rho + \bar{p})\left(\frac{A_4}{A} + \frac{B_4}{B} + \frac{C_4}{C}\right)\right] \tag{14}$$

The conservation of energy equation (11), after using equation (6), split into two equation

$$\left(\frac{A_4}{A}+\frac{B_4}{B}+\frac{C_4}{C}\right)=0 \tag{15}$$

and

$$8\pi G\rho+\Lambda=8\pi G\xi\left(\frac{A_4}{A}+\frac{B_4}{B}+\frac{C_4}{C}\right)^2 \tag{16}$$

The average scale factor R for the metric (4) is defined by

$$R=(ABC)^{\frac{1}{3}} \tag{17}$$

The volume scale factor V is given by

$$V=R^3=(ABC)^{\frac{3}{2}} \tag{18}$$

The generalized mean Hubble parameter H is given by

$$H=\frac{1}{3}(H_1+H_2+H_3) \tag{19}$$

where $H_1=\frac{A_4}{A}$, $H_2=\frac{B_4}{B}$, $H_3=\frac{C_4}{C}$

The expansion scalar θ and shear scalar σ^2 are given by

$$\theta=3H=\left(\frac{A_4}{A}+\frac{B_4}{B}+\frac{C_4}{C}\right) \tag{20}$$

and

$$\sigma^2=\frac{1}{3}\left[\left(\frac{A_4}{A}\right)^2+\left(\frac{B_4}{B}\right)^2+\left(\frac{C_4}{C}\right)^2-\frac{A_4B_4}{AB}-\frac{B_4C_4}{BC}-\frac{A_4C_4}{AC}\right] \tag{21}$$

The important observational quantity in cosmology is the deceleration parameter q which is defined as

$$q=-\frac{\ddot{R}R}{\dot{R}^2} \tag{22}$$

The sign of q indicates whether the model inflates or not. The positive sign corresponds to the standard decelerating model whereas the negative sign indicates inflation.

3. Solution of the field equations:

Equations (8) – (13) are six independent equations in seven unknowns A, B, C, ρ, p, ξ and ϕ. For the complete determinacy of the system we need extra conditions. We consider the equation (12) yielding

$$A=kB \tag{23}$$

Since we wish to consider space-time with Bianchi type-III we have $A=B$ by taking $k=1$ without loss of generality equation (23) yields:

$$A=B \tag{24}$$

Using equation (24) the field equations (8)-(13) becomes

$$\frac{B_{44}}{B}+\frac{C_{44}}{C}+\frac{B_4C_4}{BC}-\frac{\omega}{2}\phi^2\phi_4^2=-8\pi G\rho+\Lambda \tag{25}$$

$$2\frac{B_{44}}{B}+\left(\frac{B_4}{B}\right)^2+\frac{B_4}{B}-\frac{\omega}{2}\phi^2\phi_4^2=-8\pi G\rho+\Lambda \tag{26}$$

$$\left(\frac{B_4}{B}\right)^2+2\frac{B_4C_4}{BC}+\frac{B_4}{B}+\frac{\omega}{2}\phi^2\phi_4^2=-8\pi G\rho+\Lambda \tag{27}$$

and

$$\phi_{11}+\phi_1\left[\frac{2B_1}{B}+\frac{3}{\xi}+\frac{1}{2}\left\{\frac{n}{3}\left(\frac{\phi_1}{\phi}\right)^{\frac{1}{n}}\right\}\right]=0 \tag{28}$$

solving equations (25) and (26), we get

$$\frac{B_{11}}{B}+\frac{C_{11}}{\xi^2}+\frac{B_1}{B}\left\{\frac{B_1}{B}-\frac{C_1}{\xi}\right\}+\left\{\frac{n}{3}\left(\frac{\phi_1}{\phi}\right)^{\frac{1}{n}}\right\}^2=0 \tag{29}$$

Lastly we assume that the expansion is proportional to the shear which is physical condition. This condition leads to

$$\theta \propto \sigma \tag{30}$$

where θ is scalar function

equation (29) together with (30) leads to

$$\frac{B_{11}}{B}+(1+n)\left\{\frac{B_1}{B}\right\}^2=\frac{1}{(1-n)}\left\{\frac{n}{B}\right\}^2 \tag{31}$$ which can be written as

$$\frac{d}{dB}\left(\frac{B_1^2}{B^{2(1+n)}}\right)=\frac{2}{(1-n)}\left\{\frac{n}{B}\right\}^2 \tag{32}$$

where

$$B=f(B) \tag{33}$$

From (32) we obtain

$$\frac{dB}{d\beta}=\frac{B_1}{(1-n)}+\frac{k}{B^{2(1+n)}} \tag{34}$$

where k is the constant of integration. After a suitable transformation of coordinates, the metric (4) reduces to the form

$$ds^2=\left[\frac{n^2}{(1-n)^2}+\frac{k}{B^{2(1+n)}}\right]dT^2-B^2dX^2-B^2e^{-2X}dY^2+B^2dZ^2 \tag{35}$$

where $B=T$

In addition to obtain the expression for Saez-Ballester scalar field ϕ we rewrite the equation (28) as

$$\frac{\phi_{11}}{\phi_1}+(2+n)\frac{B_1}{B}+\frac{n\phi_1}{2\phi}=0 \tag{36}$$

after straightforward calculation

$$B^{(2+n)}\phi^{\frac{1}{2}}d\phi=n\,dt \tag{37}$$

Now we substitute the value of B, we obtained

$$\phi^{\frac{1}{2}}d\phi=\frac{n^2}{T^{2(1+n)}}dT \tag{38}$$

On integrating, we get the form

$$\phi=\left[\frac{(n+2)}{2(n+1)}\left\{\frac{n^2}{(1-n)T^{2(n+1)}}+\frac{k}{T^{2(n+1)}}\right\}\right]^{\frac{1}{2}}+\phi_0 \tag{39}$$

where K_0 is integrating constant.

It is clear that even in $n=2$ case we can find the physical and kinematical parameters associated with metric (35). The effect of bulk viscosity is to produce a change in the cosmic fluid and therefore exhibits essential change on characteristic of the solution. In most of the investigations, the bulk viscosity is assumed to be a simple power function of the energy density [1995, 1972]

$$\zeta(t) = \zeta_0 \rho^{\alpha} \tag{40}$$

where ζ_0 and α (≥ 0) are constant. For small density α may even be equal to unity [35]. The case $\alpha = 1$ corresponds to a radiative fluid [1972]. Near a big-bang, $0 \leq \alpha \leq \frac{1}{2}$ is more appropriate assumption to obtain realistic models [1976].

For the specification of α, we assume that the fluid obeys an equation of state of the form

$$p = \gamma\rho \tag{41}$$

where γ ($0 \leq \gamma \leq 1$) is a constant.

From equation (38) and (41), we obtain

$$\rho^{\alpha} = \frac{\dot{a}(n+2\alpha(1-\gamma))}{a} \tag{42}$$

Where a dash denotes differentiation with respect to T.

Integrating of equation (42) yields

$$a^{\lambda} = T^{\lambda} \tag{43}$$

Where λ is non-zero integration constant. Using equation (42) we obtain

$$\rho^{\alpha} = \frac{\lambda(n+2\alpha(1-\gamma))}{T} \tag{44}$$

Now using equation (39) from equation (37), we find

$$8\pi\rho = \lambda \left[\frac{n(n-1)}{2} \left(\frac{\lambda}{T^{\lambda}} \right)^2 \right] \left[\frac{n^2}{(1-\alpha)^2 T^{2(\lambda-1)}} + \frac{\lambda}{T^{2(\lambda-1)}} \right] \tag{45}$$

Using equation (44) in equation (45), we get

$$8\pi\left(\frac{\lambda}{T}\right)^{\alpha} = \lambda^{-\alpha} \left[\frac{(3n-1)n^2}{(1-\alpha)^2 T^{2\alpha(\lambda-1)}} + \frac{4(3n-2)n\lambda}{(1-\alpha)T^{2\alpha(\lambda-1)}} + \frac{4(2n-1)\lambda^2}{T^{2\alpha(\lambda-1)}} \right]$$

$$\frac{4(2n^2-3n+1)}{T} - \frac{2n(n-2)}{T} \tag{46}$$

Comparing the coefficients of T on both sides of equation (46), we obtain

$$\alpha = \left[\frac{(3n-1)n^2}{(1-\alpha)^2} + \frac{4(3n-2)n\lambda}{(1-\alpha)T^{\lambda}} + \frac{4(2n-1)\lambda^2}{T^{2\lambda}} \right]$$

$$4(2n^2-3n+1) - \frac{2n(n-2)}{T} \left[\frac{8\pi\zeta_0}{\lambda^{\alpha}} \left(\frac{n}{(1-\alpha)T^{\lambda}} + \frac{\lambda}{T^{2\lambda}} \right) \right]$$

$$8\pi\zeta_0 = \lambda^{\alpha} \tag{47}$$

Equations (43), (44) and (47) are the required

$$\left. \frac{(n+2)(1+\gamma)}{T^{\frac{3(n+1)(1+\gamma)}{2}}} \right] \propto \frac{}{T^{\frac{3(n+1)}{2}}} \tag{48}$$

(on) evolution (49) and (53) we obtain

$$\frac{}{T^{\frac{3(n+1)}{2}}} \tag{49}$$

5. Some physical and Kinematical Properties.

In this section we discuss some physical and kinematical properties of the velocity vector U^i of the model (29), the spatial volume (V), the scalar expansion (θ), the shear scalar (σ^2) and deceleration parameter (q) for the fluid are given by

$$V = \sqrt{-g} = a(T)T^{\frac{3(n+1)}{2}} \tag{50}$$

$$\theta = (n+2)\sqrt{\frac{a^2}{(1-n^2)T^2} + \frac{k_1}{T^{3(n+1)}}} \tag{51}$$

$$\sigma^2 = \frac{(n^2-4n+4)a^2}{2}\left(\frac{a^2}{(1-n^2)T^2} + \frac{k_1}{T^{3(n+1)}}\right) \tag{52}$$ and,

$$q = \frac{n^2+3n-2n}{n-2n} \tag{53}$$

The Hubble parameter is given by

$$H = \frac{(n+2)}{3}\sqrt{\frac{a^2}{(1-n^2)T^2} + \frac{k_1}{T^{3(n+1)}}} \tag{54}$$

The spatial volume of the model given by (49) shows the non-static expansion of the universe with time. For the model expansion scalar θ and shear scalar σ^2 both tends to zero as $T \to \infty$. The positive value of deceleration parameter indicates the model decelerates in the standard way.

CONCLUSION

In this paper, we investigated Bianchi Type III bulk viscous final cosmological model with variable G and Λ in Saez-Ballester theory of gravitation by applying a determinate solution of the field equations, we have assumed the relation between metric potential and shear viscosity is proportional to the scale expansion. We observe that the spatial volume is zero at $T=0$. At this epoch the energy density ρ, expansion θ, shear scalar σ and the bulk viscosity coefficient ξ are all infinite. Therefore the model (35) starts evolving with a big-bang at $T=0$. For large T energy density becomes zero, the rate of expansion in the model shows decrease tending to zero as $T \to \infty$. The cosmological constant term Λ is infinite at the beginning of the model and decreases at late time. The gravitational constant G is zero initially tends to

$\rho \to \infty$ as $T \to \infty$. These are supported by recent results from the observations of the hyper La supernova explosion (SN 1a).

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REFERENCES

1. Adhav, K.S., Nimkar, A. S., Lgali, M.R. Raut, V.B.: Astrophys Space Sci 2009;318:235-60.
2. Adhav, K.S., Nimkar, A. S., Naidu, R.J., 2007, Astrophys Space Sci 312,165-169.
3. Ital. Rend Physics Pramana J. Phys. 2001, 56, 513.
4. Brans, H., Dicke, R.H., Phys Rev. 1961, 124,925.
5. Hawking, S. W. and Ellis, G.F.R. 1973. The large scale structure of space-time, p88A, ambridge University Press
6. Nordtvedt, K., Class Quantum Grav. 1995, 12, 2435.
7. Sheykhi, K., Post-Newtonian Metric for a General Class of Scalar-Tensor Gravitational Theories and Observational Consequences, Ap. J. 1674: 161 1622.
8. Pradhan, V., Nalini, L.S., Yadav, L.L., ARYN journal of Science and Technology 2015, 3-4, 423-429.
9. Sreedhar, V.Rekha Jawa of Rajasthan Short Up. Appl. Phys. 2011,2,1882,PP 30-36
10. Barros, D. Batista, J. and Lucchesi, D., Class Quant. Grav. 1998, 15, 797.
11. Reddy, D.R.K., Venkateswara Rao, N., Astrophys. Space Sci. 2001, 277, 601.
12. Santos, N.O., Dias, R.S. and Banerjee, A., J. Math. Phys. 1985, 26, 878.
13. Saez, D., Ballester, V.J. Phys. Lett. 1986, A113, 467.
14. Singh, T. and Agrawal, A.K. Astrophys. Space sci. Vol. 182, 289.
15. Shri Ram, Tiwari, S.K., Astrophys Space sci., 1998, 317,301.
16. Verma, M.K. and Shri Ram, Adv. Studies Theor. Phys., 2011, 5, 8, 387-398.
17. Weinberg, S., Gravitation and Cosmology, Wiley, New York 1972.
18. Yu, H., Zhu, Z.H., 2008, Several Physics, 2011, 1003.pp 1178-1187.
19. Zumalt, D., Phys. Rev., 1969, 1153, 1483.
20. Wagoner, R.V., Pysical Review, 1970, 0, Vol. 1, No. 12, pp 3209-3216.
21. Linde, A.D., JETP Letter, 1974, Vol.19 No. 5, pp 183.
22. Kalligas, D., Wesson, P., Everitt, C.W.F., General Relativity and Gravitation,, 1992, Vol. 24, pp 351-357.
23. Arbab, A.I., General Relativity and Gravitation, 1997, Vol 29, No. 1pp 61-74.
24. Abdussattar and Vishwakarma, R.G., Quantum Gravity, 1997, Vol.14, No. 4, pp 945-953.
25. Kandalkar, S.P., Samudrkar, S.W., Gawande, S.P., IJSER, 2012, 3,11,1-7.
26. Manj. K. Verma, Shrim Ram., Applied Mathematics, 2011, 2, 348-354.
27. Deo, S.D., Gopalkrishna S., Punwatkar,, Archives of Applied Science and Research, 2015, Vol.7, No.1, pp. 48-53.

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Water Quality Assessment and Kidney Stone Formation from Jalgaon Jamod Area of Buldana District Maharashtra

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Abstract

Water quality is crucial aspect in front of human society. It influence on various facet of national development. All national and international aspect gets affected by water quality. Water quality checked from various physico-chemical parameters. These parameters were evaluated by using various literature methods. Present research work regarding to the evaluation of various physico-chemical parameters such as pH, TA', total hardness, alkalinity, chloride, fluoride, sulphate, phosphate, calcium and magnesium of drinking water. These evaluation helps to understand the potency of kidney stone formation in population belong to Jalgaon Jamod area.

Introduction

Now a day world population continuously increases simultaneously increase in demand of fresh water. Today only the Ground water resources are available to effectively complete the demand of pure water of rural and urban populations. Most of the world population depends on ground water resources for the fresh water for drinking purpose. Approximately one third of the world population depends on ground water resources. Life on Earth widely influence by air, water and various minerals. If any one influencing factor deflected from their range it will shown negative effect on human health. In India contaminated water emerge as a great problem. Hydro-geochemical conditions influence the ground water quality.Kidney stone formation disease became a great disaster in front of world human society. Usually formation of stone in the kidney (nephrolithiasis), ureter (ureterolithiasis), or urinary bladder(cystolithiasis) these stone produced due to the successive physicochemical events of supersaturation, nucleation, aggregation and finally retention1. Calcium oxalate, calcium phosphate, calcium carbonate, magnesium-ammonium phosphate, uric acid and cysteine are the basic components observed in kidney stone2.Different world portion having different probability of stone formation and it is estimated as 1%– 5% in Asia, 5%– 9% in Europe and 13% in North America3. In India, 5-7 million patients are facing this trouble that is approximately 15% 4.Kidney stone disease took a long time to cure and it accountably influence on other body function like epidemiological, biochemical, metabolic, and genetic risk factors. It is a multifactorial disease5. Stone formation closely influence by drinking water quality. Water quality decides from various physicochemical parameters. These parameters are determined from the known literature methods6-10. Although there was some controversy observed in between to water quality and stone formation issue. No one devoted toward investigation of pre and post monsoon season water quality with respect to kidney stone formation in population belong to Sangrampur area. Therefore in present research scheme designed with title as water quality evaluation and potency of kidney stone formation from Jalgaon Jamod area.

Materials And Methods

Selection of patients:

Subjected patients are selected from Sarbati mate government hospital shegaon, PHC from Jalgaon Jamod area during April 2000 to April 2014.Patients belonging to study area reliably responded and they were consent for patient interaction and were provided proper and details information about their stone problem and daily life routine.

Collection of water samples

Denser kidney stone patient area specifically selected for sampling. Collection of samples was carried out from selected study areas on the same time. Water samples are selected from those water bodies used by population for drinking purpose from more than last 15 years. Sample was collected in 500-mL high-density, clean and sterile polyethylene bottles from those particular places where we got a maximum number of patients (case areas). Sampling were collected twice yearly in pre monsoon and post monsoon season. Before a sample was collected, the water was initially released for some time to ensure fresh water. Then the bottle was filled with water having no acid or air bubbles and was capped immediately to prevent atmospheric contamination5. Before analysis of sample, carefully labelled it and maintain temperature in cooling condition for next 24 hrs.

Analysis of water samples

After passing 24 hrs water samples were analyzed for pH, EC, TA, TDS, Total Hardness, calcium , magnesium, chloride, fluoride, phosphate and sulphate.pH determination received more values because it indicate the acidic nature and pollutant contaminants states. The EC evaluation informed the mineral content and salinity of water. also revels the inorganic pollution from of water.TDS study help to understand the total amount of inorganic like potassium, calcium, sodium, bicarbonates, chlorides, magnesium, sulphates as well as organic minerals contaminants from water. Titration method methods are used to examine the total alkalinity and hardness of water. All standard literature methods were used for physicochemical analysis of water6

Results And Discussion

This research work carried out in three parts. In first part preliminary information regarding to kidney stone patients was collected from different villages belong to Jalgaon Jamod regions. from these study select the specific water sampling areas on the basic of patients density It is the second part and in third part concern to determination of water quality from the analysis of physic-chemical parameters of sampling water. Analysis carried out by various standard methods. During present work total 1100 patients of kidney stone subjected for preliminary data. They are belonging to aged 10-75 years old and admitted in the Saibai Mai government hospital Shegaon. PHC belong to Sangrampur region from 2000 to 2014. Out of 1100 kidneys stone patients 715 patients (i.e. 65%) were man and remaining 385 patients (i.e 35%) were women and man to women sex-ratio become approximately 2:1. Preliminary data tabulated in table no.-1, table no. 2 represent physic-chemical analysis of water.

Twenty five highly kidney prone sampling station were selected for pH, Electrical conductivity, TDS, Total hardness, T.A., Ca^{2+}, Mg^{2+}, Chloride, fluoride, sulphate and phosphate. Total alkalinity and Acidity analyzed by using standard method as prescribed by APHA. The status of drinking water quality of study area and correlation is tabulated in Table 2 and Table 3 respectively for pre and post monsoon seasons.

Table 1: Characteristics of the patients (n=1100)

Characteristic	Value
Age (y)	46.5±8.74
Gender	
Male	715 (65%)
Female	385 (35%)
Daily water intake (L)	
Less than 3	652 (59.3%)
<2	103 (9.4%)
2–3	345 (31.4%)
More than 3	526 (47.8%)
3–4	362(32.9%)
4–5	200(18.18%)
>5	12 (1.09%)
Residence	
Urban	00(0%)
Rural	1100 (100%)

Characteristic	Value
Food habit	
Vegetarian	575 (34.09%)
Non-vegetarian	725 (65.90%)
Average stone size (cm)	1–3
Stone location	Left and right kidney, ureter and urinary bladder
Major constituent of stone (%)	
Calcium oxalate	~60 to 70
Calcium phosphate	~5 to 10
Uric acid	~5 to 10
Struvite	~10 to 20
Symptoms	Flank and back pain, hematuria, nocturia, burning sensation during urine passage
Lifestyle	
Sedentary	399 (36.27)
Non-sedentary	701 (63.72)

Table-2 : Water parameters (Post sampling (Winter2012))

	Sample No.	TA	Ca^{++}	Mg^{+}	Cl	TH	TDS	E.C	SO_4^{--}	F	PO_4^{--}	pH
Akoli Khurd	DW1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Asalgaon	DW2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Awsa	DW3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bayanbo	DW4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bhendwal	DW5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bilkhed	DW6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Boba	DW7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bodakha	DW8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chunawati	DW9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chavan	DW10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Chandi	DW11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ghumarwadi	DW12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ghanoti	DW13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Godegaon	DW14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hiware	DW15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jamod	DW16	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Jamthan	DW17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Karanji	DW18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kasarwadi	DW19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kokode	DW20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kolurdi	DW21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kolambhed	DW22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kolkhed	DW23	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kolwandi	DW24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Kothali	DW25	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Max	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9
	Min	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Average	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table -3:- water parameters (Pre sampling (Summer 2013))

	Sample No.	TA	Ca^{++}	Mg^{+}	Cl	TH	TDS	E.C	SO_4^{--}	F	PO_4^{--}	pH
Akoli Khurd	DW1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Asalgaon	DW2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Awsa	DW3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bayanbo	DW4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Bhendwal	DW3	162	156	66	146	323	800	6412	[illegible]	1.2	0.032	7.88
Bhilkhet	DW6	218	165	97	165	573	2000	20	550	0.7	0.041	7.97
Bhoo	BW7	187	241	39	71	202	630	1450	281	0.6	0.033	7.89
Bodakha	DW8	195	201	99	854	460	2000	385	280	0.8	0.032	7.79
Changezhal	DW9	300	80	67	53	336	1450	312	293	1.2	0.027	7.89
Chawag	DW10	204	95	84	97	444	1600	713	488	0.9	0.022	7.73
Comet	BW11	250	80	54	66	736	1200	380	29	1.4	0.0062	7.89
Dhamangaon	BW12	204	73	53	107	112	800	425	282	0.9	0.021	8.1
Dhamna	BW13	328	122	83	684	302	1600	332	256	0.6	0.026	7.92
Gadegaon	BW14	155	203	93	74	276	1600	1578	282	0.8	0.034	7.82
Jalgaon	BW15	205	80	234	996	524	450	350	193	0.7	0.035	7.66
Jamod	BW16	330	441	915	854	1200	9584	2050	142	0.9	0.007	7.76
Jastagaon	BW17	160	154	36	82	208	450	6350	259	1.3	0.012	7.7
Kategaon	BW18	210	276	301	75	1320	2562	1460	283	1.2	0.042	8.15
Kakanwada	DW19	260	98.6	33	759	555	600	390	201	1	0.043	7.68
Kakoos	BW20	450	255	173	69	928	9574	2100	229	0.9	0.035	8.07
Kalmeda	DW21	450	624	691	295	1029	8550	8520	495	0.8	0.001	8.09
Kalamkund	DW22	285	125	157	005	64*	740	250	199	0.6	0.01	7.4
Kalkhed	BW23	246	300	212	104	682	830	350	306	0.7	0.032	7.84
Kanergaon	BW24	220	273	62	168	532	2630	1350	294	0.9	0.021	8.11
Katsul	DW25	333	514	228	445	536	2060	420	306	0.6	0.027	7.84
	Max	720	634	912	998	4120	9584	6050	593	1.4	0.221	8.20
	Min	160	80.6	33	53	112	400	312	100	0.6	0.001	7.13
	Avg	332	274	194	274	958	1760	1538	323	0.97	0.034	7.810

Conclusions

Table 1 reveals the preliminary information about the 1109 patients belong to study area. This information's depicted about the density and intensity of kidney stone disease. This knowledge helps to selection of study area from Sangrampur region. Table-2and Table -3reveals the current trends of physicochemical parameter of drinking water in post-monsoon (2012)ard pre-monsoon (2013) season respectively.

Table- 2reveal that, Total Alkalinityvalues of drinking water from DW5, DW7, DW8, DW14, BW17, DW22 were found to be below the permissible limit while BW observed beyond permissible limit of TA value. Total Hardness values of drinking water from DW2,DW3, DW6,BW15,BW16,BW18,BW20,BW23,DW21 and DW25were found to be beyond permissible limit and their total average 1029.2 mg/l. Tota dissolve solid values of drinking water from DW1,DW2,DW3,DW6,DW8,DW9,DW21,DW22,DW25,BW16,BW18,BW20,BW24 were found to be beyond permissible limit and their total average is 2737.8 mg/l. Electric conductivity values of drinking water from DW3,DW5,DW6,DW7,DW10,BW14,BW16,BW17,BW18,BW20,DW21,BW24 were found to be beyond permissible limit and their total average is 1682.1mg/l. Ca2+ values of drinking water from DW1,DW2,DW3,DW4,DW5,BW7,DW8,BW14,BW16,BW17,BW18,BW20,DW21,BW23,BW24,DW25were found to be beyond permissible limit and their total average is 260.01mg/l. Mg2+ values of drinking water belong to DW2,DW3,DW6,DW8,DW10,BW16,BW18,BW20,DW21,DW22,DW23,DW25 were found to be beyond permissible limit and their total average is 218mg/l. Cl-values of drinking water belong to DW3,DW6,DW7,DW9,DW10,DW11,

BW14,BW17,BW18,BW20were found to be below permissible limit and their total average 337mg/l. SO4 2-values of drinking water belong to DW1, DW4, DW6 DW10, DW21, DW22, DW25, BW15, BW16found to be beyond permissible limit and their total average is 403.8 mg/l. F-valuesof all drinking water samples were found in within permissible limit and their total average is 1.08 mg/l. PO4 3-values of drinking all water samples are found in permissible limit and their total averageis1682.1mg/l. pHvalue of all drinking water samples were found within permissible limit excepting DW2.

Table-3 reveals that, Total alkalinity value of drinking water found to be within permissible limit excepting BW24 water sample And their total average is 323.1mg/l. TH DW2, DW3, BW15, BW16, BW18, BW20, DW21, DW22, BW23found beyond permissible limit. Average is 958.2mg/l. Total Dissolved Solid values of drinking water of DW2, DW3, DW9, BW16, BW18, BW20, DW21, DW22, DW24 found to be beyond permissible limit and their total average is 3269 mg/l. Electric conductivity values of drinking water from DW3,DW5,BW7,BW14,BW16,BW17, BW18, BW20,DW20,DW21,BW24 were found to be beyond permissible limit and their total average is 1528.1 mg/l. Ca2+-values of drinking water from DW3,DW4,BW7,DW8,BW 4,BW16,BW18,BW20,BW21,BW24,DW25 found to be beyond permissible limit. Mg2+values of drinking water belong to DW2,DW3,BW15,BW 6,BW18,BW20, BW21,DW21,DW23,BW23,DW25were found to be beyond permissible limit and their average is 194.6 mg/l. Cl- values of drinking water of DW1,DW2,DW4,DW8,BW13,BW15,BW16,DW19,DW21,DW22,BW23,DW25 were found to be beyond permissible limit and them average is 674.2mg/l. SO4 2- values of drinking water belong to DW1, DW4, DW5, DW10, DW22 were found to be beyond permissible limit and their total average is 325mg/l. F-values found in permissible limit for all water samples and their total average is 0.47118mg/l. PO4 3-values of all water samples were found to be in permissible limit and their average is 0.034 mg/l. Totalaverage of pH values for all water samples found to be 7.85.

It is observed that those water sample parameters values beyond to permissible limit which is responsible to low quality of water. Due to higher values of total hardness, EC, Calcium and magnesium increases the risk of kidney stone formation. It is advice to villagers to boil water and filter it to minimize the risk of kidney stone diseases. Kidney stone may occur due to continuous use of hard water.

References:

1 Robertson WG, Peacock M, Heyer M, Marshall DJ, Pearson R, Speed R. et al (1983) Studies on the prevalence and epidemiology of urinary stone disease in men in Leeds. Br J S. et al 73:393-398.
2 Hussain M, Jan M, Ali B, Ahmad A, Zia N, Saqib Z, et al (2004) Study on role of urinary calcium associated with renal failure. J Pak Med Assoc. 54:205-208.
3 Biradar AN, Patil NB, Yadawe MS, Kundargi VS(2014) Influence of water quality on urolithiasis. World J Pharm Res. 3:483-487.
4 Klemer SM (1995). Water: an essential but overlooked nutrient. J Am Diet Assoc. 99:200-206.
5 Khan S, Shahnaz M, Jehan N, Rehman S, Shah MT, Din I(2013). Drinking water quality and human health risk in Charsadda district, Pakistan. J Clean Prod. 60:93-101.
6 Hoegh J, Hesse T, Schlüter T, Bergsdorf A, Osterle A, Alken J, et al (1989). Urine volume: stone risk factor and preventive measure. Nephron. 51(Suppl 1):31-35.
7 World Health Organization(1971). Guidelines for drinking-water quality, health criteria and other supporting information. 2nd ed. Vol.2. Geneva: World Health Organization.
8 Indian Council of Medical Research. 1975. Manual of standards of quality for drinking water supplies. India. Counc Med Res Spl Rep No 44:27.
9 Kumar M, Puri A(2012). A review of permissible limits of drinking water. Indian J Occup Environ Med. 16:40-44.
10 Garg VK, Suthar S, Singh S, Sheoran A, Garima, Meenakshi, et al(2009). Drinking water quality in villages of southwestern Haryana, India: assessing human health risks associated with hydrochemistry. Environ Geol. 58:1329-1345.

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Effect of Drinking Water on Potential Kidney Stone From Sangrampur Region of Buldana District, Maharashtra

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Abstract :

The high incidence of renal disorders/diseases in Sangrampur Tehsil of Buldana District in India has been a matter of great concern. The present work deals with physicochemical analysis of drinking water and number of kidney stone patients found in study area. Physico chemical parameters such as pH, Electrical conductivity, TDS, Total hardness, Ca hardness, Mg hardness, Chloride, Total alkalinity and Acidity were analyzed (APHA 1998) to know the present status of drinking water quality during periods of one year from February 2013 to January 2014 and correlated with kidney stone patients. It was observed that, water parameters were found above the permissible limit and responsible for increase kidney stone problem in study area.

Keywords : Sangrampur Tehsil, Drinking Water, Total Hardness, Kidney Stone.

Introduction :

Now a day in India and all over world kidney stone treated as a major problem because of less quality of drinking water. It is rising in rural and urban societies of India. A large population of country suffers by kidney stones which are formed due to deposition of calcium, phosphates and oxalates in kidneys and later moving in urinary tracts and bladders (Madhav Awasthi et al. 2011)[1]. Calcium oxalate monohydrate is more frequent in normocalcemic group and also is associated with a lack of inhibitory capacity, while a mixed calculus of calcium oxalate and phosphate or calcium oxalate dihydrate can be related with hypercalciuria (V. Conte et al,1990)[2]. Intake of sodium is also associated with increased risk of stone formation presumably because of increased urinary calcium excretion (Carbone et al. 2003; Vasanthamani and Sushumba, 1997).[3]

This work is done beginning with visiting hospitals for collecting information of kidney stone patients like name, gender, address, age etc. Secondly, using questionnaire prepared specifically, visiting the patients' houses for knowing water sample point and collect water for water analysis at laboratory for estimating various water quality parameters such as pH, Electrical conductivity, TDS, Total hardness, Ca hardness, Mg hardness, Chloride, Total alkalinity and Acidity by using standards methods (APHA 1998) to know the present status of the drinking water quality during the periods of one year from February 2013 to January 2014.

and correlate with kidney stone patients. The present work is an attempt to study the relationship among quality of water and kidney stone patients in Sangrampur Tehsil of Buldana District, Maharashtra.

Study Area :

Sangrampur tehsil coordinates 21.05'N 76.05'E. It is part of the Jalgaon Jamod Sub-Division for Revenue of the Buldhana district. The tehsil has an area of 592 square km and consists of 105 villages, totaling a population of around 72,000 approximately.

Research Methodology:

Total Nineteen highly kidney prone sampling station selected on the basis of data gather from questionnaire and Diagnostic camp of Sangrampur tehsil. Water samples were collected in morning hours between 9 to 11am in polythene bottle regularly for every month. Physico-chemical parameters such as pH, Electrical conductivity, TDS, Total hardness, Ca hardness, Mg hardness, Chloride, Total alkalinity and Acidity were analyzed by using standard method as prescribed by APHA.

Sample Collection :

Sampling locations consist of urban as well as rural area. Water samples collected from nineteen locations from Sangrampur tehsil headquarter pre and post monsoon season. Details of sampling locations are shown in Table -1

Table-1

Sampling area Code	Sampling Location	Sampling area Code	Sampling Location
DW1	Asolaamarath	DW12	Khandeo
DW2	Bhendwal	DW13	Khiroda
DW3	Chonda	DW14	Mahishal
DW4	Godeoan	DW15	Nimbhora(Bar.
DW5	Jalgaon Jamod	DW16	Pimpli
DW6	Jategaon	DW17	Sawali
DW7	Kadoda	DW18	Sawanga
DW8	Kalamkhed U.	DW19	Takali
DW9	Kalamkhed L.	DW20	Takli Khoje
DW10	Kavadgaon		

Results & Discussion :

Nineteen highly kidney prone sampling station selected for present research work and their physico-chemical parameters investigated by standard method [2]. These parameters are plays a prime role in quality of water.

pH, Electrical conductivity, TDS, Total hardness, Ca hardness, Mg hardness, Chloride, Total alkalinity and Acidity investigated and obtained results compared with the Indian Standard (IS 10500). The status of quality of drinking water of study area is depicted in Table-2.

Table -2

Sampling	Total Alkalin	Ca^{2+} (Mg/	Cl (Mg/	E.C.	Hardness	Mg^{2+} (Mg/	pH	TDS (Mg/	Acidity	Kidney

area code	ity (Mg/L)	L)	L)		(Mg/L)	L)		L)	(Mg/L)	stone patients found ?
DW1	120	198.79	21.3	0.46	944	181.08	8.57	31600	7.5	Yes
DW2	480	378.35	76.68	1.24	1696	320.18	7.99	13800	122.5	Yes
DW3	410	285.36	46.86	1.04	1280	241.69	8.36	26000	72.5	Yes
DW4	660	128.2	298.2	1.68	1200	260.34	8.24	28000	115	Yes
DW5	550	444.8	155	2.03	4200	91.251	7.71	40000	250	Yes
DW6	440	420.03	56.56	1.42	2000	385.03	7.8	3200	185	Yes
DW7	450	227.65	69.58	1.15	928	170.18	8.17	26200	45	Yes
DW8	680	567.53	565.16	3.93	3092	832.14	7.85	19000	190	Yes
DW9	790	320.64	144.84	1.99	1248	225.32	8.1	14000	85	Yes
DW10	710	278.95	73.84	1.46	1520	301.57	8.45	13600	67.5	Yes
DW11	470	634.86	597.82	3.85	4338	897.43	8.02	38200	147.5	Yes
DW12	720	275.75	163.3	1.58	534	62.76	8.14	2600	150	Yes
DW13	420	262.92	136.32	1.35	2080	441.55	8.04	17400	52.5	Yes
DW14	600	307.81	86.62	1.35	1840	372.32	8.04	38400	400	Yes
DW15	1270	477.75	629.06	4.9	1568	264.93	8.06	18800	167.5	Yes
DW16	440	179.5	86.62	1.33	1736	378.22	8.3	13000	67.5	Yes
DW17	480	496.9	200.22	1.84	2760	549.93	7.87	48400	155	Yes
DW18	370	160.32	58.22	0.88	1232	260.41	8.37	2800	12.5	Yes
DW19	440	339.87	117.86	1.59	1344	244	8.49	14606	37.5	Yes

Conclusions:

Table-2 revels that total alkalinity of village code DW4, DW8, DW9, DW10, DW12, DW15 were beyond the permissible limit. Calcium found within permissible limit of village DW1, DW4, DW16,DW18. Electrical Conductivity and Hardness parameters shows Vice-versa correlation in study area. Present work revels hardness of water of DW12 has lowest value and DW11 has highest. DW17 has highest value of TDS while DW3 and DW12 has lowest value of TDS.

Hardness and TDS were found to beyond permissible limit in all villages. It is observed that in all villages water is not suitable for drinking due to highest hardness which is out within permissible limits. It is advice to villagers to boil water cool and filter it to minimize the risk of kidney some diseases. Kidney stone may occur due to continuous use of hard water.

References:

1. Kornack and P. Rakic, "Cell Proliferation without Neurogenesis in Adult Primate Neocortex," Science, vol. 294, Dec. 2001, pp. 2127-2130, doi: 10.1126/science.1065467
2. S. Ahman and R. Parizek, Dilution of nonpoint source nitrate in ground water. J. Environ. Quality 1998; 24:707-717.
3. APHA, Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF 1998. Washington D.C.
4. Adekunle, A. S. Effects of Industrial Effluent on Quality of Well Water Within Asa Dam Industrial Estate, Ilorin, Nigeria. Nature and Science 2006;7(1).
5. Datta, P.S. Ground water abuse for its sustainability. Current Science 2005; 89 (5): 18.
6. IS 10500: Drinking Water Specification, 1992 (Reaffirmed 1993)
7. Jaiswal, A. Dixit, S. Pre and post monsoon variation in physico-chemical characteristic in groundwater quality in Bhopal, India. Asian J. Exp. Sci. 2008; 22(3).
8. Mahanta, B.N., Sarkar, B.C., Singh, G., Saikia, K., Paul, P. R. Multivariate statistical modeling and indexing of ground water quality in and around Jharia coalfields, Jharkhand. NSEEME. 2004.
9. Ramachandraiah, C. Right to drinking water in India. Centre for Economic and Social Studies. 2004:56.
10. Pandey, Sandeep K., Tiwari, S. Physico-chemical analysis of ground water of selected area of Ghazipur city-A case study. Nature and Science. 2009;7(1).
11. World Health Organization-WHO. Guidelines for drinking water quality. 2nd Edition. Volume 3 Surveillance and Control of community supplies. Geneva, Switzerland. 1997
12. Rao, Sudhkar M., Mamatha, P. Water quality in sustainable water management. Current science.

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12. Water Quality and Potency of Kidney Stone Formation from Sangrampur Tehsil Area

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Abstract

Water quality is crucial aspect in front of human society. It influence on various facet of national development. All national and international aspect gets affected by water quality. Water quality checked from various physico-chemical parameters. These parameters were evaluated by using various literature methods. Present research work regarding to the evaluation of various physico-chemical parameters such as pH, EC, total hardness, alkalinity, chloride, fluoride, sulphate, phosphate, calcium and magnesium of drinking water. These evaluation helps to understand the potency of kidney stone formation in population belong to Sangrampur Tahsil area.

Introduction

Now a day world population continuously increases simultaneously increase in demand of fresh water. Today only the Ground water resources are available to effectively complete the demand of pure water of rural and urban populations. Most of the world population depends on ground water resources for the fresh water for drinking purpose. Approximately one third of the world population depends on ground water resources. Life on Earth widely influence by air, water and various minerals, if any one influencing factor detected Beyond their range it will shown negative effect on human health. In India contaminated water immerge as a great problem. Hydro-geochemical conditions influence the ground water quality. Kidney stone formation disease became a great disaster in front of world human society. Usually formation of stone in the kidney (nephrolithiasis), ureter (ureterolithiasis), or urinary bladder(cystolithiasis) these stone produced due to the successive physicochemical events of supersaturation, nucleation, aggregation and finally retention[1]. Calcium oxalate, calcium phosphate, calcium carbonate,

magnesium-ammonium phosphate, uric acid and cystine are the basic components observed in kidney stone[2]. Different world portion having different probability of stone formation and it is estimated as 1% - 5% in Asia, 5% - 9% in Europe and 13% in North America[3]. In India, 5-7 million patients are facing this trouble that is approximately 15%[4]. Kidney stone disease took a long time to cure and it accountably influence on other body function like epidemiological, biochemical, metabolic, and genetic risk factors. It is a multifactorial disease[5]. Stone formation closely influence by drinking water quality. Water quality decides from various physicochemical parameters. Those parameters are determined from the known literature methods[6-19]. Although there was some controversy observed in between to water quality and stone formation issue. No one devoted toward investigation of pre and post monsoon season water quality with respect to kidney stone formation to population belong to Sangrampur area. Therefore in present research scheme designed with title as water quality evaluation and potency of kidney stone formation from Sangrampur Tehsil area.

Materials and Methods

Selection of Patients

Subjected patients are selected from Sahai mole government hospital shegaon, PHC from sangrampur during April 2000 to April 2014. Patients belonging to study area reliably responded and they were consent for patient interaction and were provided proper and details information about their stone problem and daily life routine.

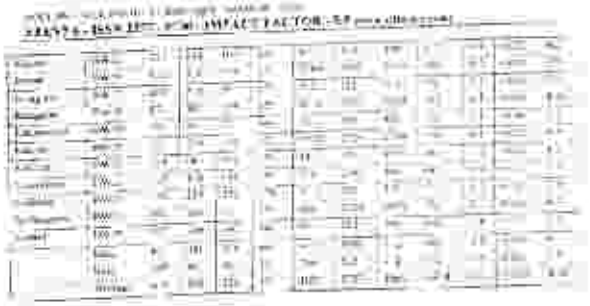
Collection of water samples

Denser kidney stone patient area specifically selected for sampling. Collection of samples was carried out from selected study areas on the same time. Water samples are selected from those water bodies used by population for drinking purpose from more than last 15 years. Sample was collected in 500-ml high-density, clean and sterile polyethylene bottles from those particular places where we got a maximum number of patients (case areas). Sampling were collected twice yearly in pre monsoon and post monsoon season. Before a sample was collected, the water was initially released for some time to ensure fresh water. Then the bottle was filled with water having no acid or air bubbles and was capped immediately to prevent atmospheric contamination[7]. Before analysis of sample, carefully labelled it and maintain temperature in cooling condition for next 24 hrs.

Analysis of water samples

Results and Discussion









Conclusion

TO STUDY INTERMOLECULAR INTERACTION OF SUBSTITUTED THIOCARBAMIDOPHENOL AND Cu(II) AND Cd(II) ION IN 70% MIXED SOLVENT MEDIA

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Abstract

Pharmacodynamics and pharmacokinetics of drug received importance in the study of drug potency. Physicochemical parameter of newly synthesized molecules reasonably influence to different steps of pharmacodynamics. Intermolecular interactions and stability constant related to activity of synthesized molecules. Present work concerning to the interaction result synthesized 4-Phenylthiocarbamidophenol (L1) and 4-(p-Chlorophenyl)thiocarbamido phenol (L2) and Cu(II) and Cd(II) metal ions in 70% ethanol-water mixture. Jobs method of continuous variation is used through this investigation. The stoichiometry of complex formation found to be 1:1. This investigation helps to understand drug effect and drug activity of newly synthesized drugs.

Keywords - 4-Phenylthiocarbamidophenol (L1) and 4-(p-Chloro) phenylthiocarbamido phenol (L2), Stability constant, Jobs Method of Continuous variation.

INTRODUCTION

Drugs Potency closely related to molecular structure and their ionic interactions. Interaction of newly synthesized molecules with different metal ions has received some major importance to understand their intra and inter molecular interactions. Solution equilibrium of molecule possible to understand their complex formation ability of ligands and activity of complexes. Drug potentials of ligands are relatively corresponding to complexation and its knowledge how to know composition as well as conformation of complex formation. Drug activity, drug effect, transportation of drug and absorption of drug all these four factors are depending on stability constant of molecule. Absorption directly proportional to concentration and it is alter by different physical parameters of molecules. Spectrophotometric technique more efficiently examines absorption. Due this technique has a great significance in measurements of stability constant and confirmation of complex formation in solution. Wagh [1] and Deshmukh [2] determined log K value of chalcones pyrazine methacrylic acids and N-(p-hydroxyl ethyl benzene. Gulhan et al [3] studied (L)-2-mercaptopropionyl-N-(p-tolyl)benzamide with some metal ion by spectrophotometrically. Boldescu et al [4] Spectrophotometrically studied sanguinine-beta cyclodextrin complex formation. Spectrophotometrically determination of phenylprine hydrochloride and salbutamol sulphate drugs in pharmaceutical preparation were measured. metaclopramine hydrochloride was carried out by Al-Abachi and Abed [5]. Alsammarraie et al [6] investigated ephedrine-hydrochloride by spectrophotometrically. Saleh et al [7] investigated sulphonamide antibiotics drugs. Investigation of ion complex formation of anti-hypertensive drug methyldopal was studied [8]. Meshram [9] studied complexation by interaction of Dy (III) with Imipramine and Ivermectin in 70% ethanol-water medium. Spectrophotometric study of diltiazem hydrochloride, trimetazidine methyl ester and isosorbide pharmaceutical dosages using tetraphenylborate was carried out by Shehzad et al [10].

Wadekar and Tayade [11] studied conditional stability constants and confirmation of complex formation of Cu (II), Cd (II) and Cr (III) complex with substituted thiocarbamidophenols Spectrophotometrically. Vidyasagar Alvarda et al [12] investigated complex formation equilibrium of Cu(II), Solvent effect on dissociation of ammonium and pyridinium ion was studied by Dhanaki [13]. Investigation of effect of dielectric constant on Cu(II) -Complexes of phthalic acid in various percentage of dioxane-water mixture was carried by Talaskar [14]. To study the interaction of *4-Phenylthiocarbamidophenol* (L1) and *4-(p-Chlorophenyl)thiocarbamido phenol (L2)* and Cu (II) and Cd(II) metal ions spectrophotometrically. This investigations helps in understand metal ligand stability constant and confirmation of complexes formation of these interaction at 0.1 M ionic strength. Job method of continuous variation used to through current work. It is specially associated to study of effect of solvents, effect of ligands and group as well as effect of metal ions during formation of complexes.

MATERIALS and METHOD :

Experimental

4-Phenylthiocarbamidophenol (L1) and *4-(p-Chlorophenyl)thiocarbamido phenol* (L2) has been synthesized in laboratory by standard method. The nitrate salts of Nickel was used & their solutions were prepared in double distilled water. The solutions of potassium nitrate was prepared (1M) & used for maintaining ionic strength constants. Absorption are measured by UV Spectrophotometer model 106, (Systronic make) with an accuracy = 0.001s was used.

RESULTS and DISCUSSION

Spectrophotometric Measurement

Job's Method

Jobs method of continuous variation method is reliable to examine formation of complex [15]. Jobs method consist of equimolar solutions of metal and ligand varying proportion in such manner that total concentration of metal plus ligand is constant in resulting mixtures[16]. The compositions of metal ion solution (1 x10^{-3} M) & ligand (1x 10^{-3}M) were prepared in ten series. Ionic strength was maintained constant (0.1M) by adding an appropriate amount of (M KNO3 solution in 10 ml volume (kmax) was determined using one of the compositions at which there is maximum absorption. The absorption for the compositions were recorded at a constant wave length (λmax). The data on absorption & composition of metal ion and ligand solutions at constant pH can be used to construct the curves. It observed that 1:1 complex formation occurs in the pH range of 3 to 6. Each solution is diluted up to 10 ml and recorded absorption at same (λ max). Conditional stability constants of metal ligand complexes were calculated for all the systems using following expression.

$$K = \frac{X}{(a1-x)(b1-x)} = \frac{X}{(a2-x)(b2-x)}$$

K = Conditional stability constants of complex. X = Concentration of complex.
a1 & a2 = Concentration of metal ions. b1 & b2 = Concentration of ligand.

Conditional stability constants of metal ligand complexes showed in Table-1

Table – 1: Determination of Conditional Stability of Metal Ligand Complexes

System	Conditional stability constant K	Log K
L1+Cu(II)	1.4936 X 10^{7}	0.1741 X 10^{7}
L2+Cu(II)	2.4741 X 10^{4}	0.1734 X 10^{4}
L1+Co(II)	1.8963 X 10^{7}	0.2598 X 10^{7}
L2+Co(II)	1.4596 X 10^{4}	0.1641 X 10^{4}

CONCLUSION

Table No. 1 reveals that as ligand value shows but [illegible] only good. There is no appreciable change in log K values. It is indicated the metal ion only complex is organic

L1+Co(II) interaction has more Log K value than L1+Co(II) interaction. It indicate that L1 able to form more stable complex with Co(II) than L2 and L2+Co(II) interaction has same Log K value than L1+Co(II) interaction. It indicate that L1 able to form more stable complex with Co(II) than L2.

Variation in Log K values observed due to three partners of dielectric constant, solvent-solvent interaction, solute-solvent interaction and solute-other-solvent interaction. The investigation helps to study of drug activity and drug effect of newly synthesized drugs.

REFERENCES

1. S. P. Wagh, Metal-ligand stability constant value of chalcone pyridine carboxylic acids PhD Thesis, Amravati University, Amravati, 2004
2. P. M. Deshmukh, M.A. stability constant of chalcone hydroxyl ethyl amine PhD Thesis Amravati University, Amravati, 2004
3. A.A. Galwan, A.Y. El-Sayed, M.A. Mahmoud and M.M. Ismail, "A study of 1,2,3-benzotriazole chelating agent with N-cetylbetaine with some metal ions by spectrophotometric method", Int. J. of Advanced Research, 2015, 3(1), 630-643.
4. Yeamsley Bridgeen, Tara Beaver, Jose Bonilla and Olusegun Dada, "A study the enzyme-hydrocodeine complex formation", Chemistry J. of Rhodes 2015, 1(1), 52-58.
5. Mahgoub G. Al Mosha & Sadeem S. Abed, Spectrophotometrically determination of phenylpropylethanolamine and ephedrine drugs in pharmaceutical preparation using diazotized metoclopramide hydrochloride, Baghdad Science J. 2008, 5, (1).
6. Khalid F. Alsammarraie, Sarmad H. Hekmat, Mamen D. Al-amrani, "Spectrophotometrically study of ephedrine-hydrochloride", International journal of science technology and management, 2015, 4(1), 1738-1746.
7. Magda M. S. Sadeka, Tiffany Y. Hassan, Ahmed K. Youssef and Doaa A. Abdel-Latif, "Spectrophotometric study of sulfonylurea antidiabetic drugs, World Journal of pharmacy and pharmaceutical sciences, 2015, 4(5), 205-220.
8. Tehmina Taqi, Waseem Jamali, S. Zafar Abbas Zaidi, Tanveer Abbas Shaikh, P. Kumar, "Investigation of spectrophotometric formation of iron (II) complex using ferrozine", Int. J. Chemical Journal of Analytical Chemistry, 2008, 3, 551-556.
9. K. Mwatseteu, "Study complexation by colorimetry of Dy (III) with thiocyanate and 1-phenyl-3-methyl-4-benzoyl-5-pyrazolone in ethanol-water", Ph.D. thesis, Karnatak University, Dharwad, 2003.
10. R. Shanmugam, P. Kalaiyarasiyam and G. Venkatesan, "Spectrophotometric study of chemical interaction between organic reagents and biologically important compounds", Int. J. Chemical Journal of Analytical Chemistry, 2008, 3, 551-556.

[illegible] Journal of Pharmaceutical Science and Research 2015, 7(1): 1-10.

11. A.B. Watkins and D.T. Taylor, Spectrophotometrical y studied synthesized stability constant determination of complex formation of Cu (II), Cd (II) and Cr (III) complex with [illegible] antiendomorphan, World J Pharm Sci., 2015, 4(8): 223-225.
12. M. A. Valencia-Alvarado, M Pezela, Salinas-Garcia, Maria del Refugio Gonzalez-Perez, J Segovia-Hernandez, Complex formation equilibrium of Cu(II), International Journal of Scientific research publications, 2015, 5(8): 1-8.
13. H. Omachi, Solvent effect on dissociation of arsenonium and pyramidium Bull. Chemical Society Japan, 1969, 42, 1573.
14. M.G. Patankar, Effect of dielectric constant on Cu(II) Complexes of phthalic acid in solvent of Dioxane-water mixtures, Ph.D. Thesis, Karnatak University, Karwargaon 1973.
15. M.M. Kreevoy and I. R. P. Ferrillo, Complex formation by Jobs method, Microchemistry Journal 28, 162.
16. P.B. Raghuvanshi, A.G. Doshi and M.L. Narwade, Journal Indian Chemical Society, 1996, 73

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Assessment of Thermodynamic Parameters of Substituted Thiocarbamidonaphthol

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ABSTRACT:

The study of solvation has received a great attention in the fields of kinetic, microbiology and protection of environment. As per the need of this generation they synthesized many compounds and molecules and going to access their applications in various fields. Conductometric study received more value. The studies on ionic solvation in binary solvent mixtures is essential in chemical science and life sciences. Keeping these all things pertain in mind, it is proposed to determine conductometric parameters and thermodynamic parameters of 3-phenylthiocarbamido-1-naphthol at different concentration and different temperatures in 60% ethanol-water mixture. This research work helps to understand the different interactions of molecules and solvent that are used in present work. These analyses open the doors to understanding the Pharmacodynamics and pharmacokinetics of the newly synthesized molecules can be.

Keywords: 3-phenylthiocarbamido-1-naphthol, conductometric parameters, thermodynamic parameters, Conductometric study.

Introduction:

As drugs enter in point of view mobility of ions assumed more value. Mobility of ions decided the conductivity of solution that also helps to understand the interaction of solute in solvent. Determination of solute-solvent interaction value also influences the stability and solvent. Determination of solute-solvent interaction by of drug helps to understand the pharmacodynamics of drug. Mobility of ions in solution is the measure of ions from one position of solution to another position. Transportation of ions in solution and permeability of drugs through cell membrane are closely related to each other. Solubility and bioavailability are also important requirements of parameters and which are responsible factors for assessment the effective bioavailability and used in cells and even in organisms. Solubility of drugs are mainly concentrating to influence the absorption and distribution rate and also pharmacological activity of drugs. Hydrophobic, hydrophilic interaction of solute-solvent in solution is considered to solute-solvent interaction. Many researchers were performed investigations to enhance the aqueous solubility of poorly water soluble drugs by using specific drugs agents. Conductometric investigations provide valuable information about solute-solute and solute-solvent interactions. Ionic conductance of drug in aqueous solution is used [Mc Gold-1968] solubility of aqueous solutions of [Mc Gold-1968] is used [Mc Gold-1968] solubility of different concentrations by conductometric was studied by Gomaa and Al-Lmdahl

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Jumbe and Singh" and Roy et al" was investigated ionic solvation at different proportion of solute-solvent by conductometrically. Some researchers focus on the thermodynamic parameters and Walden product of different complexes and they also compare the interaction of reaction media complexes may be favourable[1-3]. Singh et al" investigated the ion pair formation and thermodynamic parameters of Glycine Dioxane-Water mixtures at different temperatures and Thermodynamic parameters of different temperatures. Keeping these all in mind current research scheme designed to determine thermodynamic parameters viz. ΔH, ΔS and ΔG and conductometric parameters of 3-phenylthiocarbamido-1-naphthol conductometrically at different concentrations, different temperatures in 60% ethanol-water mixture. The studies helps to understand the solute-solvent and ion-molecular interactions like solvent-solvent, solute-solvent and solute-solute interactions. That information helps to understand the pharmacodynamics of drugs and the effects of various treatments.

Materials And Experimental Methods:

Freshly prepared solutions are used through-out the work. All AR grade chemicals are used through-out the work. The solvents were purified by standard method before used. To prepared 0.01M, 0.005M, 0.0025M and 0.00125M concentrations of 3-phenyl thiocarbamido-1-naphthol in ethanol-water mixture. Thermal equilibrium maintained at temperatures 298K and 303K of drugs solution by using thermostat temperature. Conductivity measured for each concentration of solution after getting thermal equilibrium.

Result And Discussion:

Prepared the solution of 0.01 M concentration of 3-phenylthiocarbamido-1-naphthol then by using serial dilution method required solutions of 0.005M, 0.0025M and 0.0012M with 60% and 70% ethanol-water mixture respectively. To measured conductance for each solutions using Conductivity Bridge at 298K and 303K. The obtained result tabulated as given in Table-1 an Table-2. Observed conductance (G), specific conductance (k) and molar conductance (μ) were evaluated by applying standard formulas method from conductance data.

Table – 1 : Conductometric Measurements At Different Concentrations Of 3-Phenylthiocarbamido-1-Naphthol

DETERMINATION OF G, K And μ AT DIFFERENT CONCENTRATIONS AND DIFFERENT TEMPERATURES IN 60% E-W MIXTURE

Temp	Concentration C (M)	Observed conductance (G) mS	Specific conductance (k) mSm^{-1}	Molar conductance (μ) $ohm^{-1}mol^{-1}$
298k	0.01	0.0256	0.003433 X 10-3	0.21532
	0.005	0.01248	0.001674 X 10-3	0.20783
	0.0025	0.00654	0.001096 X 10-3	0.196821
	0.0012	0.0068	0.000917 X 10-1	0.251179
303k	0.01	0.02201	0.002979 X 10-3	0.297532
	0.005	0.01479	0.001701 X 10-3	0.152230
	0.0025	0.01079	0.001241 X 10-3	0.222857
	0.0012	0.00839	0.000965 X 10-3	0.886954

Observed conductance (G), specific conductance (k) decreases and molar conductance (μ) values are tabulated in Table-1. Here G, k and μ increases along with decrease concentrations and G, k and μ increases along with increasing temperatures. The specific conductance increases with increasing temperatures. Calculated values the specific constant (Kapp vs. Deg) and thermodynamic parameters viz. ΔH, ΔG and ΔS of 3-phenylthiocarbamido-1-naphthol by known by using methods at different concentration with different temperatures. Observed result compiled in Table 2.



Table 2: Evaluation of Measurements at Different Concentrations and Inference Temperatures (10% Phenylboronic Acid) Applied

Temperature (°C)	Concentration of Acid	Acid	Log Acid	Δ[ ] Kinetic	Δ[ ] Kinetic²	Δ[ ] Kinetic³

Medium: 60% Ethanol/Water Mixture

Table 2 (Continued): Evaluation of Measurements at Different Concentrations and Inference Temperatures (10% Phenylboronic Acid) Applied

Temperature (°C)	Concentration of Acid	Acid	Log Acid	Δ[ ] Kinetic	Δ[ ] Kinetic²	Δ[ ] Kinetic³

Table 2 (Continued): Evaluation of Measurements at Different Concentrations and Inference Temperatures (10% Phenylboronic Acid) Applied

Temperature (°C)	Concentration of Acid	Acid	Log Acid	Δ[ ] Kinetic	Δ[ ] Kinetic²	Δ[ ] Kinetic³

This above table (Table 2) is included to show the variation of measurements at different concentrations and temperatures. Note that the values are not directly comparable to the previous table due to differences in experimental setup.

As discussed in the main text, the relationship between concentration and measurement is not linear. The data in the last two columns, which represent the squared and cubed values of the kinetic measurement, are provided for completeness but are not used in the primary analysis. Researchers should focus on the relationship between the acid concentration and the logarithm of the acid concentration when interpreting the results.

References

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]



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Assessment of Molecular Interactions of 4-Ethyl Thiocarbamidophenol on Acoustic Parameters Base

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ABSTRACT

Acoustic parameters assessment significantly able to disclose molecular and intermolecular interactions briefly. These parameters measured more significant by ultrasonic interferometer. Present research scheme concern to measurements of ultrasonic velocity and density for solutions of 4-ethylthiocarbamidophenol (ETP) at different molar concentrations (i.e. 0.1M, 0.075M, 0.05M and 0.025M) and 303 K, in 70% composition of ethanol-water mixtures. These determinations makes a confirmation of adiabatic compressibility (β), apparent molar compressibility (k), apparent molal volume (v), intermolecular free length (L), relative association (RA) and specific acoustic impedance (Z). These properties were help to know about solute-solute and solute-solvent interactions in solvent system and molecular association can be possible to understand through present investigation.

Keywords: 4-ethylthiocarbamidophenol (ETP), interferometer, thermodynamic, intermolecular interactions and acoustic parameters.

INTRODUCTION

Molecular structure and their interactions in solution is always received importance in various field of sciences. Ultra sound and ultrasonic interferometer significantly used in

estimation of molecule interactions such as inter and intra ionic or molecular interactions. Since from last few decades ultra sound and ultrasonic interferometer investigations extensively used to understand molecular interactions in liquid. This investigation has important to know the properties and significances of molecules. Ultra sound and ultrasonic wave's measurements widely applicable in many evaluations and new concepts in engineering, applied, industrial, processing, agricultural, medicinal, forensic sciences and quite research development and updating. Ultrasonic is a branch of science, which deals with waves of high frequencies. A Thiocarbamido phenol molecule has various significances in different industrial and life sciences. Valuable information regarding internal structure, molecular association, complex formation, internal pressure and stability[1] obtained from the study of ultrasonic parameters investigation in liquid phase[2-4], liquid mixture[5-8] and electrolyte solution[9-11]. Ultrasonic interferometric study of 4-(p-chlorophenylthiocarbamido phenol in mixed solvents media carried out by Ismkar et al[12]. Comparative study of intermolecular interaction by interferometric measurements of o-bromoacetophenones and meta-3-nitro in ethanol and dioxan solvents was studied by Aswale et al[13] and acoustical studies on ternary mixture of toluene in cyclohexane and chloroform at 298 K was studied[14]. Ultrasonic velocity and density of binary liquid mixture of diethyl ether with three non polar solvents such as CCl_4, CS_2 and C_6H_6 at 303.15K were investigated[15] and interferometric investigated 4-ethylthiocarbamidophenol in 60% mixed solvent media[16].

Ultrasonic investigation received more important to understand the ion solvent and solvent solvent and structure breaking and making properties of solutes. Organic ligands solutions used through the current investigation and this study provide an excellent information concern to solute as well as intermolecular interactions. In present investigation, mainly concentrate on the assessment of ultrasonic velocity and density for solutions of 4-ethylthiocarbamidophenol (ETP) at different molar concentrations and 303K, in 70% compositions ethanol-water mixtures and estimation of adiabatic compressibility (β), apparent molal compressibility (k), apparent molal volume (v), intermolecular free length (L), relative association (RA) and specific acoustic impedance (Z). In the view of above current research scheme designed as "Assessment of molecular interactions of 4-ethylthiocarbamidophenol on acoustic parameters base". This investigation regarding to know effect of concentrations on various acoustical properties and effect of acoustic parameters on molecular interactions.

MATERIAL AND METHODS

All AR grade chemicals used through current work. Freshly prepared solution used during study. The solvents were purified by standard method. 0.1M, 0.075M, 0.05M and 0.025M solutions of ETP in 70% ethanol-water mixture were prepared. Ethanol was purified by standard procedure[17]. Densities were measured with the help of bicapillary pykanometer (10.15×10^{-6} m^3). Pykanometer used is of Borosil make. Weighing was made on Citizen CY 104 one pan digital balance (± 0.0001 gm). A special thermostatic arrangement was done for density and ultrasonic velocity measurements. Elite thermostatic bath was used in which continuous stirring of water was carried out with the help of electric stirrer and temperature

variation was maintained within ± 0.1 °C. The speed of sound waves was obtained by using variable path, Single crystal interferometer (Mittal Enterprises, Model MX-1) with accuracy ± 0.01% and frequency 1 MHz was used in the present work. The densities and ultrasonic velocity of liquids in ethanol solvent were measured at 300 K for the calculations of intermolecular free length and the value of Jacobson's constant[16] (K = 0.31) was taken.

RESULTS AND DISCUSSION

Ultrasonic velocities and densities of ETP in 70% ethanol-water mixture investigated through present work and it is tabulated in following Table No.1

Table-1.1: Average Ultrasonic Velocity of Water at 300K

Sr. No.	No. of Returns of Screw	Micrometer Reading (mm)	Difference Between Reading (mm)	Distance Travelled By Screw in One Rotation	Average Ultrasonic Velocity (m/sec)
1	5	10.4705	1.6108	0.321615	1598.308256
2	10	8.8642	5.5310	1.10489	
3	15	13.3952	3.1707	1.20041	
4	20	16.2664	4.4671	1.33227	
5	25	11.8193	4.8249	1.29301	
6	30	7.3376	1.4918	1.6004	
7	35	5.8458	2.1039	1.7314	
8	40	3.7419		10.45332	

Table-1.2: Average Ultrasonic Velocity of Pure Ethanol 300K (U_E)

Sr. No.	No. of Rotation of Screw	Micrometer Reading (mm)	Difference Between Reading (mm)	Distance Travelled by Screw in One Rotation	Average Ultrasonic Velocity (m/sec)	Density (d_E) (Kg m^{-3})	$\beta_S \times 10^{-10}$ (Pa^{-1})
1	5	15.2623	4.0016	0.8321	1241.64	1030.01	6.8319172555
2	10	10.1686	2.0221	0.7845			
3	15	8.1464	3.3168	1.2464			
4	20	5.2296	1.1705	1.1690			
5	25	1.8591		1.4331			

Table-1.3: Average Ultrasonic Velocity of 70% Ethanol 300K (U_E)

Sr. No.	No. of Rotation of Screw	Micrometer Reading (mm)	Difference Between Reading (mm)	Distance Travelled By Screw in One Rotation	Average Ultrasonic Velocity (m/sec)	Density (d) (Kg m^{-3})	$\beta_S \times 10^{-10}$ (Pa^{-1})
1	5	10.6171	3.5422	1.39301	1316.98	1010.57	6.7726271641
2	10	11.2965	1.9280	1.5925			
3	15	9.3775	3.4075	1.21837			
4	20	5.2252	3.9032	1.48081			
5	25	2.4733		6.65083			

Table-1.4: Acoustic Parameters at Different Concentration of (ETP) at 300 K in 70% E-W

Conc. C (Mole/lit)	Average Ultrasonic Velocity (U) (m/sec)	Density (d) (Kg m^{-3})	$\beta_S \times 10^{-10}$ (pa^{-1})	ϕ_K (cm^3mol^{-1})	ϕ_a $\times 10^{-10}$	$L_f \times 10^{-8}$ (Å)	R_A	$Z \times 10^{-5}$ ($Kgm^{-2}sec^{-1}$)
0.1	1593.587	1031.32	6.7746	0.8882	-4.9081	0.03104	0.982	164.341
0.075	1468.427	1022.52	7.0611	0.2249	-1.0294	0.03408	1.007	145.300
0.050	1270.737	1015.12	8.991	0.2211	23.855	0.04186	1.048	126.999
0.025	1172.663	1011.12	9.9847	0.3138	33.791	0.04599	1.072	116.440

CONCLUSION

Table-1.4 reveals acoustic parameters of ETP at different concentration such as 0.1M, 0.075M, 0.050M and 0.025M and 100% to 70% ethanol-water mixture. Table-1.4 reveals that Ultrasonic Velocity (U_E), Density (d) and decreases along with decreasing concentration from 0.1M to 0.025M. Acoustic parameters such as adiabatic compressibility (β_S), Apparent molar volume (ϕ_K), Apparent molar compressibility (ϕ_a), Intermolecular free length (L_f), Relative association (R_A) increases and Specific acoustic impedance (Z) decreases along with decreasing concentration from 0.1M to 0.025M. This acoustic parameters investigation help to understand molecular interactions occur and responsible for breaking and making of their structure in solution.

REFERENCES

1. P.H. Raghuwanshi and A.D. Deshmukh, *Int. J. Chem. Science*, 11(1), 141-149 (2013)
2. C.V. Deshmukh, A.G. Doshi, P. Agrawal and G.M. Deshmukh, *Ultra Science*, 3, 535 (2002)
3. D.T. Tayade and A.N. Kshirsagar, *Int. J. Eng. Res. and Tech.*, 5(1), 2130-2141 (2013)
4. R.P. Varma and Surendra Kumar, *Ind. J. Pure Appl. Phy.*, 38(2), 96 (2000)
5. N.A. Kalambe, P.B. Raghuwanshi and A.K. Maldhure, *Ind. J. Chem. Sci.*, 12(2), 730 (2014)
6. R.R. Watane and P.B. Raghuwanshi, *Int. Research Journal*, 6(4), 162-166 (2014)
7. S.S. Mehtrokar and P.B. Raghuwanshi, *Int. J. Chem. Sci.*, 8(3), 2336-2342 (2010)
8. N.A. Kalambe, *J. Chem. Pharmac. Res.*, 9(12), 148-155 (2017)
9. A. Ali, K. Tiwari, A.K. Nain and V. Chakravarthy, *Ind. J. Pur. Ap. B*, 74(5), 351 (2000)
10. R.D. Jankar, D.T. Tayade and A.B. Wadekar, *Indo American J. of Pharmac. Sci.*, 5(5), 4790-4798 (2018)
11. S.S. Aswale, P.B. Raghuwanshi and D.T. Tayade, *Ind. J. Chem. Soc.*, 84, 159 (2007)
12. Rita Mohan, *Ind. J. Chem.*, 44A (2), 1834 (2005)
13. S.K. Pradhan, S.K. Dash, T. Mohanta and B.B. Swain, *Ind. J. Pure Appl. Phy.*, 50, 161 (2012)
14. R.R. Ivanhe, D.T. Tayade and A.B. Wadekar, *Int. J. Eng. Develope Res.*, 6(2), 595-598 (2018)
15. Vogel, "A text Book of Quantitative Inorganic Analysis", 3rd Edition, ELBS 1st Edition Reprint (1968)
16. B. Jacobson, *J. Physical Chem.*, 20, 927 (1952)

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CONTENTS

Sr. No.	Research Papers	Page No.
1.	Teaching And Learning Supported By ICT In Higher Education Dr. Kamaldeo R. Dhoot, Akola	01-06
2.	Role of Stakeholders In Higher Education Dr. Vandana K. Mishra, Akola	07-12
3.	Role of ICT In 21st Century Teaching And Learning Dr. D. V. Jagle, Akola	13-16
4.	Jigsaw Technique: A Research Based Pedagogical Tool (RBPT) To Teach Estimation of Glucose Hemant S Chandak, Khamgaon	17-19
5.	ICT For Quality Teaching And Learning Nasir A Rashid, Darwha Dist.Yavatmal	20-24
6.	Coordinated Functioning Of Stakeholders In Higher Education In Colleges Dr Anjali Rajvade, Akola	25-29
7.	Performance-Based Approach To Bring About Total Quality Management In Higher Educational Institute: A New Accreditation Methodology Dr V. C. Kharode, Pulgaon, Dist. Akola	30-33
8.	Stakeholder Analysis of Higher Education Institutions Pimani Narendra Mahalle, Amravati	34-41
9.	Role of ICT In Higher Education (Information And Communication Technology) Dr. K. K. Patil, Parbhani & Satish Diliprao Todkar Nanded	42-46
10.	Utility of ICT In Teaching, Learning And Evaluation Prof Dr Abdulaziz Razvia, Akola	47-51
11.	Role of Stakeholders Leading To Development Of Higher Education Dr P D Rajeshwar, Darwha & P H Bhagwat, Darwha	52-57
12.	Role of Stakeholder In Higher Education Dr. V.H. Chavhan, Akola	58-61
13.	Use of E - Resources For E - Learning In The College Libraries With Special Reference To Akola City R. G. Bahetti, Akola & Dr. A. S. Sonone, Akola	62-65
14.	Role of Stakeholders In Higher Education Miss.Chandni S.Gadodiya, Akola	66-71

60.	The Emergence of ICTS As A Learning Technology Prof Dr Ganesh G. Gondane, Akola	298-302
61.	ICT Based Teaching-Learning In Higher Education Institutions Dr.Ku.Y.S.Patil & Dr.R.E.Khadsan, Shegaon	303-305
62.	Role of ICT Tools And E- Resources In ICT Based Teaching Learning Process Dr. Sanjay R .Bhoyar, Pusad	306-309
63.	ICT Based Teaching Learning And Evaluation - Needs of The Day Dr. Rajendra A. Raut, Wardha	310-313
64.	NAAC: Quality Enhancement, Enriched, Introspect, Attitude And So On... Dr. Sandip Bhimrao Dongare, Yeoda Dist. Amravati	314-316
65.	A Study The Effectiveness of ICT In The Higher Education of Amravati Division Researchers Prof. Haridas M. Dhurve, Yavatmal	317-321
66.	E = F, An Equation In 21st Century E Stands For Education And F Stands For Future Dr. Prof. Ratna Chandak, Akola	322-327
67.	माहिती संप्रेषण तंत्रज्ञान (ICT) आधारित अध्ययन – अध्यापन आणि मूल्यांकन आजच्या काळाची गरज प्रा. अनिल प्रल्हाद निंबाळकर, अकोला	328-331
68.	माहिती व संप्रेषण तंत्रज्ञानावर आधारित अध्ययन अध्यापन आणि मुल्यांकन- आजची गरज डॉ. एल. एल. वाघमारे	332-335
69.	अध्ययन आणि अध्यापनात माहिती संप्रेषण तंत्रज्ञान चे (ICT) भुमिका अमोल रा. सज्जन, मलकापुर	336-338
70.	अध्यापिका आधारित शिक्षण आणि मुल्यमापनाचे फायदे सुनिल रामराव भोसले , शेगाव	339-343
71.	नविन माहिती तंत्रज्ञानाव्दारे शैक्षणिक सुलभता – एक आढावा प्रा.किशोर कुलदिपक इंगोले, औरंगाबाद	344-347
72.	माहिती तंत्रज्ञानाधारित भाषा अध्यापन काळाची गरज डॉ. वनश्री वि. दामोदरे, अकोला	348-353
73.	नई संचार सूचना प्रौद्योगिकी के संदर्भ में हिंदी का विकास डा.सुरेशकुमार केसवानी, अकोला	354-358

(61)

ICT BASED TEACHING-LEARNING IN HIGHER EDUCATION INSTITUTIONS

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ABSTRACT:

The paper deals with the role of ICT-based teaching-learning in higher education institutions.ICT stands for Information and Communication Technologies. ICT which is now broadly used in educational world. Teacher, Student, administrator and every person related to education are popularly using ICT. Teachers must know the use of ICT in their subject areas to help the learners for learning more effectively. So, the knowledge of ICT is very much essential for both prospective teachers as well as in-service teachers also. This will help teachers to know integrated technology with classroom teaching. Teacher use ICT for making teaching learning process easy and interesting. This creates an interest among students and causes to change their habits of learning. Students get complete understanding of the topic with its various facets. It increases the level of confidence of students and their learning can be tested at the end of class by asking some questions, distributing handouts for the homework or they can be said to prepare a seminar or short presentation on the topic. At present Technology has become an indispensible tool for education. It is mainly intended to improve education access, so as to provide education for all. The outcome of this study could serve as an input for education planners to consider better utilization of ICT in various aspects relating to teaching-learning activities.

Keywords: ICT, Teaching-Learning, Evaluation, Higher Education.

Introduction:

The process of teaching-learning has become more students centric and its set aim is to produce skilled work-force. ICT stands for Information and Communication Technology and defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information (**Gunton, 1993**). "Curriculum needs to be rescued from traditional behaviorist approach domination and cognitive-constructivist approach should be introduced to the system, which is today internationally accepted and fast growing model in education systems". "The quality of basic education provided to our children is largely influenced by the quality of our teachers in the schools. As no nation can afford to provide poor quality education, it is necessary that we build a strong system of quality teacher education—on which depends the quality of the teacher and ultimately the Nation's education." (**Menon and Rama 2006**). The Indian education system is striving to impart the overall development of individual and society and enabling the teaching-learning community to compete the global market with sustainable growth and development. Teaching-learning and evaluation is the base and center of our education system. The monitoring agency like National Assessment and Accreditation, more popularly known as NAAC often emphasizes and signifies the process of teaching-learning and evaluation considering one of the major criterions of 350 points/ marks among seven indicators of assessment. Today, technology has increasingly become a vital

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ment for firms to compete and develop. (Ajayi 2008) highlighted that the world of today is sidered as a global village through the use of ICT in different educational, political, economic and ial sectors. Almost in all situations or tasks, we find the integration and the use of technology to ve problems. Accordingly, future teachers need to equip and acquaint themselves to make changes ught about by technology (Mua Rodamny Kennah2016). Learning on a continued basis is uired to bridge the skill gap between the requirements and competence of the individuals. Across globe, information and communications technologies (ICTs) are changing the face of education. r world is changing, and information and Communication technology (ICT) is central to this ange. ICT changes education from institution-centric to learner-centric, from classroom-based to ing pervasively connected through e-learning and wireless technologies. New classes of learners are eated, namely those who are not able to come to campus, or cannot afford a fixed timeframe, or those ho would want to have a tailored program for their specific needs. ICT allows us to have the exibility in space, time, and content.

Learning using electronic means involves the acquisition of knowledge and skill using lectronic technologies such as computer-and Internet-based courseware and local and wide area etworks, and this is called e-learning.From the above literature review, it is evident that ICT is playing a vital role in knowledge acquisition and there are lots of benefits of introducing ICT in the knowledge process. ICT is applied very effectively into a range of teaching strategies, including some very good interactive teaching involving questioning and discussion. ICT played an important role in helping teachers to demonstrate and reinforce key ideas during lessons using 'electronic blackboard', and e-mail was used efficiently to support homework (Douglas Osler 2000).have clearly mentioned in their framework that knowledge capture/acquisition, knowledge store, knowledge share, knowledge enhancement, and knowledge dissemination can all be enhanced by technology and good policies.

Methodology:

Based on the above discussion, ICT is used as a tool for teaching and learning in higher education. This study is being approved for higher education institutions. The sampling frame consists of 40 institutions and the sample size includes 50% of the total population. Random sampling technique was used for selecting the institutions. Reliability and content validity test were also done. Further the model questioners were used for analysis. An analysis was done to study the relationship between the factors and their impact on teaching learning process.

Table 1. Questioners generated to analyze Teaching-learning Process

Process	ICT Tools
ICT-based Teaching-Learning process	Usage of e-mails to interact with other professors / experts to enhance knowledge
	Usage of Technology for research work
	Usage of Power Point Slides for delivery of lectures
	Existence of Virtual library
	Existence of Virtual learning (e-learning)
	Internet browsing to supplement book information
	Usage of computers for multimedia-based delivery
	Evaluation of Test, Assignments and publication of results done electronically
	Usage of ICT-based communication among faculties and students

Discussion:

The various items that contribute to ICT-based teaching-learning process are identified and depicted in Table 1.The demographic factors taken into consideration include the type of the institution, place and years of existence of the institution, the type of university to which they are affiliated, and the department and experience of the respondents. The demographic analysis did not reveal any statistically significant difference among the factors contributing to teaching-learning process.

It is evident from the above data that both teachers and learners use ICT-based tools for teaching-learning process. There is a lifelong thirst for learning and knowledge enhancement and ICT acts as a facilitating tool for it. The data in the above table reveals that learners use ICT-based tools to the highest for supplementing book information and in their research work. Teachers use ICT –based tools for delivering lectures. ICT can be used to enhance the existing knowledge through expert interactions and through discussion board and forums. There is a transition from traditional learning system to e-learning system in the higher education scenario. The analysis reveals that there is much scope in the area of developing virtual libraries in higher education institutions. Traditional library systems are still in existence to a large extent though computers are used for managing the day-to-day transactions of the library system. This study further reveals that application of ICT-based tools in the area of examination and evaluation needs improvement.

Conclusion:

ICTs save large amount of time, money and energy making the process of teaching-learning and evaluation more fascinating and all involving with a smoother application. In the country like India, we need to have abundance of resources and at the same time an expert teacher community to implement and to reach at the very rural outset where most of the illiterate population resides. And this target can only be accomplished through the impressive and active use of ICTs in education. The outcome of this study could serve as an input for education planners to consider better utilization of ICT in various aspects relating to teaching-learning activities.

References:

1. Ajayi, L. (2008). Towards effective use of information and communication technology (ICT) for teaching in Nigerian colleges of education. Asian Journal of information Technology, 5(5), 210-214.
2. Agyei, D. D. & Voogt, J. (2011b). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education*, 56(1), 91-100.
3. Agyei, D. D., & Voogt, J. (2012). Developing Technological Pedagogical Content Knowledge in pre-service mathematics teachers, through Teacher Design Teams. Australasian Journal of Educational Technology, 28, 547–564.
4. Cuban, L. (2001). Oversold and underused: Computers in the classroom. Cambridge, Mass: Harvard University Press.
5. Douglas Osler.,(2000) The Use of ICT in Learning and Teaching! A Report by HM Inspectors of Schools: Scottish Executive Education, Gunton, T. (1993). Dictionary of information technology. Penguin, London.
6. Gunton, T. (1993). Dictionary of information technology. Penguin, London.
7. Menon, Mohan & K. Rama. (2006) *Quality Indicators for Teacher Education*. Bangalore: NAAC and Commonwealth of Learning (COL). E-Print
8. Mira Rodanny Kennah.(2016) The Use of ICT in the Teaching and Learning Process.
9. Voogt J. (2010).Teacher factors associated with innovative curriculum goals and pedagogical practices: differences between extensive and non-extensive ICT-using science teachers. *Journal of Computer Assisted Learning* 26, 453–464.

12. Plane Symmetric Universe Filled With Electromagnetic Filed In $f(R)$ Theory of Gravity

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Abstract

In $f(R)$ theory of gravity, we have studied the electromagnetic fields in plane symmetric space-time, by considering the general case $f(R) = \lambda R$. It is observed that the convergent and isotropic solution of the metric function can be evolved with the components of the vector potentials.

Keyword: Plane symmetric, electromagnetic field, $f(R)$ theory of gravity, constant vector potentials.

Introduction

Now a days there has a lot of interest of cosmologists in modified theory of gravity in the view of the direct evidence of late time accelerated expansion of the universe which comes from high redshift supernova experiment (Riess *et al* [1,2]).There are mainly two approaches in $f(R)$ theory of gravity. The first is called "metric approaches" in which the connection is the Levi-Civita connection and the variation of the action is done with respect to metric. The second approach is "Palatini formalism" in which connection and the metric are considered independent of each other and the variation done for parameters independently. Sharif and Shamir [3] have studied plane symmetric solution in $f(R)$ gravity. The idea of introducing additional terms of the Ricci scalar to the Einstein-Hilbert action did not begin years ago with the $f(R)$ theory of gravity (Carroll *et.al* [4]).There are two kinds of alternative accelerated expansion of the universe have been proposed for this unexpected observational phenomenon. One is negative

pressure known as dark energy (DE) which induces a late-time accelerating cosmic expansion and the other one is the modified gravity, which originates from the idea that the general relativity is inadequate in the cosmic scale and therefore need to be modified. The $f(R)$ theory of gravitation formulated by Nojiri and Odintsov [5,6] In order to explain the nature of the DE and accelerated expansion, a variety of theoretical models have been proposed in literature.

Symmetry plays an important role to find exact analytical solution for R^2 gravity, by invoking Nother symmetry [7]. Further it has been shown [8], that there exists a conserved current, other that Nother current, for a general scalar tensor theory of gravity, nonminimally coupled to a scalar field under certain condition [9] In our opinion, one of interesting and prospective version of modified gravity theories is the $f(R,T)$ gravity proposed by Harko *et al* [10,11] The exact solutions of $f(R,T)$ field equations for locally rotationally symmetric Bianchi type-I cosmological model has been discussed by Adhav [12] Mete and Mule [13] studied Biachi-VIe magnetized cosmological model in $f(R)$ gravity Bijan Saha [14] explored the interacting scalar and electromagnetic fields in Bianchi type-I universe Solanke and Karade [15] have studied plane symmetric universe filled with combination of perfect fluid and scalar field with electromagnetic fields in $f(R,T)$ theory of gravity Our interest is to explore the role of electromagnetic field played in the amended $f(R)$ theory of gravity in other Biachi types of metric universe. In this paper we considered plane symmetric metric universe

Plane symmetric space-time

Here, we consider the plane symmetric metric in the form

$$ds^2 = dt^2 - A^2(dx^2 + dy^2) - B^2dz^2 \tag{1}$$

where A and B are functions of time t only.

Gravitational field equations of $f(R)$ gravity

The field equation of $f(R,T)$ theory due to Harko [10-11] are deduced by varying the action

$$S = \int f(R,T)\sqrt{-g}d^4x + \int L_m\sqrt{-g}dv^4 \tag{2}$$

where L_m are Lagrangian and other symbols have their usual meaning

Varying the action equation (2) with respect to g^{ij} which yields

$$\delta S = \frac{1}{2x}\int\left\{f_R(R,T)\frac{\partial R}{\partial g^{ij}} + f_T(R,T)\frac{\partial T}{\partial g^{ij}} - \frac{f(R,T)}{\sqrt{-g}}\frac{\partial\sqrt{-g}}{\partial g^{ij}} - \frac{2x}{\sqrt{-g}}\frac{\partial\left(L_m\sqrt{-g}\right)}{\partial g^{ij}}\right\}\sqrt{-g}d^4x \tag{3}$$

Considering $\delta s = 0$ from equation (3) upon integration, we obtain

$$f_R(R,T)R_{ij} - \frac{1}{2}f(R,T)g_{ij} + \left[g_{ij}\left(\nabla^i\nabla_j - \nabla_i\nabla_j\right)\right]f_R(R,T) = xT_{ij} - f_T(R,T)\left[T_{ij} + \theta_{ij}\right]. \quad (4)$$

where ∇_i is the covariant derivative.

Replaced $f(R,T)$ by $f(R)$ in equation (4), we obtain

$$f_R(R)R_{ij} - \frac{1}{2}f(R)g_{ij} - \left[g_{ij}\left(\nabla^i\nabla_j - \nabla_i\nabla_j\right)\right]f_R(R) = xT_{ij}. \quad (5)$$

Taking trace of equation (5), we get

$$\nabla^i\nabla_j f_R(R) = \frac{1}{3}xT + \frac{2}{3}f(R) - \frac{1}{3}f_R(R). \quad (6)$$

Energy momentum tensor for electromagnetic field

Energy momentum tensor for electromagnetic field is given by

$$T_{ij} = L_m g_{ij} - 2\frac{\partial L_m}{\partial g^{ij}}; \quad (7)$$

where $L_m = \frac{1}{4}F_{kl}F^{kl}$ and F_{kl} electromagnetic field $\frac{\partial L_m}{\partial g_{ij}^{ij}} = \frac{1}{2}g^{ij}F_{ik}F_{kj}$, (8)

Using equation (8), the equation (7) reduces to

$$T_{ij} = F_{ik}F_j^k + \frac{1}{4}F_{kl}F^{kl}g_{ij} \quad (9)$$

The equation (9) can be conveniently expressed in the mixed form

$$T_j^i = F_k^i F_j^k + \frac{1}{4}g_j^i F_{kl}F^{kl}. \quad (10)$$

Electromagnetic field tensor

The electromagnetic field tensor is given by

$$F_{ij} = \frac{\partial V_j}{\partial x^i} - \frac{\partial V_i}{\partial x^j} \quad (11)$$

To achieve the capability with non-static space time (1), we assume electromagnetic vector potential in the form

$$V_i = \left[\mu(\alpha)v_1(t), v_2(t), v_3(t), v_4(t)\right]. \quad (12)$$

From equations (11) and (12), we can easily deduce

$$F_{14} = m\dot{v}_1, F_{24} = \dot{v}_2, F_{34} = \dot{v}_3, F_{41} = -m\dot{v}_1, \quad (13)$$

$$F^{34} = -\frac{u\dot{v}_1}{A^2}, F^{24} = -\frac{\dot{v}_2}{A^2}, F^{34} = -\frac{\dot{v}_3}{B^2}, F^{41} = \frac{u\dot{v}_1}{A^2}. \tag{14}$$

From equations (13) and (14), we can compute

$$F_{ij}F^{ij} = -2\left[\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2}\right]. \tag{15}$$

Using (14), we establish the following nonzero components of the energy momentum tensor of material field

$$T_1^1 = \frac{1}{2}\left[\frac{u\dot{v}_1^2}{A^2} - \frac{\dot{v}_2^2}{A^2} - \frac{\dot{v}_3^2}{B^2}\right]. \tag{16}$$

$$T_2^2 = \frac{1}{2}\left[-\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} - \frac{\dot{v}_3^2}{B^2}\right]. \tag{17}$$

$$T_3^3 = -\frac{1}{2}\left[\frac{u^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} - \frac{\dot{v}_3^2}{B^2}\right]. \tag{18}$$

$$T_4^4 = \frac{1}{2}\left[\frac{u\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2}\right] \tag{19}$$

From equations (16) to (19), we can deduced the components of energy tensor as follows

$$T_j^i = 0, \text{ for } i \neq j. \tag{20}$$

Variation of Lagrangian L_m with respect to electromagnetic field [14] gives

$$\frac{\partial}{\partial x^i}\left(\sqrt{-g}F^{ij}\right) = 0, \tag{21}$$

For $i = 1, j = 4$ $\frac{(\dot{v}_1)^{\cdot}}{v_1} + \frac{\dot{v}_1^2}{v_1^2} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B}\right] = 0$ (22)

For $i = 2, j = 4$ $\frac{(\dot{v}_2)^{\cdot}}{v_2} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{B}}{B}\right] = 0$ (23)

For $i = 3, j = 4$ $\frac{(\dot{v}_3)^{\cdot}}{v_3} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{2\dot{A}}{A} - \frac{\dot{B}}{B}\right] = 0$.

For $i = 4, j = 1$ $u = c$. (24)

where c constant of integration (25)

Since for space time (1), we get $R_1^1 = R_2^2 = R_3^3 = 0$ and from equation (11), give

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = a, \tag{26}$$

which further imply

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \tag{27}$$

where D is some unknown function of t

Using equation (27), we obtain

$$v_1 = k_1 D,\ v_2 = k_2 D,\ v_3 = k_3 D, \tag{28}$$

where k's are constants of integration

Solution of field equations

As in Solanke and Karade [16], we consider

$$\frac{uv_1^2}{A^2} + \frac{\dot{v}_2^2}{A^2} + \frac{\dot{v}_3^2}{B^2} = \left[\frac{u^2 l^2}{A^2} + \frac{\dot{v}^2}{A^2} + \frac{\dot{v}_1^2}{B^2}\right]\left[\frac{\dot{D}}{D}\right]^2 = -I\left[\frac{\dot{D}}{D}\right]^2$$

Now our plan is to express the components of T_j^i in terms of I_j^i

$$T_0^0 = \frac{uv_1^2}{2A^2} + \frac{\dot{v}_2^2}{2A^2} + \frac{\dot{v}_3^2}{2B^2} = -I^0 + \frac{u^2 v^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2, \tag{29}$$

$$T_1^1 = -\frac{uv_1^2}{2A^2} + \frac{\dot{v}_2^2}{2A^2} + \frac{\dot{v}_3^2}{2B^2} = -I^1 + \left(\frac{\dot{v}_1}{A^2} + \frac{\dot{D}}{D}\right)^2, \tag{30}$$

$$T_2^2 = \frac{uv_1^2}{2A^2} + \frac{\dot{v}_2^2}{2A^2} + \frac{\dot{v}_3^2}{2B^2} = -I_2^2 + \frac{\dot{v}_1}{B^2}\left(\frac{\dot{D}}{D}\right)^2, \tag{31}$$

$$T_3^3 = \frac{uv_1^2}{2A^2} + \frac{\dot{v}_2^2}{2A^2} - \frac{\dot{v}_3^2}{2B^2} = -\frac{1}{2}I\left(\frac{\dot{D}}{D}\right)^2 \tag{32}$$

By using equation (28), we get trace of energy momentum tensor as

$$T = I\left(\frac{\dot{D}}{D}\right)^2 - I\left(\frac{\dot{D}}{D}\right)^2 = 0. \tag{33}$$

With the help of equations (28) and from equations (22) to (24), we get

$$\left(\frac{\dot{D}}{D}\right)^{\cdot}+\left(\frac{\dot{D}}{D}\right)^{2}+\frac{\dot{D}}{D}\left[\frac{\dot{B}}{B}\right]=0, \tag{34}$$

$$\left(\frac{\dot{D}}{D}\right)^{\cdot}+\left(\frac{\dot{D}}{D}\right)^{2}+\frac{\dot{D}}{D}\left[\frac{2\dot{A}}{A}+\frac{\dot{B}}{B}\right]=0 . \tag{35}$$

From equations (34) and (35), we get

$$\frac{\dot{A}}{A}=\frac{\dot{B}}{B}, \tag{36}$$

Integrating equations (36) with respect to t, we get

$$A=k_1 B, \tag{37}$$

where k_1 is a constant of integration.

Particular Case $f(R)=\lambda R$

we consider the particular case $f(R)=\lambda R$

$$f_R(R)=\frac{\partial f(R)}{\partial R}=\frac{\partial}{\partial R}\lambda R=\lambda , \tag{38}$$

The field equation (4) with the aid of (38), reduces to

$$\lambda R_{ij}-\frac{1}{2}\lambda R g_{ij}=\chi T_{ij}, \tag{39}$$

The equation (10) with the aid of (38), reduces to

$$\chi T+(\lambda R)=0 . \tag{40}$$

Using equation (38) in (40), we obtain

$$\lambda R_{ij}+\frac{1}{2}(\chi T)g_{ij}=\chi T_{ij}, \tag{41}$$

The equation (41) can be conveniently expressed in the mixed form

$$\lambda R_i^j+\frac{1}{2}(\chi T)g_i^j=\chi T_i^j$$

$$\lambda\left[\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{A}}{A\dot{A}}+\frac{\dot{A}\dot{B}}{A\dot{B}}\right]=\chi\left[-T_4^4+\frac{u^2v_1^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2\right] \tag{42}$$

$$\lambda\left[\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{A}}{A\dot{A}}-\frac{\dot{A}\dot{B}}{A\dot{B}}\right]=x\left[-T_1^1+\frac{\dot{u}^2\dot{v}_1^2}{A^2}\left(\frac{\dot{D}}{D}\right)^2\right] \tag{43}$$

$$\lambda\left[\frac{\ddot{B}}{B}+2\frac{\dot{A}\dot{B}}{A\dot{B}}\right]=x\left[-T_1^1+\frac{\dot{v}_1^2}{B^2}\left(\frac{\dot{D}}{D}\right)^2\right] \tag{44}$$

$$\lambda\left[\frac{\ddot{B}}{B}+2\frac{\dot{A}}{A}\right]=x\left[-\frac{1}{2}I\left(\frac{\dot{D}}{D}\right)^2\right] \tag{45}$$

By using equation (33) and from equations (42) to (45), yields

$$\frac{\ddot{A}}{A}+\frac{\dot{A}\dot{A}}{A\dot{A}}+\frac{\dot{A}\dot{B}}{A\dot{B}}=0, \tag{46}$$

$$\frac{\ddot{B}}{B}+\frac{\dot{A}\dot{B}}{A\dot{B}}-\frac{\dot{A}\dot{B}}{A\dot{B}}=0, \tag{47}$$

$$\frac{2\dot{A}}{A}+\frac{\dot{B}}{B}=0, \tag{48}$$

From equations (37) and (46), we get

$$\frac{\ddot{A}}{A}+2\frac{\dot{A}^2}{A^2}=0 \tag{49}$$

Which on integration, give

$$A=(3k_1t+k_2)^{\frac{1}{3}}, \tag{50}$$

where $k_1\neq 0$ and $k_2=0$ are constants of integration

From equations (37) and (47), we get

$$B=(3k_3t+k_4)^{\frac{1}{3}}, \tag{51}$$

where $k_3\neq 0$ and $k_4=0$ are constants of integration

From equations (37), (50) and (51), we get

$$A=B=(3k_1t+d_2)^{\frac{1}{3}}, \tag{52}$$

where $d_1=k_1=k_3\neq 0$ and $d_2=k_2=k_4$ are constants of integration

From equation (34), we get

(53) With

$$f(t) = k_{10}\exp\left\{k_0\int\frac{1}{B}dt\right\} \tag{54}$$

the help of equation (52) and the equation (28) convert in to

$$v_1 = k_{20}\exp\left\{k_0\int\frac{1}{B}dt\right\} \tag{55}$$

$$v_2 = k_{30}\exp\left\{k_0\int\frac{1}{B}dt\right\} \tag{56}$$

$$v_3 = k_{40}\exp\left\{k_0\int\frac{1}{B}dt\right\} \tag{57}$$

v_4 remain undetermined

where k's is a constant

Adjusting the all constants of equations (54) to (57) and the vector potential assume that the following form as

$$v_i = [k, k, k, v_4]$$

Using equation (52), the line element (1) reduces to

$$ds^2 = dt^2 - (3a_1 t + a_2)^{\frac{2}{3}}\left[(dx^2 + dy^2) - dz^2\right] \tag{58}$$

Conclusion

In this paper, we have investigated plane symmetric cosmological model in the presence electromagnetic field in $f(R)$ theory of gravity with particular case $f(R) = \lambda R$. It is observed that convergent non-singular, isotropic solution can be evolved for the metric function and the components of vector potential. Model shows that universe expand algebraically in $f(R) = \lambda R$ theory of gravity. The metric function in non-static space time admits constant value at early time of the universe $(t = 0)$ tends to zero and after that the metric function start increasing with increase in cosmic time and finally diverge to infinity as time tend to infinity. This shows that the universe expand and approaches to infinite volume. It is also interesting to note that the investigated model is free from singularity. Hence, the model approaches isotropic for the anytime.

References

1. Riess,A .(1998) Astron J 116,1009
2. Riess, A .(2004) Astron J 607,665

3. Sharif M and Shamir Faraat M.(2011) Modern Phy. Lett. arXiv 0912.1303
4. Carroll S.M.,Duvvuri,V and Turner,M.S.,(2004) Phys. Rev. D 70, 043528
5. Nojiri, S.,Odintsov,S.D.,(2007) Int. J. Mod. Phys. 4,115, hep-th/0601213
6. Nojiri, S.,Odintsov,S.D. and Tretyakov,P.V., (2007) Phys. Lett. B 651, 224
7. Sanyal,A.K., Modak,B.,Rubano,C.,Piedipalumbo,E.(2005) Astro-ph/0310610
8. Sanval,A.K.,(2002) Phys.Lett.B ,177, gr-qc/0107053
9. Sanyal,A.K.,(2005) Phys.Lett.B, 81, hep-th/0504021
10. Harko,T.,Koivisto,T.S. and Lobo,F.S.N.,(2010) arXiv 1007.4415
11. Harko,T.and Lobo,F.S.N.,(2010) Eur. Phys. J. C 70, 373
12. Adhav, K. S.,(2012) Astrophysics. Space sci. 339,365
13. Meie,V. G. and Mule, K. R.,(2017) Int. Jof IRBT, Vol 5,issue2,pp 1149-1156
14. BymSaha,(2015) Int. j.of Phy. 1073-75,31
15. Solanke,D.T. and Karade,T.M.(2016) Prespacetime J.vol.7,issue12,pp 1535-1551
16. Solanke,D.T. and Karade,T.M.,(2016),Prespacetime, J.vol.7,issue13,pp 1766-1785

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Bianchi Type - III Charged Fluid Universe in Brans-Dicke Theory of Gravitation

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Abstract – We investigate the spatially homogeneous Bianchi Type-III space time with electromagnetic field tensor and relativistic charged perfect fluid in Brans-Dicke (B-D) theory of gravity. Solutions have been obtained by using a general approach of solving the partial differential equations. It is observed that the convergent and isotropic solution of the metric function can be derived with the components of the vector potentials.

Keywords- Bianchi type-III universe, Brans Dicke theory of gravitation, electromagnetic field, perfect fluid, vector potentials

I. INTRODUCTION

In recent years there has been a lot of interest in several alternative theories of gravitation, out of which the most important among them is scalar-tensor theory of gravitation formulated by Brans-Dicke [1]. This theory of gravity is one of the most competent theory due to its vast cosmological implications [2]. In this theory, the scalar field has the dimensions of inverse of the gravitational constant and its role is confined to its effect on gravitational field equations. This theory of gravity is mediated by a scalar field ϕ in addition to the usual metric tensor field g_{ij} present in Einstein's theory. Among the various modifications of general relativity, the B-D theory of gravity is well known example of a scalar tensor theory in which the gravitational interaction involves a scalar field and the metric tensor.

In recent years, the study of Bianchi type models in the context of B-D theory has attracted many authors Pawar *et.al* [3], Sharif *et.al* [4], Kandalkar *et.al* [5], Raut *et.al* [6], Katore *et.al* [7]. A detailed discussion of B-D cosmology is given by Singh *et al.*[8]. Lorenz-Petzold [9] studied exact Bianchi type-III solutions in the presence of electromagnetic field. Bianchi type-I space-time in scalar-tensor theory have been investigated by Kumar *et al.*[10]. Adhav *et al.*[11] studied LRS Bianchi type-II cosmological model with anisotropic dark energy. Katore *et al.*[12,13] explored Bianchi type-V and plane symmetric space-time filled with dark energy models in B-D theory. Bianchi type - III dark energy model in scalar tensor theory of gravitation explained by Naidu *et al.*[14]. Adhav *et al.* [15] explored Bianchi type-III cosmological model with negative constant deceleration parameter in B-D theory of gravity in presence of perfect fluid. Shamir *et al.* [16] have studied anisotropic dark energy Bianchi type-III cosmological models in B-D theory of gravity.

The Brans-Dicke field equations are given by

$$G_j^i = \frac{-8\pi}{\phi}\left(T_j^i\right) - \frac{\omega}{\phi^2}\left(\phi^{;i}\phi_{,j} - \frac{1}{2}g_j^i\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(\phi^{;i}{}_{,j} - g_j^i\Box\phi\right),$$

where ω is a dimensionless coupling constant. The function ϕ is known as B-D scalar field. Karade and Solanke [17] investigated Bianchi type-III universe field with the perfect fluid and scalar field coupled with electromagnetic fields in $f(R,T)$ theory of gravity. Recently Bhoyar *et al.*[18] discussed the Bianchi type-III and Kantowski Sachs cosmological model containing magnetic field with variable cosmological constant.

This motivates us to investigate Bianchi type-III charged fluid universe in B-D Theory of gravitation.

The paper is organized as follows:

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Section II. deals with the derivation and solutions of the field equations. A brief summary is given is section III.

II. THE METRIC AND FIELD EQUATIONS

Here, we consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2 dx^2 + B^2 e^{-2mx} dy^2 + C^2 dz^2, \quad (1)$$ where A, B and C are functions of t and m is constant.

For the charged fluid the field equations of B-D theory assume that

$$G_j^i = \frac{-8\pi}{\phi}\left(T_j^{if} + E_j^f\right) - \frac{\omega}{\phi^2}\left(\phi^{,i}\phi_{,j} - \frac{1}{2}g_j^i\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(\phi^{;i}_{;j} - g_j^i\phi^{;k}_{;k}\right), \quad (2)$$

where G_j^i is Einstein tensor, E_j^i is energy momentum tensor for electromagnetic field, T_j^{if} is energy momentum tensor for perfect fluid with conservation equation

$$\phi_j^i = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^{,k}\right]_{,k}$$

and other symbols and notations have their conventional meanings.

Electromagnetic field

The energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{ab}F^{ab}g_{ij} - F_{ia}F_{bj}g^{ab}, \quad (3)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial V_i}{\partial x^j} - \frac{\partial V_j}{\partial x^i}, \quad (4)$$

where V_i is a four potential vector.

To achieve the compatibility with space time (1), we assume electromagnetic vector potential as

$$V_i = [\alpha(x)v_1(t), v_2(t), v_3(t), v_4(t)], \quad (5)$$

Noting (4) and (5) we can deduce easily the following

$$F_{14} = \alpha v_1, F_{24} = v_2, F_{34} = v_3, F_{43} = -v_3, \quad (6)$$

From equations (4), (5) and (6), we can deduce

$$F_{ab}F^{ab} = -2\left[\frac{\alpha^2 v_1^2}{A^2} + \frac{v_2^2}{B^2 e^{-2mx}} + \frac{v_3^2}{C^2}\right], \quad (7)$$

Using (3) we can deduce the components of energy momentum tensors

$$E_1^1 = \frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{v_3^2}{C^2}, \quad (8a)$$

$$E_2^1 = \frac{\alpha v_1 v_2}{A^2}, \quad (8b)$$

$$E_3^1 = \frac{\alpha v_1 v_3}{A^2}, \quad (8c)$$

$$E_2^2 = -\frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} + \frac{1}{2}\frac{v_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{v_3^2}{C^2}, \quad (8d)$$

$$E_3^2 = \frac{v_2 v_3}{B^2 e^{-2mx}}, \quad (8e)$$

$$E_1^3 = \frac{\alpha v_1 v_3}{C^2}, \quad (8f)$$

$$E_2^3 = -\frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{v_3^2}{C^2}, \quad (8g)$$

$$E_4^4 = \frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{v_3^2}{C^2}, \quad (8h)$$

The stress energy tensor of a perfect fluid with density ρ, pressure p and four velocity u_i is given by

$$T_j^i = (\rho + p)u^i u_j - p\delta_j^i, \quad (9)$$

where $g_{ij}u^i u^j = 1$

For co-moving coordinate system, we have

$u_1 = 0, u_2 = 0, u_3 = 0, u_4 \neq 0,$

Accordingly (9) provides

$$T_1^1 = (\rho + p)u^1 u_1 - p\delta_1^1 = -p,$$

$$T_2^2 = (\rho + p)u^2 u_2 - p\delta_2^2 = -p,$$

$$T_3^3 = (\rho + p)u^3 u_3 - p\delta_3^3 = -p,$$

$$T_4^4 = (\rho + p)u^4 u_4 - p\delta_4^4 = \rho,$$

$$T_1^1 + E_1^1 = \frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2m}} - \frac{1}{2}\frac{v_3^2}{C^2} = -p, \quad (9a)$$

$$T_2^1 + E_2^1 = \frac{\alpha v_1 v_2}{A^2}, \quad (9b)$$

$$T_3^1 + E_3^1 = \frac{\alpha v_1 v_3}{A^2}, \quad (9c)$$

$$T_2^2 + E_2^2 = -\frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2m}} - \frac{1}{2}\frac{v_3^2}{C^2} = -p, \quad (9d)$$

$$T_3^2 + E_3^2 = \frac{v_2 v_3}{B^2 e^{-2m}}, \quad (9e)$$

$$T_3^3 + E_3^3 = -\frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} - \frac{1}{2}\frac{v_2^2}{B^2 e^{-2m}} + \frac{1}{2}\frac{v_3^2}{C^2} = -p, \quad (9f)$$

$$T_4^4 + E_4^4 = \frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} + \frac{1}{2}\frac{v_2^2}{B^2 e^{-2m}} + \frac{1}{2}\frac{v_3^2}{C^2} = \rho, \quad (9g)$$

Conservation law is

$$\frac{\partial}{\partial x^j}\left(\sqrt{-g}T_i^j\right) = 0, \quad (10)$$

This equation with different combination of i and j, gives following equations

$$\left[\frac{\dot{v}_1}{v_1}\right] + \frac{v_1^2}{v_2^2} + \frac{v_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \quad (10a)$$

$$\left[\frac{\dot{v}_2}{v_2}\right] + \frac{v_2^2}{v_2^2} + \frac{v_2}{v_2}\left[\frac{\dot{A}}{A} - \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \quad (10b)$$

$$\left[\frac{\dot{v}_3}{v_3}\right] + \frac{v_3^2}{v_3^2} + \frac{v_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \quad (10c)$$

$$\phi_4^4 = -\dot{\beta} - \dot{\psi}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right]. \quad (10d)$$

From the vanishing components of Einstein tensor, using equations (2) and (4), we deduce

$$\frac{v_1 v_2}{v_1 v_2} - \frac{v_1 v_3}{v_1 v_3} - \frac{v_2 v_3}{v_2 v_3} = 0, \quad (11)$$

$$\frac{v_1}{v_1} = \frac{v_2}{v_2} = \frac{v_3}{v_3} = \frac{\dot{D}}{D} \quad (12)$$

where D is an unknown function of t

Integrating this with respect to t, we get

$$v_1 = k_1 D \quad , \quad v_2 = k_2 D \quad , \quad v_3 = k_3 D \quad (13)$$

where k_1, k_2 and k_3 are constants

Inserting (12) in (11), we get

$$\left(\frac{\dot{D}}{D}\right)^2 = 0, \quad (14)$$

With the aid of equation (12), we can write the equation (10) as,

$$\left(\frac{\dot{D}}{D}\right) + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \quad (15a)$$

$$\left(\frac{\dot{D}}{D}\right) + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \quad (15b)$$

$$\left(\frac{\dot{D}}{D}\right) + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0, \quad (15c)$$

From equations (15a), (15b)and (15c) ,we have

$$\frac{\dot{A}}{A} = \frac{\dot{B}}{B} = \frac{\dot{C}}{C}, \quad (16)$$

Integrating with respect to t, we get

$$A = k_4 B, \quad B = k_5 C, \quad C = k_6 A, \quad (17)$$

where k_4, k_5 and k_6 are constants

We attempt to express the component of T_i^j in terms of T_4^4 for this consider the expression

$$\frac{\alpha^2 v_1^2}{A^2} + \frac{v_2^2}{B^2 e^{-2m}} + \frac{v_3^2}{C^2} = \left[\frac{\alpha^2 v_1^2}{A^2} + \frac{v_2^2}{B^2 e^{-2m}} + \frac{v_3^2}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0$$

$$T_4^4 = \frac{1}{2}\frac{\alpha^2 v_1^2}{A^2} + \frac{1}{2}\frac{v_2^2}{B^2 e^{-2m}} + \frac{1}{2}\frac{v_3^2}{C^2} - p = \rho, \quad (18a)$$

$$T_1^1 = -T_4^4 - p = -p, \quad (18b)$$

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$$T_3^3 = -T_4^4 + p - p, \tag{18c}$$

$$T_4^4 = -T_3^3 + p - p. \tag{18d}$$

Now, considering the non-vanishing component of Einstein tensor, from equation (2), we derive

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{-8\pi}{\phi}\left[-T_1^1 + p - p\right] - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{19a}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = \frac{-8\pi}{\phi}\left[-T_2^2 + p - p\right] - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right), \tag{19b}$$

$$\frac{\omega\dot{\phi}^2}{\phi^2} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi}{\phi}\left[\rho\right] + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{19c}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0. \tag{19d}$$

Integrating (19d) with respect to t, we get

$$A = k_1 B, \tag{20}$$

where k_1 is constant.

From equations (19a) and (19b), we get

$$\frac{\ddot{B}}{B} - \frac{\ddot{A}}{A} + \frac{\dot{C}}{C}\left(\frac{\dot{B}}{B} - \frac{\dot{A}}{A}\right) + \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} - \frac{\dot{A}}{A}\right) = 0, \tag{20a}$$

From equations (19b) and (19c), we get

$$\frac{\omega\dot{\phi}^2}{\phi^2} + \frac{\ddot{C}}{C} - \frac{\ddot{B}}{B} - \frac{\dot{A}}{A}\left[\frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] + \frac{\dot{\phi}}{\phi}\left[\frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0. \tag{20b}$$

Using equations (19c) and (19a), we obtain

$$-\frac{\omega\dot{\phi}^2}{\phi^2} - \frac{\ddot{A}}{A} - \frac{\ddot{C}}{C} + \frac{\dot{B}}{B}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right] + \frac{\dot{\phi}}{\phi}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right] = 0. \tag{20c}$$

Eliminating $\frac{\omega\dot{\phi}^2}{\phi^2}$ between (20a) & (20c), we get

$$\frac{\ddot{A}}{A} - \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{C}}{AC} - \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} - \frac{\dot{B}}{B}\right) = 0, \tag{20d}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\left[\frac{\dot{A}}{A} - \frac{\dot{B}}{B}\right] - \frac{\dot{\phi}}{\phi}\left[\frac{\dot{A}}{A} - \frac{\dot{B}}{B}\right] = 0, \tag{20e}$$

Upon Integration of (20d) and (20e), yields

$$\frac{\dot{A}}{B} = k_0 \exp\left\{k_2 \int \frac{1}{ABC\phi} dt\right\}, \tag{21a}$$

Similarly

$$\frac{\dot{B}}{A} = k_{01} \exp\left\{k_{21} \int \frac{1}{ABC\phi} dt\right\}, \tag{21b}$$

We can express the values of A and B in the following form:

$$A = (ABC)^{\frac{1}{2}} k_{11} \exp\left\{k_{11} \int \frac{1}{ABC\phi} dt\right\}, \tag{22a}$$

$$B = (ABC)^{\frac{1}{2}} k_{12} \exp\left\{k_{12} \int \frac{1}{ABC\phi} dt\right\}, \tag{22b}$$

Equation (17) implies C is scalar multiple of A

$$C = (ABC)^{\frac{1}{2}} k_{13} \exp\left\{k_{13} \int \frac{1}{ABC\phi} dt\right\}, \tag{22c}$$

Using equations (15) and (22), we get,

$$\frac{\dot{D}}{D} - \frac{\dot{A}}{A} = 0, \tag{23}$$

Integrating above equation, we get

$$D = k_{14} \int \frac{1}{A} dt + k_{15}. \tag{24}$$

Using (24) the equation (13) reduces to

$$v_1 = k_{19} \int \frac{1}{A} dt - k_{20}, \tag{25}$$

$$v_2 = k_{21} \int \frac{1}{A} dt + k_{22}, \tag{26}$$

$$v_3 = k_{23} \int \frac{1}{A} dt + k_{24}, \tag{27}$$

ψ_3 is undetermined.

The metric in (1), with the help of (22) can be redefined in the form

$$ds^2 = \left(ABC^2\right)^{\frac{2}{3}}\left[K^{'}\exp K^{''}\int\frac{1}{(ABC)^3}dt\right]^2\left(dx^2+e^{-2mx}dy^2-dz^2\right)-dt^2, \quad (28)$$

where $K^{'}=k_{12}k_{13}k_{23}$ and $K^{''}=k_{11}k_{12}k_{13}$ are constants.

III. Conclusion

In this present paper, we have presented Bianchi Type-III space time with electromagnetic field tensor and relativistic charged perfect fluid in the context of Brans-Dicke theory of gravity. We have derived and solved the gravitational field equations corresponding to B-D theory. It is observed that the convergent, non-singular, isotropic solutions can be obtained along with the components of vector potential. It is also interesting to note that the investigated models are free from singularity.

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References

[1] C. Brans and R. H. Dicke, "Mach's Principle and a Relativistic Theory of Gravitation", Phys. Rev. 124 pp. 925, 1961.

[2] Orfeu Bertolami and P. J. Martins, "Non-minimal coupling and quintessence", Phys. Rev. D 61, 064007, 2000.

[3] D.D. Pawar, S.N. Bayaskar, V.R. Patil "Plane Symmetric Cosmological Model with Hard Fluid in Brans-Dicke Theory of Gravitation", Bulg. J. Phys. 36 pp. 68–75, 2009.

[4] Sharif M. and Sania Waheed, "Anisotropic Universe Models in Brans-Dicke Theory", Int. J. Phys. 1 (2) pp. 76-79, 2013.

[5] Sharad Kandekar, Seema Sandhankar, "Bianchi Type-V Cosmological Model with Linear equation of State in Brans-Dicke Theory of Gravitation", Int. J. of Astronomy and Astrophysics 4, pp. 229-236, 2014.

[6] V.R.Raut, S.S.Adhao, S.D. Katore and S.K. Sarkate, "Magnetized Anisotropic Dark Energy Bianchi Type-III Cosmological Models in Brans-Dicke Theory of Gravitation", Int. J. of Advanced Applied Physics Research, pp. 70-78, 2014.

[7] Snehlata D. Katore, A. Y. Shaikh, N. K. Sarkate, R. Tayade, "Dynamics of Bianchi type-III Universe with Magnetized Anisotropic Dark Energy", Prespacetime Journal, Vol. 3, Issue 2, pp. 154-169, 2012.

[8] T. Singh, L. N. Rai, Tarkeshwar Singh, "Anisotropic cosmological model in Brans-Dicke theory", Astrophys. Space Sci., Vol. 96, issue 1, pp. 95-105, 1983.

[9] Lorenz-Petzold, D., "Tilted electromagnetic Bianchi type III cosmological solution", Astrophys. Space Sci., 85, pp. 89 - 91, 1982.

[10] Suresh Kumar, C. P. Singh, "Exact Bianchi Type-I Cosmological Models in a Scalar-tensor Theory", Int. J. Theor. Phys., Vol. 47, Issue 6, pp. 1722–1730, 2008.

[11] K.S. Adhav, "LRS Bianchi Type-II Cosmological Models with Anisotropic Dark Energy", Electronic J. Theor. Phys., 9, No. 26, pp. 239-250, 2012.

[12] Shuvdas D. Katore, & A. Y. Shaikh, "Kantowski-Sachs Dark Energy Model in R(R,T) Gravity", Prespacetime J., Vol. 3(11), pp. 1087-1096, 2012.

[13] S.D.Katore, A.Y. Shaikh, "Plane Symmetric Dark Energy Model in Brans-Dicke Theory of Gravitation", Bulg. J. Phys. vol.39 no.3, pp. 241-247, 2012.

[14] R.L. Naidu, B. Satyanarayana and D.R.K. Reddy, "Bianchi Type-III Dark Energy Model in a Saez-Ballester Scalar-Tensor Theory", Int. J. Theor. Phys., Vol. 51, pp. 2857–2862, 2012.

[15] K.S. Adhav, A.S. Nimkar, M.R. Ugale, M.V.Dawande "Bianchi Type-III Cosmological Model with Negative Constant Deceleration Parameter in Brans Dicke Theory of Gravitation", Int. J. Theor. Phys. Vol. 47, issue 3, pp. 634–639, 2008.

[16] M.F. Shamir, A.A. Bhatt, "Anisotropic Dark Energy Bianchi Type III Cosmological Models in Brans Dicke Theory of Gravity", Canadian Journal of Physics, Vol. 90(2) pp. 193-198, 2012.

[17] D.T. Solanke, T.M. Kamde, "Bianchi Type-III Universe Filled with Combination of Perfect Fluid and Scalar Field Coupled with Electromagnetic Fields in R(R,T) Theory of Gravity", Int. Journal of Mathematical Archive, 7 (7), pp. 151-162, 2016.

[18] S.R. Bhoyar, V.R. Chirde, "Magnetized Anisotropic fluid Cosmological Models with Variable Cosmological constant", Int. J. Scientific Research in Mathematical and Statistical Science, 5 (1), pp. 11-18, 2018.

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KALUZA- KLEIN SPACE TIME WITH COSMOLOGICAL CONSTANT IN SCALAR TENSOR THEORY

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ABSTRACT

Kaluza Klein type cosmological model with time dependent cosmological term in the framework of Saez and Ballester (1986) theory of gravitation has been studied. In order to find the exact solution of the field equations, we have used the equation of state and the fact that scalar expansion is proportional to the shear scalar. The cosmological constant term is found to decreasing function of cosmic time. Some physical and kinematical properties of the model are also discussed.

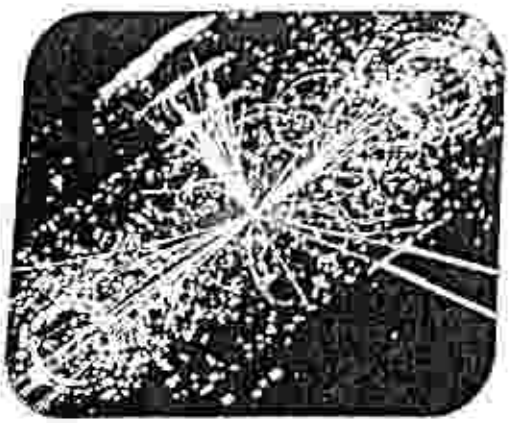
KEYWORDS: *Cosmological constant term, scalar- tensor theory, Kaluza-Klein cosmological space-time.*

1. INTRODUCTION

Einstein's general theory of relativity has successfully described gravitational phenomena. It has also served as a basis for models of the universe. However since Einstein first published his theory of gravitation there have been many criticisms of general relativity because of the lack of certain desirable features in the theory. For example Einstein himself pointed out that the general relativity does not account satisfactorily for inertial properties of matter i.e Mach's principle is not substantiated by general relativity. Since last few decades there is a growing interest in alternative theories of gravitation, especially scalar-tensor theories of gravity, which are very useful tools in understanding the early stages of evolution of the universe. The most important among them are scalar-tensor theories of gravitation formulated by Brans and Dicke [1], Nordtvedt[2] and Saez and Ballester [3]. All version of the scalar tensor theories are based on the introduction of a scalar field φ into the formulation of general relativity, this scalar field along with the metric tensor field forms a scalar- tensor field representing the gravitational field.

The Saez-Ballester theory [3]have developed a new scalar - tensor theory of gravitation in which metric is coupled with a dimensionless scalar field in a simple manner. This coupling gives a satisfactory description of weak fields. In spite of the dimensionless character of the scalar field, an antigravity regime appears in the theory. Also, this theory suggests a possible way to solve missing matter problem in non-flat FRW cosmologies.

Some of the authors, Sing and Agrawal [4], Shri Ram and Tiwari [5], Reddy and VenkateswaraRao [6], Reddy et.al [7] have studied several aspects of the Saez-Ballester scalar-tensor theory. Adhav et al.[8] investigatedaxially symmetric non-static domain walls in scalar-tensor theories formulated by Brans and Dick (1961) and Saez-Ballester.RecentlyEinstein-Rosen, Axially symmetry and Plane symmetry cosmological models in Saez-Ballester theory of gravitation have been investigated by Mete et.al [9, 10,11].



The Kaluza-Klein theory was introduced to unify Maxwell's theory of electromagnetism and Einstein's gravity theory by adding the fifth dimension. Kaluza-Klein theory has been regarded as a candidate

of the fundamental theory due to its potential theory function to unite the fundamental interactions. Kaluza-Klein cosmological model has been studied with different matters [12-16]. In Kaluza-Klein theory, the inflation was considered [17] and the Schwarzschild solution for three space and n dimensions were formed [18]. String cloud and domain walls with quark matter in n-dimensional Kaluza-Klein cosmological model have also been studied by Adhav et al [19].

Higher dimensional cosmology is important because it has physical relevance to the early stages of evolution of the universe before it has undergone compactification transitions. Hence several authors(Witten[20],Chodos and Detweiler[21] Appelquist et al.[22],Marchiano[23])were attracted to the study of higher dimensional cosmology. Also in the context of Kaluza-Klein and super string theories higher dimensions have recently acquired much significance. Several investigations have been made in higher dimensional cosmology in the frame work of different scalar - tensor theories. In particular, Reddy et al. [24] have investigated a five dimensional Kaluza-Klein cosmological model in the presence of perfect fluid in $f(R,T)$gravity.

The effect of cosmological constant has been extensively studied in the literature within the framework of general relativity and its alternative theories. Singh and Singh[25] investigated a cosmological model in Brans Dicke theory by considering cosmological constant as a function of scalar field ϕ. Pimentel [26]obtained exact cosmological solutions in Brans-Dicke theory with uniform cosmological constant.A class of flat FRW cosmological models with cosmological constant in Brans- Dicke theory have also been obtained by Azar and Riazi [27]. The age of the universe from a view point of the nucleosynthesis with Λ term in Brans-Dicke theory was investigated byEloch et al.[28], Azad and Islam [29]extended the idea of Singh and Singh [25]to study cosmological constant in Bianchi type- modified Brans-Dicke cosmology.Recently Qiang et al. [30] discussed cosmic acceleration in five dimensional Bran Dicke theory using interacting Higgs and Brans-Dicke fields.

This motivatesus toinvestigate Kaluza-Klein type cosmological model with time dependent cosmological term-Λ in the framework of Saez and Ballester (1986) theory of gravitation.

2. THE METRIC AND FIELD EQUATION

The Einstein's field equations (in gravitational units, $8\pi c = 1$) in the scalar tensor theory proposed by (Saez and Ballester,1986) with time dependent Λ -term may be written as

$$R_{ij} - \frac{1}{2} R g_{ij} - \omega\phi^{n}\left(\phi_{,i}\phi_{,j} - \frac{1}{2} g_{ij}\phi_{,k}\phi^{,k}\right) = -T_{ij} + \Lambda(t) g_{ij}, \quad (1)$$

where T_{ij} is the energy momentum tensor of matter and ϕ is the scalar field satisfying the equation

$$2\phi^{,i}\phi_{;i} + n\phi^{n-1}\phi_{,i}\phi^{,i} = 0 \quad (2)$$

Here n is arbitrary constant.ω is the dimensionless coupling constant. Comma and semi-colon respectively denote partial and covariant derivativewith respective to x^i.

The energy momentum tensor T_{ij} of cosmic fluid can be define as

$$T_{ij} = (\rho + p)u_i u_j - p g_{ij} \quad (3)$$

where ρ, p are the energy density and pressure respectively and $u_i = (0,0,0,0,1)$ is the flow vector satisfying the relation

$$g_{ij} u^i u^j = 1 \quad (4)$$

Here weconsider Kaluza-Klein type space time described by the line element

$$ds^2 = dt^2 - A^2(t)\left(dx^2 + dy^2 + dz^2\right) - B^2(t)d\psi^2, \quad (5)$$

where the metric potentials A and B are functions of the proper time t only.

The field equations (1) and (2) for the metric (5) with the help of (3) and (4) can be written as

$$2\frac{\ddot{A}}{A}+\left(\frac{\dot{A}}{A}\right)^2+2\frac{\dot{A}\dot{B}}{AB}+\frac{\ddot{B}}{B}-\frac{\omega}{2}\phi^{-2}\dot{\phi}^2=-p+\Lambda \quad (6)$$

$$3\frac{\ddot{B}}{B}+3\left(\frac{\dot{B}}{B}\right)^2-\frac{\omega}{2}\phi^{-2}\dot{\phi}^2=-p+\Lambda \quad (7)$$

$$3\left(\frac{\dot{A}}{A}\right)^2+3\frac{\dot{A}\dot{B}}{AB}+\frac{\omega}{2}\phi^{-2}\dot{\phi}^2=\rho+\Lambda \quad (8)$$

$$\ddot{\phi}+\dot{\phi}\left(\frac{2\dot{A}}{A}+\frac{\dot{B}}{B}\right)-\frac{\omega}{2}\left(\frac{\dot{\phi}^2}{\phi}\right)=0, \quad (9)$$

where suffix 4 at the symbols A, B, ϕ and ρ denotes ordinary differentiation with respective to t.

The geometrical quantities spatial volume V and average scale factor $a(t)$ for Kaluza-Klein space time are define by

$$V=a^4(t)=A^3B \quad (10)$$

The mean Hubble parameter H is given by

$$H=\frac{1}{4}\sum_{i=1}^{4}H_i$$

$$=\frac{1}{4}\left(3\frac{\dot{A}}{A}+\frac{\dot{B}}{B}\right) \quad (11)$$

The scalar expansion θ and shear scalar σ^2 given by

$$\theta=4H=3\frac{\dot{A}}{A}+\frac{\dot{B}}{B} \quad (12)$$

$$\sigma^2=\frac{1}{2}\sigma^{ij}\sigma_{ij} \quad (13)$$

$$\sigma_{ij}=\frac{1}{2}\left[u_{i;j}-u_{j;i}\right]+\frac{1}{2}\left[u_{i;j}u^j u_i-u_i u_{j;k}u^k\right]-\frac{1}{3}\theta \quad (14)$$

The average anisotropic parameter A_p is define as

$$\sum_{i=1}^{3} H_i = \frac{\dot{V}}{V} \qquad (15)$$

where H_i $(i = 1, 2, 3)$ represents the directional Hubble parameters in x, y, z and w directions respectively and $V = e^{\beta}$ corresponds to volume expansion.

SOLUTION OF THE FIELD EQUATIONS

The set of field equations (6), (7), (8) are the system of four independent equations with six unknowns $A, B, \alpha, \beta, \gamma$ and λ. To find deterministic solution, extra condition should be needed. Here we use the scalar expansion θ is proportional to shear expansion σ^2 so that we have (Collins et al. [21]),

$$A = B^n, \qquad (16)$$

where n is an arbitrary constant.
From equations (6) and (7), we get

$$\frac{R}{R} = n\left(\frac{S}{S}\right) \qquad (17)$$

solving the differential equation, we obtain the expression for metric coefficients as

$$S = \left[(3m+1)(k_1 t + k_2)\right]^{\frac{1}{3m+1}} \qquad (18)$$

And

$$R = \left[(3mn+1)(k_1 t + k_2)\right]^{\frac{n}{3m+1}} \qquad (19)$$

where $k_1 \neq 0$ and k_2 are constants of integration.
From equation (9), we have

$$\phi\phi = A^n B = \phi_0 \qquad (20)$$

using equations (18) and (19), equation (20) yields

$$\lambda = -\left(\frac{\phi_0}{2k_1}\right)\left(\frac{n+2}{3m+1}\right)\log(k_1 t + k_2) + \psi_0, \qquad (21)$$

where ϕ_0 and ψ_0 are constants of integration.
Therefore the investigated Kaluza-Klein space time (5) can be written as

$$ds^2 = -dt^2 - \left[(3m+1)(k_1 t + k_2)\right]^{\frac{2n}{3m+1}}\left(dx^2 + dy^2 + dz^2\right) - \left[(3m+1)(k_1 t + k_2)\right]^{\frac{2}{3m+1}} dw^2 \qquad (22)$$

4. SOME PHYSICAL DISCUSSION

We assume the relation between pressure and density of matter i.e. the linear equation of state given by

$$p = \gamma\rho \quad (23)$$

using this relation one can obtain the following expressions for energy density , pressure and cosmological constant term Λ as

$$\rho = \frac{6m(m+1)+\omega\phi_0^2}{(1+\gamma)(3m+1)(k_1 t+k_2)^2} \quad (24)$$

$$p = \frac{6\gamma m(m+1)+\omega\phi_0^2}{(1+\gamma)(3m+1)(k_1 t+k_2)^2} \quad (25)$$

And

$$\Lambda = \left[3m(m+1)+\omega\phi_0^2\right]\left(\frac{1-\gamma}{1+\gamma}\right)\left(\frac{1}{(3m+1)^2(k_1 t+k_2)^2}\right) \quad (26)$$

From the relations (24) - (25), we can obtain three types of physical relevant models

- When $\gamma = 0$, we obtain empty model ,the energy density, pressure and cosmological term Λ are given by

$$\rho = \frac{6m(m+1)+\omega\phi_0^2}{(3m+1)(k_1 t+k_2)^2} \quad (27)$$

$$p = 0 \quad (28)$$

and

$$\Lambda = \left[3m(m+1)+\omega\phi_0^2\right]\left(\frac{1}{(3m+1)^2(k_1 t+k_2)^2}\right) \quad (29)$$

- When $\gamma = \frac{1}{3}$, we obtain radiating dominated model, the energy density, pressure and cosmological term Λ are given by

$$\rho = \frac{3\left[6m(m+1)+\omega\phi_0^2\right]}{4(3m+1)(k_1 t+k_2)^2} \quad (30)$$

$$p = \frac{\left[6m(m+1)+\omega\phi_0^2\right]}{4(3m+1)(k_1 t+k_2)^2} \quad (31)$$

And

$$\Lambda = \left[3m(m+1) + \omega(3m+1)^2 \left(\frac{1}{2(3m+1)^2 (k_1 t + k_2)^2} \right) \right] \qquad (32)$$

- When $n = 1$, we obtain Zeldovich fluid or stiff fluid model, the energy density, pressure and cosmological term Λ are given by

$$\rho = p = \frac{\left[3m(m+1) + \omega(3m+1)^2 \right] \frac{1}{2}}{2(3m+1)^2 (k_1 t + k_2)^2} \qquad (33)$$

And

$$\Lambda = 0 \qquad (34)$$

The physical and kinematical quantities for the model (22) have the following expressions

The mean Hubble parameter $H = \frac{1}{4(k_1 t + k_2)}$ (35)

Spatial volume $V^3 = (3m+1)(k_1 t + k_2)$ (36)

Scalar expansion $\theta = 4H = \frac{1}{k_1 t + k_2}$ (37)

Shear scalar $\sigma^2 = \frac{3}{4} \left(\frac{1}{k_1 t + k_2} \right)^2$ (38)

Deceleration parameter $q = \frac{d}{dt} \left(\frac{1}{H} \right) - 1 = 3$ (39)

and the anisotropic parameter is

$$A_m = \frac{1}{12} \qquad (40)$$

From equation (26), we observe that the cosmological term- Λ decreases as t increases i.e. it varies inversely as square of time therefore our solution is consistent with observation of the present day values of the cosmological constant term-Λ which are very small. The positive value of deceleration parameter indicates that the universe is decelerated. The spatial volume V^3 of the model increases as cosmic time increases which shows the spatial expansion of the universe. The Hubble parameter H, scalar expansion θ and shear scalar σ are decreases at $t \to \infty$.

5. CONCLUSION

In this paper, we have studied Kaluza-Klein type cosmological model with time dependent cosmological term-Λ in the framework of Saez and Ballester (1986) theory of gravitation Here, we have

discussed in two cases corresponding the values of $\gamma = 0$, $\frac{1}{3}$, 1. When $\gamma = 0$, $\frac{1}{3}$, the cosmological term Λ is decreasing function of time t and when $\gamma = 1$, the cosmological term Λ becomes zero. Also in the investigated model, we observed that $\frac{\sigma^2}{\theta^2}$ = constant i.e. the model does not approach isotropy at any time. The energy density and pressure are also decreases as time $t \to \infty$.

REFERENCES

[1] Brans, C.H., Dicke, R.H., Phys. Rev. **124**, 925, 1961.
[2] Nordtvedt, K., Post-Newtonian Metric for a General Class of Scalar-Tensor Gravitational Theories and Observational Consequences, Ap..., **161**, **1059**, 1970.
[3] Saez, D., Ballester, V.J., Phys. Lett. **A113**, 467, 1986.
[4] Singh, T. and Agrawal, A.K., Astrophys. Space Sci., **182**, 289, 1991.
[5] Sinn Ram, Tiwari, S.K., Astrophys. Space Sci., **277**, 461, 1998.
[6] Reddy, D.R.K., VenkateswaraRao, N., Astrophys. Space Sci. **277**, 461, 2001.
[7] Reddy, D.R.K. et al., Adv. in High Energy Physics, 2013, http://dx.doi.org/10.1155/2013/509807.
[8] Adhav, K.S., Nimkar, A.S., Naidu, R.L., Astrophys. Space Sci., **312**, 165-169, 2007.
[9] Mete, V.G. et al., Journal of vectorial relativity, 5(4), 25-33, 2010.
[10] Mete, V.G., Nimkar, A.S. and Ekar, V.D., Int. J. Theor. Phys., **55**, 412-420, 2016.
[11] Mete, V.G., Ekar, V.D., Prespacetime Journal., **7(12)**, 1501-1516, 2016.
[12] Chi, L.K., Gen. Rel. Gravity **22**, 1347, 1990.
[13] Coley, A.A., Astrophys. J. **427**, 585, 1994.
[14] Fukui, T., Gen. rel. Grav., **25**, 941, 1993.
[15] Liu, H., Wesson, P.S., Int. Gen. Mod. Phys. 03, 627, 1998.
[16] de Leon, P.J., Gen. Rel. Grav. **20**, 539, 1988.
[17] Li, L.X., Gott, I., Richard, J., Phys. Rev. **D58**, 103513, 1998.
[18] Palatnik., E.M., Arxiv.org http://arxiv.org/pdf/gr-qc/0703088v4.pdf (2009) arXiv:gr-qc/0703088v4, Accessed 1 Aug. 2009.
[19] Adhav, K.S., Nimkar, A.S. Dawande, M.V., Int. J. Theo. Phys., **47**, 2002-2010, 2008.
[20] Witten, E., Phys. Lett. **B144**, 351, 1984.
[21] Chodos, A., Detweiler, S., Phys. Rev. **D21**, 2167, 1980.
[22] Appelquist, T. et al., Modern Klein Theories, Addison-Wesley, Reading, 1987.
[23] Marchiano, W.J., Phys. Rev. Let., **52**, 498, 1986.
[24] Reddy, D.R.K. et al., Astrophys. Space Sci., **339**, 401, 2012.
[25] Singh, T. and Singh, T., J. Math. Phys., 25, 9, 1984.
[26] Pimentel, L.O., Astrophys. Space Sci., **112**, 175-183, 1985.
[27] Azar, I.A. and Raza, N., Astrophys. Space Sci., **226**, 1-5, 1995.
[28] Ftoch, T., Hashimoto, M., Arai, K. and Fujimoto, S., Astron and Astrophys., **325**, 893, 1997.
[29] Azad, A.K. and Islam, J.N., Pramana, **60**, 25-27, 2003.
[30] Li-e Qiang, Ma Yong-ge, Han Mu-xin and Yu Dan, Phys. Rev. **D, 71**, 061501, 2005.
[31] Collins, C.B., Glass, E.N., Wilkinson, D.A., Ge Relativ.Gravit., **12**, 805, 1980.



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MAGNETIZED PLANE SYMMETRIC COSMOLOGICAL MODEL WITH WET DARK FLUID IN SCALAR TENSOR THEORY OF GRAVITATION

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Abstract

Magnetized plane symmetric Bianchi type-I cosmological model with wet dark fluid is investigated in a scalar tensor theory of gravitation proposed by Nordtvedt [7]. To solve the field equations, a special law of variation of Hubble's parameter proposed by Berman [20] has been used. The exact solutions of the field equations are obtained. Some important geometrical and physical features regarding this model have also been studied.

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The equation of state for WDF:

$$p_{WDF} = \omega(\rho_{WDF} - \rho^*) \tag{2.1}$$

is very simple and is motivated by the fact that it is a good approximation for many fluids including water, in which the internal attraction of the molecules makes negative pressures possible.

To find the WDF energy density, we use the energy conservation equation

$$\dot{\rho}_{WDF} + 3H(p_{WDF} + \rho_{WDF}) = 0. \tag{2.2}$$

From the equation of state (2.1) and using $3H = \frac{\dot{V}}{V}$ in the above equation, we get

$$\rho_{WDF} = \frac{\omega}{1+\omega}\rho^* + \frac{C}{V(1+\omega)}, \tag{2.3}$$

where C is a constant of integration and V is the volume expansion. WDF naturally includes two components: a piece that behaves as a cosmological constant as well as pieces those red shifts as a standard fluid with an equation of state $p_{WDF} = \omega\rho_{WDF}$.

If we take $C > 0$, then we can show that this fluid will never violate the strong energy condition

$$\rho_{WDF} + p_{WDF} \geq 0,$$

$$\rho_{WDF} + p_{WDF} = (1+\omega)\rho_{WDF} - \omega\rho^* = (1+\omega)\frac{C}{V(1+\omega)} \geq 0. \tag{2.4}$$

Bianchi type-I universe with WDF has been studied by Singh and Chaubey [11]. Adhav et al. [12, 13] have investigated wet dark fluid cosmological model. Jain et al. [14] studied axially symmetric cosmological model with dark fluid in biometric theory of relativity. Recently, Nimkar [15] has studied axially symmetric non-static wet dark fluid in Brans-Dicke theory of gravitation. Kandalkar and Samdurkar [16] have constructed

Bianchi type-I cosmological model in scalar tensor theory of gravitation with viscous fluid distribution, anisotropic bulk string cosmological model in scalar tensor theory of gravitation has been investigated by Reddy et al. [17] and Mete et al. [18, 19] have studied Bianchi type-V and IX magnetized cosmological models in various aspects.

Inspired by the above works, in this paper, we obtain a plane symmetric cosmological model in the presence of electromagnetic field with WDF.

3. The Metric and Field Equations

Here, we consider the plane symmetric metric in the form

$$ds^2 = dt^2 - A^2(dx^2 + dy^2) - B^2dz^2, \tag{3.1}$$

where A and B are functions of time t only.

Saez-Ballester field equations for combined scalar-tensor field are

$$G_{ij} - \omega\phi^n\left(\phi_{,i}\phi_{,j} - \frac{1}{2}g_{ij}\phi_{,k}\phi^{,k}\right) = -T_{ij} + E_{ij}, \tag{3.2}$$

where $G_{ij} = R_{ij} - \frac{1}{2}Rg_{ij}$ is Einstein tensor, R is the scalar curvature, ω is the dimensionless constant and n is a constant.

The scalar field satisfies the equation

$$2\phi^n\phi_{,i}^{\ ,i} + n\phi^{n-1}\phi_{,k}\phi^{,k} = 0. \tag{3.3}$$

In equation (3.2), E_{ij} is the electromagnetic field given by

$$E_{ij} = \frac{1}{4\pi}\left[-F_{ip}F_j^{\ p} + \frac{1}{4}g_{ij}F_{lm}F^{lm}\right] \tag{3.4}$$

We assume that the magnetic field is in xy-plane; therefore, the current is flowing along the z-axis. Thus, F_{12} is the only non-vanishing component of the electromagnetic field tensor F_{ij}. In a co-moving co-ordinate system,

we have

$$v^i = (0, 0, 0, 1) \text{ and } x^i = \left(0, 0, 0, \frac{1}{c}, c\right).$$

The first set of Maxwell's equations is

$$F_{ij,k} + F_{jk,i} + F_{ki,j} = 0 \text{ and } \left[F^{ij}\sqrt{-g}\right]_{,j} = 0, \quad i = 0, \tag{3.5}$$

This leads to

$$F_{12} = ke^{-ax}, \tag{3.6}$$

where k is a constant so that magnetic field depends upon space co-ordinate x only.

From equations (3.4), (3.5) and (3.6), it follows that $F_{12} = 0$.

The non-vanishing components of E_i^j corresponding to the line element are given by

$$E_1^1 = \frac{H^2}{8\pi l^2} = E_4^4, \quad E_2^2 = -\frac{H^2}{8\pi l^2} = E_3^3. \tag{3.7}$$

Also, we have energy conservation equation

$$T^{ij}_{;j} = 0. \tag{3.8}$$

The energy-momentum tensor is given by

$$T_{ij} = (p_{WDF} + p_{WDF})u_i u_j - p_{WDF} g_{ij}, \tag{3.9}$$

where p_{WDF} - p_{WDF} are density and pressure of WDF, respectively.

Here, the four velocity vectors u_i and x_i satisfy the standard relations

$$u_i u^i = -x_i x^i = 1 \text{ and } u^i x_i = 0.$$

In the moving co-ordinate system, from equations (3.8) and (3.9), we get

$$T_1^1 = T_2^2 = T_3^3 = -p_{WDF}, \quad T_4^4 = p_{WDF}. \tag{3.10}$$

The field equations (3.2) for the metric (3.1) with the help of equations (3.7) to (3.10) can be written as

$$\frac{\ddot{B}}{B} + \frac{\dot{B}}{B}\cdot\frac{\dot{H}}{H} - \frac{\omega\phi^{n}\dot{\phi}^{2}}{2} = p_{(3)(3)} + \frac{H^{2}}{8\pi\,l^{2}}, \tag{3.11}$$

$$\frac{\dot{A}^{2}}{A^{2}} = \frac{1}{4}\omega\phi^{n}\dot{\phi}^{2} + p_{(3)(3)} + \frac{H^{2}}{8\pi\,l^{2}}, \tag{3.12}$$

$$\frac{\dot{A}^{2}}{A^{2}} + 2\frac{\dot{A}\dot{B}}{AB} + \frac{\omega\phi^{n}\dot{\phi}^{2}}{2} = p_{(3)(3)} + \frac{H^{2}}{8\pi\,l^{2}}, \tag{3.13}$$

$$\ddot{\phi} + \dot{\phi}\left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right) + \frac{n\omega\phi^{n}}{2\phi} = 0, \tag{3.14}$$

where dot over the field variables denotes differentiation with respect to t.

Spatial volume and the scale factor for the metric (3.1) are defined by

$$V^{3} = R^{3} = A^{2}B \tag{3.15}$$

4. Solutions and the Model

From equations (3.10) and (3.12), we get

$$2\left(\frac{\ddot{A}\dot{B}}{A\dot{B}} - \frac{\dot{A}}{A}\right) - \omega\phi^{n}\dot{\phi}^{2} = 0. \tag{4.1}$$

The set of equations (3.11)-(3.14) is nonlinear, hence, we assume the linear relationship between the metric potentials A and B, that is,

$$A = nB, \tag{4.2}$$

where $n \neq 0$ is a constant.

We solve the above set of equations with the help of special law of variation of Hubble's parameter proposed by Berman [20] yielding constant deceleration parameter model of the universe defined by

$$q = \frac{R\ddot{R}}{\dot{R}^2}, \tag{4.3}$$

this admits the solution

$$R = (at + b)^{\frac{1}{1+q}}, \tag{4.4}$$

where $a \neq 0$ and b are constants of integration.

This implies that the condition for accelerated expansion of the universe is $1 + q > 0$.

Now, from equations (3.18), (4.3) and (4.4), we get

$$(AB)^{\frac{1}{2}} = (at + b)^{\frac{1}{1+q}}. \tag{4.5}$$

From equations (4.2) and (4.5), we obtain

$$A = c_1(at + b)^{\frac{1}{1+q}}, \tag{4.6}$$

where $c_1 = (a)^{\frac{1}{2}}$.

$$B = c_2(at + b)^{\frac{1}{1+q}}, \tag{4.7}$$

where $c_2 = (a)^{\frac{2}{3}}$.

Using equations (4.6) and (4.7), the line element (3.1) can be written as

$$ds^2 = dt^2 - c_1^2(ax + b)^{\frac{2}{1+q}}[(dx^2 + dy^2) - c_2^2(ax + b)^{\frac{2}{1+q}}dz^2]. \tag{4.8}$$

Using the suitable transformation of the coordinates, equation (4.7) is reduced to

$$ds^2 = \frac{dT^2}{a^2} - c_1^2T^{\frac{2}{1+q}}[(dX^2 - dY^2) - c_2^2T^{\frac{2}{1+q}}dZ^2], \tag{4.9}$$

where $T = (at + b)$, $X = x$, $Y = y$, $Z = z$.

5. The Geometrical and Physical Significance of the Model

Using the Saez-Ballester scalar tensor theory of gravitation, some physical and kinematical properties of the model (4.9) are obtained as follows.

The physical quantities of observational interest in cosmology are the expansion scalar (θ), shear scalar (σ) and the mean anisotropic parameter (A_m) defined as

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{5.1}$$

$$2\sigma^2 = \sum_{i=1}^{3}\left(H_i^2 - \frac{\theta^2}{3}\right), \tag{5.2}$$

$$A_m = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2. \tag{5.3}$$

Further, we find the volume, mean Hubble parameter, expansion scalar θ, shear scalar σ and mean anisotropic parameter A_m as

$$V = T^{\frac{3}{1+q}}, \tag{5.4}$$

$$H = \frac{1}{(1+q)T}, \tag{5.5}$$

$$\theta = 3H = \frac{3}{(1+q)T}, \tag{5.6}$$

$$\sigma^2 = 0, \tag{5.7}$$

$$A_m = 0. \tag{5.8}$$

From equations (3.15) and (4.2), we obtain a scalar function for Saez-Ballester scalar tensor theory of gravitation as

$$A^{\frac{3}{2}}\dot{\phi}=\bar{K}, \tag{5.9}$$

where $\bar{K}$ is a constant of integration, which, on integrating equation (5.9) and inserting the value of $A^{\frac{3}{2}}$, give

$$\phi=\begin{cases}\dfrac{n+1}{2}\dfrac{T^{-(2+3q)}}{(2+3q)}K_2+K_3\end{cases}^{\frac{2}{n+2}}, \quad n\neq 2 \tag{5.10}$$

where $K_1^2=K_2$ and K_3 are constants of integration.

The pressure density $p_{(1)(1)}$ and energy density $\rho_{(1)(1)}$ of the model (4.9) are, respectively, given by

$$p_{(1)(1)}=\frac{H^2}{8\pi A^2}+\frac{q}{(1+q)^2T^2}-\frac{n}{2}\begin{cases}\dfrac{K_2(n+1)}{2}\dfrac{T^{-(2+3q)}}{(2+3q)}-K_3\end{cases}^{\frac{2n}{n+2}}$$

$$\begin{cases}\dfrac{T^{-3(1+q)}}{2}\dfrac{nK_2(n+1)}{-(2+3q)}T^{-(2+3q)}+K_3\end{cases}^{\frac{n}{n+2}}, \tag{5.11}$$

$$\rho_{(1)(1)}=\frac{H^2}{8\pi A^2}-\frac{3}{(1+q)^2T^2}-\frac{n}{2}\begin{cases}\dfrac{n+1}{2}\dfrac{T^{-(2+3q)}}{-(2+3q)}K_2+K_3\end{cases}^{\frac{2n}{n+2}}$$

$$\cdot\begin{cases}T^{-(2+3q)}\dfrac{n+1}{2}\dfrac{T^{-(2+3q)}}{-(2+3q)}K_2+K_3\end{cases}^{\frac{n}{n+2}} \tag{5.12}$$

6. Conclusion

In this paper, we have investigated a plane symmetric cosmological model with wet dark fluid and electromagnetic field in Saez-Ballester scalar tensor theory of gravitation. We have used a special law of variation of the Hubble parameter proposed by Berman [20]. The model which is presented in this paper could give an appropriate description of the evolution of the

universe. It is observed from the result (5.4) that the model is expanding with time, since $1 + q > 0$. At initial moment, when time $T = 0$, the proper volume with be zero, whereas when T tends to zero, the expansion scalar θ, Hubble's parameter H and shear scalar σ tend to infinity and for large value of T, we observe that the expansion scalar θ, Hubble's parameter H and shear scalar σ become zero. Hence, the model approaches isotropically for the large value of T. Thus, the presen model may be a useful tool for describing the early stages of the evolution of the physical universe.

References

[1] A. Einstein, Die Grundlage der allgemeinen Relativitats theorie, Ann. Physics 49 (1916), 769-822.

[2] P. Jordan, Schwerkraft, Wellall, Friedeh Vieweg and Sohn, Braunschweig, 1955, pp. 207-214.

[3] C. H. Brans and R. H. Dicke, Mach's principle and a relativistic theory of gravitation, Phys. Rev. 24 (1961), 925-935.

[4] K. Nordtvedt, Post-Newtonian metric for a general class of scalar-tensor gravitation, The Astrophysical 161 (1970), 1059-1067.

[5] D. K. Ross, Scalar-tensor theory of gravitation, Phys. Rev. D. 5 (1972), 284-289.

[6] G. Schmidt, W. Greiner, J. Hemz and B. Muller, Stability of massive objectives in new scalar-tensor theory, Phys. Rev. D 24 (1981), 1484-1490.

[7] D. Sucz and V. J. Rutledge, A simple coupling with cosmological implications, Phys. Lett. A 113 (1986), 467-470.

[8] M. V. Mehra, Homogeneous axial cosmologies with electromagnetic field and dust, Ann. New York Acad. Sci. 262 (1975), 253-274.

[9] P. G. Tait, The Voyage of HMS Challenger, HMSO, London, 1988.

[10] A. T. J. Hayward and J. Brit, Compressibility equations for liquids: a comparative study, Appl. Phys. 18 (1967), 965-977.

[11] T. Singh and R. Chaubey, Bianchi type-I universe with wet dark fluid, Pramana Journal of Physics 71(3) (2008), 447-458.

[12] K. S. Adhav, A. S. Nimkar, M. R. Ugale and R. S. Thakare. Plane symmetric cosmological model with wet dark fluid in bimetric theory of gravitation. Adv. Stud. Theor. Phys. 4 (2010), 917-922.

[13] A. S. Nimkar and A. M. Pund. Wet dark fluid cosmological model in Ruban's background. IOSR Journal of Mathematics (IOSR-JM) 11(4) (2015), 47-50.

[14] P. Ram, S. K. Sahoo and B. Misra. Axially symmetric cosmological model with wet dark fluid in bimetric theory of gravitation. International Journal of Theoretical Physics 51 (2012), 2546-2551.

[15] A. S. Nimkar. Axially symmetric non-static wet dark fluid in Brans-Dicke theory of gravitation. Multilogic in Science 2(2) (2012), 93-99.

[16] S. P. Kandalkar and S. W. Samdurkar. Bianchi type-I cosmological model in scalar tensor theories of gravitation with viscous fluid distribution. IOSR Journal of Mathematics (IOSR-JM) 2(3) (2012), 39-43.

[17] D. R. K. Reddy, Ch. Purnachandra Rao, T. Vidyasagar and R. Bhuvana Vijaya. Anisotropic bulk viscous string cosmological model in scalar tensor theory of gravitation. Advances in High Energy Physics. http://dx.doi.org/10.1155/2013/609807

[18] V. G. Mete, K. R. Mule and V. D. Ilkar. Bianchi type-V magnetized cosmological model with wet dark fluid in general relativity. International Journal of Current Research 8(11) (2016), 41464-41486.

[19] A. G. Mete, V. D. Ilkar and Poonam Kadu. Bianchi type-IX magnetized bulk viscous string cosmological model in general relativity. Theor. Phys. 2(1) (2017), 14-19.

[20] M. S. Berman. A special law of variation for Hubble's parameter. Il Nuovo Cimento B 74 (1983), 182-186.

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76.	The Need For Extensive Training As A Barrier In The Process of Library Automation Atul Pundalikrao Wanjdhade	261 – 263
77.	Barriers In Library Automation : A Contradiction Dr.Vijay G. Wardikar	264 – 265
78.	Skills Required For LIS Professionals In The Age of Library Automation Mr. Avinash G. Yette, Mr. Manoj P. Waghmare, Dr. Virendrakumar L. Barde, Dr. Sanjay Madhukarrao Salwe	266 – 268
79.	*Need And Importance of Library Automation* Miss. Yadav Shyamla C., Dr. Ghumre Shivshankar K.	269 – 273
80.	Development In Public Libraries In Maharashtra Vijaya Bhaurao Suryawanshi,	274 – 276
81.	Need And Importance of Library Automation Mr. Yogesh P. Surwade, Dr. Hitendra J. Patil	277 – 279
82.	*Library Automation: An Overview* Dr. Vishal Shekhawat	280 – 282
83.	Effective Use of Computer And Automated Libraries In Social Science Research Dr.Vidya Raut	283 – 285
84.	Library Automation: An Overview Ranjana K. Jawanjal	286 – 288
85.	Library Automation Shri. Amol Bhaudas Meshram	289 – 291
86.	Problems And Solutions of Library Automation Dr. P.S.Mohe	292 – 293
87.	Stress Munagement For Library Science Professionals In Digital Era Dr. Prashant S. Thakare	294 – 296
88.	Demands of A Fully Automated Library Dattatray P Sankpal	297 – 299
89.	Barriers In The Process Library Automation And Its Solution Nilesh D Raut	300 – 301
90.	A Study On Library Networking And Library Automation In India Mr. Rohidas B. Rathod, Mr. Sagar A. Dhumal	302 – 305

84

LIBRARY AUTOMATION: AN OVERVIEW

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ABSTRACT

Today libraries are moving from traditional ways towards Automation, which is the result of the need for modern information society. Automated libraries can immediately adopt various innovations in technology and provide the services very effectively, rapidly, efficiently, adequately and economically. The recent trend in automation of library has made significant growth in development and upgrading of the library. In India, Information Technology is being successfully introduced in all types of libraries and information centers . This article reviews the literature on the library automation. The literature includes journal articles, reports, monographs etc., published inside and outside India, discussing about Library Automation, Library Technical Process, Library Networking, Information Systems, Library Co-operations, Cataloguing, Integrated Library Systems, Library Services, Information processing, Academic Libraries, the need for library automation and the problems faced by library professionals.

INTRODUCTION:-

Library is Heart of any academic institution. Also it is soul of any learning and research institution, which is pivot of teaching-learning process. Now in these day's we have just entered in new millennium or new technological era. The ICT make lots of changes in every field also in Library information Services. In recent decades we have witnessed the establishment of automation industries and library information networks and services around the world through use of ICT. The use of Information Technology tools facilitates a vast flow of information to end user via information services .Also the information seeking behavior of user has dynamically changed. They want relevant, authentic information very quickly within a single place at their hand .This concept has posed challenges for library professionals for quick delivery of library services and information. This development in library field has brought the idea of Library Automation.

New technologies library provides several new materials, media and mode of storing and communicating the information. Library Automation reduces the drudgery of repeated manual efforts in library routine. By use of library automation collection, Storage, Administration, Processing, Preservation and communication etc. In an broad sense a Library network should share resources. Networking is necessitated keeping in view of the following facts:

- Tremendous growth of literature
- Increasing cost of documents
- Declining library budget
- Technological advancement
- Customers need satisfaction

What is Automation :

he term automation is introduced used first D.S. Harder in 1936. He defined it as, "the auto andling of parts between progressive production processes. Since then the term has been ap ide variety of automatic machinery and automatic systems. And is action for human e ntelligence

listory of Library Automation

ibrary automation began in the year 1930"s when punched card equipment was implem brary for circulation and acquisition. Harley E Tillet began experiments for storage and searcl o-coordinating index. Using an IBM 70. Soon after this machine arrived in September 1953. resented his report in IBM Computational Seminar at Endicott, New York. This paper is eport on library-related computerization (Tilllitt, Harley E).

leed for Library Automation:

There are several reasons for automation. A considerable saving in efforts, Time and re nvolved in manual processing can be achieved. The other reasons are:

1) To improve control over collection.
2) To have an entries control over the entire operation.
3) To improve the existing services as well as introduce new services.
4) To avoid duplicate of work.
5) To use services of the existing staff effectively.

From the library point of view automation in library is also necessary because:

1) Largely textual in nature.
2) Bibliographic record is of variable length.
3) A field in a record may repeat many times.
4) File size is usually vary large.
5) Updating of files is done almost every day.
6) To record the date accurately, special devices are required.

Steps in library automation

- Identifying the library functions which could be computerized
- Analyze these functions in details from the view point of
- Operation involved
- Type and size of records
- Storage media required
- Various outputs required
- Estimations of the volume of information to be handled and the rate of growth
- Cost factors
- For manual system
- For automated system

LANNING OF LIBRARY AUTOMATION

lanning for library automation has been defined as planning for "integrated systems" that computerize a array of traditional library functions using a common database. While this is still generally true, apid technological change is forcing a reexamination of what it means to "automate the library." As hysical, spatial and temporal barriers to acquiring information are crumbling, libraries must plan for a roader and more comprehensive approach to providing automated services.

dvantages of Library Automation:

here are several advantages of Library Automation a machine readable catalogue prepared at the time acquisition may be required respectively for number of purposes. Automation has the following antages.

1) Professional staff need not spend much time to do the routine library work.

2) Eliminates human errors while performing routine library works.
3) Improved control covers library collection.
4) Increased computer awareness among users.
5) Cataloguing is faster, instant access to item records.
6) Excellent control over circulation

Few Software for Library Automation

1. Alice for Windows	2. AUTOLIB	3. CALIBAN
4. LIBASOFT	5. LIBRARIAN	6. LIBSYS
7. NIRMA	8. SOUL	9. TLMS
10.LIBMAN		

Conclusion

Library automation is the process which needs proper planning, timely implementation and periodical evaluation. The librarian with the administrators has to set the priorities after analyzing the current status and future requirements. Selection of the suitable integrated library management package according to the needs of the users and the library is important. Acquisition, Circulation, Cataloguing, Serial Control OPAC, etc. should be conducted with care. Staff training and user education are keys to the success of the process. For the successful implementation of an integrated library system all key factors must be in place support from administration, staff, competence, consideration of user requirements, presence of infrastructure, (Hardware, software, networks) available data, excellent managerial skill from the co-coordinator of the project.

References

1) Mishra Ajya, Thakur Santosh & Singh, Tarseem (2015) Library Automation: Issues, Challenges And Remedies Author.Times international Journal of research . Websit http://tijr.net
2) Das, Debasis.& Chatterjee ,Parnab.(2015) Library automation: An Overview International Journal of Research in Library Science Volume 1 Issue 1.
3) Singh ,Yogendra.(2014) Library Automation in Academic Libraries in India: Problems and Prospects file:///C|/CALIBER_Files/Caliber_2003_CD/LA/19.htm (2 of 6) 3
4) Shukla, R.K.: (1995)Automation of Libraries and Information Centers, New Delhi: Concept publishing company,
5) Tabusum. SZ, Shabana. , Saleem, A.&M. Sadik Batcha,(2013) Impact of Libray
6) Automation in the Development Era. *IOSR Journal Of Humanities And Social Science (IOSR-JHSS)* Volume 17, Issue 5 PP 20-26.
7) Allan, Ferne C., and Shields, Joyce M. 1986. "Automation Challenges of the 80s: What to Do Until Your Integrated Library System Arrives." Special Libraries 77 (Winter), pp. 15-19.

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INDEX

No.	Title of the Paper — Author's Name	Page No.
1	Evaluation of Judicial Information System (JUDIS) — Dr. Sanjay H. Bhoge Librarian & Dr. Mahendra V. Mete	07
2	A Review of Knowledge Management in Academic Library — Dr. Sonali Abhay Deshmukh	10
3	Self Publishing - A new trend in Book Publication — Dr. Atul R. Sidurkar	14
4	Impact of Internet on Reading Habits of Political Science Departmentstudents in Savitribai Phule Pune Universityby — Dr. ShilpaGawande & Mr. Rohidas B. Rathod	16
5	Big Data Management in Academic Libraries — Dr. Neeta A. Kene	19
6	Knowledge Management in Academic Library — Ranjana K. Jawanjal	22
7	Institutional Repositories : A New Platform in Scholarly Communication — Dr Sanjay N. Wagh	26
8	Contents of Knowledge Management in Academic Libraries — Dr. Sanjay Shenmare,	30
9	Knowledge Management in Academic Libraries: E-Learning Environment — Dr. Mrs. Smita D. Suryawanshi	35
10	Role of INFLIBNET in Development of Academic Library — Arvind S. Pazare	39
11	Bibliometrics Study of "Finance India" Journal — Dr. Nitesh V. Chore	43
12	Knowledge Management in Libraries — Dr. Vilas P. Ubhale & Mr. Manoj Sonone	48
13	Citation Analysis of Doctoral Theses in Social Work — Dr. Prince Ajaykumar T. Agashe & Dr. Pritam B. Gedam	52
14	Role of Librarian as NAAC Coordinator While Facing NAAC: A Practical Experience — Dr. Sachin G. Mahajan	58
15	Challenges Face to Implement Knowledge Management System : A Survey of Academic Libraries of Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur, — Dr. Sanjay Madhukarrao Salwe	63
16	Information Literacy Assessment of Post Graduation Students of Departments of Sant Gadge Baba Amravati University, Amravati — Swati Sanjayrao Kandalkar& Dr. Vaishali P. Gudadhe	79
17	College and Research Libraries Journal: A Bibliometric Study — Mrs. Supriya A. Bejalwar & Mr. Mangesh V. Lad	85
18	Knowledge Management System and Academic Libraries in IT Era — Dr. Virendrakumar L. Barde	94
19	Implementing Knowledge Management in Academic Libraries — Prof. Sushma R. Mawande	98
20	Knowledge Management in Libraries — Dr.Narendra A. Thakare	102
21	Knowledge Management in New Digital Scenario — Nitin S. Satpute	104
22	Knowledge Management in Academic Libraries — Dr Pranali M Pete & Mr Ashish Gawande	108
23	Adopting Knowledge Management in Academic Libraries — R.H.Wankhade	113
24	An Evaluation of Staffing Pattern of Engineering College Libraries in Rest of Maharashtra — Milind B.Anasane	117
25	Knowledge Management System in College Library — Sandeep A Lande	124
26	Information Seeking Behavior of Post Graduate Students ofsant Gadge Baba Amravati University,Amravati — Vrushabh Surendrarao Dahake,	130
27	Seemanthi Bai Memorial Government Museum Library Manglore: A Study	135

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Knowledge Management in Academic Library

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Abstract

Academic libraries are information center established in support of the mission of their parent institutions to generate knowledge, and people equipped with knowledge in order to serve the society and advance the well-being of mankind. In the digital age, academic libraries face challenges from both within (academia) and without (the business sector). Academic departments, or even faculty and students, may purchase or build their own portals to meet their academic and/or research needs. To prove their relevance and value, academic libraries must strive to provide the right amount of information to the right clientele at the right time with a right expense of financial and human resources. With a stagnant or dwindling library budget, academic libraries have to increase their operational efficiency in order to meet the challenge. One management tool that can help in this regard is Knowledge Management .Knowledge management is a viable means in which academic libraries could improve their services in the present knowledge era. This paper mainly focuses on the concept of Knowledge Management and its role Academic libraries, Objectives of Knowledge Management in Academic Libraries

Keywords: Information, Knowledge, Knowledge Management, Knowledge management in academic libraries:

Introduction

In recent years, the importance of KM has been widely recognized as the foundations of industrialized economies shifted from natural resources to intellectual assets. Since 1995 there has been an explosion in the literature surrounding the developing concept of KM. In library and information science, Ranganathan (2011) was the first to advocate that a universe of subjects is synonymous to a universe of knowledge and therefore proposed the concept of knowledge management in libraries. To prove their relevance and value, academic libraries must strive to provide the right amount of information to the right clientele at the right time with a right expense of financial and human resources. Academic Institutions have significant opportunities to apply knowledge management practices to support every part of their mission.

The Concept of Knowledge Managemen

The concept –"Knowledge Management"--was started and popularized in the business world during the last decade of the 20th century. It was the business world that first recognizes the importance of knowledge in the global economy" of the "knowledge age". In the new knowledge economy, the possession of relevant and strategic knowledge and its unceasing renewal enables businesses to gain competitive advantage. The applications of knowledge management have now spread to other organizations including government agencies, research and development departments, universities and library Information Profession .As early as 1965, Peter Drucker already pointed out.

Knowledge Management

Knowledge Management is "a process, which deals with knowledge creation, acquisition, packaging and
application or reuse of knowledge." It is basically consists of the following four steps:

1. Knowledge Collection
2. Organization
3. Data protection and presentation
4. Dissemination of Knowledge Information

Knowledge Management is the way to keep knowledge growing through sharing and such sharing is
best done either in material or human terms

Types of Knowledge

Knowledge is classified into two types.

1. Explicit knowledge
2. Tacit knowledge

Explicit knowledge: It is formal and easy to communicate to others. It is the knowledge of rationality. That is, policies, rules, specifications and formulae. It is also known as declarative knowledge. Tacit knowledge: It is complex form of knowledge. It has two dimensions namely technical and cognitive. This is personal knowledge, which is in human mind and difficult to formalize and also difficult to communicate.

Knowledge management in academic libraries:

As a learning organization academic libraries are expected to provide strong leadership in knowledge management. They need to improve their knowledge management in all the key arof articles on knowledge management dealt with the operation of the technical services. (Turvey and Letarte (2002)13argue that" the library world is characterized by fast-paced change, and perhaps no other area as much as field of cataloguing and they tried to define cataloguing as very important aspect of knowledge management in as increasingly digital world.

The availability of information in multiple and varied formats, new means and methods of the delivery of information in the networked environments , emphasis on self-directed, independent study, student- centered learning, modularization in teaching and learning pattern, changes in organization structure etc. are the major issues and concerns which urges the academic librarian to implement the knowledge management. Library needs to use new approach to capture web information by cooperative efforts such as Dublin core and metadata and the cooperative online resource catalogue.

Principles of Knowledge Management:

Thomas H. Davenport15formulated ten (10) principles of knowledge management as stated below:

1. Knowledge management is expensive (but so is stupidity!)
2. Effective management of knowledge requires hybrid solutions involving both people and technology.
3. Knowledge management is highly political.
4. Knowledge management requires knowledge managers.

5. Knowledge management benefits more from maps than models, more from markets than hierarchies.
6. Sharing and using knowledge are often unnatural acts.
7. Knowledge management means improving knowledge work processes.

Objectives of knowledge management in Academic libraries: The main objectives of knowledge management in academic libraries are as follows:-

1. (To promote collection, processing, storage and storage and distribution of knowledge.
2. To promote scientific research.
3. To promote relationship between library and users
4. To protect the intellectual property right, in IT era
5. To create knowledge repositories and manage knowledge as an asset
6. To organize the value of knowledge and improve effective research

Need /importance of knowledge management in Academic libraries:

Some of the specific factors that stress the need of knowledge management academic libraries are as follows:

1. Knowledge being the strategic and key resource of an organization likes academic libraries.
2. The threat of being marginalized by internet based information services and students and faculty"s own information gathering efforts.
3. To fulfillment of dream of library professionals and mission of the academic libraries and their parent institution, that is, to provide right knowledge at the right time to the right person in the right format.
4. Reduction in staff and budget need to replace informal knowledge with formal methods.
5. Quitting job by potential workforce lead to loss of valuable organizational knowledge.
6. Reduced budget, increased demand from the faculty and students and greater expectation from higher administration.

Expected benefits of implementation of Knowledge management in academic libraries:

1. Following are the benefits that can be derived from knowledge management:
2. (Better coverage of resources and capabilities
3. Better staff utilization.
4. Higher quality of deliverables.
5. Just in time, performance centered learning and training.
6. Collaboration at the norm (no disincentives for collaboration)
7. More user engagements and interactions, both with internal users and with the library"s external users, clients, customers and stakeholders.
8. Improved customers/ users/staff satisfaction.
9. Increased libraries operational efficiency and cater to the ever increasing needs of the users.

Role of Library Professionals in Knowledge Management

The conventional role of library and information professionals was to collect, process, disseminate, store and utilize information to provide multidisciplinary services to the personal and professional needs of the library users. But now their role is not restricted to information

management only. They play major role in knowledge management programmes and identifying, acquiring, developing, resolving, storing and sharing of knowledge. Library and information professionals have to manage relationships with external providers of information and knowledge and should negotiate with them. Knowledge management has created new ground in the field of library and information science. The library professionals should have following types of knowledge:

I. Knowledge Management in Academic Libraries ♦
II. International Journal of Parallel and Distributed Systems

Conclusion

Academic libraries are thus playing a vital role in crossing the borders ,the key to opening all gateways toknowledge. Librarians should train themselves and their staff to develop the appropriate knowledge management systems and use information technologies to equipped libraries to provide better, faster and pinpointed services to its clients/ users. Knowledge Management helps library and information professionals in improving the services being rendered to their users. Information professionals have to recast their roles as knowledge professional. The librarian's roles should not be limited to being the custodians of information but they have to acquire skills to keep themselves updated so as to cope intelligently and objectively with the effective and efficientknowledge management in Academic libraries.

1. Judith Mavodzal and Patrick Ngulube Exploring the use of knowledge management practices in anacademic library in a changing information environment SA Jnl Libs & Info Sci 2011, 77(1
2. Rajurkar M.U. Knowledge Managementin Academic Libraries International Journal of Parallel and Distributed SystemsVolume 1, Issue 1, 2011, pp-05-08
3. Available online at: http://www.bioinfo.in/contents.php?id=107
4. R. Poonkothai Knowledge Management as an important tool in Library International Journal of Information Technology and Library Science. ISSN 2349-235X Volume 5, Number 1 (2016), pp. 9-14 © Research India Publications http://
5. Asogwa, Brendan E. Knowledge Management In Academic Libraries: Librarians In The 21st Century. Journal of Knowledge Management Practice, Vol. 13, No. 2, June 2012. http://www. tlainc. com/artic1301. htm (accessed 14. 03. 16).
6. Ciganek, Andrew P. Organizational Culture for Knowledge Management Systems: A Study of Corporate Users. http://www. irma-international. org/viewtitle/41855/ (accessed 14. 03. 16)

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CONTENTS OF PART - XII

S. No.	Title & Author	Page No.
14	Role of ICT in Academic Libraries **Ranjana K. Jawanjal**	75-78
15	ICT Role of Academic Library **Dr. Rashmi Shyamsundar Bakane**	79-85
16	Effective Management of E-Resources **Nitin S. Satpute**	86-91
17	Role of ICT in Academic Libraries **Asst. Prof. Sangita Gangamar Utekar** **Mrs. Kalpana Ranganatha Tathare**	92-97
18	Changing Role of College Librarian in Digital Era **Dr. Milind B. Anasane**	98-101
19	Knowing Digital Library **Dr. Umesh B. Deshmukh**	102-105
20	Revolution of Digital Libraries in Indian Higher Education **Prof. Sushma R. Mawande**	106-109
21	Use of Information Technology in Libraries **Dr. Rajabhau V. Bajad**	110-118
22	Management of E-resources and its Utility **Mangesh R. Ubale**	119-123
23	Impact of In-Service Training: Organized by National Institute of Technical Teachers Training and Research Centre with Regards to Technical Education Librarians **Mrs. Pratibha Wankhede**	124-134
24	Digital Library Services in Higher Education **Dr. Vijay P. Jadhao**	135-139
25	Application of QR Code Technology in providing Library and Information Services in Academic Libraries **Dr. Prashant P. Deshmukh**	140-148

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14. Role of ICT in Academic Libraries

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Librarian, Shri. Dnyaneshwar M. Burungale science & arts college, Shegaon

Abstract

The information environment is greatly changing throughout the world. The rapid development in Communication and Information Technology and recent innovation in technology have witnessed as challenges and changing emphasis in the role of information and its management. This century has witnessed the every information contents changing into digital format. This paper made an attempt to analysis the changing of the academic libraries and skill required by the library professionals. Developments in ICT have made significant impact on all spheres of human life ICT libraries are also playing a very important role in facilitating access to global information and knowledge resources

Keywords ICT, Developments, Components, Sources, Services

Introduction

Information and Communication Technology (ICT) has transformed library services globally. Most current information are recorded in electronic format, ICT has also contributed immensely to the performance of librarians in the discharge of their duties such as in cataloguing, reference services, circulation management, serials control etc. ICT has contributed to the library in the following specific ways. Information technology (IT) is the modern buzz word, it has provided facilities for the free flow of information. The world has become a global village with information superhighways created through networks like Internet. This has facilitated electronic librarian-ship with the diversification of library facilities and services to its user. The concept of virtual libraries OPAC, Hypertext, and teleconferences for the purpose of library and information services have become common (Sujatha, 1999). New technological developments have already profoundly affected libraries; almost every function carried out in a library has been altered to some extent by advances in electronics, computerization, and telecommunications. The technological evolution in libraries has been called a "quiet revolution" (Abdus-Sattar, 1997). The changes brought about by advances in technology have been so

extensive that it is difficult to assess their total effect, but is clear that libraries are in the state of fundamental transformation.

Concept of ICT

The term Information and Communication Technology (ICT) is more commonly used. Whilst Information Technology (IT) has been the accepted term in the UK and USA, it is not the universal term. Telemetric is widely used in France, and Information is also used elsewhere in this sense. ICT deals with the use of electronic computer and computer software to convert, store, protect, process, transmit, and retrieve information.

Neeeds of Information Technology

Due to information explosion it is very difficult to handle large information with traditional library tools like manual catalogue, bibliographies, etc. In today's library environment, to provide the right way, is not possible without ICT application. ICT has become necessity and need.

Impact of Information Communication Technology

In old days library was considered as mere storehouse of knowledge. But these days ICT has reshaped the functioning and services of libraries. The activities which were carried out manually are being carried out effectively and smoothly with the help of ICT. ICT has changed the way of acquisition, technical processing, periodical subscription, and circulation activities etc. in such a way that library readers can get desired information and services effectively in shortest time with less man power involvement. This is the information age because information technology is growing fast. Traditional libraries are changing their role and functions according to the new trends in the society. Library is providing information through the computers and internet. It can be said that without the help of the computers and internet any library information Centre cannot satisfy the users.

ICT sources

The library professionals were asked to indicate their preference for different information sources to support their educational and information needs. It is clear that there is an inclination towards use of internet sources to satisfy the information requirements of the professionals.

Some ICT Sources in following:

Current Awareness Service (CAS)

Internet Connectivity

Online Journals

ICT-Based User Services

Some library users are adopting electronic habits, making increasing use of the new ICT including computers, the Internet, the Web, Intranet, Extranet and other technologies. As a result, library users are placing new demands on their libraries. They require access to the latest information, updated information resources and access to ICT facilities that they could use in their work. Use of ICT in libraries enhances user's satisfaction. It provides numerous benefits to library users. Some of the benefits are:

Provide speedy and easy access to information

Provides remote access to users

Provides round the clock access to users

Provides access to unlimited information from different sources

Provides information flexibility to be used by any individual according to his/her requirements

Provides increased flexibility

Facilitates the reformatting and combining of data from different sources

Libraries are also providing various ICT-based services to their user, including the following

Provision of Web access to OPACs

Electronic document delivery

Networked information resources

Delivery of information to user desktops

Online instructions

Online readers advisory services

Advantages of Using ICT in the Library

ICT makes library work easier, faster, cheaper and more effective. Helps to manage information overload as information retrieval is made easier in computerized systems. Remote access is enabled through networked systems.

Challenges of Using ICT in Libraries

Poor funding of ICT infrastructures

Constant change of software and hardware

Erratic power supply

Insufficient bandwidth

Lack of technical IT knowledge by library staff

Copyright and intellectual property rights management

Conclusion

Even though librarians are facing challenges for new and emerging skills, the most important aspect of this change is to be able to adapt the existing skills, many of which are traditional librarianship skills and the ability to remain flexible in a working environment that is constantly changing. The rapidly changing environment of academic libraries needs attention of the authorities that manage LIS education in the country. Information technology competencies demanded by most of the institutions require particular emphasis in our LIS curriculum. Library must also understand the risk and challenges of ICT sourcing.

References

1. Asian Journal of Information Technology, 2006 Department of Library and Information science.Balakrishnan, N. 1996. Impact of information Technology on Library Science, In N.M. Malwad.
2. Brodin, J., Lindstrand, P. 2003. What about ICT in special education? Special educators evaluate information and communication technology as a learning tool.
3. Jamal Uddin, Nazmul Hasan 2012 Use of information technology in library service:
4. A study on some selected libraries in northern part of Bangladesh International Journal of Library and Information Science Vol. 4(3), pp. 34-44
5. Vinitha, K Kanthimathi (2006) "Impact of Information and Communication Technology on Library and its Services" ICT Conference on Digital Learning Environment 11-13 Jan. 2006 Bangalore

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28	Digital Innovative of E- Learning for Social Development by Indian Higher Education	Sudhakar Ghorpade	143
29	Need of LIS Activity for the Development of Library Profession	Prof. Swapnil Dandade & Dr. Devendra Bhongade	147
30	Resource Sharing, Networking and Library Consortia : A Vital Role in Libraries	Madhuri Deshmukh	149
31	Intellectual Property Rights in Digital Environment	Mrs. Jyoti Rakte	156
32	Best Practices in Shri D. M. Burungale Science & Arts College Shegaon Library.	Ranjana Jawanjal	163
33	Bibliometric Analysis of Productive Research of faculty Members of Amrutha College of Pharmacy, Chikhli	S. R. Ambaskar & Dr. A.S.Raut	168

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Best Practices in Shri D. M. Burungale Science & Arts College Shegaon Library

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Abstract:

Role of libraries in the era of information explosion in 21st century is very important. Library tries to provide maximum service provide to students, staff, and external readers in minimum cost. In this paper I have discussed the best practices in the library of Shri D. M. burungale science & Arts college shegaon library. Library services to external readers , Internet Facility in the library , book bank Facility and information about Competitive Exams as well as development of automation procedures and applied tools and to identify the status of library.

Keywords: Best Practices, D.M.B. College Library, library Automation, ICT, Collection Development & N-list

Introduction:

Best practices are the best ways to perform a process, a function, or an activity that leads to a superior performance. These pertain to the processes, practices, and systems identified in public and private organizations that perform exceptionally well and are widely recognized as improving organization's performance and efficiency. Successfully identifying and applying best practices can reduce costs and improve quality. Best Practices are the means by which leading organizations in any field have achieved top performance, and they serve as goals for the other organizations striving for excellence

Best Practices

Definition

ODLIS (Reitz, 2004) defined term 'best practices' as follows: "In the application of theory to real-life situations, procedures that, when properly applied consistently yield superior results and are therefore used as reference points in evaluation of the effectiveness of alternative methods of accomplishing the same task. Best practices are identified by examining empirical evidence of success."

Best Practices in library and NAAC

Document prepared by NAAC for "Best Practices in Academic Libraries" says Best practice may be innovative and be a philosophy, policy, strategy, program, process or practice that solves a problem or create new opportunities and positively impact on organizations. For college libraries NAAC has developed the following set of best practices for college libraries

Computerization of library with standard software.
Inclusion of sufficient information about the library in the college prospectus.
Compiling student / teacher statistics
Displaying newspaper clippings and a clipping file maintained periodically.
Career/ employment information services

Internet facility to different user groups
Information literacy programmes
Suggestion Box
Displaying New Arrivals
Conduct book exhibition on different occasions
Organizing book talks
Instituting Annual Best Use Award for students
Organizing competitions annually
Conduct user survey periodically
Making of a Path Finder to the library
Keeping the library premises neat and clean
Library Committee formation

Best practices of College of D.M.B. Science & Arts Shegaon Library

The College of D.M.B.Science &Arts,Vasali Road Shegaon is one of the leading branch of the Late Reverend Father Shri. Maskuji Birnji Burungale Shikshan Sanstha, Shegaon which is establish in the year 2000 affiliated to sant Gadge Baba Amravati University Amravati of Maharashtra state. The college is NAAC accredited with B+ grade ,in 2017.The institute established with aim to train young minds through upgraded knowledge ,various skills and attitude to become Dynamic person. The college of D.M.B. Science & Arts library having 4200 books for use of students and faculty . Reading room ,Display of Magazine , Issue & return counters & the Students are having better access. All administrative work are done, Library automated by LIB-SOFT software and all modules run very well. Library connected LAN with internet broad band connection & Wife connection.

Library Collection

In DMBC library there are total 4131 collection of books ,journals, reports, printed and non-print material and e-journals and e- books also.

Sr.No.	Types of Materials	No. of Materials
1	Books	4200
2	Book Bank Scheme	50
3	Bound Volume	132
4	Competitive exam Book	284
5	Reference book	175
6	Donated Books	170
7	CDs & DVDs	40
8	Journals &Magazines	30
9	Newspapers	09
10	N-list Journal	6000
11	N-list books	31,30,000

Best Practices in SDMRCS Library

Library is automated with LIBSOFT software and all modules run very well. Library connected with internet broad band connection & Wifi connection .Some of the best Practices discusses as follows.

1 Library Advisory Committee

Library formed the Library Advisory Committee with faculty and students. The role of the Committee and its functions in developing the library are to be well defined .

2 User Services

All type of user services are provide in the library. Few best practices in the library are as follows:-

- To provide library facilities to member of the management ,teaching & non-teaching staff and students of the the college including ex student.
- To provide library facilities /services to students

Services and Benefits of library:

- The library membership is open to all .
- He/ She is informed about the rules & regulations of the library.
- Books are issued of the ,Ex-students ,other readers and students.
- To information from the internet is provided free of cost.

3 Books Exhibition-Dr. S.R. Ranganathan Jyanti ,Dr. A.P.J. Abdul kalam jyanti and Marathi Rajbhasha day on this occasion take the various subject wise books exhibition and new books exhibition.





4 Library User orientation programme- New Admitted library users in SDMB library organized library orientation programme every year. The motto behind this activity is to make them acquainted with the facilities and services provided by the library .It's a very useful to optimize the usage of the library and training them in searching the library database ,e-journals ,e-mail and Internet /Intranet browsing etc.

5 Book Bank Facility- There is book Bank Facility to support the student to increase their reading habits . library provide book bank facility class wise students. Students are provided books for the whole academic year till the examination.

6 Career /Employment Information Services – SDMB Library provides Career guidance newsletter to the student .Advertise about employment displayed on the notice board .Library have very rich collection of competitive examination

7 Reprography Facility-- Reprography Facility is available for all types of users .UG students, faculty members, research scholars, as well as to the visitors.

8 On line Information Retrieval – SDMB Library provides broadband internet connection for unlimited access online information resources. Library Staff member monitor this service during the working hours in the library.

9 Traning to use E-resources- SDMB Library conducted programmes for student & staff every year. In this programmes about access e-resources ,library opac, free online journals, n-list database ,useful websites,etc .library resources services are given to the users.



10 Institutional Repository—library developed Institutional Repository of question paper, syllabus, research paper, notes are available for the student.

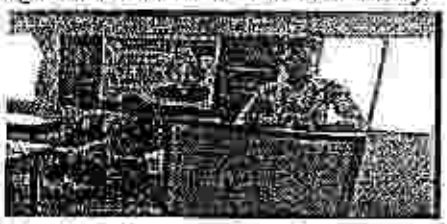
11 User Feedback –In SDMB Library users feedback is collected on all aspects through feedback form.

12 Deposit scheme—Library started a Deposit scheme in 2014 to provide an opportunity to off campus users to avail the the facilities of the library resources and reading room at close distance and affordable costs .These scheme was recognized at the best practice by NAAC in their Best practice series for library and Information services.

Library Activities—

1. Wachanprerana Din

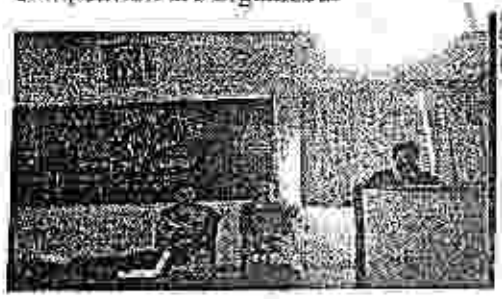
SDMB Library celebrate wachanprerana Din in the memory of Dr. APJ Abdul Kalam and on this occasion Exhibition of Books Dr. APJ Abdul Kalam thoughts poster competition. is organized , on the birth Anniversary

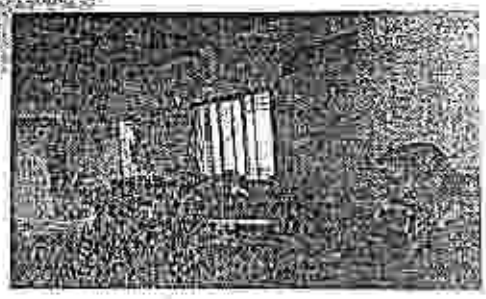




2 Dr. S.R. Ranganthan Jaynti

Every year a library day is celebrated on the birth anniversary of Dr.S.R. Ranganthan , father of library science. On this day the competitions such as essay competition, poster competition are organized.





3 International reading day Celebrated every year in library Occasion Various competition organized on this day.

4 Book Review competition–AKSHAR FORAM' under the Scheme students read a book and after the completion librarian collect the reviews and displayed them for other students





5 'Granthalay Samrudhi Yojana' Yojana Under this scheme, staff and students donate books to the library on the occasion of his /her birthday

6 Guest Lectures- SDMBC library lectures of experts on various subjects.





6 Best library Users Awards-Students are encouraged and other students also motivated by selected for best library users awards. Every year library three best library users from B.A & B. SC. student gifted one book Extra Issue & certificate Gives awards to them on annual function of the college.



7 Wall Of Creativity

There is display board in the library for student activity . Students display their creation like poem,drawing , article etc.on this board.

Conclusion:

Best practices SDMB College library are very useful in providing support to students, staff and other external readers. SDMBC library is the B+ grade accredited library. The web based services are also provided to have up to date information to all users. Best practices college library creates its own image in the mind of students and society. Hence adopting new technique and tools in imparting users' education may be best practice in extent of use of library services.

References:

1) Vyas, S.D.(2009) Best Practices in Academic Libraries in India: A Study International conference on academic Libraries (ICALIDC)New Delhi University Delhi
2) Reitz, J. M. (2004). ODLIS Online Dictionary for Library and Information Science. Retrieved DECEMBER 14, 2012,from ABC-CLIO: http://www.abcclio.com/ODLIS/odlis_b.aspx
3) Jaiswani, D. (2008). Best Practices in a Modern Library and Information Center - The Case of Central Library, IIT Bombay. 6th International CALIBER 2008. Allahabad: University of Allahabad.
4) Khakra,Manisha R.(2018) Best Practices in Arts, commerce &science College,Arvi library Revaping of Academic Libraries for new generation (Vol-1) National conference paper Jalgaon .
5) Patil, Anita.P. (2018) Best practices in college of social work Badnera Library (A Study library Revaping of Academic Libraries for new generation (Vol-1) National conference paper Jalgaon.

(61)

ICT BASED TEACHING-LEARNING IN HIGHER EDUCATION INSTITUTIONS

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ABSTRACT:

The paper deals with the role of ICT-based teaching-learning in higher education institutions.ICT stands for Information and Communication Technologies. ICT which is now broadly used in educational world. Teacher, Student, administrator and every person related to education are popularly using ICT. Teachers must know the use of ICT in their subject areas to help the learners for learning more effectively. So, the knowledge of ICT is very much essential for both prospective teachers as well as in-service teachers also. This will help teachers to know integrated technology with classroom teaching. Teacher use ICT for making teaching learning process easy and interesting. This creates an interest among students and causes to change their habits of learning. Students get complete understanding of the topic with its various facets. It increases the level of confidence of students and their learning can be tested at the end of class by asking some questions, distributing handouts for the homework or they can be said to prepare a seminar or short presentation on the topic. At present Technology has become an indispensible tool for education. It is mainly intended to improve education access, so as to provide education for all. The outcome of this study could serve as an input for education planners to consider better utilization of ICT in various aspects relating to teaching-learning activities.

Keywords: ICT, Teaching-Learning, Evaluation, Higher Education.

Introduction:

The process of teaching-learning has become more students centric and its set aim is to produce skilled work-force. ICT stands for Information and Communication Technology and defined as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information (**Gunton, 1993**). "Curriculum needs to be rescued from traditional behaviorist approach domination and cognitive-constructivist approach should be introduced to the system, which is today internationally accepted and fast growing model in education systems". "The quality of basic education provided to our children is largely influenced by the quality of our teachers in the schools. As no nation can afford to provide poor quality education, it is necessary that we build a strong system of quality teacher education—on which depends the quality of the teacher and ultimately the Nation's education." (**Menon and Rama 2006**). The Indian education system is striving to impart the overall development of individual and society and enabling the teaching-learning community to compete the global market with sustainable growth and development. Teaching-learning and evaluation is the base and center of our education system. The monitoring agency like National Assessment and Accreditation, more popularly known as NAAC often emphasizes and signifies the process of teaching-learning and evaluation considering one of the major criterions of 350 points/ marks among seven indicators of assessment. Today, technology has increasingly become a vital

element for firms to compete and develop. (Ajayi 2008) highlighted that the world of today is considered as a global village through the use of ICT in different educational, political, economic and social sectors. Almost in all situations or tasks, we find the integration and the use of technology to solve problems. Accordingly, future teachers need to equip and acquaint themselves to make changes brought about by technology (**Mua Rodamy Kennah2016**). Learning on a continued basis is required to bridge the skill gap between the requirements and competence of the individuals. Across the globe, information and communications technologies (ICTs) are changing the face of education. Our world is changing, and information and Communication technology (ICT) is central to this change. ICT changes education from institution-centric to learner-centric, from classroom-based to being pervasively connected through e-learning and wireless technologies. New classes of learners are created, namely those who are not able to come to campus, or cannot afford a fixed timeframe, or those who would want to have a tailored program for their specific needs. ICT allows us to have the flexibility in space, time, and content.

Learning using electronic means involves the acquisition of knowledge and skill using electronic technologies such as computer-and Internet-based courseware and local and wide area networks, and this is called e-learning.From the above literature review, it is evident that ICT is playing a vital role in knowledge acquisition and there are lots of benefits of introducing ICT in the knowledge process. ICT is applied very effectively into a range of teaching strategies, including some very good interactive teaching involving questioning and discussion. ICT played an important role in helping teachers to demonstrate and reinforce key ideas during lessons using 'electronic blackboard', and e-mail was used efficiently to support homework (**Douglas Osler 2000**).have clearly mentioned in their framework that knowledge capture/acquisition, knowledge store, knowledge share, knowledge enhancement, and knowledge dissemination can all be enhanced by technology and good policies.

Methodology:

Based on the above discussion, ICT is used as a tool for teaching and learning in higher education. This study is being approved for higher education institutions. The sampling frame consists of 40 institutions and the sample size includes 50% of the total population. Random sampling technique was used for selecting the institutions. Reliability and content validity test were also done. Further the model questioners were used for analysis. An analysis was done to study the relationship between the factors and their impact on teaching learning process.

Table 1. Questioners generated to analyze Teaching-learning Process

Process	ICT Tools
ICT-based Teaching-Learning process	Usage of e-mails to interact with other professors / experts to enhance knowledge
	Usage of Technology for research work
	Usage of Power Point Slides for delivery of lectures
	Existence of Virtual library
	Existence of Virtual learning (e-learning)
	Internet browsing to supplement text, information
	Usage of computers for multimedia-based delivery
	Evaluation of Test, Assignments and publication of results done electronically
	Usage of ICT-based communication among faculties and students

Discussion:

The various items that contribute to ICT-based teaching-learning process are identified and depicted in Table 1.The demographic factors taken into consideration include the type of the institution, place and years of existence of the institution, the type of university to which they are affiliated, and the department and experience of the respondents. The demographic analysis did not reveal any statistically significant difference among the factors contributing to teaching-learning process.

Scanned with CamScanner

It is evident from the above data that both teachers and learners use ICT-based tools for teaching-learning process. There is a lifelong thirst for learning and knowledge enhancement and ICT acts as a facilitating tool for it. The data in the above table reveals that learners use ICT-based tools to the highest for supplementing book information and in their research work. Teachers use ICT –based tools for delivering lectures. ICT can be used to enhance the existing knowledge through expert interactions and through discussion board and forums. There is a transition from traditional learning system to e-learning system in the higher education scenario. The analysis reveals that there is much scope in the area of developing virtual libraries in higher education institutions. Traditional library systems are still in existence to a large extent though computers are used for managing the day-to-day transactions of the library system. This study further reveals that application of ICT-based tools in the area of examination and evaluation needs improvement.

Conclusion:

ICTs save large amount of time, money and energy making the process of teaching-learning and evaluation more fascinating and all involving with a smoother application. In the country like India, we need to have abundance of resources and at the same time an expert teacher community to implement and to reach at the very rural outset where most of the illiterate population resides. And this target can only be accomplished through the impressive and active use of ICTs in education. The outcome of this study could serve as an input for education planners to consider better utilization of ICT in various aspects relating to teaching-learning activities.

References:

1. Ajayi, L. (2008). Towards effective use of information and communication technology (ICT) for teaching in Nigerian colleges of education. Asian Journal of information Technology, 5(5), 210-214.
2. Agyei, D. D. & Voogt, J. (2011b). Exploring the potential of the will, skill, tool model in Ghana: Predicting prospective and practicing teachers' use of technology. *Computers & Education*, 56(1), 91-100.
3. Agyei, D. D., & Voogt, J. (2012). Developing Technological Pedagogical Content Knowledge in pre-service mathematics teachers, through Teacher Design Teams. Australasian Journal of Educational Technology, 28, 547–564.
4. Cuban, L. (2001). Oversold and underused: Computers in the classroom. Cambridge, Mass: Harvard University Press.
5. Douglas Osler.,(2000) The Use of ICT in Learning and Teaching| A Report by HM Inspectors of Schools: Scottish Executive Education, Gunton, T. (1993). Dictionary of information technology. Penguin, London.
6. Gunton, T. (1993). Dictionary of information technology. Penguin, London.
7. Menon, Mohan & K. Rama. (2006) *Quality Indicators for Teacher Education*. Bangalore: NAAC and Commonwealth of Learning (COL). E-Print
8. Mua Rodanny Kennah.(2016) The Use of ICT in the Teaching and Learning Process.
9. Voogt J. (2010).Teacher factors associated with innovative curriculum goals and pedagogical practices: differences between extensive and non-extensive ICT-using science teachers. *Journal of Computer Assisted Learning* 26, 453–464.

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RESEARCH ARTICLE

TO STUDY INDIVIDUAL AND COMBINED ANTIBIOTICS EFFICACY AGAINST RESISTANT PATHOGEN ISOLATED FROM DIABETIC FOOT INFECTION.

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Manuscript Info

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Keywords:-
Diabetic foot infections, Antibiotics, antibiotic resistance, Antibiotic combination, Synergy.

Abstract

Diabetic foot infections typically begin in a wound, most often due to neuropathic ulceration. Diabetic foot infection facing unique challenge of successful treatment because of wide spread of resistant bacteria to many antibiotics. Combination antibiotic therapy could be helpful to combat these resistant bacteria. This basically depends on the microbial etiology and selection of appropriate antibiotics for combination therapy. Using manual E-test method, Minimum inhibitory concentration (MIC) was determined susceptibility to individual antibiotics. Fractional inhibitory concentration index (FICI) was used to determine synergistic effects for combined antibiotics. . Gentamicin susceptibility showed 100%, 20%, 30%, 80% and 70% of *Escherichia coli, Klebsiella pneumonia, Proteus spp. Pseudomonas spp,* and *Staphylococcus aureus,* were sensitive, respectively. Ciprofloxacine showed 80%, 30%, 60%, 40% and 90 % resistant to *Escherichia coli, Klebsiella pneumonia, Proteus spp. Pseudomonas spp,* and *Staphylococcus aureus,* respectively. Ceftriaxone showed 50%, 40% 60%, 10%, and 70% resistant result against *Escherichia coli, Klebsiella pneumonia, Proteus spp. Pseudomonas spp,* and *Staporlylococcus aureus,* respectively. Fractional inhibitory concentration index (FICI) recorded and synergistic effects were determined. Knowledge on the antibiotic synergy pattern of the isolates will be helpful in determining the drugs for the empirical treatment of diabetic foot infections.

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Introduction:-

Foot infections in individuals with diabetes are an increasingly common public health problem and are associated with mortality and morbidity. Diabetes mellitus is a metabolic syndrome characterized by hyperglycemia due to defects in insulin secretion, function. Diabetic patients are more susceptible to infections; in particular foot infections which are a common and serious problem and sometimes lead to complications and amputations. Diabetic patients have a lifetime risk as high as 25% for developing foot ulceration (Singh N, *et al*; 2005). It is characterized by several pathological complications such as neuropathy, peripheral vascular disease, foot ulceration and infection with or without osteomyelitis, which leads to the development of gangrene and which even necessitates limb amputation. (Baron E J, *et al*; 2011) The individuals with diabetes have at least a 10-fold greater risk of being hospitalized for soft tissue and bone infections of the foot than individuals without diabetes. (Bowler P G, *et al*; 2011) The impaired micro-vascular circulation in patients with diabetic foot limits the access of phagocytes

favouring development of infection (Anandi C,*et al*; 2004, Gadepalli R, *et al*; 2006). The local injuries and the improper foot wear further compromise the blood supply in the lower extremities. While the foot infections in persons with diabetes are initially treated empirically, a therapy which is directed at the known causative organisms may improve the outcome. (Amitabha B.,2012) Antimicrobial resistance is an increasing global public health problem affecting both developed and resource-limited countries; and prompted call for action worldwide (DiazGranados,C.A.*et al*;2008). Selection of appropriate antibiotic for management of diabetic foot infection is crucial and largely dependent on identification of microbial pathogen and evaluation of antibiotic susceptibility (Citron, J.et al, 2011). Escherichia coli, Proteus spp., Pseudomonas spp., Staphylococcus aureus and Enterococcus spp. are the most frequent pathogens contributing to progressive and widespread tissue destruction. (Anandi C,*et al*; 2004, Gadepalli R, *et al*; 2006). Diabetic foot infections are often polymicrobial (Alavi S.M.*et al*; 2007 and Gadepalli R, *et al*; 2006). Appropriate selection of antibiotics based on the antibiograms of the isolates from the lesions is most critical for the proper management of these infections. Nevertheless, the initial empirical therapy is often decided based on the knowledge of the susceptibility profile of the prevalent microbial flora recovered from the previous cases. The use of two antibiotics prevents the emergence of resistance to either of the antibiotics if used separately as a monotherapy (Leekha, S.*et al*; 2011).

The purpose of this study was to define the range of resistance of bacteria isolated from diabetic foot infections and further evaluate synergistic effect of combination antibiotics to guide proper therapy.

Materials and Methods:-

This study included twenty-five individuals with diabetic foot infection at multispeciality hospital Akola, March and April of 2016. Laboratory analysis was conducted in department of Microbiology, Shegaon. The study focused on evaluation of the five most prevalent bacteria isolated from diabetic foot infections, which include *Escherichia coli, Klebsiella pneumonia, Proteus spp, Pseudomonas spp,* and *Staphylococcus aureus*. five isolates of each isolated pathogen were evaluated for sensitivity testing.

Materials:-

Antibiotics used in study: Commercial antibiotics standard solution accompanied by a statement of its activity in mg/ ml for Gentamicin (Hi-media, India), Ciprofloxacin (Hi-media, India), and Ceftriaxone antibiotics (Hi-media, India), collected from the Hi-media seller in Amravati. Isolates were tested against gentamicin, ciprofloxacin, ceftriaxzone, then against a combination of gentamicin with ciprofloxacin and combination of gentamicin with ceftriaxzone.

Methods:-

E-test Method:-

Two fold dilutions of the antibiotic solution in sterile normal saline were prepared for each individual antibiotic (Table 1). This was followed by impregnation via the immersion method; blank sterile disks were soaked in the different concentration of each antibiotic for half an hour. Then the impregnated disks were transferred into sterile Petri dishes. These were allowed to dry and stored in a freezer at -14°C.

The Antibiotic Susceptibility Test for isolates:-

The strains of bacterial isolates were collected from infected foot of diabetic patients. Isolated strains were homogenized in 0.85% NaCl to achieve 0.5 McFarland's turbidity. A sterile, non-toxic swab was dipped into the inoculums suspension and pressed against the inside of the tube. Then, the surface of Muller Hinton agar in petridish was inoculated with suspension. Sterile forceps were used to deposit the antibiotic discs onto the surface of the inoculated media. Disks were made in complete contact with the agar surface, which was located in one line beginning with the highest concentration to the lowest one of the same antibiotics. The plate was then incubated at 37°C for 24 hours. After incubation, an elliptical zone of inhibition was produced and the point at which the ellipse met the defined disk concentration represented the minimum inhibitory concentration (MIC) of the antibiotics according to Clinical laboratory Standards Institute (CLSI 2013). Fractional inhibitory concentration index (FICI) was used to interpret the result. The FICs were calculated as follows: ΣFIC =FIC (A) +FIC (B); where FIC (A) is the MIC of drug (A) in combination / MIC of drug (A) alone. And FIC (B) is the MIC of drug B in the combination/MIC of drug (B) alone (Meletiadis, J.*et al*; 2010).

Table 1:-Different gradient concentration of antibiotics (mg/ ml) dilution

Sr.no.	Antibiotic (mg/mL)	Tubes 1-8						
		1 mg/ml	2 mg/ml	3 mg/ml	4 mg/ml	5 mg/ml	6 mg/ml	7 mg/ml
1	Gentamicin	80	40	20	10	5	2.5	1.25
2	Ciprofloxacin	200	100	50	25	12.5	6.25	3.16
3	Ceftriaxzone	250	125	62.5	31.25	15.63	7.81	3.91
4	Gentamicin/Ciprofloxacin	80/200	40/100	20/50	10/25	5/12.5	2.5/6.25	1.25/3.16
5	Gentamicin/Ceftriaxone	80/250	40/125	20/62.5	10/31.25	5/15.63	2.5/7.81	1.25/3.91
6	Gentamicin	80	40	20	10	5	2.5	1.25

Results:-

The results showed that 100% of the *E. coli* strains were sensitive to gentamicin with (MIC=6.6mg/ml), 70% of *Staphylococcus aureus* were sensitive (MIC=0.6mg/ml), only 20% were resistant (MIC=20-80mg/ml). *Klebsiella pneumoniae* were sensitive to 20 % only (MIC=20-80mg/ml). *Protus spp* showed that 30% were sensitive (MIC=0.6-1.25mg/ml), 20% were intermediate (MIC=10 mg/ml) and 50% were resistant (MIC=20-80mg/ml). *Pseudomonas aureginosa*, showed that 20% were resistant (MIC=40-80mg/ml) and 80% were sensitive (MIC=0.6-2.5mg/ml). for ciprofloxacin, only 10% of *Pseudomonas aureginosa* were sensitive, while the other strains showed high rate of resistant 80% for *E.coli* with MIC=25-200mg/ml, *Klebsiella pneumoniae* were resistant to 30 % only (MIC=20-80mg/ml), 60% for *Protus.spp* with MIC=25-100mg/ml and 40% for *Pseudomonas aureginosa* with MIC=6.25-200mg/ml. However, 10% of *Staphylococcus aureus* were of intermediate sensitivity (MIC=1.6mg/ml). For ceftriaxone, it is clear that the four strains showed closed intermediate susceptibility result. While *S.aureus* was sensitive (30%) with MIC=1.9-7.8mg/ml and *Protus.spp* was highly resistant (60%) with MIC=7.8-62.5mg/ml (Table 2). The combination of gentamicin/ciprofloxacin, gentamicin/ ceftriaxone, produced the lowest mean FIC value for *Pseudomonas aureginosa* with 20%-40% of combinations demonstrating synergy. In contrast, *in E coli* the highest antagonism effect (100%). On the other hand, *Staphylococcus aureus, Klebsiella pneumoniae* and *Protus spp* gave highly indifferent effect (80%-90%) (70%-80%), respectively (Fig. 1, 2).

Table 2:-Sensitivity pattern of Gentamicin, Ciprofloxacin and ceftriaxone individually on the five most common bacterial isolates from diabetic foot infection.

Sr.no.	Organisms	gentamicin			ciprofloxacin			ceftriaxone		
		S%	I%	R%	S%	I%	R%	S%	I%	R%
1	*E.coli*	100	0	0	0	20	80	0	50	50
2	*Klebsiella pneumoniae*	20	20	60	0	70	30	10	50	40
3	*Protus spp*	30	20	50	10	30	60	0	40	60
4	*Pseudomonas aureginosa*	80	0	20	0	60	40	70	20	10
5	*Staphylococcus aureus*	70	10	20	0	10	90	0	30	70

S: sensitive, I: intermediate, R: resistance

Discussion:-

Antimicrobial resistance is an increasingly serious threat to global public heath that needs urgent action. There are many factors contribute to the emergence of antimicrobial resistance and its spread in the community. These include exposure of patients to MDR bacteria while receiving medical care in healthcare facilities, inappropriate antibiotics use and lack of antimicrobial stewardship efforts, inadequate infection control measures, travel of people and goods, socioeconomic factors, antibiotic residues in the environment, bacterial gene transfer and clonal spread (Levy, S. B. 2002). Our study showed that *E.coli* was highly sensitive to gentamicin (100%) while it was 80% resistant to ciprofloxacin. This result is similar to the finding of Kibret and Abera (Kibret, M. & Abera, B. 2011). who reported 79.6% of *E.coli* sensitivity to gentamicin, while recording high degree of sensitivity to ciprofloxacin. Regarding ceftriaxone, the result showed zero percent sensitivity, thus similar to study done in South Africa that tested resistant to ceftriaxone (Lowman, W. et al; 2012). *Pseudomonas spp* showed 70% sensitivity rate to ceftriaxone which is less than other study which gave 92.7% (Masood, S. H. and Aslam, N. 2010). Gentamicin in this study inhibited 20% of *Pseudomonas* strains comparing with other study which recorded higher inhibition rate (87.5%) (Anguzu, J. R. and Olila, D. 2007). Ciprofloxacin showed high resistant rate this is similar to the study done in Saudi Arabia (Akhtar, N.*et al*; 2010). *Proteus spp* showed 60% resistant to both ceftriaxone and ciprofloxacin which greatly agrees with that 83.8% sensitively reported by (Masood *et.al*; 2010). 30% of *Proteus.spp* was sensitive to gentamicin comparing

with 36.8% sensitivity recorded by Saleh and Hatem (Bahnshwan,*et al;* 2013). *Staphylococcus aureus* showed 30% sensitivity to ceftriaxone. This result agrees with the study of Immanuel and Magnji (Nwankwo,*et al;* 2011) who reported 71.8% sensitive. While *S.aureus* was resistant to ciprofloxacin, gentamicin 90%, 20%, respectively. This result is almost similar with the studies of Monnir and Bekhit (Salem-bekhit,*et al;* 2014) who reported 48.7% and 14% of *S. aureus* colonies resistant to ciprofloxacin and gentamicin, respectively. The resistance of these bacteria to antibiotics can be partly attributed to the ability of these bacteria to form small colony variants following the exposure to antibiotics or environmental stressors such as cold stress (Sammelson,*et al;* 2005) (Onyango,*et al;*2012). Combination antibiotic treatments can have significant effects on bacterial survival. Therefore, two combinations of antibiotics can be more effective in treatment of infections. The synergistic effects were observed in 20% of *Pseudomonas.spp* isolates to gentamicin and ciprofloxacin combination, our finding replicates the study of (Yasmin *et al;* 2013) who observed synergy in16.7% of isolates. Similarly, combination of gentamicin /ceftriaxone showed 40% synergy effect, in agreement with the study of (Angehm 1983), who recorded 67.5% synergy. Ciprofloxacin /gentamicin combination showed antagonistic effect against *E.coli*, this result disagrees with the study of (Dickgiesser, *et al;* 1986) who reported synergistic effect. The same authors reported indifferent effect of the combination agent to *S.aureus* this agrees with the present result. *Proteus spp* demonstrated indifferent effect to gentamicine/ciprofloxacin combination. This result disagrees with the study of(Weiss,*et al;* 1986) who reported higher susceptibility of *proteus spp* when subjected to gentamicin/ciprofloxacin combination. Access to microbiology services for Identification of microbial etiology and antimicrobial sensitivity profiles is crucial to guide effective optimal antimicrobial treatment; emphasizing the importance of adoption of quality assurance measures for microbiology laboratories. Antimicrobial susceptibilities including combination drugs and their interaction would inform appropriate therapy and minimize the emergence of antimicrobial resistance.

Conclusions:-

This study attempted to evaluate the susceptibility results of individual and synergistic effect of two combination antibiotics, gentamicin plus ciprofloxacin and gentamicin plus ceftriaxone, using manual E- test method. The individual antibiotics displayed resistance pattern to ciprofloxacin and ceftriaxone against the five isolated strains. The gentamicin antibiotic displayed synergistic effect when combined with ciprofloxacin and with ceftriaxone against *Pseudomonas aeruginosa*, but it had antagonistic effect when tested against *E.coli*. The other three organisms, *Staphylococcus aureus, Klebsiella pneumoniae and Proteus spp*, showed indifferent effect. Combination antibiotics strategy should be considered to target bacterial pathogens with emerging resistance pattern. The synergistic and antagonistic effects among the different antibiotics combinations to maximize the efficacy of antimicrobials and prevent emergence of bacterial resistance.

References:-

1. Akhtar, N., Alqurashi, A. M. and Abu Twibah, M. (2010). In vitro ciprofloxacin resistance profiles among gram-negative bacteria isolated from clinical specimens in a teaching hospital. J. Pak. Med. Assoc. 60, 625–7 (2010).
2. Alavi SM, Khosravi AD, Sarami A, Dashtebozorg A, Montazeri EA. Bacteriologic study of diabetic foot ulcer. Pak J Med Sci 2007; 23: 681-4.
3. Amitabha Bhattacharjee. Antimicrobial susceptibility of pseudomonas aeruginosa isolated from wound infections, Indian journal of dermatology. 2012, vol 51(4), 286-288.
4. Anandi C, Ahguraja D, Naturajan V, Ramanathan M, Subramaniam CS, Thulasiram M, et al. Bacteriology of diabetic foot lesions. Indian J Med Microbiol 2004; 22: 175-8.
5. Angehm, P. (1983). In vitro and in vivo synergy between ceftriaxone and aminoglycosides against Pseudomonas aeruginosa. Eur. J. Clin. Microbiol. 2, 489–95 (1983).
6. Anguzu, J. R. and Olila, D. (2007). Drug sensitivity patterns of bacterial isolates from septic post-operative wounds in a regional referral hospital in Uganda. Afr. Health Sci. 7, 148–54 (2007).
7. Bahnshwan, S. A. & Shafey, H. M. El. (2013). Antimicrobial resistance patterns of proteus isolates from clinical specimens. Eur. Sci. J. 9, 1857–788 (2013).
8. Baron E J, Thomson RB. Specimen collection, transport and processing: bacteriology .manual of clinical microbiology. 2011, vol (10), 228-271.
9. Bowler P G, Duerden B I, Armstrong DG .wound microbiology and associated approaches to wound management. Clin Microbiol. 2011, vol (14), 244-269.

10. Clsi. (2013). Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Second Informational Supplement. Clinical and Laboratory Standards Institute 32, (2013).
11. Crouzet, J., Lavigne, J. P., Richard, J. L. and Sotto, A (2011). Diabetic foot infection: a critical review of recent randomized clinical trials on antibiotic therapy. *Int. J. Infect. Dis.* 15, e601–10 (2011).
12. DiazGranados, C. A., Cardo, D. M. and McGowan, J. E. (2008). Antimicrobial resistance: international control strategies, with a focus on limited-resource settings. *International Journal of Antimicrobial Agents* 32, 1–9 (2008).
13. Dickgiesser, N., in der Stroth, S. and Wundt, W. (1986). Synergism of ciprofloxacin with beta-lactam antibiotics, gentamicin, minocycline and pipemidic acid]. Infection 14, 82–5 (1986).
14. Gadepalli R, Dhawan B, Sreenivas V, Kapil A, Ammini AC, Chaudhry R.A clinico-microbiological study of diabetic foot ulcers in an Indian tertiary care hospital. Diabetes Care 2006; 29: 1727-32.
15. Kibret, M. & Abera, B. (2011). Antimicrobial susceptibility patterns of E. coli from clinical sources in northeast Ethiopia. Afr. Health Sci. 11 Suppl 1, S40–5 (2011).
16. Leekha, S., Terrell, C. L. & Edson, R. S. (2011). General principles of antimicrobial therapy. *Mayo Clin. Proc.* 86, 156–67 (2011).
17. Levy, S. B. (2002). Factors impacting on the problem of antibiotic resistance. *J. Antimicrob. Chemother.* 49, 25–30 (2002).
18. Lowman, W., Aithma, N., Duse, A. G. and Mer, M. (2012). Comparative MIC evaluation of a generic ceftriaxone by both microdilution on clinically relevant isolates from an academic hospital complex in South Africa. *South African Medical Journal* 102, 102–103 (2012).
19. Masood, S. H. and Aslam, N. (2010). In Vitro Susceptibility Test of Different Clinical Isolates against Ceftriaxone. *Oman Med. J.* 25, 199–202 (2010).
20. Meletiadis, J., Pournaras, S., Roilides, E. and Walsh, T. J. (2010). Defining fractional inhibitory concentration index cutoffs for additive interactions based on self-drug additive combinations, Monte Carlo simulation analysis, and in vitro-in vivo correlation data for antifungal drug combinations against Aspergillus fumi. *Antimicrob. Agents Chemother.* 54, 602–9 (2010).
21. Nwankwo, E. O. and Nasiru, M. S. (2011). Antibiotic sensitivity pattern of *Staphylococcus aureus* from clinical isolates in a tertiary health institution in Kano, Northwestern Nigeria. Pan Afr. Med. J. 8, 4 (2011).
22. Onyango LA, Dunstan RH, Gottfries J, von Eiff C, Roberts TK. (2012). Effect of Low Temperature on Growth and
23. Salem-bekhit, M. M. Phenotypic and Genotypic Characterization of Nosocomial Isolates of *Staphylococcus aureus* with Reference to Methicillin Resistance. 13, 1239–1246 (2014).
24. Samuelsen O, Haukland HH, Kahl BC, von Eiff C, Proctor RA, Ulvatne H, et al. (2005). *Staphylococcus aureus* small colony variants are resistant to the antimicrobial peptide lactoferricin B. J Antimicrob Chemother. 2005;56(6):1126-9.
25. Singh N, Armstrong DG, Lipsky BA. Preventing foot ulcers in patients with diabetes. JAMA 2005; 293: 217-28.
26. Ultra-Structure of Staphylococcus spp. PLoS One. 2012; 7(1): e29031. PubMed Central PMCID: PMC3265459.
27. Weiss, D., Trautmann, M., Wagner, J., Borner, K. and Hahn, H. (1986). Ciprofloxacin: a comparative evaluation of its bactericidal activity in human serum against four enterobacterial species. *Drugs Exp. Clin. Res.* 12, S89–94 (1986).
28. Yasmin, F., Akhtar, N. and Hameed, A. (2013). Report: In vitro synergistic Effect of Ciprofloxacin with Aminoglycosides against Multidrug resistant-Pseudomonas aeruginosa. Pak. J. Pharm. Sci. 26, 1041–4 (2013).

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The Efficacy of Individual and Combined Antibiotics Against Resistant Pathogen Isolated from Diabetic Foot Infection.

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Abstract:
Diabetic foot infections typically begin in a wound, most often due to neuropathic ulceration. Diabetic foot infection facing unique challenge of successful treatment because of wide spread of resistant bacteria to many antibiotics. Combination antibiotic therapy could be helpful to combat these resistant bacteria. This basically depends on the microbial etiology and selection of appropriate antibiotics for combination therapy. Using manual E-test method, Minimum inhibitory concentration (MIC) was determined susceptibility to individual antibiotics. Fractional inhibitory concentration index (FICI) was used to determine synergistic effects for combined antibiotics. . Gentamicin susceptibility showed 10%, 20%, 30%, 40% and 70% of *Escherichia coli, Klebsiella pneumonia, Proteus spp, Pseudomonas spp,* and *Staphylococcus aureus*, were sensitive, respectively. Ciprofloxacine showed 60%, 30%, 60%, 40% and 40 % resistant to *Escherichia coli, Klebsiella pneumonia, Proteus spp, Pseudomonas spp,* and *Staphylococcus aureus*, respectively. Ceftriaxone showed 50%, 40% 60%, 10%, and 70% resistant result against *Escherichia coli, Klebsiella pneumonia, Proteus spp, Pseudomonas spp,* and *Staphylococcus aureus*, respectively. Fractional inhibitory concentration index (FICI) recorded and synergistic effects was determine. Knowledge on the antibiotic synergy pattern of the isolates will be helpful in determining the drugs for the empirical treatment of diabetic foot infections.

Keywords: Diabetic foot infections, Antibiotics, antibiotic resistance, Antibiotic combination, Synergy.

1. Introduction:

Foot infections in individuals with diabetes are an increasingly common public health problem and are associated with mortality and morbidity. Diabetes mellitus is a metabolic syndrome characterized by hyperglycemia due to defects in insulin secretion function. Diabetic patients are more susceptible to infections; in particular foot infections which are a common and serious problem and sometimes lead to complications and amputations. Diabetic patients have a lifetime risk as high as 25% for developing foot ulceration (Singh, *et al*, 2005). It is characterized by several pathological complications such as neuropathy, peripheral vascular disease, foot ulceration and infection with or without osteomyelitis, which leads to the development of gangrene and which even necessitates limb amputation. (Baron, *et al*; 2011) The individuals with diabetes have at least a 10-fold greater risk of being hospitalized for soft tissue and bone infections of the foot than individuals without diabetes. (Bowker, *et al*; 2011) The impaired micro-vascular circulation in patients with diabetic foot limits the access of phagocytes favouring development of infection (Anandi ,*et al*, 2004 and Gadepalli, *et al*; 2006). The local injuries and the improper foot wear further compromise the blood supply in the lower extremities. While the foot infections in persons with diabetes are initially treated empirically, a therapy which is directed at the known causative organisms may improve the outcome. (Amitabha,2012) Antimicrobial resistance is an increasing global public health problem affecting both developed and resource-limited countries; and prompted call for action worldwide (DiazGranados,*et al*;2008). Selection of appropriate antibiotic for management of diabetic foot infection is crucial and largely dependent on identification of microbial pathogen and evaluation of antibiotic susceptibility (Crouzet,*et al*; 2011). *Escherichia coli, Proteus spp., Pseudomonas spp., Staphylococcus aureus and Enterococcus spp.* are the most frequent pathogens contributing to progressive and widespread tissue destruction. (Anandi,*et al*; 2004 and Gadepalli, *et al*; 2006). Diabetic foot infections are often polymicrobial (Alavi,*et al*; 2007 and Gadepalli, *et al*; 2006). Appropriate selection of antibiotics based on the antibiograms of the isolates from the lesions is most critical for the proper management of these infections. Nevertheless, the initial empirical therapy is often decided based on the knowledge of the susceptibility profile of the prevalent microbial flora recovered from the previous cases. The use of two antibiotics prevents the emergence of resistance to either of the antibiotics if used separately as a monotherapy (Leekha, *et al*; 2011).

The purpose of this study was to define the range of resistance of bacteria isolated from diabetic foot infections and further evaluate synergistic effect of combination antibiotics to guide proper therapy.

2. Materials and Methods

This study included twenty-five individuals with diabetic foot infection at multispeciality hospital Akola, during March and April of 2016. Laboratory analysis was conducted in department of Microbiology, Shegaon. The study focused on evaluation of the five most prevalent bacteria isolated from diabetic foot infections, which include *Escherichia coli, Klebsiella pneumonia, Proteus spp, Pseudomonas spp,* and *Staphylococcus aureus*. five isolates of each isolated pathogen were evaluated for sensitivity testing.

2.1. Materials

Antibiotics used in study: Commercial antibiotics standard solution accompanied by a statement of its activity in mg/ ml for Gentamicin (Hi-media, India), Ciprofloxacin (Hi-media, India), and Ceftriaxone antibiotics (Hi-media, India), collected from the Hi-media seller in Amravati. Isolates were tested against gentamicin, ciprofloxacin, ceftriaxzone, then against a combination of gentamicin with ciprofloxacin and combination of gentamicin with ceftriaxzone.

2.2. Methods

2.2.1 E-test Method

Two fold dilutions of the antibiotic solution in sterile normal saline were prepared for each individual antibiotic (Table 1). This was followed by impregnation via the immersion method, blank sterile disks were soaked in the different concentration of each antibiotic for half an hour. Then the impregnated disks were transferred into sterile Petridishes. These were allowed to dry and stored in a freezer at -14°C.

2.2.2. The Antibiotic Susceptibility Test for Isolates

The strains of bacterial isolates were collected from infected foot of diabetic patients. Isolated strains were homogenized in 0.85% NaCl to achieve 0.5 McFarland's turbidity. A sterile, non-toxic swab was dipped into the inoculums suspension and pressed against the inside of the tube. Then, the surface of Muller Hinton agar in petridish was inoculated with suspension. Sterile forceps were used to deposit the antibiotic discs onto the surface of the inoculated media. Disks were made in complete contact with the agar surface, which was located in one line beginning with the highest concentration to the lowest one of the same antibiotics. The plate was then incubated at 37°C for 24 hours. After incubation, an elliptical zone of inhibition was produced and the point at which the ellipse met the defined disk concentration represented the minimum inhibitory concentration (MIC) of the antibiotics according to Clinical laboratory Standards Institute (CLSI 2013). Fractional inhibitory concentration index (FICI) was used to interpret the result. The FICs were calculated as follows: ΣFIC =FIC (A) +FIC (B); where FIC (A) is the MIC of drug (A) in combination / MIC of drug (A) alone. And FIC (B) is the MIC of drug B in the combination/MIC of drug (B) alone (Meletiadis, J. *et al*, 2010).

Table 1. Different gradient concentration of antibiotics (mg/ ml) dilution

Sr. no.	Antibiotic (mg/ml)	Tubes 1-8						
		1 mg/ml	2 mg/ml	3 mg/ml	4 mg/ml	5 mg/ml	6 mg/ml	7 mg/ml
1	Gentamicin	80	40	20	10	5	2.5	1.25
2	Ciprofloxacin	200	100	50	25	12.5	6.25	3.16
3	Ceftriaxzone	250	125	62.5	31.25	15.63	7.81	3.91
4	Gentamicin/Ciprofloxacin	80/200	40/100	20/50	10/25	5/12.5	2.5/6.25	1.25/3.16
5	Gentamicin/Ceftriaxzone	80/250	40/125	20/62.5	10/31.25	5/15.63	2.5/7.81	1.25/3.91
6	Gentamicin	80	40	20	10	5	2.5	1.25

3. Results

The results showed that 100% of the *E coli* strains were sensitive to gentamicin with (MIC=0.6mg/ml), 70% of *Staphylococcus aureus* were sensitive (MIC=0.6mg/ml), only 20% were resistant (MIC=20-80mg/ml). *Klebsiella pneumoniae* were sensitive to 20 % only (MIC=20-80mg/ml). *Proteus spp* showed that 30% were sensitive (MIC=0.6-1.25mg/ml), 20% were intermediate (MIC=10 mg/ml) and 50% were resistant (MIC=20-80mg/ml). *Pseudomonas aureginosa*, showed that 20% were resistant (MIC=40-80mg/ml) and 80% were sensitive (MIC=0.6-2.5mg/ml). for ciprofloxacin, only 10% of *Pseudomonas aureginosa* were sensitive, while the other strains showed high rate of resistant 80% for *E.coli* with MIC=25-200mg/ml, *Klebsiella pneumoniae* were resistant to 30 % only (MIC=20-80mg/ml), 60% for *Proteus spp* with MIC=25-100mg/ml and 40%for *Pseudomonas aureginosa* with MIC=6.25-200mg/ml. However, 10% of *Staphylococcus aureus* were of intermediate sensitivity (MIC=1.6mg/ml). For ceftriaxone, it is clear that the four strains showed closed intermediate susceptibility result. While *S.aureus* was sensitive (30%) with MIC=1.9-7.8mg/ml and

Proteus spp was highly resistant (60%) with MIC=7.8-62.5mg/ml (Table 2). The combination of gentamicin/ciprofloxacin, gentamicin/ for *Pseudomonas aureginosa* with 20%-40% of combinations demonstrating synergy. In

Table 2. Sensitivity pattern of Gentamicin, Ciprofloxacin and ceftrinxone individually on the five most common bacterial isolates from diabetic foot infection.

Sr. no.	Organisms	gentamicin			ciprofloxacin			ceftriaxone		
		S %	I %	R %	S %	I %	R %	S %	I %	R %
1	*E.coli*	100	0	0	0	20	80	0	50	50
2	*Klebsiella pneumoniae*	20	20	60	0	70	30	10	50	40
3	*Proteus spp*	30	20	50	10	30	60	0	40	60
4	*Pseudomonas aeruginosa*	80	0	20	0	60	40	70	20	10
5	*Staphylococcus aureus*	70	10	20	0	10	90	0	30	70

S: sensitive, I: intermediate, R: resistance

4. Discussion

Antimicrobial resistance is an increasingly serious threat to global public health that needs urgent action. There are many factors contribute to the emergence of antimicrobial resistance and to spread in the community. These include exposure of patients to MDR bacteria while receiving medical care in healthcare facilities, inappropriate antibiotics use and lack of antimicrobial stewardship efforts, inadequate infection control measures, travel of people and goods, socioeconomic factors, antibiotic residues in the environment, bacterial gene transfer and clonal spread (Levy, S. B. 2002). Our study showed that *E.coli* was highly sensitive to gentamicin (100%) while it was 80% resistant to ciprofloxacin. This result is similar to the finding of (Kibret, and Abera, 2011). who reported 79.6% of *E.coli* sensitivity to gentamicin, while recording high degree of sensitivity to ciprofloxacin. Regarding ceftriaxone, the result showed zero percent sensitivity, thus similar to study done in South Africa that tested resistant to ceftriaxone (Lowman, et al; 2012). *Pseudomonas spp* showed 70% sensitivity rate to ceftriaxone which is less than other study which gave 92.7% (Masood, and Aslam, 2010). Gentamicin in this study inhibited 20% of *Pseudomonas* strains comparing with other study which recorded higher inhibition rate (87.5%) (Anguzu, and Olila, 2007). Ciprofloxacin showed high resistant rate this is similar to the study done in Saudi Arabia (Akhtar, et al; 2010). *Proteus* contrast, *E. coli* shows highest antagonism effect (100%). On the other hand, *Staphylococcus aureus, Klebsiella pneumoniae* and *Proteus spp* gave highly indifferent effect (80%-90%) (70%-80%), respectively.

spp showed 60% resistant to both ceftriaxone and ciprofloxacin which greatly agrees with that 83.6% sensitively reported by (Masood et al; 2010). 30% of *Proteus spp* was sensitive to gentamicin comparing with 36.8% sensitivity recorded by (Balmohwan, et al; 2013). *Staphylococcus aureus* showed 30% sensitivity to ceftriaxone. This result agrees with the study of Emmanuel) and (Nwankwo, et al; 2011) who reported 71.6% sensitive. While *S.aureus* was resistant to ciprofloxacin, gentamicin 90%, 20%, respectively. This result is almost similar with the studies of (Salem-bekhit, et al; 2014) who reported 48.7% and 14% of *S. aureus* colonies resistant to ciprofloxacin and gentamicin, respectively. The resistance of these bacteria to antibiotics can be partly attributed to the ability of these bacteria to form small colony variants following the exposure to antibiotics or environmental stressors such as cold stress (Samuelsen, et al; 2005) (Onyango, et al; 2012). Combination antibiotic treatments can have significant effects on bacterial survival. Therefore, two combinations of antibiotics can be more effective in treatment of infections. The synergistic effects were observed in 20% of *Pseudomonas spp* isolates to gentamicin and ciprofloxacin combination, our finding; replicates the study of (Yasmin et al; 2013) who observed synergy in 16.7% of isolates. Similarly, combination of gentamicin /ceftriaxone showed 40% synergy effect, in agreement with the study of (Angelim 1983), who recorded 67.5% synergy. Ciprofloxacin /gentamicin combination showed antagonistic effect against *E.coli*, this result disagrees with the study of (Dudiglesser, et al; 1986) who reported synergistic effect. The same authors reported indifferent effect of the combination agent to S.aureus this agrees with the present result. *Proteus spp* demonstrated indifferent effect to gentamicine/ciprofloxacin combination. This result disagrees with the study of(Weiss, et al;1986) who reported higher susceptibility of *proteus spp* when subjected to gentamicin/ciprofloxacin combination. Access to microbiology services for identification of microbial etiology and antimicrobial sensitivity profiles is crucial to guide effective optimal antimicrobial treatment; emphasizing the importance of adoption of quality assurance measures for microbiology laboratories.

Antimicrobial susceptibilities including combination drugs and their interactive results should be considered during and monitor the emergence of antimicrobial resistance.

5. Conclusions

This study attempted to evaluate the susceptibility results of individual and synergistic effects of two combinations antibiotics, gentamicin plus ciprofloxacin and piperacillin plus tazobactam by diagonal Etest method. The individual antibiotics displayed resistance pattern to ciprofloxacin and tazobactam against the bacterial strains. The gentamicin antibiotic displayed synergistic effect when combined with ciprofloxacin and with ceftriaxone against *Pseudomonas aeruginosa*, but it had antagonistic effect when tested against *S.aureus*. The other three organisms, *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Proteus spp.* showed indifferent effect. Combination antibiotic strategies should be considered to target bacterial pathogens with emerging resistance patterns. The synergistic and antagonistic effects among the different antibiotic combinations to maximize the efficacy of antimicrobials and prevent emergence of bacterial resistance.

6. References

Akhtar, N., Agarwal, A. M. and Abu Baqah, M. (2014) In vitro ciprofloxacin resistance profile among gram-negative bacteria isolated from clinical specimens in a teaching hospital. J. Pak. Med. Assoc. 64: 523-7.

Alavi SM, Khosravi AD, Sanami A, Dashtebozorg A, Mansouri RA (2007) Bacteriologic study of diabetic foot ulcer. Pak J Med Sci. 23: 951-4.

Anindita Bhattacharjee (2013) Antimicrobial susceptibility of pseudomonas aeruginosa isolated from wound infections, Indian journal of dermatology , vol 58 (4), 280-288.

Arunkumar C, Algarsamy D, Natarajan V, Ramanathan M, Subramanian CS, Thulasiram M, et al. (2004) Bacteriology of diabetic foot lesions. Indian J Med Microbiol. 22: 175-6

Augustin, P. (1983). In vitro and in vivo synergy between ceftriaxone and aminoglycosides against Pseudomonas aeruginosa. Eur. J. Clin. Microbiol. 2, 488-495.

Bagyan, J. R. and Okia, D. (2007). Drug sensitivity patterns of bacterial isolates from septic post-operative wounds in a regional referral hospital in Uganda. Afr. Health Sci. 7, 148-54.

Balouiri, S., A. & Bouter, H. M. 17 (2013) Antimicrobial resistance patterns of proteus isolates from clinical specimens. Eur. Sci. J. 9, 1857-7881.

Baron, E. J., Peterson, L. R. (2011)Specimen collection, transport and processing: bacteriology. manual of clinical microbiology. vol(10), 326-371.

Bowler P G, Duerden B I, Armstrong D. G.(2011) wound microbiology and associated approaches to wound management. Clin Microbiol. vol(14), 244-269.

Clsi. (2013). Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Second Informational Supplement. Clinical and Laboratory Standards Institute 33.

Conort, J., Lavigne, J. P., Richard, J. L. and Sotto, A. (2011) Diabetic foot infection: a critical review of recent randomized clinical trials on antibiotic therapy. Int J Infect Dis. 15, e601-10.

Panchmatia, C. A., Cando, D. M. and McGowan, J. E. (2008). Antimicrobial resistance: international control strategies, with a focus on limited-resource settings. International Journal of Antimicrobial Agents 32, 1-9.

Pedersen, K., in der Stroth, S. and Wundt, W. (1986). Synergism of ciprofloxacin with beta-lactam antibiotics, gentamicin, mezlocillin and piperacillin. Infection 14, 53-8.

Sahoo R, Dhawan B, Srivastava V, Kapil A, Ammini AC, Chaudhry RA. (2006) clinico-microbiological study of diabetic foot ulcers in an Indian tertiary care hospital. Diabetes Care 29: 1727-32.

Sibhat, M. & Abera, B. (2011). Antimicrobial susceptibility patterns of E. coli from clinical sources in northeast Ethiopia. Afr. Health Sci. 11 Suppl 1, S40-5.

Seekka, S., Terrell, C. L. & Edson, R. S. (2011). General principles of antimicrobial therapy. Mayo Clin Proc. 86, 156-67.

Levy, S. B. (2002). Factors impacting on the problem of antibiotic resistance. J. Antimicrob Chemother. 49, 25-30.

Lowman, W., Achilla, N., Duse, A. G. and Mer, M. (2012). Comparative MIC evaluation of a generic ceftriaxone by both microdilution on clinically relevant isolates from an academic hospital complex in South African. South African Medical Journal 102, 102-103.

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Fire impact on chemical and physicochemical parameters in a dry deciduous forest of Melghat

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ABSTRACT
Effects of a wildfire on soil chemical and physical properties in a Melghat forest north – western compact block is extending over 3075 Sq km, in the Amravati district of Maharashtra) were investigated. Response of the soil during the first two years following a wildfire was examined, where data from soil in a burned forest were compared to that in an adjacent, unburned soil. The effects that wildfire have on soil properties in this highly fragmented ecosystem are not well understood, but results from this study suggest similar responses to those found in other Mediterranean forest systems. Both physical and chemical properties were examined, and data presented here suggest that soil properties may in their initial response to fire in this ecosystem Na and K does not alter in burn and unburned soil, total nitrogen also remain same. While total organic carbon increases, electric conductivity also increases. TOC TN ratio also increases. The available phosphorus increases sharply which may result in the P^H 6.5. The results of this study have implications for the productivity and sustainable management of the native forest remnants that remain in this region.

Key words: soil chemical properties, soil physical properties, wildfire, burned soil, unburned soil.

INTRODUCTION:

The most common hazard in forests is forests fire. Forests fires are as old as the forests themselves. They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. During summer, when there is no rain for months, the forests become littered with dry senescent leaves and twinges, which could burst into flames ignited by the slightest spark. It happens particularly during summer, with colossal loss of vegetation cover of that region.

Forest fires are considered to be a potential hazard with physical, biological, ecological and environmental consequences (Jaswal *et al.*, 2002). As per (Jhariya and Raj, 2014) fire is a big disaster in the forest causes a loss of natural resources, depleting of soil biomass resulting loss of various mobile nutrient Impact of forest fire is varies from vegetational structure of forest community, availability of fuel load, frequency, intensity and fire return interval of that forest. Globally, biomass fires are burning between 3-4.5 million Km2 per year, this is area equivalent to India plus Pakistan or more than half of Australia (Chatenoux and Peduzzi, 2012). However, impacts from biomass fires are numerous and severe. They include loss of soil cohesion from heat, which then accelerate soil erosion (from wind or rain), it destroys complex ecosystems and thus has a significant impact on biodiversity, it emits GHG, and biomass fires are responsible for 17.4% of GHG global emissions (Solomon *et al.*, 2007). Fires may also play a significant role in regulating ecosystem productivity and diversity by promoting mineralization of nutrients stored in organic matter and allowing the invasion of rapid growing early successional species (Boerner *et al.*, 2009). Fire leads to important change in physical, chemical and biological properties of soil, which are relevant for the future productivity and sustainability of ecosystem (Neary *et al.*, 2005). (Wang *et al.*,2012) reported that fire increases C and N availability and increase microbial activity, which consequently decreases the potential rates of C sequestration. The extent and duration of these effects on soil properties depend on the intensity and residence time, fire severity (Certini, 2005).

Organic matter is a key factor for forest soil. It has a direct and /or an indirect influence on all physical and chemical characteristics of the soil. While low severity fires, such as those prescribed for forest management, have been reported to have transient but positive effect on soil fertility, severe wildfire result in significant losses of soil organic matter, and nutrient, and deterioration of the overall physical-chemical properties of soil that determine its fertility, such as porosity, structure among others (Certini, 2005).

The study of the burned soil is necessary to analyze the soil degradation, not only to estimate the modification of the nutrient content but either the physicochemical characteristics of the organic matter.

The objective of this research was to study, several soil parameters related to chemical soil fertility, chemical and physicochemical properties(through different analytical techniques). To review the effect of wildfire on flora, fauna and various property of soil, which are important in maintaining healthy ecosystem.

MATERIAL AND METHODS:

Melghat forest, the north – western compact block is extending over 3075 Sq km, in the Amravati district of Maharashtra. It is situated on the branch of Gavilgarh being the name of the fort on the one of the southern spurs. This forest is dry deciduous forest with some patches of semi evergreen at higher plateaus. Melghat Tiger Reserve, Gugamal National Park, Melghat

Sanctuary, and territorial forest are the components of Melghat forest.

METHOD:

Two composite samples were taken from the upper layer (0-10 cm) of soil, some days after the wildfire occurrence and before any rainfall event. The samples were taken from the burned (BS) and adjacent unburned soil (UBS), at the same sampling moment. Litter and the ash were not removed from the soil surface before sampling in the unburned and burned soil, respectively. The samples were air-dried, crushed and passed through a 2 mm sieves before all the analytical analysis.

The samples of burned and unburned soil were analyzed for pH at a rate 1:2.5 (w:v), electric conductivity (EC), total nitrogen content (TN) by the Kjeldahl method, phosphorus available (P) by Bray & Kurtz method (1945), total organic carbon (TOC) by combustion at 540 °C for 4hrs (Abad, *et al.*, 2004).

RESULTS AND DISCUSSION:

Table: 1. Principal chemical characteristic of burned and unburned soil.

Sr.no	Sample	pH	E.C.	TN	TOC	TOC/TN	P	Na	K
1	S1 UBS	6.21	0.60	7.6	111	14.61	18.0	0.26	1.15
2	S1 BS	6.59	1.18	8.1	138	17.04	45.3	0.25	1.02

S1 = Sample 1, UBS = Unburned soil, BS = Burned soil.

The results of the principal chemical parameters are shown in table 1. The concentration of the cations, such as Na^+ and K^+ were not altered by fire (Certini, 2005). The forest fires have not necessarily the same impact on soil P as on N, because losses of P through volatilization or leaching are small. The combustion of vegetation and litter causes modification on biogeochemical cycle of P. Burning convert the organic pool of soil P to orthophosphate, which is the form of P available to biota. Furthermore, the peak of P bioavailability is around pH 6.5. These could be the reason for which an enrichment of P is observed in the studied burned soil, but this enrichment will decline soon, because it precipitates as slightly available mineral forms (Certini, 2005, Cade-Menun *et al.*, 2000). In agreement with this suggestion, the increase in the available P content in this burned soil could be due to the soil pH value.

The effect of burning onto soil Total Nitrogen (TN) content present a paradox, which have been debated for years (Neary *et al.*, 1999; Knicker & Skjemstad., 2000). (Certini 2005), suggested that organic N could be volatilizes and in part mineralized to ammonium. (Santin *et al.* 2008) found that the TN after fire increase and (Gonzalez-Vila *et al.* 2009) suggest that wildfire promote the accumulation of recalcitrant organic-N forms. The N, would be as NH_4^+ or NO_3^-, the NH_4^+ could be adsorbed onto negative charge of mineral and/or organic surface, but with time transformed to NO_3^-. Nitrate, without any plant uptake, will be lost from the ecosystem either by denitrification or leaching (Certini, 2005; Knicker, 2007). The electric conductivity (EC) increase in the burned soil, it could be assigned to the release of inorganic ions from the combusted organic matter present as litter or ash; this increase could be temporary (Hernandez, *et al.*, 1997; Certini, 2005).

Organic matter

The most intuitive expected change in the soils during a fire event is the loss of organic matter. This change depends on the fire severity, vegetation type, soil texture and even slope. The impact on the organic matter consist of slight distillation (volatilization of minor constituents), charring or complete oxidation. Substantial consumption of organic matter begins in the 200–250 °C range to complete at around 450-500 °C (Certini, 2005; Knicker, 2007). The influence of fire on the organic matter content have been reported a wide range of effects, showing even contrasting results (Czimczik *et al.*, Alexis *et al.*, 2007). The total organic carbon (TOC) increase around 21%, this behavior could be attributed to the accumulation of recalcitrant hydrophobic fraction of organic matter (Gonzalez-Perez *et al.*, 2004, Santin *et al.*, 2008).

CONCLUSION:

Fire is a natural ecological disturbance factor in forest and these forests plays an important role to maintain ecosystem structure and their function and provide services include carbon storage, production of O_2, production of biomass (timber, fire wood) and production of pharmaceutical products. Wildfires create countless of environmental, social and economic impacts. Wildfire impacts includes total acres burned, cost of fire suppression, damage to homes and structures, alternation of wildlife habitat, damage to watersheds and water supply, damage to public recreation facilities, evacuation of adjacent communities, tourism impacts, damage to timber resources, destruction of cultural and archaeological sites, costs of rehabilitation and restoration, public health impacts, transportation impacts. To save the forest from scourge of fire is thus a central responsibility of forest managers in this area. From conservation point of view, maintaining and sustaining these all forest types is important as they harbor high biodiversity of not only plant species, but are also a preferred habitat for several wild animals. From management perspectives a participatory approach should incorporate for betterment of environmental conservation and ecological stability. Use of controlled fire, fire lines, fuel

breaks, fuel load removal and mapping of fire sensitive areas are key principles to minimize fire risk. Remote sensing and GIS science techniques for detection and monitoring systems for fire prediction and it must become an integral part of fire management.

REFERENCES:

Abad, M., Noguera, P., Puchades, R., Maquieira, A. & Noguera, V., (2002) Physico-chemical properties of some coconut coir dusts for use as a peat substitute for containerized ornamental plants. *Bioresour Technol*, 82: 241-245.

Alexis, M. A., Rasse, D. P., Rumpel, C., Bardoux, G., Pechot, N., Schmalzer, P., Drake, B., & Mariotti, A. (2007). Fire impact on C and N losses and charcoal production in a scrub oak ecosystem. *Biogeochemistry* 82: 201-219.

Boerner, R.E., Huang, J. and Hart, S.C. (2009) Impacts of fire and fire surrogate treatments on forest soil properties: A meta-analytical approach. *Ecol. Appl.*, 19: 338-358.

Cade-Menun, B. J., Berch, S. M., Preston, C. M. & Lavkulic, L. M.(2000). Phosphorus forms and related soil chemistry of Podzolic soils on northern Vancouver Island II. The effects of clear-cutting and burning. *Can J Forest Research* 30:1726-1741.

Certini, G. (2005). Effects of fire on properties of forest soils: a review. *Oecologia*, 143: 1-10.

Chatenoux, B. and Peduzzi, P. (2012). Biomass fires: preliminary estimation of ecosystems global economic losses. UNEP/GRID-Geneva pp 1-11.

Czimczik, C. I., Schmidt, M. W. I. & Schulze, E. D. (2005). Effects of increasing fire frecuency on black carbon and organic matter in Podzols of Siberian Scots pine forest. *European J of soil Sci* 56: 417-428.

Gelzalez-Vila, F. J. & Almendros, G. (2009) *Thermal transformation of soil organic matter by natural fires and laboratory controlled heating*. In: Natural and Laboratory Simulated Thermal Geochemical Processes. R. Ikan (ed.) Kluver Academic Publisher Netherlands.

Hernandez, T., Garcia, C. & Reinhardt, I. (1997). Short-term effect of wildfire on the chemical, biochemical and microbiological properties of Mediterranean pine forest soil. *Appl. Farm. Ecol.* 2: 109-116.

Jaiswal, R.K., Mukherjee, S., Raju, K.D. and Saxena, R. (2002). Forest fire risk zone mapping from satellite imagery and GIS. *Int. J. Appl. Earth Observ. Geoinformation*, 4: 1-10.

Jhariya, M.K. and Raj, A. (2014) Human Welfare from Biodiversity. *Agrobios Newsletter*, 12(9): 89-91.

Knicker, H. & Skjemstad, J. O. (2000). Nitrogen and nitrogen functionality in privileged organic matter of some Australian soils as revealed by solid-state CP- and CP/MAS ^{15}N NMR. *Australian J of Soil Sci*., 38: 113-127.

Knicker, H. (2002) How does fire affect the nature and stability of soil organic nitrogen and carbon? A review. *Biogeochemistry* 85: 91-118.

Neary, D.G., Klopatek, J.C., DeBano, L.F. and Ffolliott, P.F. (1999). Fire effects on belowground sustainability: a review and synthesis. *Forest Ecology and Management*, 122: 51-71.

Neary, D.G., Ryan, K.C. and DeBano, L.F. (2005) Wildland fire in ecosystem: effects of fire on soils and water. Gen. Tech. Rep. RMRS-GTR-42-vol.4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, 250 pp.

Ramin, C., Knicker, H., Fernandez, S., Mendez-Duarte, R. & Alvarez, M. A. (2008) Wildfire influence on soil organic matter in an Atlantic mountainous region (NW of Spain). *Catena* 74: 286-295.

Solomon, S., Qin Manning, D.M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M. and Miller, H.L. (2007). The physical science basis-contribution of working group I to the fourth assessment report of the inter-governmental panel on climate change. Cambridge Univ. Press, Cambridge, U.K., New York, USA.

Wang, Q., Zhong, M. and Wang, S. (2012). Meta-analysis on the response of microbial biomass, dissolved organic matter, respiration, and N mineralization in mineral soil to fire in forest ecosystems. *Forest Ecology and Management*, 271: 91-97.

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RESEARCH ARTICLE

IMPACT OF WILD FIRE ON SOIL PHYSICOCHEMICAL PARAMETERS IN A DRY DECIDUOUS FOREST OF MELGHAT.

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Abstract

Effects of a wildfire on soil chemical and physical properties in a Melghat forestt north – western compact block is extending over 3075 Sq km, in the Amravati district of Maharashtra) were investigated. Response of the soil during the first two years following a wildfire was examined, where data from soil in a burned forest were compared to that in an adjacent, unburned soil. The effects that wildfire have on soil properties in this highly fragmented ecosystem are not well understood, but results from this study suggest similar responses to those found in other Mediterranean forest systems. Both physical and chemical properties were examined, and data presented here suggest that soil properties vary in their initial response to fire in this ecosystem.Na and K does not alter in burn and unburned soil, total nitrogen also remain same. While total organic carbon increases, electric conductivity also increases, TOC: TN ratio also increases. The available phosphorus increases sharply which may result in the P^H 6.5. The results of this study have implications for the productivity and sustainable management of the native forest remnants that remain in this region.

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Introduction:-

The most common hazard in forests is forests fire. Forests fires are as old as the forests themselves. They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. During summer, when there is no rain for months, the forests become littered with dry senescent leaves and twinges, which could burst into flames ignited by the slightest spark. It happens particularly during summer, with colossal loss of vegetation cover of that region.

Forest fires are considered to be a potential hazard with physical, biological, ecological and environmental consequences (Jaiswal *et al.*, 2002). As per (Jhariya and Raj, 2014) fire is a big disaster in the forest causes a loss of natural resources, depleting of soil biomass resulting loss of various mobile nutrient.Impact of forest fire is varies from vegetational structure of forest community, availability of fuel load, frequency, intensity and fire return interval of that forest,. Globally, biomass fires are burning between 3-4.5 million Km2 per year, this is area equivalent to India plus Pakistan or more than half of Australia (Chatenoux and Peduzzi, 2012). However, impacts from biomass fires are numerous and severe. They include loss of soil cohesion from heat, which then accelerate soil erosion (from wind or rain), it destroys complex ecosystems and thus has a significant impact on biodiversity, it

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emits GHGs, and biomass fires are responsible for 17.4% of GHG global emissions (Solomon *et al*., 2007). Fires may also play a significant role in regulating ecosystem productivity and diversity by promoting mineralization of nutrients stored in organic matter and allowing the invasion of rapid growing early successional species (Boerner *et al*., 2009). Fire leads to important change in physical, chemical and biological properties of soil, which are relevant for the future productivity and sustainability of ecosystem (Neary *et al*., 2005). (Wang *et al*. 2012) reported that fire increases C and N availability and increase microbial activity, which consequently decreases the potential rates of C sequestration. The extend and duration of these effects on soil properties depend on the intensity and residence time, fire severity (Certini, 2005).

Organic matter is a key factor for forest soil. It has a direct and for an indirect influence on all physical and chemical characteristics of the soil. While low severity fires, such as those prescribed for forest management, have been reported to have transient but positive effect on soil fertility, severe wildfire result in significant losses of soil organic matter, and nutrient, and deterioration of the overall physical-chemical properties of soil that determine its fertility, such as porosity, structure among others (Certini, 2005).

The study of the burned soil is necessary to analyze the soil degradation, not only to estimate the modification of the nutrient content but either the physicochemical characteristics of the organic matter.

The objective of this research was to study, several soil parameters related to chemical soil fertility, chemical and physicochemical properties(through different analytical techniques). To review the effect of wildfire on flora, fauna and various property of soil, which are important in maintaining healthy ecosystem.

Material And Methods:-

Melghat forest, the north – western compact block is extending over 3075 Sq km. in the Amravati district of Maharashtra. It is situated on the branch of Gavilgarh being the name of the fort on the one of the southern spurs. This forest is dry deciduous forest with some patches of semi evergreen at higher plateaus. Melghat Tiger Reserve, Gugamal National Park, Melghat Sanctuary, and territorial forest are the components of Melghat forest.

Method:-

Two composite samples were taken from the upper layer (0-10 cm) of soil, some days after the wildfire occurrence and before any rainfall event. The samples were taken from the burned (BS) and adjacent unburned soil (UBS), at the same sampling moment. Litter and the ash were not removed from the soil surface before sampling in the unburned and burned soil, respectively. The samples were air-dried, crushed and passed through a 2 mm sieves before all the analytical analysis.

The samples of burned and unburned soil were analyzed for pH at a rate 1:2.5 (w: v), electric conductivity (EC), total nitrogen content (TN) by the Kjeldahl method, phosphorus available
(P) by Bray & Kurtz method (1945), total organic carbon (TOC) by combustion at 540 °C for 4 hrs. (Abad, *et al*., 2002).

Results And Discussion:-

The results of the principal chemical parameters are shown in Table 1. The concentration of the cations, such as Na^+ and K^+ were not altered by fire (Certini, 2005). The forest fires have not necessarily the same impact on soil P as on N, because losses of P through volatilization or leaching are small. The combustion of vegetation and litter causes modification on biogeochemical cycle of P. Burning convert the organic pool of soil P to orthophosphate, which is the form of P available to biota. Furthermore, the peak of P bioavailability is around pH 6.5. These could be the reason for which an enrichment of P is observed in the studied burned soil, but this enrichment will decline soon, because it precipitates as slightly available mineral forms (Certini, 2005; Cade-Menun *et al*., 2000). In agreement with this suggestion, the increase in the available P content in this burned soil could be due to the soil pH value

Table 1:-Principal chemical characteristic of burned and unburned soil.

Sr.no	Sample	P^H	E.C.	TN	TOC	TOC/TN	P	Na	K
1	S1 UBS	6.21	0.60	7.6	111	14.61	18.0	0.26	1.15
2	S1 BS	6.53	1.18	8.1	138	17.04	48.3	0.25	1.02

S1= Sample 1, UBS = Unburned soil, BS = Burned soil

The effect of burning onto soil Total Nitrogen (TN) content present a paradox, which have been debated for years (Neary *et al*., 1999; Knicker & Skjemstad., 2000). (Certini 2005), suggested that organic N could be volatilizes and in part mineralized to ammonium, (Santin *et al* 2008) found that the TN after fire increase and (Gonzalez-Vila *et al* 2009) suggest that wildfire promote the accumulation of recalcitrant organic-N forms. The N, would be as NH_4^+ or NO_3^-, the NH_4^+ could be adsorbed onto negative charge of mineral and/or organic surface, but with time transformed to NO_3^-, Nitrate, without any plant uptake, will be lost from the ecosystem either by denitrification or leaching (Certini, 2005; Knicker, 2007) The electric conductivity (EC) increase in the burned soil, it could be assigned to the release of inorganic ions from the combusted organic matter present as litter or ash; this increase could be temporary (Hernandez, *et al*., 1997; Certini, 2005).

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Fire is a natural ecological disturbance factor in forest and these forests plays an important role to maintain ecosystem structure and their function and provide services include carbon storage, production of O_2, production of biomass (timber, fire wood) and production of pharmaceutical products. Wildfires create countless of environmental, social and economic impacts. Wildfire impacts includes total acres burned, cost of fire suppression, damage to homes and structures, alteration of wildlife habitat, damage to watersheds and water supply, damage to public recreation facilities, evacuation of adjacent communities, tourism impacts, damage to timber resources, destruction of cultural and archaeological sites, costs of rehabilitation and restoration, public health impacts, transportation impacts. To save the forest from scourge of fire is thus a central responsibility of forest managers in this area. From conservation point of view, maintaining and sustaining these all forest types is important as they harbor high biodiversity of not only plant species, but are also a preferred habitat for several wild animals. From management perspectives a participatory approach should incorporate for betterment of environmental conservation and ecological stability. Use of controlled fire, fire lines, fuel breaks, fuel load removal and mapping of fire sensitive areas are key principles to minimize fire risk. Remote sensing and GIS is novel techniques for detection and monitoring systems for fire prediction and it must become an integral part of fire management.

References:-

1. Abad, M., Noguera, P., Puchades, R., Maquieira, A. & Noguera, V., (2002). Physico- chemical properties of some coconut coir dusts for use as a peat substitute for containerized ornamental plants. *Bioresour Technol*., 82: 241-245.
2. Alexis, M. A., Rasse, D. P., Rumpel, C., Bardoux, G., Pechot, N., Schmalzer, P., Drake, B., & Mariotti, A. (2007). Fire impact on C and N losses and charcoal production in a scrub oak ecosystem. *Biogeochemistry* 82: 201-219.
3. Boerner, R.E., Huang, J. and Hart, S.C. (2009). Impacts of fire and fire surrogate treatments on forest soil properties: A meta-analytical approach. *Ecol Appli*., 19: 338-358.
4. Cade- Menun, B. J., Berch, S. M., Preston, C. M. & Lavkulic, L. M.(2000). Phosphorus forms and related soil chemistry of Podzolic soils on northern Vancouver Island: II. The effects of clear-cutting and burning. *Can J Forest Research* 30:1726-1741.
5. Certini, G. (2005). Effects of fire on properties of forest soils: a review. *Oecologia*, 143: 1-10.
6. Chatenoux, B. and Peduzzi, P. (2012). Biomass fires: preliminary estimation of ecosystems global economic losses. UNEP/GRID-Geneva. pp. 1-11.
7. Czimczik, C. I., Schmidt, M. W. I. & Schulze, E. D. (2005). Effects of increasing fire frecuency on black carbon and organic matter in Podzols of Siberian Scots pine forest. *European J of soil Sci* 56: 417-428.

8. Golenetz-Vila, F. J. & Almendros, G. (2009). *Thermal transformation of soil organic matter by natural fires and laboratory controlled heating.* In: Natural and Laboratory Simulated Thermal Geochemical Processes. R. Ikan (ed.) Kluwer Academic Publishers. Netherlands
9. Hernandez, T., Garcia, C. & Reinhardt, I. (1997). Short-term effect of wildfire on the chemical, biochemical and microbiological properties of Mediterranean pine forest soil. *Biol. Fertil. Soil* 25:109-116
10. Jaiswal, R.K., Mukherjee, S., Raju, K.D. and Saxena, R. (2002). Forest fire risk zone mapping from satellite imagery and GIS. *Int. J. Appl. Earth Observ. Geoinformation*, 4: 1-10.
11. Jhariya, M.K. and Raj, A. (2014). Human Welfare from Biodiversity. *Ippodilos Newsletter* 12(3): 89-91.
12. Knicker, H. & Skjemstad, J. O. (2000). carbon and nitrogen functionality in protected organic matter of some Australian soils as revealed by solid-state 13C and 15N NMR. *Australian J. of Soil S.* 38: 113-127.
13. Knicker, H. (2007). How does fire affect the nature and stability of soil organic nitrogen and carbon? A review. *Biogeochemistry* 85:91-118.
14. Neary, D.G., Klopatek, C.C., DeBano, L.F. and Ffolliott, P.F. (1999). Fire effects on belowground sustainability: a review and synthesis. *Forest Ecology and Management*, 122: 51-71.
15. Neary, D.G., Ryan, K.C. and DeBano, L.F. (2005). Wildland fire in ecosystem: effects of fire on soils and water. Gen. Tech. Rep. RMRS-GTR-42-vol.4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station; 250 pp.
16. Santín, C., Knicker, H., Fernandez, S., Mendez-Duarte, R. & Alvarez, M. A. (2008). Wildfire influence on soil organic matter in an Atlantic mountainous region (NW of Spain). *Catena* 74: 286-295.
17. Solomon, S., Qin Manning, D.M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M. and Miller, H.L. (2007) The physical science basis-contribution of working group I to the fourth assessment report of the inter-governmental panel on climate change, Cambridge Univ. Press, Cambridge, U.K., New York, USA.
18. Wang, Q., Zhang, M. and Wang, S. (2012). Meta-analysis on the response of microbial biomass dissolved organic matter respiration, and N mineralization in mineral soil to fire in forest ecosystems. *Forest Ecology and Management*, 271: 91-97.

16

A TEXT MINING APPROACH FOR INFORMATION EXTRACTION

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Abstract – In this modern era, text is the most common means of the formal information exchange. Lot of textual data available in digital format all around us. This textual data may contain useful hidden information. If this hidden information can be extracted from the textual data then it can be useful for further use. Text mining is defined as the process of extracting previously unknown and potential knowledge from the huge collection of unstructured textual data. Text mining is like to data mining except that data mining handles the structured data but text mining works with the unstructured or semi-structured data. Information Extraction (IE) is a process that analyses natural language in order to extract specific data. This extracted data may be used further for indexing purposes in IR applications such as Internet search engines.

Keywords – data mining, text mining, KDT, NLP, IE

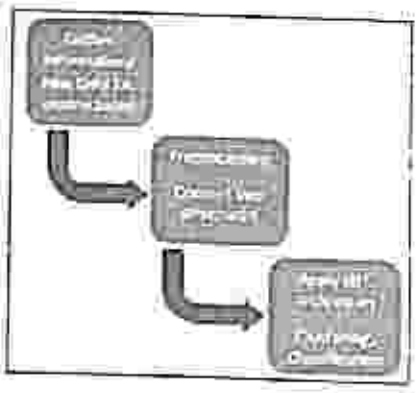
1. Introduction

In this modern era, text is the most common means of the formal information exchange. Generally the information stored in natural form, is called text. We have a lot of textual data available in digital format all around us. This textual data may contain useful hidden information. If this hidden information can be extracted from the textual data then it can be useful for further use. Although extracting useful information from texts is not simple task, it requires tool which is able to extract useful information quickly with at a low cost. Text Mining tries to extract significant information from natural language text. Text mining is like to data mining except that data mining handles the structured data but text mining works with the unstructured or semi-structured data such as e-mails, full text documents, HTML files etc. The goal of data mining is to discover the previously unknown trend and patterns from database implicitly. Data mining consists of many techniques, such as classification, clustering, neural networks and decision trees [1].

Text mining also known as knowledge discovery in textual database(KDT) [2] or text data mining [3] is defined as the process of extracting previously unknown and potential knowledge from the huge collection of unstructured textual data. Text mining or knowledge discovery from text (KDT) was firstly mentioned by Feldman et al. [2], in which he presented the machine supported analysis of text. Techniques from natural language processing (NLP), information retrieval and information extraction are used and connected them with the methods of KDD, data mining, and machine learning.

Text mining is generally involved with of three steps: text pre-processing, text mining operations, and post-processing. The first step text pre-processing includes the selection of data, data classification and feature extraction. This step mostly converts the documents into intermediate forms, that can be useful for different mining purpose. The text mining operations are the main part of any text mining system, which includes the operations such as clustering, association rule discovery, pattern discovery and other knowledge discovery algorithms. The fi-

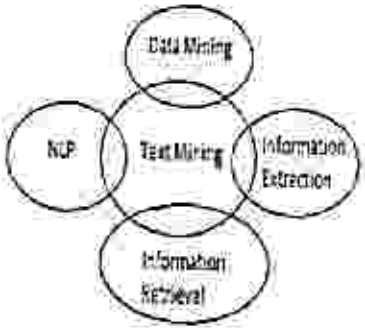
nal step of post-processing manipulates knowledge coming from previous step and offers the selection of knowledge, interpretation and visualization of knowledge [4]. The basic process of text mining shown in following figure Fig.1:



[Fig. Basic Process of Text Mining [5]]

2. Areas of Text Mining

The main aim of text mining to transform textual data (unstructured) into a form that can be used for further analysis using natural language processing (NLP) methods. Test mining mostly involves data mining, information extraction, information retrieval, and NLP [6]. Following figure Fig.2 shows various areas of Text mining:



[Fig. 2: Text mining areas]

2.1 Data Mining (DM)

Data mining is a process of searching through large databases to extract useful data which is previously unknown and hidden [7]. Data mining can be freely expressed as searching for patterns in data. Data mining tools can search databases for hidden, unknown patterns and critical information for further use. Once these patterns are extracted they can be used to make some further decisions. Data mining uses various techniques and algorithms such as Classification, Clustering, Regression, Artificial Intelligence, Neural Networks, Association Rules, Decision Trees, Nearest Neighbor method etc., for knowledge discovery from databases [8].

2.2 Information Retrieval (IR)

Information retrieval (IR) is stated as an extension to document retrieval where the documents that are returned are processed to extract or compress the particular information required by the user. A text summarization or an information extraction stage could be followed by document retrieval. IR systems help to reduce the set of documents that are related to a particular problem. While text mining applies very complex algorithms to large corpus, IR reduces the number of documents which can considerably speed up the analysis [7].

2.3 Natural Language Processing (NLP)

NLP is one among the oldest and most challenging issues in the field of artificial intelligence. It is a study of human language such that computers can also understand natural languages just like humans [9]. Hence sense of NLP is simple, which makes human to communicate with the machine easily. So many work is done in NLP in last few years and many of the developed applications are very useful in day to day life such as a machine that understand instructions by voice [10].

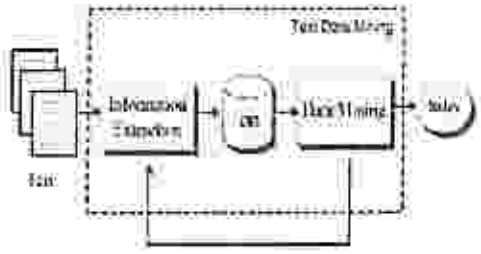
2.4 Information Extraction (IE)

Information Extraction (IE) is a process that analyses natural language in order to extract specific data. The process of IE takes textual data as input and produces fixed-format, unambiguous data as output. This data may be used further for various operations such as storing in a database for later analysis, or may be used for indexing purposes in IR applications such as Internet search engines like Google search engine [11].

3. Information Extraction and Text Mining

There is a lot of information in natural language text that isn't directly suitable for automatic analysis by a computer. The process of extracting information decomposes naturally into a number of processing steps such as, tokenization, sentence segmentation, part-of-speech assignment, and the identification of named entities. Number of data mining techniques are applied to these steps [12].

Information Extraction is possibly the most major technique currently used in text mining pre-processing operations. Without IE techniques, knowledge discovery capabilities in text mining systems would be more limited. IE technology will help one to create fast extraction systems for new tasks whose performance is on same level with human performance. There are many approaches to construct IE systems. One of them is manually create pattern-matching rules, but this method is difficult and does not result in a very robust system. Instead of this, another way is to use supervised machine-learning methods trained on human annotated corpora to develop IE systems. The methods like the Hidden Markov Model (HMM), Conditional Random Field (CRF), Maximum Entropy, and many others can also be used in IE [13]. Information extraction can play an evident role in text mining as illustrated in [14] following fig.:



[Fig. 3: Overview of IE-based text mining framework [14]]

If abstract knowledge is represented rather than concrete data when the information is extracted from a corpus of documents, then Information Extraction system itself acts as a knowledge discovery system from text repositories. Discovery of knowledge by information extraction is found useful for many other text mining tasks, such as, classification, clustering, summarization etc [15]. In general, IE systems are useful if a small number of templates are sufficient to summarize the relevant parts of the document and the needed information is expressed relatively locally in the text [16].

4. Conclusion

It is necessary to analyze the widely available huge text data to get useful information. Text mining methods and techniques are used to explore the useful information efficiently from massive data. This paper presents a brief overview of text mining areas such as data mining, information retrieval, information extraction and natural language processing. This paper also describes the use of text mining in information extraction.

5. References

[1] M.Sukanya and S.Biruntha, "Techniques on Text Mining", IEEE International Conference on Advanced Communication Control and Computing Technologies (ICACCCT), 2012.

[2] Feldman, Ronen, and I. Dagan, "Knowledge Discovery in Textual Databases (KDT)" In Proceedings of the First International Conference on Knowledge Discovery and Data Mining (KDD-95), 1995, pp 112-117.

[3] Marti A. Hearst, "Untangling text data mining", In Proceedings of the 37th annual meeting of the Association for Computational Linguistics on Computational Linguistics, (ACL'99), Association for Computational Linguistics, June 99, pp 3–10.

[4] Y Zhang, M Chen and L. Liu, "A review on text mining", In IEEE International Conference on Software Engineering and Service Science, IEEE, 2015, pp 681-685.

[5] Lokesh Kumar and Parul Kalra Bhatia, "Text Mining: Concepts, Process and Applications", Journal of Global Research in Computer Science, Volume 4, No. 3, March 2013, pp 36-39.

[6] https://en.wikipedia.org/wiki/Text_mining

[7] Mrs. Sayantani Ghosh, Mr. Sudipta Roy and Prof. Samir K. Bandyopadhyay, "A tutorial review on Text Mining Algorithms", In International Journal of Advanced Research in Computer and Communication Engineering, Vol. 1, Issue 4, 2012.

[8] Bharati M. Ramageri, "Data Mining Techniques and Applications", Indian Journal of Computer Science and Engineering, Vol. 1 No. 4, 2010, pp 301-305.

[9] http://www.scism.lsbu.ac.uk/inmandw/ir/jaberwocky.htm

[10] Chandhana Surabhi. M, "Natural Language Processing Future", Proceedings of International Conference on Optical Imaging Sensor and Security, IEEE, Coimbatore, Tamil Nadu, India, July 2-3, 2013.

[11] H. Cunningham, "Information Extraction, Automatic", Encyclopedia of Language and Linguistics, 2nd Edition, 5:665–677, November 2006.

[12] Hotho, Andreas & Nurnberger, Andreas & Paass, Gerhard, "A Brief Survey of Text Mining", LDV Forum - GLDV Journal for Computational Linguistics and Language Technology, 2005, pp 19-62.

[13] Mulins, Matt, "Information extraction in text mining", Computer Science Graduate and Undergraduate Student Scholarship, 2008, 4, https://cedar.wwu.edu/computerscience_stupubs/4

[14] Raymond J. Mooney and Un Yong Nahm, "Text Mining with Information Extraction" Multilingualism and Electronic Language Management: Proceedings of the 4th International MIDP Colloquium, September 2003, Bloemfontein, South Africa, Daelemans, W., du Plessis, T., Snyman, C. and Teck, L. (Eds.) pp.141-160, Van Schaik Pub., South Africa, 2005.

[15] Sandeep R Sirsat, Dr Vinay Chavan and Dr Shrinivas P Deshpande, "Mining knowledge from text repositories using information extraction: A review", Sadhana Vol. 39, Part 1, February 2014, pp. 53–62.

[16] Ben-Dov M. and Feldman R, "Text Mining and Information Extraction", In Maimon O., Rokach L. (eds) Data Mining and Knowledge Discovery Handbook. Springer, Boston, MA, 2005, https://doi.org/10.1007/0-387-25465-X_38.

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Bianchi Type VI$_0$ Magnetized Cosmological Model in $f(R,T)$ Theory of Gravitation

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Abstract: In the $f(R)$ theory of gravity, we have studied electromagnetic fields in Bianchi type-VI$_0$ space time by considering the general case. It is found that if the study is confined to the case of $f(R)=\mu R$, it is observed that the convergent and isotropic solution of the metric function can be evolved with the components of the vector potentials.

Keywords: Bianchi Type VI$_0$, Electromagnetic Field, $f(R)$ theory of gravity, isotropy, constant vector potential.

1. Introduction

Basically, two kinds of alternative accelerated expansion of the universe have been proposed for this unexpected observational phenomenon. One is negative pressure known as dark energy (DE) which induces a late-time accelerating cosmic expansion. The other is the modified gravity, which originate from the idea that the general relativity is incorrect in the cosmic scale and the action need to be modified. In order to explain the nature of the DE and accelerated expansion, a variety of theoretical models have been proposed in literature. There are several modified gravity theories like $f(R)$ gravity formulated by Nojiri and Odintsov [4-6]. The idea of introducing additional terms of the Ricci scalar to the Einstein-Hilbert action did not begin years ago with the $f(R)$ theory of gravity paper by Carroll *et al* [5]. He explained the presence of a late time cosmic acceleration of the universe in $f(R)$ theory of gravity. The $f(T)$ theory of gravitation formulated by Nojiri and Odintsov [3].To justify the current expansion of the universe come from modified or alternative theories of gravity. $f(T)$ Theory of gravity is one such example which has been recently developed. This theory is a generalized version of teleparallel gravity in which Weitzen bock connection is used instead of Levi- Civita connection. The interesting feature of this theory is that it may explain the current acceleration without invoking dark energy. In our opinion, one of interesting and prospective version of modified-gravity theories is the $f(R,T)$ gravity proposed by Harko *et al* [8,9] and Myrzakulov [10]. In $f(R,T)$ theory of gravity, cosmic acceleration may result not only due to geometrical contribution to the total cosmic energy density but it is also depends on matter contents. Many authors have investigated different problem within the scope of $f(R,T)$ theory. Sahoo [11] has studied the interacting scalar and electromagnetic fields in Bianchi type I universe. Solanke and Sarade [12] have studied electromagnetic field in $f(R,T)$ gravity in Bianchi type-III space-time. Our interest is to explore the role of scalar and electromagnetic field played in the amended $f(R,T)$ gravity in other Bianchi types or other metric universe. In this paper we consider axially symmetric metric universe.

2. Gravitational field equations of $f(R)$ gravity

The field equation of $f(R,T)$, theory due to Harko[8-9] are deduced by varying the action.

$$s=\int f(R,T)\sqrt{-g}\,d^4x+\int L_m\sqrt{-g}\,d^4x \qquad (2.1)$$

where L_m are Lagrangian and other symbols have their usual meaning.

Varying the action (1.1) with respect to g^{ij} which yields as

$$\delta R = \frac{1}{2\kappa}\int \left[g_{ik}\delta\Gamma^{i}_{lm}\frac{\partial g^{kl}}{\partial x^{n}} + g_{ik}g^{lm}\frac{\partial \delta\Gamma^{i}_{lm}}{\partial x^{n}} - \frac{\partial g_{ik}}{\partial x^{n}}g^{lm}\delta\Gamma^{i}_{lm} - \frac{\partial g_{ik}}{\partial x^{l}}g^{lm}\delta\Gamma^{i}_{mn} \right]\sqrt{-g}\,d^{4}x \qquad (2.3)$$

Contracting $\delta R_{ik} = 0$ from equation (2.3) upon multiplication, we can obtain

$$g_{ik}R^{ik} = \frac{1}{2}g_{ik}g^{ik}R - \left(g_{ik}\nabla^{l}\nabla_{l} - \nabla_{k}\nabla_{i}\right)T_{ik}(R) = \kappa T \qquad (2.3)$$

where κ is the constant of integration.

Substituting $R = g_{ik}T^{ik}(R)$ in equation (2.3), we obtain

$$g_{ik}R^{ik} = \frac{1}{2}g_{ik}T^{ik}(R) - \left(g_{ik}\nabla^{l}\nabla_{l} - \nabla_{k}\nabla_{i}\right)T_{ik}(R) = \kappa T \qquad (2.4)$$

Taking trace of equation (2.4), we get

$$g_{ik}R^{ik}g^{ik} - \frac{1}{2}g_{ik}T^{ik}(R)g^{ik} - \left(g_{ik}g^{ik}\nabla^{l}\nabla_{l} - g^{ik}\nabla_{k}\nabla_{i}\right)T_{ik}(R) = \kappa g^{ik}T_{ik}$$

$$g_{ik}R^{ik} - \frac{4}{2}g_{ik}T^{ik}(R) - \left(4\nabla^{l}\nabla_{l} - \nabla^{i}\nabla_{i}\right)T_{ik}(R) = \kappa T$$

$$g_{ik}R^{ik} - 2g_{ik}T^{ik}(R) + 3\nabla^{l}\nabla_{l}T_{ik}(R) = \kappa T$$

$$3\nabla^{l}\nabla_{l}T_{ik}(R) = \kappa T - g_{ik}(R) + 2T_{ik}(R)$$

$$\nabla^{l}\nabla_{l}T_{ik}(R) = \frac{1}{3}\kappa T - \frac{2}{3}T_{ik}(R) - \frac{1}{3}T_{ik}(R) \qquad (2.5)$$

We consider the particular case $T_{ik}(R) = \mu R$ which follows uniform

$$T(R) = \frac{\partial T(R)}{\partial R} = \frac{\partial}{\partial R}\mu R = \mu \qquad (2.6)$$

The field (2.4) with the aid of (2.6), reduces to

$$\mu R - \frac{1}{2}\mu R g_{ik} + \left(g_{ik}\nabla^{l}\nabla_{l} - \nabla_{k}\nabla_{i}\right)\mu R = \kappa T_{ik}$$

$$\mu R - \frac{1}{2}\mu R g_{ik} = \kappa T_{ik} \qquad (2.7)$$

The expression (2.5) with the aid of (2.6), reduces to

$$\nabla^{l}\nabla_{l}T_{ik} = \frac{1}{3}\kappa T - \frac{2}{3}(\mu R) - \frac{1}{3}\mu R$$

$$\frac{1}{3}\kappa T - \frac{1}{3}(\mu R) = 0$$

$$\kappa T - (\mu R) = 0 \qquad (2.8)$$

Using (2.8) in (2.7), we have

$$\mu R_{ik} - \frac{1}{2}(\kappa T)g_{ik} = \kappa T_{ik}$$

$$\mu R_{ij} - \frac{1}{2}(\kappa T)g_{ij} = \kappa T_{ij} \qquad (2.9)$$

$$\mu R^{ij} - \frac{1}{2}(\kappa T)g^{ij} = \kappa T^{ij}$$

3. Energy momentum tensor for electromagnetic field

Energy momentum tensor for electromagnetic field is given by

$$T_{ij} = \frac{2}{\sqrt{-g}}\frac{\delta\left(\sqrt{-g}L_m\right)}{\delta g^{ij}} = \frac{2}{\sqrt{-g}}\left(-\sqrt{-g}\frac{\partial L_m}{\partial g^{ij}} + L_m\frac{\delta\sqrt{-g}}{\delta g^{ij}}\right) = 2\frac{\partial L_m}{\partial g^{ij}} + \frac{2}{\sqrt{-g}}L_m\frac{\delta\sqrt{-g}}{\delta g^{ij}}$$

$$= 2\frac{\partial L_m}{\delta g^{ij}} + \frac{2}{\sqrt{-g}}L_m\left(\frac{-\frac{1}{2}\sqrt{-g}\,g_{mn}\delta g^{mn}}{\delta g^{ij}}\right) = 2\frac{\partial L_m}{\delta g^{ij}} - g_{mn}L_m\frac{\delta g^{mn}}{\delta g^{ij}} = 2\frac{\partial L_m}{\delta g^{ij}} - g_{mn}\delta_i^m\delta_j^n$$

$$T_{ij} = 2\frac{\partial L_m}{\delta g^{ij}} - g_{ij}L_m = 2\frac{\partial L_m}{\delta g^{ij}} - L_m g_{ij} \qquad [3.1]$$

where $$L_m = \frac{1}{4}F_{kl}F^{kl} \qquad [3.2]$$

where F_{kl} electromagnetic field

$$\frac{\partial L_m}{\delta g^{ij}} = \frac{1}{4}\frac{\partial}{\partial g^{ij}}F_{kl}F^{kl}$$

$$\frac{\partial L_m}{\delta g^{ij}} = \frac{1}{4}\frac{\partial}{\partial g^{ij}}F_{kl}g^{ak}g^{\beta l}F_{a\beta}$$

$$\frac{\partial L_m}{\delta g^{ij}} = \frac{1}{2}g^{\alpha k}F_{\alpha j}F_{ki} \qquad [3.3]$$

Using (3.3), the equation (3.1) reduces to

$$T_{ij} = \frac{1}{4}F_{kl}F^{kl}g_{ij} - F_{ki}F_j^k \qquad [3.4]$$

4. The metric and field equations.

We consider the axially symmetric metric in the form

$$ds^2 = dt^2 - a_1^2dx^2 - a_2^2e^{2\alpha x}dy^2 - a_3^2e^{2\alpha x}dz^2, \qquad [4.1]$$

where a_1, a_2 and a_3 are functions of time t

5. Electromagnetic field tensor F_{ij}

The electromagnetic field tensor is given by

$$F_{ij} = \frac{\partial A_i}{\partial x^j} - \frac{\partial A_j}{\partial x^i} \qquad [5.1]$$

To achieve the capability with non-static space time (4.1), we assume electromagnetic vector potential in the form

$$A_i = \left[a(\alpha)v_1(t) \quad v_2(t) \quad v_3(t) \quad v_4(t)\right], \qquad [5.2]$$

From (5.1) and (5.2) we can easily deduce

$$F_{14} = av_1, \quad F_{24} = v_2, \quad F_{34} = v_3, \qquad [5.3a]$$

$$F^{41} = \frac{av_1}{a_1^2}, \quad F^{42} = -\frac{v_2}{a_2^2e^{2\alpha x}}, \quad F^{43} = \frac{v_3}{a_3^2e^{2\alpha x}}, \qquad [5.3b]$$

$$F_4^2 = -\frac{v_2}{a_2^2e^{2\alpha x}}, \quad F_4^3 = -\frac{v_3}{a_3^2e^{2\alpha x}}, \qquad [5.3c]$$

$$F_1^4 = -av_1, \quad F_2^4 = -v_2, \quad F_3^4 = -v_3, \qquad [5.3d]$$

From above equations we can compute

$$T_1^1 = -\frac{1}{2}\left[\frac{uv_1^2}{a_1^2} + \frac{v_2^2}{a_2^2 e^{-2w^2 t}} + \frac{v_3^2}{a_3^2 e^{-2w^2 t}}\right] \quad (5.4)$$

Using (3.4), we establish the following nonzero components of the energy momentum tensor of material field

$$T_1^1 = \frac{1}{2}\left[\frac{u^2 v_1^2}{a_1^2} - \frac{v_2^2}{a_2^2 e^{-2w^2 t}} - \frac{v_3^2}{a_3^2 e^{-2w^2 t}}\right], \quad (5.4a)$$

$$T_2^2 = \frac{1}{2}\left[\frac{u^2 v_2^2}{a_1^2} + \frac{v_2^2}{a_2^2 e^{-2w^2 t}} - \frac{v_3^2}{a_3^2 e^{-2w^2 t}}\right], \quad (5.4b)$$

$$T_3^3 = \frac{1}{a_1^2 a_2^2 e^{2w^2 t}}\left[\frac{a_3^2 u^2 v_1^2}{2a_1^2} e^{2w^2 t} + \frac{a_3^2 v_2^2}{2a_2^2 e^{-2w^2 t}} e^{2w^2 t} - \frac{v_3^2}{2}\right], \quad (5.4c)$$

$$T_4^4 = \frac{1}{2}\left[\frac{u^2 v_1^2}{a_1^2} + \frac{v_2^2}{a_2^2 e^{-2w^2 t}} + \frac{v_3^2}{a_3^2 e^{-2w^2 t}}\right], \quad (5.4d)$$

From equations (5.4a) (5.4b) (5.4c) and (5.4d), we can deduced the components of energy Tensor as follows

$$T_i^j = 0 \quad (5.5)$$

6. Maxwell's Equation

The Maxwell Equations are given by

$$\frac{(v_1)^{\cdot}}{v_1} + \frac{v_1^2}{v_1^2} + \frac{v_1}{v_1}\left[\frac{a_2}{a_2} + \frac{a_3}{a_3} - \frac{a_1}{a_1}\right] = 0 \quad (6.1a)$$

$$\frac{(v_2)^{\cdot}}{v_2} + \frac{v_2^2}{v_2^2} + \frac{v_2}{v_2}\left[\frac{a_1}{a_1} + \frac{a_3}{a_3} - \frac{a_2}{a_2}\right] = 0 \quad (6.1b)$$

$$\frac{(v_3)^{\cdot}}{v_3} + \frac{v_3^2}{v_3^2} + \frac{v_3}{v_3}\left[\frac{a_1}{a_1} + \frac{a_2}{a_2} - \frac{a_3}{a_3}\right] = 0 \quad (6.1c)$$

$$u = c, \quad (6.1d)$$

where c is a constant.

7. Solution of vector potential

Considering the trivial solution component of Ricci tensor form field (2.9), we get

$$\frac{v_1 v_2}{v_3 v_4} = 0 \qquad (7.1a)$$

$$\frac{v_1 v_3}{v_2 v_4} = 0 \qquad (7.1b)$$

$$\frac{v_2 v_3}{v_1 v_4} = 0 \qquad (7.1c)$$

From (7.1a to 7.1c), we write

$$\frac{v_1 v_2}{v_3 v_4} = \frac{v_1 v_3}{v_2 v_4} = \frac{v_2 v_3}{v_1 v_4} = 0 \qquad (7.2)$$

which further imply

$$\frac{v_1}{v_4} = \frac{v_2}{v_3} = \frac{v_3}{v_2} = \frac{D}{D} \qquad (7.3)$$

where D is some unknown function of t.

Using (7.3), we obtain

$$v_1 = K_1 D,\ v_2 = K_2 D,\ v_3 = K_3 D \qquad (7.4)$$

where k's are constants of integration.

8. Solution of field equations.

As in Bolanle and Karade [12], we consider

$$\frac{u^2 v_1^2}{a^2 v_4^2} + \frac{v_2^2}{a_1^2 e^{2\omega x} v_4^2} + \frac{v_3^2}{a_2^2 e^{-2\omega x} v_4^2} = \left[\frac{u^2 v_1^2}{a_1^2} + \frac{v_2^2}{a_2^2 e^{-2\omega x}} + \frac{v_3^2}{a_3^2 e^{2\omega x}}\right]\left(\frac{D}{D}\right)^2 = -I\left(\frac{D}{D}\right)^2$$

Now our plan is to express the components of T_i^j in terms of $\bar{T}_i^j$

$$\bar{T}_1^1 = \frac{u^2 v_1^2}{2a^2 v_4^2} - \frac{v_2^2}{2a_1^2 e^{2\omega x} v_4^2} - \frac{v_3^2}{2a_2^2 e^{-2\omega x} v_4^2} = -T_4^4 - \frac{u^2 v_1^2}{a^2 v_4^2} I\left(\frac{D}{D}\right)^2 \qquad (8.1a)$$

$$T_2^2 = -\frac{u^2 v_1^2}{2a^2 v_4^2} + \frac{v_2^2}{2a_1^2 e^{2\omega x} v_4^2} - \frac{v_3^2}{2a_2^2 e^{-2\omega x} v_4^2} = -T_4^4 + \frac{v_2^2}{a_1^2 e^{2\omega x} v_4^2}\left(\frac{D}{D}\right)^2 \qquad (8.1b)$$

$$T_3^3 = -\frac{u^2 v_1^2}{2a^2 v_4^2} - \frac{v_2^2}{2a_1^2 e^{2\omega x} v_4^2} + \frac{v_3^2}{2a_2^2 e^{-2\omega x} v_4^2} = -T_4^4 + \frac{v_3^2}{a_2^2 e^{-2\omega x} v_4^2}\left(\frac{D}{D}\right)^2 \qquad (8.1c)$$

$$T_4^4 = \frac{u^2 v_1^2}{2a^2 v_4^2} + \frac{v_2^2}{2a_1^2 e^{2\omega x} v_4^2} + \frac{v_3^2}{2a_2^2 e^{-2\omega x} v_4^2} = -\frac{1}{2} I\left(\frac{D}{D}\right)^2 \qquad (8.1d)$$

By using (7.4), we get trace of energy momentum tensor as

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$$T = \lambda\left[\frac{D}{D}\right]^2 - \frac{1}{2}\lambda\left[\frac{D}{D}\right]^2 = 0 \qquad (8.2)$$

Consequently the non-trivial components of Ricci tensor from field equation (2.9)

$$\mu R_j^i + \frac{\lambda}{2}\delta T_j^i = \delta T_j^i \qquad (8.3)$$

$$\mu\left[-\frac{2m^2}{a^2 a_1^2} + \frac{a_1}{a_1} + \frac{a_1 a_2}{a_1 a_2} + \frac{a_1 a_3}{a_1 a_3}\right] = \lambda\left[-T_1^1 + \frac{a^2 v_1^2}{a^2}\left(\frac{D}{D}\right)^2\right] \qquad (8.3a)$$

$$\mu\left[\frac{a_2}{a_2} + \frac{a_1 a_2}{a_1 a_2} + \frac{a_2 a_3}{a_2 a_3}\right] = \lambda\left[-T_2^2 + \frac{v_2^2}{a_2^2 e^{2m^2 t}}\left(\frac{D}{D}\right)^2\right] \qquad (8.3b)$$

$$\mu\left[\frac{a_3}{a_3} + \frac{a_1 a_3}{a_1 a_3} + \frac{a_2 a_3}{a_2 a_3}\right] = \lambda\left[-T_3^3 + \frac{v_3^2}{a_3^2 e^{2m^2 t}}\left(\frac{D}{D}\right)^2\right] \qquad (8.3c)$$

By using (7.4), above equations leads to

$$-\frac{2m^2}{a^2 a_1^2} + \frac{a_1}{a_1} + \frac{a_1 a_2}{a_1 a_2} + \frac{a_1 a_3}{a_1 a_3} = 0 \qquad (8.4a)$$

$$\frac{a_2}{a_2} + \frac{a_1 a_2}{a_1 a_2} + \frac{a_2 a_3}{a_2 a_3} = 0 \qquad (8.4b)$$

$$\frac{a_3}{a_3} + \frac{a_1 a_3}{a_1 a_3} + \frac{a_2 a_3}{a_2 a_3} = 0 \qquad (8.4c)$$

With the help of (7.3), we can write the equation (8.1) as

$$\left(\frac{D}{D}\right) + \left(\frac{D}{D}\right)^2 + \frac{D}{D}\left[\frac{a_1}{a_1} + \frac{a_2}{a_2} - \frac{a_3}{a_3}\right] = 0 \qquad (8.4d)$$

$$\left(\frac{D}{D}\right) + \left(\frac{D}{D}\right)^2 + \frac{D}{D}\left[\frac{a_1}{a_1} + \frac{a_3}{a_3} - \frac{a_2}{a_2}\right] = 0 \qquad (8.4e)$$

$$\left(\frac{D}{D}\right) + \left(\frac{D}{D}\right)^2 + \frac{D}{D}\left[\frac{a_1}{a_1} + \frac{a_2}{a_2} - \frac{a_3}{a_3}\right] = 0 \qquad (8.4f)$$

This equation further imply that

$$\frac{\dot{a}_1}{a_1} = \frac{\dot{a}_2}{a_2} = \frac{\dot{a}_3}{a_3} \qquad (6.3)$$

which on integration with respect to t, we get

$$a_1 = K_1 a_2 \quad a_2 = K_2 a_3 \quad a_3 = K_3 a_1 \qquad (6.4)$$

where K's are constants of integration.

From (6.4) and (6.5), we get

$$\frac{\dot{a}_1}{a_1} - 2\left(\frac{\dot{a}_2}{a_2}\right) = 0 \qquad (6.7a)$$

$$\frac{\dot{a}_2}{a_2} - 2\left(\frac{\dot{a}_3}{a_3}\right) = 0 \qquad (6.7b)$$

Upon integration, we get

$$a_2 = (3k_4 t + 3k_5)^{\frac{1}{3}} \qquad (6.8a)$$

$$a_3 = (3k_5 t + 3k_6)^{\frac{1}{3}} \qquad (6.8b)$$

With the help of (6.6) and (6.8a), we have

$$a_1 = (3k_1 t + 3k_2)^{\frac{1}{3}} \qquad (6.9a)$$

By using the equations (6.3), (6.8a), (6.8b) and (6.8c) we get

$$k_1 = K_1 = k_4 = d_1 \quad k_2 = K_1 = k_5 = d_2$$

$$a_1 = a_2 = a_3 = (3d_1 t + 3kd_2)^{\frac{1}{3}} \qquad (6.9)$$

$$\frac{\dot{D}}{D} = 0 \quad \dot{D} = 0, \; D = C \qquad (6.10)$$

where C is constant.

From equation (6.9) and (6.4a) we get

$$m = n$$

Using equations (6.9), the line element (4.1) reduces to

$$ds^2 = dt^2 - (3d_1 t + 3kd_2)^{\frac{2}{3}}\left[dx^2 - e^{2(x+y)}dy^2 + e^{2(x+y)}dz^2\right] \qquad (6.11)$$

Conclusion

In this paper, we have considered the particular case $f(R) = \mu R$ model in Bianchi type VI$_0$.

1) It is observed that convergent non-singular isotropic solution can be evolved for the metric function and the components of vector potential.
2) Model shows that universe expand algebraically in $f(R) = \mu R$ theory of gravity.
3) The metric function in non-static space time admits constant value at early time of the universe, it tends to zero and after that the metric function start increasing with increase in cosmic time and finally diverge to infinity as time tend to infinity. This shows that the universe expand and approaches to infinite volume.
4) It is also interesting to note that the investigated model is free from singularity. Hence the model approaches isotropic for the anyone.

References

[1] M.A. Melvin ,(1975), "*Homogeneous axial cosmologies with electromagnetic field and dust*", Ann. NewyorkAcad. Sci., **262**, 253-274.

[2] R. Maartens,(2000), "*Cosmological magnetic fields*" Pramana J. Phys.; **55**: 575-58315.

[3] D. Grasso , H.R.Robinstein ,(2001), "*Magnetic fields in the early universe*", Phys. Rep.; **348**: 163-266.

[4] S.Nojiri and S. D. Odintsov(2003), "Modified gravity with negative and positive power of curvature: Unification of inflation and cosmic acceleration phys.Rev D 68,123512

[5] S. M. Carroll, V. Duvvuri and M. S. Turner, (2004), Phys. Rev. D 70, 043528

[6] S. Nojiri and S. D. Odintsov, "Introduction to modified gravity and gravitational alternative for dark energy , arXiv:hep-th/0601213V5 (2006).

[7] S. Nojiri, S. D. Odintsov and P. V. Tretyakov, (2007); Phys. Lett. B 651, 224

[8] T. Harko, T. S. Koivisto and F. S. N. Lobo,(2010), arXiv:1007.4415

[9] T. Harko and F. S. N. Lobo, (2010), Eur. Phys. J. C 70, 373

[10] Myrzakulov,(2012) "RFW Cosmologicaly in f(R,T) gravity" The E.ph.J. 72:2203,

[11] BijanSaha ,(2015) "Introduction Scalar and Electromagnetic Field in f(R,T) theory of gravity" Int. j.of Phy.:1073-75,31.

[12] D.T.Solanke,T.M.Karade,(2016),prespacetime j.,Nov,2016,vol.7,issue13,pp:1766-1785

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ULTRASONIC INTERFEROMETRIC STUDY OF 4-(p-CHLORO) -PHENYLTHIOCARBAMIDOPHENOL IN MIXED SOLVENT MEDIA

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Abstract:

In last few decades many researchers and new theories in physico-chemical, agricultural, medicinal, material, space research, forensic, sciences and biochemical sciences get updated through wide spread and effective used of measurements. Recently ultrasonic velocity and density for solutions of 4-(p-chlorophenylthiocarbamidophenol (I) in different molar concentrations and 30% to 70% compositions ethanol-water mixture have been investigated for determination of adiabatic compressibility (β) apparent molal compressibility (φk) apparent molal volume (φv) intermolecular free length (Lf) relative association (RA) and specific acoustic impedance (Z). These parameters were utilized to study intermolecular interaction in solute-solvent system which provide important and valuable information regarding structural behavior of molecules in solution.

Keywords: *4-(p-chlorophenyl thiocarbamidophenol (I), ultrasonic interferometer, acoustic parameters, ethanol-water mixture.*

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INTRODUCTION:

Ultrasonics is the branch of acoustic, which consists of waves of high frequencies. Ultrasonic is the technique used for the study of molecular interaction in liquids. The study of molecular interaction in liquids provides valuable information regarding internal structure, molecular association, complex formation, internal pressure and stability of complexes [1]. Ultrasonic parameters are used extensively to study molecular interactions in pure liquids [2-4], liquid mixtures [5,6] and electrolyte solution [7,8]. Aswale et al [10] investigated the comparative study of intermolecular interaction by acoustic properties of p-bromoacetophenone and camphor-oxime in ethanol and dioxan solvents. Acoustical studies of ternary mixture of toluene in cyclohexane and tetrahedrone at 308K [11]. Ultrasonic velocity and density of binary liquid mixture of diethyl ether with three non polar solvents such as CCl_4, CS, and C_6H_6 at 303.15K [12].

Now a days dynamic studies in the research of ultrasonics are enormously going on due to its gigantic scope in chemical, physical, technical and biological sciences. Taking all these things into consideration, present investigation was carried out for the determination of ultrasonic velocity and density for solutions of 4-(p-chlorophenyl thiocarbamidophenol (L_3) at different molar concentrations and 30% to 70% compositions ethanol-water mixture have been investigated for determination of adiabatic compressibility (β), apparent molal compressibility (ϕ_k), apparent molal volume (ϕ_v), intermolecular free length (L_f), relative association (R_A) and specific acoustic impedance (Z).

MATERIALS AND METHODS:

All AR grade chemicals used during present investigation. Freshly prepared solutions used for analysis. The solvents were purified by standard method. Prepared 0.0M, 0.025M, 0.050M and 0.075M concentrations of 4-(p-chlorophenylthiocarbamidophenol (L_3) 70% ethanol-water mixture. 4-(p-chlorophenylthiocarbamidophenol (L_3) was synthesized by known method [13]. The solvents ethanol was purified by standard procedure [14]. Densities were measured with the help of bicapillary pyknometer (10 ml kg m^{-3}). Pyknometer used of Borosil. 0.01M solution of ligand in ethanol solvent. Weighing were made on Citizen CY 104 one pan digital balance (± 0.0001 gm). A special thermostatic arrangement was done for density and ultrasonic velocity measurements. One thermostatic bath was used, in which continuous stirring of water was carried out with the help of electric stirrer and temperature variation was maintained within ± 0.1 °C. The speed of sound waves was obtained by using variable path, Single crystal interferometer (Mittal Enterprises, Model: MX-3) with accuracy ± 0.05% and frequency 1 MHz was used in the present work. The densities and ultrasonic velocity of liquids in ethanol solvent at 303 K. For the calculation of intermolecular free length the value of Jacobson's constant [15] (K = 631) at temperature 303 K is used.

RESULTS AND DISCUSSION:

In the present investigation measurements of densities and ultrasonic velocities of 4-(p-Chloro) phenylthiocarbamidophenol (L_3) in 70% ethanol-water mixture has been carried out and given in Table No.1.

Table no. 1: Acoustic Parameters at Different Concentrations of 2-TP at 303K

W-E Mix. %	Conc. C (Mole/lit)	Average Ultrasonic Velocity Us (m/sec)	Density ρ_s (Kg m^{-3})	β_s x10^{10} (pa^{-1})	ϕ_v (m^{3}mol^{-1})	ϕ_k x10	L_f (Å)	R_A	Z * 10^5 (Kgm^{-2} sec^{-1})
70	0.1	1439.567	1030.32	4.3239	0.2845	-5.8711	0.0162	1.1018	160.516
	0.005	1322.591	1028.32	5.3854	0.3329	81.775	0.018	1.1048	152.499
	0.050	1217.909	1021.32	6.4941	0.3359	35.591	0.0193	1.1063	121.018
	0.075	1072.119	1016.22	8.3753	0.3763	88.438	0.0218	1.1082	105.987

CONCLUSION:

Table-1 revels resultant values of Acoustic Parameters of L- at (0.1M, 0.075M, 0.050M and 0.025M) and 303K in 70% ethanol-water mixture from table-1 it was concluded that Ultrasonic Velocity (Us) , Density (ds) decreases while Adiabatic compressibility (βs) Apparent molar volume (φv), Apparent molar compressibility (φk), Intermolecular free length (L_f) Relative association (R_A) increases and Specific acoustic impedance (Z) decreases along with decreasing concentration of L- at 303 K By using ultrasonic interferometric study Us , ds, βs, φv, φk, L_f, R_A, z etc acoustic properties were determined, which explain how these interactions occur and responsible for breaking and making of the structure in the solution.

REFERENCES:

1.C. N. Deshmukh, A. G. Doshi, Pratibha Agrawal and C M Deshmukh, *Ultra Science* Vol (3),535,(**2002**).

2.R.P Varma, Surendra Kumar, *Ind. J. Pure Appl. Phy* ,38(2),96,(**2000**).

3.N.A Kalambe, P.B.Raghuwanshi and A.K Maldhure, *Ind. J. Chem. Sci.*,12(2), 730, (**2014**).

4.P.B.Raghuwanshi and A.D.Deshmukh, *Ind. J. Chem. Sci*.,1(1),141,(**2013**)

5.S K.Upadhyay, *Ind. J. Chem.*,39(5),537,(**2000**).

6.A Ali, K Tiwari, A.K Nain and V Chakravarty, *Ind. J. Phy. Pr.* B,74(5),351,(**2000**)

7.S Ganguly and B.R Rao, *Ind. J. Pure and Appl. Phy.* ,7,(**1969**)

8.Rita Mehra, *Ind. J. Chem*.,44A(2),1834,(**2005**).

9.P.R.Malasne and A.S.Aswar, *Ind. J. Chem*.44A(12),2490,(**2005**)

10.S.S.Aswale, P.B.Raghuwanshi and D.T.Tayade, *Ind. J. Chem. Soc*.,84,159,(**2007**)

11.A.A.Mistry, V.D.Bhandarkar and D.P.Chimankar, *J. Chem. Pharm. Res*.,4(1),170, (**2012**)

12.S.K.Pradhan, S.K.Dash, L.Mohanta and B. B. Swain, *Ind. J. Pure Appl. Phy.*, 50, 161,(**2012**).

13.A.W.Raut, S.T.Jadhao and A.G.Doshi, *Asian J.Chem*.,12(2),62,(**2000**).

14.Vogel, "A text Book of Quantitative Inorganic Analysis", 3rd Edition, ELBS 1st Edition, Reprint (**1968**).

15.B Jacobson, *J.Chem.Phy*., 20,927,(**1952**).

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THERMODYNAMIC STUDY OF SUBSTITUTED THIOCARBAMIDONAPHTHOL

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Abstract:

Conductivity of drug plays a vital role in explaining pharmacodynamic and drug kinetics of new chemical compounds. Present work deals with thermodynamic parameters viz. ΔH, ΔS and ΔG study of 5-phenylthiocarbamido-1-naphthol (5PTN) solution in 70% ethanol-water mixture at different concentrations and constant temperature (303K) in 70% ethanol-water mixture. These study also contributes to solvent-solvent, solute-solvent and solute-solute interactions and the effects of various substituents.

Key Words: *5-phenylthiocarbamido-1-naphthol, thermodynamic parameters.*

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INTRODUCTION

Solubility and permeability of drugs efficiently influence by mobility of ions in electrolytic solutions, these two are prime biopharmaceutical parameters which are accountable for effective bioavailability and good in vitro and vivo correlation [1]. Nowadays pharmaceutical industries face a great challenge to tackle the solubility and dissolution rate and oral bioavailability of weakly water soluble drugs [2]. Hydrotropic Solubilization is considered as one of the significant methods of solubilization [3]. Enhancement aqueous solubilization of insoluble drugs by adding hydrotropic agents. Number of researchers work on the effect of solubility enhancers [4,5]. The valuable information about solute-solute and solute-solvent interaction obtain from the conductometric measurements [6]. Gomaa and Al Hindawi [7] was investigated ionic association of divalent symmetric electrolyte Cu (NO$_3$)$_2$ with Kryptofix-22 in mixed (MeOH-DMF) solvents at different temperatures by conductometric measurement. A Conductometric measurement of the alkali metal at different proportion of mixed solvents was carried out by Jamfle and Counsel[8] and Roy et al [9]. Very few researchers investigated the thermodynamic parameters and Walden products of different complexes and they also examine the comparison of transition metal complexes among the halide group [10-14]. The ion pair formation and thermodynamic parameters of Glycine B-(1-acridinyl)-O-methylurea ethyl (III) halides in water-methanol mixtures at different temperatures was investigated by Singh et al [15]. Recent work deals with thermodynamic parameters (viz. ΔH, ΔS and ΔG) study of 5-phenylthiocarbamido-1-naphthol by conductometric measurement at different concentrations and constant temperature in 70% ethanol-water mixture. These studies also contributes to solvent-solvent, solute-solvent and solute-solute interactions and the effects of various substituents.

MATERIALS AND METHODS

Experimental:

All AR grade chemicals used during present investigation. Freshly prepared solution used for analysis. The solvents were purified by standard method. Prepared 0.01M, 0.0025M, 0.0015M and 0.0012M concentrations of 5-phenyl thiocarbamido-1-naphthol 70% ethanol-water mixture. Maintain the thermal equilibrium (303 K) of these solution by using thermostat. After getting thermal equilibrium, conductivity of this electrolyte solution was measured.

RESULT AND DISCUSSION:

Freshly prepared solution of 0.01 M concentration then by serial dilution method prepared solutions of 0.0025M, 0.0015M and 0.0012M with 70% (Ethanol-water mixture. Measured conductance of such solutions by using Conductivity Bridge at 303 K. The results obtained are given in Table-1 to Table-2. From the data observed conductance (G), specific conductance (k) and molar conductance (μ) were determined by known literature methods.

TABLE – 1: CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF 5-PHENYLTHIOCARBAMIDO-1-NAPHTHOL

DETERMINATION OF G, k and μ AT DIFFERENT CONCENTRATIONS AND TEMPERATURE 303°C.

% of solution (Ethanol-water)	Concentration C (M)	Observed conductance (G)	Specific conductance (k)	Molar conductance (μ)
70%	0.01 M	0.027559	0.027559	2.755
	0.0025 M	0.011528	0.011388	4.776
	0.0015 M	0.010102	0.010036	6.752
	0.0012 M	0.008877	0.008799	7.475

Table 1 revel that the observed conductance (G), specific conductance (k) decreases and molar conductance (μ) increases along with decreasing concentration. The specific conductance increases with increasing temperature. Calculated values the specific enthalpy (ΔG), log (Ksp) and thermodynamic parameters viz. (ΔH), (ΔS) and (ΔG) of 5-phenylthiocarbamido-1-naphthol by known literature methods at different concentration with room temperature (303K). Obtained result compared in Table 2.

TABLE – 2 - CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATION OF 5-PHENYLTHIOCARBAMIDO-1-NAPHTHOL, DETERMINATION OF Ksp, log Ksp, ΔG, ΔH and ΔS AT DIFFERENT TEMPERATURES KEEPING THE SAME CONCENTRATION.						
SYSTEM: LIGAND [PTCN]				MEDIUM - 70% ETHANOL-WATER		
Temp T(°C)	Conc. M	Ksp	Log Ksp	ΔG	ΔH	ΔS
25	0.01	295.3714	2.470368	-14332.1	-46060.7	104.7151
	0.005	391.4162	2.592639	-15041.4	-48341.9	109.9025
	0.0025	401.7436	2.603949	-15107	-48552.4	110.3807
	0.0012	286.4956	2.457118	-15255.2	-49814.7	112.1567

The change in thermodynamic parameters values closely affected by temperature, molar concentrations and percentage compositions. These parameters shackle by another factors viz. the solute (drug)-solvent interactions, solvent-solvent interactions, solvent-solvent-solute interactions and –solute-solute-solvent interactions. Variation in these parameters affected by the internal geometry as well as internal and intra hydrogen bonding.

As observed, the μ values increase with decreasing in concentration indicating less solvation or higher mobility of ions. This is due to the fact that increased thermal energy results in greater bond breaking due to dilution. Also negative values of ΔG indicates that reaction is spontaneous. Negative values of enthalpy change (ΔH) suggests exothermic reaction. Favorable at lower temperature and positive value of (ΔS) revels entropically favorable. The change in thermodynamic parameters values closely affected by molar concentrations and percentage compositions. These parameters shackle by another factors viz. solute (drug)-solvent interactions, solvent-solvent interactions, solvent-solvent-solute interactions and – solute-solute-solvent interactions. Variation in these parameters affected by the internal geometry as well as internal and intra hydrogen bonding.

REFERENCES:

1.Somayeh Heydari , Roya Mohammadzade kakhki , *"Thermodynamic study of complex formation of b-cycladextrin with ibuprofen by conductometric method and determination of ibuprofen in pharmaceutical drugs"*, Arabian Journal of Chemistry, xxx, xxx–xxx,2013

2.S. Chakraborty, D. Shukla, A. Jain, B.Mishra and S. Singh, *J. Coll Int. Sci.*, 2009,355: 242-249

3.A. Jain, B. Mishra and S. Singh. C.W. Pouton, *"Drugs information for health care professional"* 17th Euro. J. Pharm Sci., 2006;29, 278-287

4.S. Agrawal, S.S. Pancholi, N.K. Jaiman, G.P. Agrawal, *Int.J.Pharm*.,2004;274:149-155

5.G.D. Pancholi and J.C.Gradock, *J. Pharm.Sci*., 1974;68:728-732.

6.U.N. Dash and S.Supkar, *Proc. Ind.Acad.Sci.Chem.Soc*.,1995,107: 541

7.G.C. Bag, N.M.Singh and N.R. Singh, J. Ind. Chem. Soc., 2000;77: 146

8.E.A. Gonna and B.M. Al-Jahadalli, *American J. Condensed Matter Physics*, 2012;2(1):16- 21.

9.W.A.L. Izonfuoand, C.C. Obunwo, *Ind. J. Chem*., 1999;38A: 939.(1999). Ed., USPDI, 1646, 1997

10.M.N. Roy, D. Nandi and D.K. Hazra, *J.Ind.Chem.Soc*.,1993;70,121

11.C.S. Solanki, P.Mishra, M.K. Talari, M. Tripathy and U.N.Dash, *E-J Chem*., 2012;9(1):21-26

12.L.S. Singh, A. Jibanlata and N.R. Singh, *J.Ind.Chem.Soc* 1997;74, 635.

13.N.R. Singh, *J. Ind. Chem. Soc*., 1992;69, 279

14.T.Shedlovsky, D.A.MacInnes and L.G.Longworth, *"Limiting mobilities of some monovalent and ions and dissociation constant of acetic acid"* at 20°C, Nature,1932;75: 774775.

15.N.M. Singh, T.D. Singh, N. Yaiphaba and N.R. Singh, *Asian J. Chem*.,2008;20(3):1750-1759.

TABLE – 2 - CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATION OF 5-PHENYLETHIOCARBAMIDO-1-NAPHTHOL

SYSTEM: 1,4-DIOXANE + WATER AND AT DIFFERENT TEMPERATURES

Conc.	Temp.			ΔH	ΔS
0.01	25	2.5970	2.430008	-.14121	-.46069.7	-104.7151
0.00625	25	401.7436	2.603949	-.15107	-48552.4	110.3807
0.0025	25	381.4196	2.457168	-.14247	-45797.2	104.1364

Conclusion

From the investigation of the K, Λo, R, Kc, ΔG and ΔS at different temperatures and concentrations, it is concluded that surface tension decreases along the increasing temperature as well as on the addition of soapnut powder concentration.

Table 2 and 3 showed that there is no large variation in the experimental liquid values on addition of soapnut concentration from 85.48 to 68.48.

Table 3 and 4 showed that surface tension of liquid decreases due to addition of soapnut powder. On the heating this mixture up to 50 °c surface tension decreases in case of soapnut + Tide mixture surface tension decreases from 72.22 to 62.02 while surface tension increases slightly from 54.66 to 60.86.

Finally at last we conclude that, the addition of the detergent and soapnut on the surface tension decreases surface tension. Due to this detergents and soapnuts are used for making the soft water washing the clothes, and as a cleaning agent. Soapnuts will leave laundry fresh and clean and compared to other detergents can be used in all fabrics and all temperatures. The cleaning ability of soapnut is more effective than detergents at all temperatures.

References

[1] M. G. Freire, pedro J. Carvalho, antonio J. Queimada, Isabel M. Marrucho, and João A. P. Coutinho, "Surface tension prediction of ionic liquids using the parachor method", *J. Chem. Eng. Data*, 52 (5), 1820–1824, 2007.

[2] Ishwar B. Bhandare, "Reduction of Surface Tension by Surface Active Agents", International journal of Pharmacy and Pharmaceutical Sciences, 3(3), 2011.

[3] A. A. Hussein, "The surface tension-viscosity relation", *J. Chem. Phys.* 17 (3), 1949.

[4] Wendy Stevens, "Better bond breaking due to dihydrogen", *J. Am. Chem. Soc.*, 73 (9), 4016–4018, 1951.

[5] R. Parsons, "The surface tension of solutions", *Trans. Faraday Soc.*, 46, 918–924, 1950.

[6] A. J. Kovacinal, "Empirical demonstration of surface tension lowering and its role in coagulation", *J. Colloid Sci.*, 5, 1950.

[7] Ichiro Sakurada, "The role of surface tension in thermodynamic parameters values closely affected by molar concentrations and percentage compositions", *J. Colloid Sci.*, 5, 1950.

[8] J. Campbell, "Surface tension measurement by the drop weight technique", *J. Phys. Chem.*, 74, 1970.

[9] R. Ballard, "The Surface Tension of Water", *J. Colloids and Surfaces*, 36, 369-372, 1989.

[10] S. Sugden, "The determination of surface tension from the maximum pressure in bubbles", *Journal of the chemical society*, 121, 858-868, 1922.

These parameters shackle by another factors viz solute (drug)-solvent interactions, solvent-solvent interactions, solute-solute interactions, solvent-solvent-solute interactions and solute-solvent interactions. Variation in these parameters affected by the internal geometry as well as internal and intra hydrogen bonding

REFERENCES:

1 Samayeh Heydari , Roya Mohammadzade kakhki , *"Thermodynamic study of complex formation of b-cyclodextrin with ibuprofen by conductometric method and determination of ibuprofen in pharmaceutical drugs"*, Arabian Journal of Chemistry, xxx, xxx–xxx, 2013

2 S Chakraborty, D Shukla, A Jain, B Mishra and S Singh, *J Coll Int Sci*, 2009,355 ,242-249

3 A Jain, B Mishra and S Singh, C.W. Pouton, *"Drugs information for health care professional"* 17th Euro J Pharm Sci , 2006,29 ,278-287

4 Agrawal, S S Pandhal, N K Jaman, G P Agrawal, *Int J PHum* ,2004,274 149-155

5 G D Panchali and J C Gradeck, *J Pharm Sci*, 1974,68 728-732

6 U N Dash and S Supkar, *Proc Natl Acad Sci (India)*, 1985,55 A, P. Coutinho, 7 G F Pyo, N M Sastry and N R Singh, J Ind Chem Soc., 2000,77 ,146

8 W Al-Azzawi and H M Al-Jubaidin, *American J Condensed Matter Physics*, 2012,2(1) 16- 21

9 W Al-Azzawi, *J Ind Chem Soc*, 1999,38A ,939 (1999) Ed USDDI, 1666, 1992

10 M N Roy, D Nandi and D K Hazra, *J Ind Chem Soc*, 1993,70,121

11 S Bora, P M Dey, M Tripathy and U N Dash, *J Ind Chem Soc*, 1997,74, 835

12 L S Singh, A Jhanjata and N R Singh, *J Ind Chem Soc*, 1992,69, 279

13 N R Singh, *J Ind Chem Soc*., 1992,69, 279

14 T Shinoda and L G Longwarth, *"Limiting mobilities of some gunpowder and ions and dissociation of acetic acid at 20°C"*, Nature,1932,75 ,774775.

Interferometric investigation of 4-ethylthiocarbamido- phenol in 60% mixed solvent media

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Abstract:- Molecular and intermolecular interaction studied out by using ultrasonic interferometry. Recently ultrasonic velocity and density for solutions of 4-ethylthiocarbamidophenol (ETP) at different molar concentrations (ie 0.1M, 0.075M, 0.050M and 0.025M) and 303 K in 60% compositions of ethanol-water mixtures was investigated for determination of adiabatic compressibility (β), apparent molal compressibility (φk), apparent molal volume (φv), intermolecular free length (Lf), relative association (RA) and specific acoustic impedance (Z). These properties were studied to solute-solvent and solute-solvent interaction in solvent, which provide important and versatile information regarding internal structure, molecular association.

Key words:- 4-ethylthiocarbamidophenol (ETP), Interferometric measurements, solute-solvent interactions.

I. INTRODUCTION

Since last few decades ultrasound and ultrasonic **interferometric** study play a very role in the study of molecular interaction in liquid. This investigations for important to know the properties and significance of molecules. It was observed that many revolutions and new concepts in engineering, applied, industrial, mechanical, agricultural, medicinal, chemical sciences and space research were developed and explored through ultrasound and ultrasonic waves in the environment. Ultrasonic is a branch of science which deals with waves of high frequencies. 4- Thiocarbamido phenol molecule has various significances in different industries and also extensive valuable information regarding internal structure, molecular association, complex formation, internal pressure and solubility obtained from the study of ultrasonic parameters investigation in liquid phase[1-4] liquid mixtures[5-7] and electrolytic solution[8-9]. A comparative study of intermolecular interaction by experimental determination of ultrasonic velocities and isentropic compressibility in ethanol and dioxane solvents was reported by Ahluwalia et al[10]. Acoustical studies on solute-solvent interaction of ketones in cyclohexane and tetrahydrofuran at 308 K and molecular interaction, viscosity and density of binary liquid mixtures of amides with citric acid in pure and aqueous solutions at 303.15K and 308.15K were investigated[11-12].

Ultrasonic investigations of an organic liquids solutions provide an effective method of obtaining data on the ion solvent and solute-solvent and structure breaking effect making importance of solutes in aqueous solutions and density for solutions of 4-ethylthiocarbamidophenol (ETP) at different molar concentrations and 303 K, in 60% compositions ethanol-water mixtures and adiabatic compressibility (β), apparent molal volume (φv), intermolecular free length (Lf), relative association (RA) and specific acoustic impedance (Z). This investigation regarding to future effect of concentrations and temperature on various acoustical properties.

II. MATERIALS AND METHODS

All chemicals used in investigation are AR grade. Freshly prepared solution used during study. The solutions were purified by standard methods[13]. 0.1M, 0.075M, 0.050M, and 0.025M solutions of ETP in 60% ethanol-water mixture were prepared. Ethanol was purified by standard procedure[14]. Densities were measured with the help of Borosilicate pycnometer (10 ml) to an accuracy of ± 0.0001 gm. A digital thermostatic arrangement was done for density and ultrasonic velocity measurements. Electronic balance was used to weigh accurately. Mixing of water was carried out with the help of electric stirrer and ultrasonic.

Ultrasonic velocity measurement method[15-17]. The speed of sound waves was obtained by using variable path, fixed crystal interferometer (Mittal Enterprises, Model: MX-3) with accuracy ± 0.15% and frequency 1 MHz was used at the present work. The accurate and reproducible results of velocity in ethanol solvent were measured at 303 K for the calculation of thermodynamic parameters. The height and the value of thickness x constant (1.1 × 0.1) was taken.

RESULTS AND DISCUSSION:- In the present investigation measurements of densities and ultrasonic velocity of ETP in 60% ethanol-water mixtures have been carried out and given in Table No. 1.

Table-1.1: Average Ultrasonic Velocity of Water at 303K.

Sr.No.	No. of Rotation of Screw	Micrometer Reading (mm)	Difference Between Reading (mm)	Distance Travelled By Screw in One Rotation	Average Ultrasonic Velocity (meter)
1	5	2.47961	1.7621	1.37825	1403.6171.28
2	10	23.0307	3.7685	1.47548	
3	15	19.2925	3.6547	1.47389	
4	20	15.5878	3.7601	1.43217	
5	25	11.8277	3.7609	1.47081	
6	30	8.0709	3.7682	1.47541	
7	35	4.3126	3.7990	1.48771	
8	40	0.5235		10.48112	

Table-1.2: Average Ultrasonic Velocity of Pure Ethanol 303K (I0)

Sr. No	No. of Rotation of Screw	Micrometer Reading (mm)	Difference Between Reading (mm)	Distance Travelled By Screw in One Rotation	Average Ultrasonic Velocity (v) (m/sec)	Density (da) (Kg. m^{-3})	β x 10^{10} (Pa^{-1})
1.	5	13.9462	3.512	1.3731	1254.5	1028.42	4.9536149998
2.	10	11.8892	3.494	1.3691			
3.	15	8.3942	3.162	1.2872			
4.	20	5.2312	3.36	1.3151			
5.	25	1.8712		5.3812			

Table-1.3: Average Ultrasonic Velocity of 60% Ethanol 303K(I0)

Sr. No.	No. of Rotation of Screw	Micrometer Reading (mm)	Difference Between Reading (mm)	Distance Travelled By Screw in One Rotation	Average Ultrasonic Velocity (v0) (m/sec)	Density (d0) (Kg. m^{-3})	β0 x 10-10 (Pa-1)
1.	5	20.0646	3.6053	1.3542	1379.55	1022.5	4.9518436843
2.	10	16.3371	3.6254	1.4022			
3.	15	12.6135	3.5906	1.4182			
4.	20	8.923	3.5554	1.4342			
5.	25	5.3676		5.88297			

Table-1.4: Acoustic Parameters at Different Concentrations of [ETP] at 303 K in 60% E-W

Conc. C (Molality)	Average Ultrasonic Velocity V (m/sec)	Density d0 (Kg.m^{-3})	βx10^{10} (pa^{-1})	φv (m^{3}mol^{-1})	φk x10^{10}	Lf (Å)	RA	Z = 10^5 (Kgm^{-2} sec^{-1})
0.1	1525.719	1031.32	1.2855	0.1723	-35.747	0.0186	0.964	181.675
0.075	1498.819	1028.32	1.3295	0.2017	-9.522	0.0254	0.984	179.104
0.050	1465.861	1025.22	1.4056	0.2395	9.1667	0.0172	1.005	150.061
0.025	1345.081	1021.43	1.5423	0.2878	21.796	0.0179	1.038	140.869

CONCLUSIONS

Table-1.4 showed resultant values of acoustic parameters of ETP in (0.1M, 0.075M, 0.050M and 0.025M) and 303K in 60% ethanol-water mixtures. From Table-1.4 it was concluded that, Ultrasonic Velocity (U), Density (d) increases while Adiabatic compressibility (β), Apparent molal volume (φv), Apparent molal compressibility (φk), Intermolecular free length (Lf), Relative association (RA) increases and Specific acoustic impedance (Z) decreases along with decreasing concentration of ETP at 303 K. By using ultrasonic interferometric study Ui, di, βi, φv, φk, Lf, RA, Z etc. acoustic properties were determined, which explain how these interactions occur and responsible for breaking and making of the structure in the solution.

REFERENCES

[1] C N Deshmukh, A G Doshi, Pratibha Agrawal and C M Deshmukh, *Ultra Science* Vol (3),535, (2002)

[2] R P Varma, Surendra Kumar, *Ind. J. Pure Appl. Phy*.,38(2),96, (2000)

[3] N A Kalambe, P B Raghuwanshi and A K Maldhure, *Ind. J. Chem. Sci*.,12(2), 730, (2014)

[4] P B Raghuwanshi and A D Deshmukh, *Ind. J. Chem. Sci*.,11(1),141, (2013)

[5] S K Upadhyay, *Ind. J. Chem*.,39(5),537, (2000)

[6] A Ali, K Tiwari, A K Nain and V Chakravarty, *Ind. J. Phy. Pt.* B,74(5),351, (2000)

[7] S Gammaba and B R Rao, *Ind. J. Pure and Appl. Phy*.,7, (1969)

[8] Rita Mehara, *Ind. J. Chem*.,44A(2),1834 , (2005)

[9] P R Malasne and A S Aswar, *Ind. J. Chem*.,44A(12),2490, (2005)

[10] S S Aswale, P B Raghuwanshi and D T Tayade, *Ind. J. Chem. Soc*.,84,159, (2007)

[11] A A Mistry, V D Bhandarkar and O P Chimankar, *J. Chem. Pharm. Res*.,4(1),170, (2012)

[12] S K Pradhan, S K Dash, L Moharana and B B Swain, *Ind. J. Pure. Appl. Phy*., 50, 161, (2012).

[13] Vogel, "A text Book of Quantitative Inorganic Analysis", 3 rd Edition, ELBS 1st Edition, Reprint (1968).

[14] B Jacobson, *J Chem Phy*., 20,927, (1952).

THERMODYNAMIC PARAMETERS INVESTIGATION OF SUBSTITUTED THIOCARBAMIDONAPHTHOL

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ABSTRACT

Recent protection of environment and ecosystem become urgent task for survival of the humanity. The various investigations on chemical and industrial wastes are developing real risk to the mankind, researchers are examining the significance and applications of synthesized drugs can be determined with the help of certain common parameters and studies. Some specific pharmacological properties and biological activities. Considering all this fact we determined the solution parameters and thermodynamic parameters of Synthesized chemical compounds in different concentrations and different temperatures at 303K, 298K and 293K.

Keywords: *Substituted thiocarbamido-2-naphthol, thermodynamic parameters.*

INTRODUCTION

Conductivity of drug plays a vital role to explain pharmacodynamic of drug. Mobility of ions transmission of ions, solubility and permeability of drugs efficiently influence by mobility of ions in electrolytic solution. Ions are the same biochemical elements which are accountable for effective transmission and pain in nerve and cell excitation. Nowadays pharmaceutical technologists face a great challenge to use the solubility and dissolution rate and oral bioavailability of weakly water soluble drugs. Hydrogen bonding is considered as one of the sophisticated methods of solubility to enhance the aqueous solubilization of insoluble drugs by adding hydrotropic agents, number of researchers work on the effect of solubility enhancer[1]. The Validity of exemption about water-sulfate and polyethylene interaction theory from the conductometric measurements. Thomas and Al-Jandeel[2] have investigated some associations of divalent cadmium electrolyte $CdNO_3$ with $K_4Fe(CN)_6$ in mixed dimethyl sulfoxide-water solvents at different temperatures by conductometric measurements. Conductometric measurements of the alkali metal in different proportion of mixed solvents have carried out in Dioxane and Ethanol and K. et al. [3] have investigated the thermodynamic parameters and Walden product of different complexes and they also examine the composition of aqueous metal complexes among the ligands group[4]. The ion pair formation and the conductance behaviour of glycine, lactic acid, anthranilic acid and p-aminobenzoic acid (III) family in water-methanol mixture at different temperatures was investigated by Singh et al[5]. Recent work deals with thermodynamic parameters (viz. ΔH, ΔS and ΔG) study of 3-phenylthiocarbamido-2-naphthol by conductometric measurement at different concentrations and different temperatures in 50% ethanol-water mixture. These studies also contribute to solute-solvent, solute-solute and solute-solute interactions and the effects of various substituent.

MATERIALS AND METHODS EXPERIMENTAL

All AR grade chemicals used during present investigation. Freshly prepared solution used for analysis. The solution was purified by standard method. Prepared 0.01M, 0.00858, 0.0125M and 0.0128M concentrations of 3-phenyl thiocarbamido-2-naphthol 50% ethanol-water mixture. Maintain the thermal equilibrium (293K and 298K) of drugs solution by using thermostat. After getting thermal equilibrium, conductivity of the electrolytic solution was measured.

RESULT AND DISCUSSION

Freshly prepared solutions of 0.01 M concentration then by serial dilution method prepared solutions of 0.00858M, 0.0025M and 0.0012M with 50% ethanol-water mixture. Measured conductance of each solution by using Conductivity Bridge at 293K and 298 K. The result obtained are given in Table-1 to Table-3. From the data observed conductance (G), specific conductance (k) and molar conductance (Λ_m) were determined by formula. (Diagram omitted)

TABLE – 1 : CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATIONS OF 3-PHENYL THIOCARBAMIDO-2-NAPHTHOL

DETERMINATION OF G, k and Λ_m AT DIFFERENT CONCENTRATIONS AND DIFFERENT TEMPERATURES AVAILABLE

Temp.	Concentration C (M)	Observed conductance (mho)	Specific conductance (k)	Molar conductance (Λ_m)
293K	0.01	[illegible]	[illegible]	[illegible]
	0.008	[illegible]	[illegible]	[illegible]
	0.0025	[illegible]	[illegible]	[illegible]
	0.0012	[illegible]	[illegible]	[illegible]
298K	0.01M	[illegible]	[illegible]	[illegible]
	0.00858M	[illegible]	[illegible]	[illegible]
	0.0025M	[illegible]	[illegible]	[illegible]
	0.0012 M	[illegible]	[illegible]	[illegible]

Table 1 reveal that the observed conductance (G), specific conductance (k) decreases and molar conductance (Λ_m) increases slowly with decreasing concentrations and G, k and Λ_m increases sharp increasing temperatures. The specific conductance increases with increasing temperature. Calculated values the specific conductance (k), log (k/c) and thermodynamic parameters viz. ΔG, ΔH and ΔS of 3-phenylthiocarbamido-2-naphthol by known literature methods at different concentration with different temperatures. Obtained results are mentioned in

Table 2

TABLE – 2 : CONDUCTOMETRIC MEASUREMENTS AT DIFFERENT CONCENTRATION AND DIFFERENT TEMPERATURES READS 3-PHENYL THIOCARBAMIDO-2-NAPHTHOL

DETERMINATION OF $\log_{10}(k/c)$, $\log_{10}(\Lambda_m)$, ΔG, ΔH and ΔS AT DIFFERENT CONCENTRATIONS AND DIFFERENT TEMPERATURES

SYSTEM – I : [illegible] MEDIUM – 50% Ethanol-Water Mixture

Temp(K)	Conc. M	$\log_{10}(k/c)$	$\log_{10}(\Lambda_m)$	ΔG	ΔH	ΔS
293K	0.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.008	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.0025	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.0012	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
298K	0.01	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.008	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.0025	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0.0012	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The change in thermodynamic parameters values mainly affected by temperature, molar concentrations and percentage compositions. These parameters should be another factors viz. the solute (drug)-solvent interactions, solvent-solvent interactions and solute-solute-solvent interactions. Variation in these parameters affected by the structural geometry as well as external and intermolecular bonding.

As observed the conductance increases with decreasing in concentration and increasing temperature indicates that the solution has higher mobility of ions. This is due to the fact that increased thermal energy results in greater bond breaking due to dilution and increasing temperature respectively. Also negative values of ΔG indicates that reaction is spontaneous. Negative values of enthalpy change (ΔH) suggests exothermic reaction. Favorable at lower temperature and positive value of ΔS reveals entropically favorable. The change in thermodynamic parameters values mainly affected by molar concentrations and percentage compositions. These parameters should be another factors viz. solute (drug)-solvent interactions, solvent-solvent interactions, solvent-solvent interactions and solute-solute-solvent interactions. Variation in these parameters affected by the structural geometry as well as external and intermolecular bonding.

REFERENCES

1. Somayeh Heydari , Roya Mohammadzade kakhki , "Thermodynamic study of complex formation of b-cyclodextrin with ibuprofen by conductometric method and determination of ibuprofen in pharmaceutical drugs", Arabian Journal of Chemistry, xxx, xxx–xxx(2013)
2. S. Chakraborty, D. Shukla, A. Jain, B.Mishra and S. Singh, J. Coll Int. Sci., 355, 242-249,(2009).
3. A. Jain, B. Mishra and S. Singh. C.W. Pouton, "Drugs information for health care professional" 17th Euro. J. Pharm Sci., 29, 278-287,(2006).
4. S. Agrawal, S.S. Pancholi, N.K. Jaiman, G.P. Agrawal, Int J Pharm ,274,149-155,(2004)
5. G.D Pancholi and J.C.Gradock, J. Pharm Sci., 68,728-732,(1974)
6. U.N Dash and S.Supkar, Proc. Ind Acad.Sci Chem Soc ,107, 541,(1995)
7. G.C Bag, N.M.Singh and N.R. Singh, J. Ind. Chem. Soc., 77, 146,(2000).
8. E.A. Gonna and B.M. Al-Jahadalli, American J Condensed Matter Physics,2(1),16- 21,(2012).
9. W.A.L. Izonfuoand, C.C. Obunwa, Ind. J Chem., 38A,939,(1999). Ed., USPDI, 1646, (1997)
10. M.N. Roy, D. Nandi and D.K. Hazra, J.Ind.Chem.Soc.,70,121,(1993).
11. C.S. Solanki, P.Mishra, M.K. Talari, M. Tripathy and U.N.Dash, E-J Chem., 9(1),21-26,(2012).
12. L.S. Singh, A. Jibanlata and N.R. Singh, J.Ind.Chem.Soc.,74, 635,(1997).
13. N.R. Singh, J. Ind. Chem. Soc., 69, 279,(1992).
14. T. Shedlovsky, D.A.MacInnes and L. G. Longworth. "Limiting mobilities of some monovalent and ions and dissociation constant of acetic acid" at 20°C, Nature,75, 774775, (1932)
15. N.M. Singh, T.D. Singh, N. Yaiphaba and N.R. Singh, Asian J Chem.,20(3),1750-1759,(2008).

To Determine the Cleaning Ability of Soapnut

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Abstract

The present research work regarding to investigation cleaning ability of soap nut from surface tension determination by stalagmometer. Surface tension investigated by using stalagmometer. This work help to investigate cleaning ability of soap nut as well as these different mixture with various detergents. In present work we were observed decrease in surface tension of soap nut and their detergent mixtures at different temperatures.

Keywords: Stalagmometer, a small rubber tube with a screw pinch cock, different types of detergent, soapnut solution, burette stand.

Introduction

Surface tension is the phenomenon in which the surface of a liquid is in a contact with gas, acts like a thin elastic sheet. The stalagmometric method is one of the most common methods used for the surface tension determination. This method was first time described by Tate in 1864. Molecules of most detergents and soaps are long chain hydrocarbon molecules with an ionic group at one end usually carrying a negative charge, thus making it an anion. This charge is balanced by the opposite charge of a soluble cation, for example Na. The effect of these molecules on the water surface is to considerably weaken the forces between water molecules there thus lowering the surface tension.

Mlle. Dupre investigated surface tension *Haloid* compounds. *A Hantz*[1] investigated reduction of surface tension by *surface active agents*. *A. Buchler*[2] investigated the surface tension is exactly relation. *W. M. Schwartzee* and *H.W. Mosteley*[3] were studied about the surface tension of liquid crystals. *R. Lucas*[4] identified the surface tension of sulphur. *A. J. Rayment* investigated determination of surface tension. *E.E. Burrell* determined rate of surface tension lowering and its role in foaming. *J. Campbell*[5] was determined the surface tension measurement by the drop weight technique. *N.K. Pallas* and *B. Pethica* investigated the surface tension of water. *S. Sugden* studied surface tension from the maximum pressure in bubbles[6].

Experimental and Methodology:

All AR grade chemical used through this experiment. Clean the Stalagmometer with chromic acid, wash with water and dry it. Immerse the lower end of the stalagmometer in distilled water and suck the water 1-2cm above mark A. Adjust the pinch cock so that 10-15 drops fall per minute. Repeat the reading to take three to four readings. Rinse the stalagmometer with alcohol and dry it. Similarly take the solution of detergents and soapnut and repeat above process. Now take 3-4 readings of each solution along with water at 50°C temperature by applying water process. Now mix the detergents with soapnut solution in various (1:1) composition. Take the 3-4 readings of each solution at 28°C temperature. Also take 3-4 readings of mix solutions at 50°C temperature.

Result and Discussion:

Determine Surface tension of different experimental liquid at different temperatures by using Stalagmometer. Experimental liquid solution prepared by mixing of soap nut powder at different proportional and investigation carried out at different temperatures. Observation table are given bellow.

Table-1 Surface tension of liquids at 28°C temperature

Liquid	No. of drops				Surface tension
	1	2	3	Mean	
Water	89	98	95	90	73.05
Soapnut	74	80	77	77	85.38
Ghadi	118	132	114	134	99.00
Surfexel	113	129	123	120	32.17
Tide	118	124	120	117	96.18

Table-2 Surface tension of liquids at 50°C temperature

Liquid	No. of drops				Surface tension
	1	2	3	Mean	
Water	66	74	72	70	75.66
Soapnut	93	95	100	96	68.96
Ghadi	119	123	121	121	54.53
Surfexel	120	121	124	121.66	54.03
Tide	115	119	124	119	55.08

Table-3 Surface tension of mix liquids at 28°C temperature

Liquid	No. of drops				Surface Tension
	1	2	3	Mean	
Water	85	90	95	90	73.05
Soapnut	74	80	77	77	85.38
S+Ghadi	87	96	89	88.66	74.20
S+Surfexel	123	129	130	127.33	51.66
S+Tide	66	76	72	71.33	92.22

Table-4 Surface tension of mix liquids at 50°C temperature

Liquid	No. of drops				Surface Tension
	1	2	3	Mean	
Water	66	74	72	70	75.66
Soapnut	93	95	100	96	68.96
S+Ghadi	110	108	109	109	60.31
S+Surfexel	107	108	111	108	60.86
S+Tide	107	108	104	106	62.01

Conclusion

From the table no 1, 2, 3, and 4 it is conclude that surface tension decreases along the increasing temperature as well as on the addition of soapnut powder.

Table 1 and 2 showed that there is no large variation found in surface tension of experimental liquid while surface tension of soapnut decreases from 85.38 to 68.48.

Table 3 and 4 showed that surface tension of liquid decreases due to addition of soapnut powder. On the heating this mixture up to 50 °c surface tension decreases in case of soapnut + Tide mixture surface tension decreases from 92.22 to 62.01. While surface tension increase slightly from 51.66 to 60.26.

Finally at last we conclude that, the addition of the detergent and soapnut on the surface tension decreases surface tension. Due to this detergents and soapnut are used for making the soft water, washing the clothes, and as a cleaning agent. Soapnuts will leave laundry fresh and clean and compared to other detergents. It can be used on all fabrics and at all temperatures. The cleaning ability of soapnut is more effective than detergents at all temperatures.

References

[1] M. G. Freire, pedro j. Carvalho, antonio j. Queimada, isabel m. Marrucho, and joão a. P. Coutinho, "surface tension of liquid fluorinatedcompounds", j. Chem. Eng. Data, 51 (5), 1820–1824, 2006.

[2] A. Hazra, "Reduction of Surface Tension by Surface Active Agents", International Journal of Pharmacy, 5(1), 42-45, 2015.

[3] C. A. Bunker, "the surface tension-viscosity relation", j. Phys. Chem., 42 (9), 1207–1209, 1937.

[4] W. M. Schwartz, h. W. Moseley, "the surface tension of liquid crystals", j. Phys. Chem., 51 (3), 826–833, 1947.

[5] P. Ewell, "the surface tension of sulphur", j. Am. Chem. Soc., 72 (9), 4016–4018, 1950.

[6] A. J. Rosenthal, "Determination of surface tension", j. Chem. Educ., 78 (1), 112, 2001.

[7] R. J. Bostock, "The rate of surface tension lowering and its role in foaming", j. colloid sci., 5, 421-436, 1950.

[8] J. Campbell, "surface tension measurement by the drop-weight technique", j. physics d, 10, 1459-1464, 1976.

[9] W. P. Fuller, N. A. Pethica, "The Surface Tension of Water", Colloids and Surfaces, 16, 369-372, 1986.

[10] S. Hutton, "determination of surface tension from the maximum pressure in bubbles", journal of the chemicalsociety, 121, 814-844, 1922.

Ultrasonic studies of some substituted drug such as Doxycycline and Dexamethasone in dioxane-water and DMF-water mixture

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ract: Ultrasonic velocity of Doxycycline i.e. 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12a octahydro 3,6,10,12,12a Pentahydroxyl-1,11-dio. hthacence-2-carboxamide and Dexamethasone i.e. 9-fluro-11β,17,21 trihydroxy-16α methyl pregna-1,4-diene, 3,20 dion. in dioxan er and DMF-water mixture have been determined. From these measured values, apparent molal volume (ϕ_v), partial molal volume (ϕ^0 iabatic compressibility $\phi_{K(0)}$, intermolecular free length (L_f) and relative association have been calculated at 305° K. observed and calculated values have been used to explain molecular association due to strong ion-ion interactions. The above study m elpful in understanding the dynamics between metal ions and above drug.

words- apparent molal volume, partial molal volume, adiabatic compressibility, intermolecular free length, relative association.

roduction

he recent years, ultrasonic waves have acquired the status of an important probe for the study of structure and properties of matter. In the fie echnology, ultrasonic waves are being used for detection of flows, testing of materials, mechanical cleaning of surface etc. In medic nces too, the ultrasonic waves are being used to diagnose bone fractures, cancer, tumors, foetal condition and in physiotherapy, bloodle gery, gynecology etc. Present day applications of ultrasonic are emerging in the field of forensic science space research and in wars. Adiabat mpressibility and apparent molal compressibility have been used to study the relative association, specific constant factor and solvatio nber of the system. The study of molecular interactions in liquid provides valuable information regarding internal structure molecul ociation, complex formation internal pressure etc. Ultrasonic velocity and absorption studies in case of electrolyte solutions have led to a no ight into the process of ion association and complex formation. [1-2] Tabhane et.al[3] have investigated the cluster approach to thermodynam avior of ligand mixture of acrolein in methanol-cyclohexane and dioxane using Khasare's equation of state[4]. A.P. Mishra[5] has studied t asonic velocities of some bio-applicable system involving $ZnCl_2$, dextrose and methionine in water. The apparent and partial molal volume ctrolyte solutions has proved a very important tool in elucidating the structural interactions i.e. ion-ion, ion-solvent and solute-solve ractions occurring in solutions. Partial molal volumes and adiabatic compressibility properties reflect the structural interactions with wat lecules or organic solvent molecules and therefore some substituted drug such as Doxycycline and Dexamethasone are selected for the estigations.

rasonic study of interactions in ternary solutions has been done by Pandey et.al[6]. Aswar[7] studied the interactions between bio-molecul olving Mg ion in aqueous solutions. The compressibility and apparent molal volume of any electrolyte in mixed organic solvents are fou earlier.[8] The compressibility and apparent molal volume of peptides in aqueous as well as water-organic solvent mixtures are studied l o[9]ade et.al[9]. But compressibilities and apparent molal volumes of substituted drugs in water-organic solvent mixtures are not studied Thus we herein present the ultrasonic systematic studies of substituted drugs in dioxane-water and DMF-water mixtures.

perimental

terials and Reagents

analytical grade chemicals and solvents used were obtained from Merck, India. The distilled water used has a specific conductivity of abo 0^{-6} ohm^{-1}cm^{-1}. Stock solutions of Doxycycline and Dexamethasone were prepared in different percentage of dioxane-water and DMF-wat tures. Ultrasonic velocity (2 MHz) was measured by single crystal path interferometer with an accuracy of 0.03%. The density measurement e carried out at 305° K.

The apparent molal volumes (ϕ_v) and apparent molal adiabatic compressibility $\phi_{K(0)}$ of Doxycycline and Dexamethasone in solutions a ermined from density (ds) and adiabatic compressibility (β_s) of solution using following equations

$$\phi_v = \left\{ \frac{(d_0 - d_s) \times 10^3}{m\, d_s \cdot d_0} \right\} + \frac{M}{d_s} \quad \text{---------- (1)}$$

ere M is molecular weight of the solute, m is the molality of solution, do is the density of the solvent and ds is the density of the solution.

$$\phi_{K(0)} = \left\{ \frac{(\beta_s d_0 - \beta_0 d_s) \times 10^3}{m\, d_s \cdot d_0} \right\} + \frac{\beta_s M}{d_s} \quad \text{------ (2)}$$

ere β_s is the adiabatic compressibility of solution and β_0 is the adiabatic compressibility of solvent which can be calculated by

$$= \frac{100}{U_i^2 \times d_i} \quad \text{------ (3)} \quad \text{for solution and}$$

$$= \frac{100}{U_0^2 \times d_0} \quad \text{------ (4)} \quad \text{for solvent}$$

re U_i & U_0 are the ultrasonic velocities of ultrasonic waves in solution and solvent respectively.

wing i.e. C_i and molecular weight of pyrazoline and isoxazolines, the values of ϕ_v and $\phi_{K(i)}$ are calculated. The values of ϕ_v and $\phi_{K(i)}$ a ted against molality (m) of pyrazoline and isoxazolines. The curve represented the least square and ϕ_v and $\phi_{K(i)}$ can be given as

$$= (\phi^0_v - S_v m) \quad \text{------ (5)}$$

$$= (\phi^0_{K(i)} + Sk_{(i)} m) \text{------ (6)}$$

ere $\phi^0_v = v^0$ and $\phi^0_{K(i)} = k^0$ are the infinite dilution partial molal volumes and adiabatic partial molal compressibilities respectively. S_v and Sk the experimental slopes.

$\phi_{K(i)}$ and ϕ_v values of Doxycycline and Dexamethasone in two mixed solvents are calculated and given in Table 1 to 11.

intermolecular free length (L_f), specific acoustic impendence (z) and relative association (R_A) are calculated by using the following relation

$$= K \times (B_s)^{1/2} \quad \text{------ (7)}$$

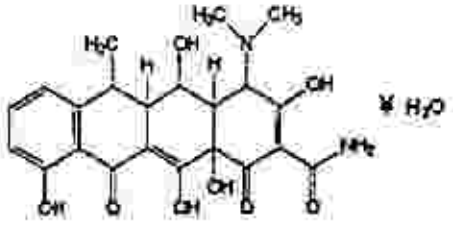
ere K is Jacobson's constant = 6.0186×10^1 and

$$Z = U_i \times d_s \quad \text{---------(8)}$$

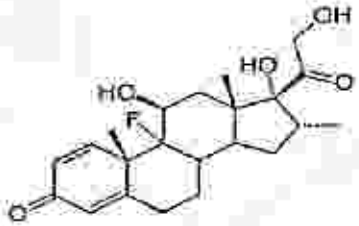
$$R_A = ds/d0\ (U_0/U_i)^{1/3} \quad \text{---------(9)}$$

The ligands used in these investigations are

1) **Doxycycline** i.e. 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12a octahydro 3,6,10,12,12a Pentahydroxyl-1,11-dioxo naphthacence-carboxamide



2) **Dexamethasone** i.e. 9-fluro-11β,17,21 trihydroxy-16α methyl pregna-1,4–diene, 3,20 dion.



esults and Discussion

ne experimental and calculated values of ultrasonic velocities (U_i), densities (ds), adiabatic compressibilities (β_s), apparent adiaba mpressibility (ϕk_s), relative association (R_A), specific acoustic impendence (z), apparent molal volume (ϕ_v) and intermolecular free length (I - Doxycycline and Dexamethasone are tabulated in Table No. 1 to 8. These values have been used to discuss the interaction s of unlil olecules of solvent in presence of solute. The variation of ultrasonic velocity in solution depends on the intermolecular free length on mixti the basis of a model for sound propagation proposed by Erying and Kincaid[30].

ne graphs are plotted between ϕk_s versus mole fraction of organic solvent and are found to be linear over the entire range of mole fractio cept one of the point, in each plot, one of the points is significantly away from the linearity. Therefore ϕk_s measurements for these organ bstances are limited for those mole fractions where linearity is being followed and this seems the range of dilute solutions.

inear pattern of the graphs is observed in dioxane-water and DMF-water as shown in graph no. 1 to 3. The plot between U_i and mole fraction ganic solvents are shown in graph no. 4 to 6 and shows that U_i values varies inversely with percentage / mole fraction of organic solvent. ne plot between ϕk_s and mole fraction of organic solvents indicates that ϕk_s values increases with increasing percentage / mole fraction ganic solvent. Pankanti and Jahagirdar[31] have investigated apparent molal compressibility for amino acids in dioxane-water and acetone-wat edia. It is observed that ϕk_s decreases upto 40% organic solvent-water mixture.

esent work reveals the increase in (ϕk_s) values above 70% organic solvent–water mixture (Table 1 to 8). This fact shows that ϕk_s increases gher percentage of organic solvent –water mixture. This suggests that loss of compressibility of water due to electrostatic forces in the vicini ions causing electro-strictive hydration of ions. The apparent molal volume (ϕ_v) has been calculated from density data of solution usi uation (2). The data obtained are in well agreement with Masson equation as the plot of ϕ_v against $(c)^{1/2}$ or mole fraction is linear. The l

of substituted pyrazoline and isoxazolines are found to increase with increasing percentage of organic solvent –water mixture. Das ed the apparent molal volume (ϕ_v) of univalent ions up to 30% dioxane-water mixture and reported that ϕ_v values of these ions increas increase in dioxane content in dioxane-water mixture. In the present investigation it is found that the values of ϕ_v values are higher ane-water mixture as compared to DMF-water mixture due to decreasing dielectric constant of medium[1]. It can be explained by postulati the polar –OH group interact with the surrounding organic solvent-water mixture through dipole-dipole interaction in such away that t ounding water losses its own compressibility to certain extent.

e ϕ_v values are found to be decrease in the following order of organic solvent-water mixture – dioxane-water< DMF-water, whi est that Doxycycline and Dexamethasone are extensively hydrated in dioxane-water mixture than DMF-water mixture. This can l ained on the basis of higher polarity of dioxane-water mixture than DMF-water mixture. Dipole induced- dipole interactions between unlil cules are more in dioxane-water mixture.

e present investigation, the values of L_f, R_A and Z are also evaluated (Table 1 to 8). It could be seen from above table that intermolecular fr it increase linearly with increasing concentration of Doxycycline and Dexamethasone. This indicates that there are significant interactio een ions and solvent molecules suggesting structure-promoting behaviour of added electrolyte molecule. This may also imply that decrea mber of free ions showing the occurrence of ionic association due to strong ion-ion interactions. Relative association (R_A) is influenced l factors- 1) the breaking up of solvent molecules on addition of electrolyte to it. And 2) the solvation of ions that simultaneously present t er resulting in decrease and later increase of relative association. The increase of R_A with concentration suggest that solvation of io ominates over the breaking up of solvent aggregates (water-water, water-dioxane and water-DMF) on addition of pyrazoline a zolines. It is observed from the table that there is linear variation of R_A signifies the weaker association between solvent and solu ecules.

rences

[1] S.K. Kor and S. S. Bhatt, *Indian J. Pure Appl. Phys.*, 1969, 7, 184.
[2] V.S. Soitkar and S.N. Jajoo, *Acoustic Lett.*, 1984, 7, 191.
[3] V.A. Tabhane, V.T. Bhandarkar and S.B. Khasare, *Indian J. Pure Appl. Phys.*, 1995, 33, 248.
[4] S.B. Khasare, *Indian J. Pure Appl. Phys.*, 1993, 31,224.
[5] A.P. Mishra, *Indian J. Chem.*, 2004, 43A, 730.
[6] V. Wadhwani, Y. Akhtar and J.D. Pandey, *Proc. Indian Acd. Sci.* 1997, 109, 353.
[7] A.S. Aswar, *J. Pure Appl. Ultrason.*, 1998, 20, 82
[8] S.D. Hamann and S.C. Limb, *Aus. J. Chem.*, 1954, 7, 329
[9] B.G. Khobragade and M.L. Narwade, Ph.D. thesis in Chemistry, Amravati University, Amravati, 1999.
[10] H. Erying and J.F. Kincaid, *J. Chem. Phys.*, 1938, 6, 620
[11] S.U. Pankanti and D.V. Jahagirdar, Ph.D. thesis in Chemistry, Marathwada University, Aurangabad, 1986.
[12] P.B. Das, *J. Indian Chem. Soc.*, 1989, 66, 380
[13] P.B. Das, *Electrumechim. Acta*, 1981, 26, 1099.

Table No. 1

Ultrasonic velocities (U_s), densities (ds), adiabatic compressibilities (β_s) and intermolecular free length (L_f) at different concentration f ligand in different percentage of dioxane-water mixture at 303 K. System L_1 **Doxycycline** i.e. 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12 ctahydro 3,6,10,12,12a Pentahydroxyl-1,11-dioxo naphthacence-2-carboxamide

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

% Dioxane	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibilities (β_s)	Inter molecular free length (L_f)
95	9.5×10^{-3}	1411.2	1.0538	4.76×10^{-5}	4.15×10^{-2}
90	9.0×10^{-3}	1427.2	1.0633	4.61×10^{-5}	4.08×10^{-2}
85	8.5×10^{-3}	1457.6	1.0604	4.43×10^{-5}	4.00×10^{-2}
80	8.0×10^{-3}	1469.0	1.0549	4.33×10^{-5}	3.91×10^{-2}
75	7.5×10^{-3}	1507.2	1.0588	4.17×10^{-5}	3.88×10^{-2}
70	7.0×10^{-3}	1535.0	1.0593	4.00×10^{-5}	3.80×10^{-2}

Table No. 2

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R_A) f different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

System L_1 **-Doxycycline** i.e. 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12a octahydro 3,6,10,12,12a Pentahydroxyl-1,11-dioxo naphthacence-2-carboxamide Ultrasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5×10^{-3}	-692.0	-1.99×10^{-4}	1.0063	1.487×10^{7}
9.0×10^{-3}	-1695.6	-4.34×10^{-4}	1.0116	1.517×10^{7}

8.5 X 10^{-3}	-1515.5	-6.45 X 10^{-4}	1.0017	1.545 X 10^{3}
8.0 X 10^{-3}	-1011.7	-9.01 X 10^{-4}	0.9879	1.578 X 10^{3}
7.5 X 10^{-3}	-1181.9	-10.58 X 10^{-4}	0.9892	1.595 X 10^{3}
7.0 X 10^{-3}	-1788.2	-13.663 X 10^{-4}	0.9838	1.620 X 10^{3}

Table No. 3

rasonic velocities (U_s), densities (ds), adiabatic compressibilities (β_s) and intermolecular free length (L_f) at different concentratio ligand in different percentage of dioxane-water mixture at 303 K.

stem L_2- **Dexamethasone i.e. 9-fluro-11β,17,21 trihydroxy-16a methyl pregna-1,4-diene, 3,20 dion.**

rasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

% Dioxane	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibilities (β_s)	Inter molecular free length (L_f)
95	9.5 X 10^{-3}	1374.4	1.0679	4.957 X 10^{-5}	4.237 X 10^{-2}
90	9.0 X 10^{-3}	1409.6	1.0546	4.772 X 10^{-5}	4.157 X 10^{-2}
85	8.5 X 10^{-3}	1476.8	1.0423	4.399 X 10^{-5}	3.991 X 10^{-2}
80	8.0 X 10^{-3}	1539.2	1.0529	4.008 X 10^{-5}	3.810 X 10^{-2}
75	7.5 X 10^{-3}	1569.6	1.0562	3.843 X 10^{-5}	3.731 X 10^{-2}
70	7.0 X 10^{-3}	1596.8	1.0740	3.651 X 10^{-5}	3.636 X 10^{-2}

Table No. 4

pparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R different concentrations of ligand in different percentage of dioxane-water mixture at 303 K.

stem L_2 - **Dexamethasone i.e. 9-fluro-11β,17,21 trihydroxy-16a methyl pregna-1,4-diene, 3,20 dion.**

rasonic frequency: 2MHz Temperature: 303 K Medium: Dioxane-water

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)
9.5 X 10^{-3}	-1127.2	-1.994 X 10^{-4}	1.0119	1467.72
9.0 X 10^{-3}	120.87	-3.400 X 10^{-4}	0.9909	1486.56
8.5 X 10^{-3}	1431.21	-7.194 X 10^{-4}	0.9643	1539.26
8.0 X 10^{-3}	290.25	-12.840 X 10^{-4}	0.9607	1620.02
7.5 X 10^{-3}	-107.50	-15.960 X 10^{-4}	0.9576	1657.81
7.0 X 10^{-3}	-2429.31	-20.537 X 10^{-4}	0.9576	1714.96

Table No. 5

trasonic velocities (U_s), densities (ds), adiabatic compressibilities (β_s) and intermolecular free length (L_f) at different concentratio ligand in different percentage of DMF-water mixture at 303 K.

m L_1 - Doxycycline i.e. 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12a octahydro 3,6,10,12,12a Pentahydroxyl-1,11-dioxo naphthacence-2-boxamide

trasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

% Dioxane	Conc. in mol dm^{-3}	Ultrasonic velocities	Densities (ds) in g cm^{-3}	Adiabatic compressibilities (β_s)	Inter molecular free length (L_f)
95	9.5 X 10^{-3}	1520.8	0.9867	4.381 X 10^{-5}	398.36
90	9.0 X 10^{-3}	1542.4	0.9912	4.240X 10^{-5}	391.90
85	8.5 X 10^{-3}	1611.2	0.9726	3.960X 10^{-5}	378.74
80	8.0 X 10^{-3}	1611.2	0.9950	3.871X 10^{-5}	374.46
75	7.5 X 10^{-3}	1628.8	0.9825	3.836X 10^{-5}	372.76
70	7.0 X 10^{-3}	1651.2	1.032	3.554X 10^{-5}	358.80

Table No. 6

pparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_s), specific acoustic impendence (z) and relative association (R different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

stem L_1 - **Doxycycline i.e. 4-(dimethyl amino) 1,4,4a,5,5a,6,11,12a octahydro 3,6,10,12,12a Pentahydroxyl-1,11-dioxo naphthacence-2-boxamide**

trasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

Conc. in mol dm^{-3}	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_s)	Relative association (R_A)	Specific acoustic impendence (z)

4.5 X 10⁻³	1491.02	-3.2[illegible] X 10⁻⁴	0.9907	1508.47
5.0 X 10⁻³	-3811	-3.[illegible]8 X 10⁻⁴	0.9906	1528.82
5.5 X 10⁻³	3850.2	-4.3214 X 10⁻⁴	0.9959	1567.05
6.0 X 10⁻³	-3[illegible]0.90	-4.[illegible]65X 10⁻⁴	0.9850	1603.24
6.5 X 10⁻³	-3[illegible]8.82	-4.[illegible]20X 10⁻⁴	0.9642	1600.29
7.0 X 10⁻³	-4558.08	-4.9178X 10⁻⁴	1.0506	1704.03

Table No. 7

Ultrasonic velocities (U_s), Densities (d), adiabatic compressibilities (β_a) and intermolecular free length (L_f) at different concentratio of ligand in different percentage of DMF-water mixture at 303 K.

System L_7 - Dexamethasone i.e. 9-fluro-11β,17α trihydroxy-16α methyl pregna-1,4-diene, 3,20 dion.

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

% Dioxane	Conc. in mol dm⁻³	Ultrasonic velocities	Densities (d) in g cm⁻³	Adiabatic compressibilities (β_a)	Inter molecular free length (L_f)
95	9.5 X 10⁻³	1523.20	1.06790.9715	4.436 X 10⁻¹⁰	4.008 X 10⁻⁸
90	9.0 X 10⁻³	1560.00	1.0039	4.098X 10⁻¹⁰	3.850 X 10⁻⁸
85	8.5 X 10⁻³	1625.90	1.0129	3.725 X 10⁻¹⁰	3.678 X 10⁻⁸
80	8.0 X 10⁻³	1678.40	1.0232	3.461 X 10⁻¹⁰	3.545 X 10⁻⁸
75	7.5 X 10⁻³	1694.20	1.0253	3.397 X 10⁻¹⁰	3.507 X 10⁻⁸
70	7.0 X 10⁻³	1698.20	1.0261	3.375 X 10⁻¹⁰	3.416 X 10⁻⁸

Table No. 8

Apparent molal volume (ϕ_v), apparent adiabatic compressibility (ϕk_a), specific acoustic impendence (z) and relative association (R_A) at different concentrations of ligand in different percentage of DMF-water mixture at 303 K.

System L_{17} - Dexamethasone i.e. 9-fluro-11β,17α trihydroxy-16α methyl pregna-1,4-diene, 3,20 dion.

Ultrasonic frequency: 2MHz Temperature: 303 K Medium: DMF-water

Conc. in mol dm⁻³	Apparent molal volume (ϕ_v)	Apparent adiabatic compressibility (ϕk_a)	Relative association (R_A)	Specific acoustic impendence (z)
9.5 X 10⁻³	-1491.16	-0.4479	1.0065	1479.78
9.0 X 10⁻³	-3402.90	-1.0[illegible]7	1.0316	1566.08
8.5 X 10⁻³	-5747.50	-1.5973	1.0268	1646.57
8.0 X 10⁻³	-8564.20	-2.0686	1.0372	1663.31
7.5 X 10⁻³	-9332.40	-3.3110	1.0283	1720.86
7.0 X 10⁻³	-10128.53	-3.5122	1.0259	1738.62

Table No. 9

Limiting apparent molal volume ($\phi\phi_v$) and limiting molal compressibility ($\phi\phi k_a$) of different ligands in Dioxane-water and DM water mixture at 303 K.

Sr.No.	System	$\phi\phi k_a$	$\phi\phi_v$
1	L_7 (Dioxane-water)	-16.00	-2200.00
2	L_{17} (Dioxane-water)	-22.50	——
3	L_7 (DMF-water)	——	-7600.00
4	L_{17} (DMF-water)	-3.70	-12000.00