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Research Committee

VPM´s B. N. Bandodkar College of Science, Thane

Editor's Message ......

It is a great pleasure that our institution is bringing out a journal **JBNB-2017** during the occasion **of National Science day, 28th February; 2017**.The theme of the journal is **'Science Education'**. This journal is a source of inspiration for students and faculty as it encourage the people as well as popularize the Science and Technology and widely spread a message about the significance of Science Education in the daily life of the people.

This issue includes Ethics in Science Education, Maths in Cricket, wild life in Western Ghats, spectroscopic analysis, Microbial analysis also on isolation of natural dyes in addition to the projects undertaken by students under DBT and Sciences Square in the form of papers.

Maintaining our broad scope, encompassing areas of Ethics to Sciences in games, Wild life to Chemistry, we shall build on substantial support for the journal to strive for a more consistently higher standard of publication. In summary, JBNB is now discussing the issues, the activities, efforts and achievements in the field of science for human welfare.

We greatly appreciate the efforts of all the authors, undergraduate students for their immense contribution..

.   "**Education is not the learning of facts,**

but the training of the mind to think"

"Cultivation of mind should be the ultimate aim of human existence".

Dr. (Mrs) M.K.Pejaver

Dr. (Mrs) A.S.Goswami-Giri

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Ethics in Research Science Education

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Abstract:

Research is challenged by various issues hence it is necessary to resolve. Ethicists have been designed by various institutions. In the present articles, ethics in research in science education has been discussed. By knowing constitutes and fully understand the policies, theories are designed to guarantee upstanding research practices.

Key words: Anonymity, Confidentiality, Informed Consent, quality and transparency

INTRODUCTION:

Ethics or morals are nothing but rules for distinguishing between right / acceptable wrong/ unacceptable behaviour that applied in research may be scientific or non-scientific. According to Sales, B.D et al 2000 research ethics that involves human subjects or participants raises unique and complex ethical, legal, social and political issues. The purpose of research is shielding of human participants, interests of individuals, groups and/or society. Research concerns the responsibility of researchers to be honest and respectful to all individuals' research other than exaggerated studies or reports. The examination of specific research activities and projects for their ethical soundness, looking at issues such as the management of risk, protection of confidentiality and the process of informed consent ; that based on human psychology. Research involving vulnerable persons, which may include children, persons with developmental or cognitive disabilities, persons who are institutionalized, the homeless or those without legal status, also raises unique issues in any research context.

Research ethicists everywhere today are challenged by issues that reflect global concerns in other domains, such as the conduct of research in developing countries, the limits of research involving genetic material and the protection of privacy in light of advances in technology and Internet capabilities.

According to David B. Resnik, J.D., (2015) ethics is a code of professional conduct like the Hippocratic Oath or wise aphorisms. Ethics are been inculcated in human beings at family, at home, at school, or in other social settings during childhood till maturity level. Some time in social we called it common sense. It means moral or ethics is nothing but agreement/legal or disagreements/ unethical for different understandings of human being.

IMPORTANCE OF ETHICS

APA Ethics Code contains ten ethical standards (www.apa.org/ethics/code.). Ethical concepts and principles are to criticize, evaluate, propose, or interpret laws. Ethics applied in all of branches including art, commerce, and science, medicinal research with psychology, philosophy, theology, law, sociology, economics, ecological, political, law, engineering, and business. In scientific research, method, procedure, or perspective, analysing complex problems and issues in different disciplines, professions with aims with goals of research are discussed. Research established standards for research such as knowledge, truth, and avoidance of error or misrepresenting research data and promote the truth for minimize error. It required lot of efforts to deal with the aim and objectives with collaboration, cooperation, coordination among interdisciplinary scientist from different institutions with trust, accountability, mutual respect, and fairness. But in case of patent secrecy or confidentiality is required for recognition for their contributions and accountable to the public with quality and integrity of research. Therefore, ethics in of research promoted with moral and social values, such as social responsibility, human rights, animal welfare, compliance with the law, and public health and safety. Hence research ethics are important.

Nowadays, academic, clinical and corporate sectors demands multidisciplinary research collaborations in addition to pursuits and challenges created by rigorous federal and provincial privacy legislation. Epistemological and philosophical issues in this dynamic field, research ethicists also face anecdotal issues at the level of individual research

ethics reviews, systemic issues related to the institutions in which research ethics reviews are carried out and social, legal and political issues related to governance and oversight of research ethics activities. Hence each sector required committee to evolve it properly.

In India, different proficient associations, government agencies, and universities have adopted specific codes, rules, and policies relating to research ethics. Many government agencies, such as the National Institutes of Health (NIH), the National Science Foundation (NSF), the Food and Drug Administration (FDA), the Environmental Protection Agency (EPA) etc. have ethics rules for funded researchers.(www.aahrpp.org ; www. nih. gov/sigs/bioethics/index.html.)

Scientific papers, thesis, report data, results, methods and procedures, and publication status shall not be fabricated. While designing design objectives of the research, data analysis, data interpretation, peer review consistency is required in thought and action. Records all observation carefully right from data collection, research design, and correspondence with agencies or journals. Share ideas and be ready for criticism and new ideas. Always grant permission for using others Intellectual Property give proper citation as well as acknowledgement. Secrecy is must till publication of scientific manuscripts or grants submitted for publication, personnel records, trade or military secrets, and patient records. The advice shall be given to the students, colleagues and society without discrimination and competition on the basis of sex, race, ethnicity, or other factors. To promote social good and prevent or mitigate social harms through research, public education, and advocacy one should maintain and develop professional expertise in the subject. Do

not conduct poor experiments instead obey relevant laws and institutional & governmental policies for animal experiments including human subjects to minimize harms, risks and maximize benefits for society? (Shamoo and Resnik , 2015).

Unethical practice is includes: ethical dilemmas-

i.   Publication of the same content in different research paper or also in different journals by changing title.

ii. Stolen information without citation of Authors.

iii. Vomiting of collaborator name in research paper or intent to file a patent in order to make sure that they are sole inventor or Authors.

iv. Donated authorship to colleague on a paper though the colleague did not make a serious contribution to the paper.

v.   Reviewer shall not discuss of confidential matter of research paper reviewing for a journal.

vi. Using of data, books, ideas, or methods from reviewing papers without permission for journal

vii. Designing of poor research experiments and enhance that by using an inappropriate statistical technique.

viii. Exaggerated form of significance writing in projects /in grant applications.

ix. Fails to acknowledge the contributions of other people in the field or relevant prior work

x.   Plagarisation of others work.

xi. Same parallel research project shall not be given to two research students just to compare who is doing fast and harm physically and psychologically.

xii. Racist in laboratory.

xiii. Asking sensual favours from the students just to upgrade grades or finishing fast research degree.

xiv. Failing of good record of research.

xv. Not obeying rules of the institutional research committee or board decisions.

xvi. Violations of government rules such as animal care, wasting of animals for experiments.

xvii. Wasting of chemicals, using of pollution creating agents which are responsible for diseases.

xviii. Excessive or inappropriate financial or other inducements for research participation.

xix. Finally, wasting of societal resources without output and advances of subjects.

These are all responsible for research misconduct. Indeed, there has been considerable debate about the definition of "research misconduct" (Adams and Pimple (2005). Several investigators and policy makers are not satisfied with the government's narrow definition of ethics. They suggested "other serious deviations," for the practical solutions of unethical problems (Shamoo and Resnik, (2015).

Researchers created fear to share not to share information of publications to collaborators or making negotiations.

Ethical codes/ policies/ legal rules:

i.   Openness and respect for credit and intellectual property.

ii. Questions, gather more information, explore different options, or consider other ethical rules for justification.

Research misconduct:

Researchers commits misconduct only due to they are morally corrupt, economically desperate, or psychologically disturbed commit misconduct while according to the "bad apple" theory, most scientists are

highly ethical (Adams and Pimple (2005)). Shamoo and Resnik 2015 explain that misconducting research is due to the "stressful" or "imperfect" environment theory because various institutional pressures, incentives, and constraints encourage people to commit misconduct, such as pressures to publish or obtain grants or contracts, career ambitions, the pursuit of profit or fame, poor supervision of students and trainees, and poor oversight of researchers (Anderson et al., 2007).

But in case of education institutions, education in research ethics may help people get a better understanding of ethical standards, policies, and issues and improve ethical judgment and decision-making (David and Resnik, 2003) Academicians were often cautious about airing the ethical dilemmas they faced in their research and academic work. Its need to seek out the advice of colleagues on issues ranging from supervising graduate students.

APA's Science Directorates:

Directorate helps researchers steer clear of ethical quandaries:

1. Discuss intellectual property frankly

Faculty should discuss publication credit with students throughout the research and publication process such as understandings in writing, continuous discussion of research problem and evaluate contributions as the research progresses. According to APA Ethics Office Director Stephen Behnke, JD, PhD, even the best plans created disputes because same situation may have different prospective. Always authorship should reflect the contribution. He also intensified the social science research that people often overvalue their contributions to a project instead of authorship-type situations. But when both parties genuinely right then APA's Ethics Code stipulates that psychologists take credit only for work they have actually performed or to which they have substantially contributed and that publication credit should accurately reflect the relative contributions. The same thing happen in case of an institutional position, such as department chair, does not justify authorship credit," says the code. "Minor contributions to the research or to the writing for publications are acknowledged appropriately, such as in footnotes or in an introductory statement."

The same rules apply to students. If they contribute substantively to the conceptualization, design, execution, analysis or interpretation of the research reported, they should be listed as authors. Contributions that are primarily technical don't warrant authorship. In the same vein, advisers should not expect ex-officio authorship on their students' work.

Psychologists should also be cognizant of situations where they have access to confidential ideas or research, such as reviewing journal manuscripts or research grants, or hearing new ideas during a presentation or informal conversation. While it's unlikely reviewers can purge all of the information in an interesting manuscript from their thinking, it's still unethical to take those ideas without giving credit to the originator.

Other case is "If someone are a grant reviewer or a journal manuscript reviewer reviews someone's research unpublished work, that persons duty is to keep confidentiality and anonymity of that work.," says Gerald P. Koocher, PhD, editor of the journal *Ethics and Behavior* and co-author of "Ethics in Psychology: Professional Standards and

Cases" (Oxford University Press, 1998) Honderich T, ed. (1995).

Researchers also need to meet their ethical obligations once their research is published and may change the interpretation of research findings by correcting the errors in a correction, retraction, and erratum or by other means. Hence to answer questions arisen by other researches one has to store data at least five years for verification of study authenticity and allow others to reanalyse the results. (Kalichman et al., 2007; Kalichman , .2009)

Susan Knapp, APA's deputy publisher says that the APA Ethics Code requires psychologists to share their data to others for reanalysis, provided that participants' confidentiality may be protected and as long as legal rights concerning proprietary data don't preclude their release and with written agreement.

2. Be conscious of multiple roles

APA's Ethics Code says multiple relationships aren't unethical as long as they're not reasonably expected to have adverse effects. Psychologists have numerous cases at a time of any person or group; they shall not be bear with it. Second example is while recruiting students or clients as participants in research studies or investigating the effectiveness of a product of a company whose stock they own. Also, to make clear that participation of students in activity is voluntary. It may be course work laboratory work which enhances their educative value or students' understanding of the study. The study of normal educational practices, curricula or classroom management methods conducted in educational settings. Teachers are researchers, mentor and also lab supervisor hence they don't abuse the power differential between themselves and students. Therefore, experts also recommend that supervisors set up timely

and specific methods to give students feedback and keep a record of the supervision, including meeting times, issues discussed and duties assigned.

3. Follow informed-consent rules

It is very much required in case of research in science education. The consent process ensures that individuals are voluntarily participating in the research with full knowledge of relevant risks and benefits. APA's Ethics Code mandates that researcher should inform about their work relevant information such as the purpose of the research, expected duration and procedures, registration or cancellation registration rights, researchers willingness to participate, such as potential risks, discomfort or adverse effects ,prospective research benefits, Limitations, timely discussion, alternatives of relevant to the research and compensation or monetary costs of participation (Senese ,1997).

4. Respect confidentiality and privacy

Safeguarding of individuals' rights is mandatory because secrecy is a central dogma of research. "Ethics in Research with Human Participants"(APA, 2000) is required in prior. For sensitive topics creates uncomfortable position of human participates. Research participants have the freedom to choose information and reveal as per circumstances.

In academics, teacher mentor shall solicit research students/ participant regarding their research and guide them for their experimental data with confidentiality and secure their consent. But keep in mind that, it is mandatory as per 2000: Education Act of 1994 prohibits by asking information of students about religion, sex or family life without parental permission.

Research participants/ students don't share research data before research begins. If researchers plan to share their data with others, they should note that in the consent

process, specifying why they want to share? How they will be shared?

But it is very difficult to share sensitive data collected in a case study or statically analysis of serious medical illnesses, valuable resources and established techniques. Whenever possible protect confidentiality since web technology is constantly evolving and someone may tap the data.

Researchers avoid and resolve ethical dilemmas by knowing ethical obligations and what resources are available to them. The Belmont Report released by the National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research in 1979, the report provided the ethical framework for ensuing human participant research regulations and still serves as the basis for human participant protection legislation. **Want to do research:** (Singer, 1993; Rachels ,1999).

Ethics shall be applied on all stages of research, such as planning, conducting and evaluating a research project. Potential of projects and its benefits should be consider.

i. Collection of data /review of literature, use, and interpretation of research data.
ii. Methods for reporting and reviewing research plans or findings.
iii. Respect for consent sets standards of relationships among researchers with one another and those that will be affected by their research.
iv. Means for responding to misunderstandings, disputes, or misconduct.
v. Options for promoting ethical conduct in research

Ethical approach

i. Ways of thinking about the responsibilities, duties and obligations

of moral life. Individually and jointly, they can provide practical guidance in ethical decision-making.
ii. Justification, approach to research ethics in planned research design.
iii. Expectation of challenge during the ethics review process.
iv. 'Research subjects must be informed fully about the purpose, methods and intended possible uses of the research, what their participation in the research entails and what risks, if any, are involved.' (Resnick, 2015).

The Role of the Ethics/ research Committee

i. To scrutinise all research proposals, to ensure that they do not raise any ethical issues. Generally, it includes research for PG and UG degrees, research may be covered by a broader research proposal from supervisor.
ii. The ethics/ research committee's role is to consider appropriate and proportionate research aims doing by the students.
iii. If a research proposal raises ethical issues, the committee will ask the researcher to look again at the issue, and consider whether they could do it differently. The committee may also suggest alternative methods that they think are more suitable for the target group, or additional precautions that you should take.
iv. You cannot start your research until you have been granted ethical approval, which will be granted formally, together with an approval number.
v. When you publish your research, whether as a thesis or in one or more journal articles, you will need to provide details of the ethical approval, including this number.

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SCIENCE EDUCATION IN LIFE SCIENCES

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ABSTRACT

Science education is the practice of sharing science content with learners. Science education imparts in students ability for scientific reasoning, an analytical mind and an ability to solve problems and making decisions based on logical thinking. Life science is an important subject in science education. The subject is dynamic as it seeks to understand how living things exist and interact. As in science education, life science education also requires constant upgradation of knowledge both by the teachers and learners.

Key words: science education, science literacy, life science, pedagogy.

INTRODUCTION

Science is acquiring knowledge based on observation and experimentation. It is a process which besides being the knowledge of content also teaches methodology. Traditional science subject includes biological sciences or life sciences, physical sciences, earth sciences, space sciences etc. Science is important because it influences almost every aspects of human life. Science is everywhere in society; a part of each persons everyday life (Marincola, 2006). The learners can be students from primary, secondary schools or colleges, adults or anyone from the community who wish to learn the subject. Science education nurtures curiosity and the methodology to turn curiosity into knowledge, which in turn lays foundation for invention and creativity. Science education gives the learner the power of finding solutions to problems. Teaching science in primary and secondary schools instills love and understanding for the subject. It inculcates discipline, research mindset and science culture in students at

an early age. Science however is a moving target, advancing and getting more and more complex at each level. Science literacy is the knowledge and wisdom the learner acquires, it bequests the power to observe, hypothesize, experiment and interpret thus, it paves way to a better quality of life from individual comfort to global issues.

LIFE SCIENCE EDUCATION

Life science is concerned with the study of living organisms, their existence and interactions. It includes disciplines like biology, botany, zoology, genetics, microbiology, physiology, medical science, psychiatry, biochemistry and related subjects. As in other branches of science, life science faces constant upgradation. The subject is dynamic adding new information every day and the changing landscape of the subject presents many challenges for the learners and the educators. The progression of basic to

applied science to useful technologies and in medicine, from cellular to clinical research to useful disease treatments and preventions, depends on an informed public (Marincola, 2006). Biologists have long been concerned about the quality of undergraduate biology education. One major challenge is accurate conceptual understanding (Singer et al., 2013). Another concern with undergraduate education is the lack of alignment of chemistry and physics with biological processes. Biology can no longer be viewed as the science that drives our understanding, but rather, an elegant expression of chemistry, physics and mathematics, which collectively are needed to provide new insight (Ausiello, 2007).

Presently biological science as pure botany or zoology shows the exponential increase in knowledge and the merging of once separate fields in biology with chemistry, physics and mathematics mean that we need to rethink how we should be preparing today's lifescience undergraduates for the future. What do we need to change and how will we implement it? India is gearing up to become an international player in the life sciences, powered by its recent economic growth and a desire to add biotechnology to its portfolio (Vale and Dell, 2009). Biotechnology is an applied branch of life sciences. Life science is going through a dramatic biotechnological revolution, producing huge amounts of data, which is often placed in public databases. The analysis of these data requires nontrivial computational ideas. Some universities require life science students to take an introductory programming course, while others require a course on bioinformatics

tools. Indeed, the need to provide life science students with a wider, deeper computational education, beyond just hands-on skills, is being widely recognized (Pevzner and Shamir, 2009).

Increasingly in recent decades however, mathematics has become pervasive in biology, taking many different forms: statistics in experimental design; pattern seeking in bioinformatics; models in evolution, ecology and epidemiology (May, 2004). Solving complex interdisciplinary problems in recent time requires life science students to go far beyond their subject and understand the connections across disciplines. They requires competency in mathematics, using mathematical models, applying algorithmic approaches, making statistical inferences from large data sets, using principles of logic, quantifying and interpreting results etc. There is more than a single way to expose life sciences students to computational thinking. The use of packages could dominate the hands-on experience, "masking" the computational ideas. On the other hand, having such a basic programming prerequisite, as in our course, enables us to take the students a step further, beyond programming and tool handling. This facilitates exploring abstract computational notions, experimenting "first hand" with coding them and applying the code to concrete biological tasks (Rubinstein and Chor, 2014).

India's footprint in the biological sciences is relatively small, especially bearing in mind its burgeoning population. In India, physics, math and engineering have been rated higher in scientific endeavors than biology. However rapidly growing interest

in biology will eventually place life sciences at an equal footing with the physical sciences. The remarkable insights, through reductionism, that have been brought forward in the last century, now demand mathematics, computer science, physics, nanotechnology, imaging and engineering to assemble that knowledge into a coherent understanding of cells, organs, organisms and ultimately the full human condition (Ausiello, 2007). In 2009, several important publications, conferences and events have pointed toward confluence around more interdisciplinary and interconnected approaches and themes for undergraduate education in the life sciences. The life sciences community has focused its attention on where biological research is likely to progress over the next several decades and how education in the life sciences might keep pace with this rethinking of research priorities and progress (Labov et al., 2010).

TEACHING APPROACHES

The role of an educator has shifted from being a subject matter expert to a facilitator of students learning in the knowledge society. Science educators often struggle to design syllabus in life science which is relevant and has sustainable connection with learner's daily lives, a syllabus that represents human beings as a vital part of the environment. Drawing on data from an environmental education project, we demonstrate how this epistemology allows us to contribute both to the improvement of education and to a sustainable future of life on earth (Van Eijck and Roth, 2007). A holistic approach draws on the central paradigm of the life sciences, which is evolution. Emerging

research is demonstrating that allowing students to make connections between the science they study and the problems that they, their families and their communities face can encourage greater interest in science as well as the motivation to learn scientific concepts more deeply (Hulleman and Harackiewicz, 2009).

Science teachers usually have a dual responsibility one to nurture future scientists and two to develop broad scientific literacy in students. Scientific literacy is the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity (OECD, 2001). To achieve these ends, we need to examine how we teach and how we can better engage our diverse students in science learning. There is a widespread dissatisfaction with the effectiveness of current educational methods. Poor instruction, stereotypes teaching is the reason cited the high rates of student attrition in the sciences. For students to understand that science subject can be interesting and relevant to them, teachers need take stock of the situation and contemplate innovative pedagogy.

INNOVATION IN LIFE SCIENCE EDUCATION

One of the challenges in life science education is to stimulate active learning and develop competences in classroom and beyond. Most biological education research since the mid-1990s has focused on identifying students conceptual understandings, developing concept inventories that measure students

understanding of a given concept and studying the effectiveness of different types of instructional approaches that promote greater student engagement (Dirk, 2011). Science education and life science teaching from school, undergraduates to post graduate level has shown tremendous change. The way in which research methods and scientific inquiry skills such as problem solving are taught, typically through instructor lectures and assigned readings, makes an important contribution to low retention and academic underperformance in the biological sciences (Seymour, 2001). Innovative pedagogy in life science includes exploring the process by which learners can accumulate knowledge, skills and values and are able to translate the same as and when required.

Effective pedagogy in life science may include practical training, hands on training, making life science education relevant and meaningful, engaging students with their immediate environment, aligning science concept with the nature of science and make clear its relevance to students' lives. Building skills for lifelong learning the use of technology as a tool to promote student learning requires teachers to reflect critically on the teaching–learning process. Innovation in life science education necessitates redesigning science courses, meeting the needs and interests of different students and paving ways for vocational pathways.

Adoption of new methods often requires heavy capital expenditures. Programs should be made available for improving the quality of training of teachers, financing sabbatical leaves for teachers

who need retraining. A second proposal is to enable college departments to achieve major curriculum revisions (National Academy of Sciences (US) Committee on Research in the Life Sciences. 1970). Innovative pedagogy incorporates learning in informal settings which helps the learners to link educational content with issues that matter to learners in their lives. Learning through argumentation, debates, group discussion exposes the learners to contrasting ideas, which can deepen their learning. Enhancing the students learning and to meet the needs of different leaners, requires innovative tools to meet the educational goals. Incidental learning is unintentional learning which encourage learners to reconceive it as part of a learning journey. Enriched context enables us to learn beyond the classroom. Computational thinking is a powerful innovative approach in problem solving. The current incorporation of ICT in the syllabus is a new pedagogy which changes the role of the teachers. Learning from remote lab systems encourages participation by providing user-friendly web interfaces, course materials, and professional growth of the educators. Adaptive teaching systems recommend the best places to start new content and when to review old content. They also provide various tools for monitoring one's progress.

CONCLUSION

Science is a significant part of human culture, it is multifaceted and some knowledge of science is essential. Science education provides a laboratory experience for development of scientific reasoning thus science education should be the non-negotiable part of primary and secondary

education. Life science, an important branch of science education, life science promotes research-based practices in biology and consistently educates the public how living things exist and interrelate. The changing nature of the subject, the complexities and the changing role of science in society has created major challenges in the coming decades. Life science education imparts in students ability for scientific reasoning, an analytical mind and an ability to solve problems and making decisions based on logical thinking about issues affecting the individual, society and the environment. However the dynamics of the subject has changed over the year life science now cannot be studied in isolation. Present day life science has inputs from chemistry, physics, mathematics, computer science and bioinformatics etc. which are collectively needed to provide new insight. The responsibility of the educator has increased manifold and for future success as a nation, media, professional scientists, industry, educators etc. must all become science communicators.

Innovations in life science education include cognitive and sociocultural studies. Innovative pedagogy underlines the importance of questioning skills to promote active and reflexive learning. The seamless inclusion of broad range of tools brings fluencies in the learning environment. The learning tools addresses the development of synergies between subjects, using inquiry as an underlying approach, using different frameworks and methodology, opening minds activity thereby designing pillars of sustainability. The interdisciplinary, inquiry-based approach shapes the learner's attitude,

flexibility and skills which benefits in their performance beyond classrooms.

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USE OF CRICKET IN TEACHING MATHEMATICS

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Abstract
Mathematics appears everywhere in our lives, in nature around us and in the technologies in our hands. Undoubtedly, Mathematics also plays a very important role in sports as well. Cricket is one of the many areas of life where an understanding of Mathematics is very important. Cricket being a very popular sport in India, we can use it in teaching few mathematical concepts in classrooms. The terms used in Cricket are discussed which are related to Mathematics. Mathematics involved in the famous Duckworth Lewis method of Cricket is studied in this paper.

Keywords: Cricket, Application of Mathematics, Duckworth Lewis method, Classroom teaching

INTRODUCTION

The most common areas where mathematics is applied are in the sciences and engineering. Yet mathematics plays a large role in the efficiency of sports. Whether discussing a player's statistics, a coach's formula for drafting certain players, or even a judge's score for a particular athlete, mathematics is involved. In particular, Cricket is a sport which involves a lot of mathematics. Most people are familiar with rules and terminology used in cricket, however, they are not always aware of the important role that mathematics play in it. Few terminologies used in cricket along with their mathematical definitions are as follows:

1. Run rate = Number of runs needed / Number of overs remaining

2. Batting average = Number of runs scored / Number of times player is out
3. Batsmen's Strike rate = Average Runs per ball x 100
   where Average runs per ball = Number of runs scored / Number of balls faced
4. Bowling average = Number of Runs conceded / Number of Wickets taken
5. Economy rate (Bowler's) = Number of runs conceded / Number of overs bowled
6. Bowler's Strike rate = (Number of overs bowled x 6) / Number of wickets taken.

MEASUREMENTS

A cricket match is played on a round or oval-shaped grassy field known as cricket ground. The borderline of the ground is known as a boundary. The central part of the ground is known as

pitch. International Cricket Council (ICC) hasn't fixed dimension of a cricket field. The pitch is a rectangular area of the ground 20 m long and 3 m wide with wickets at each end. The wicket consists of three wooden stumps that are 71 cm tall. The stumps are placed along the batting crease with equal distances between each stump. They are positioned so that the wicket is 23 cm wide. Two wooden bails are placed on top of the stumps. The bails must not project more than 1.3 cm above the stumps, and must, for men's cricket, be 10.95 cm long. A cricket ball is between 22.4 cm and 22.9 cm in circumference, and weighs between 155.9g and 163g. The bat is no more than 97 cm in length, and no more than 10.8 cm wide.

Statistics

Television sports channels and media generate a large amount of data on players, teams, divisions and leagues. They have developed new and interesting forms of presenting statistical data to viewers. These include displaying two-dimensional and three-dimensional plots of shot directions and distances on an overhead view of a cricket field, generally called as Wagon-Wheel. Graphs of run scoring and wicket taking numbers plotted against time or balls bowled over a career or within a match which can be changed as a match progresses are also used. Other forms used are bar graphs, pie charts, etc.
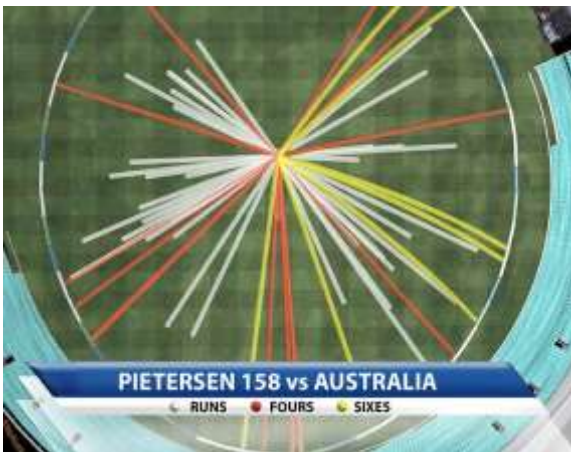
Wagon wheel 2D
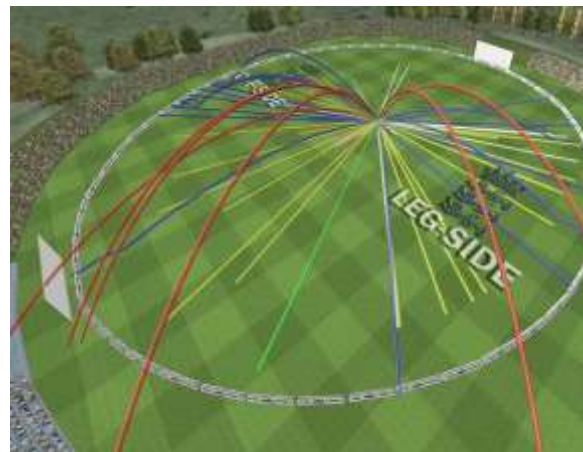
Wagon wheel 3D
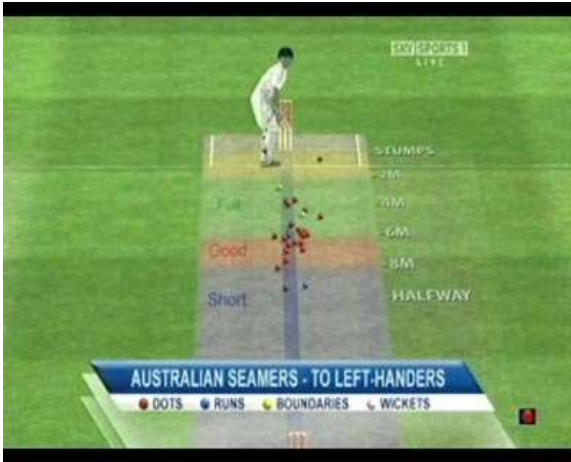
Bowler's Pitching Graphics
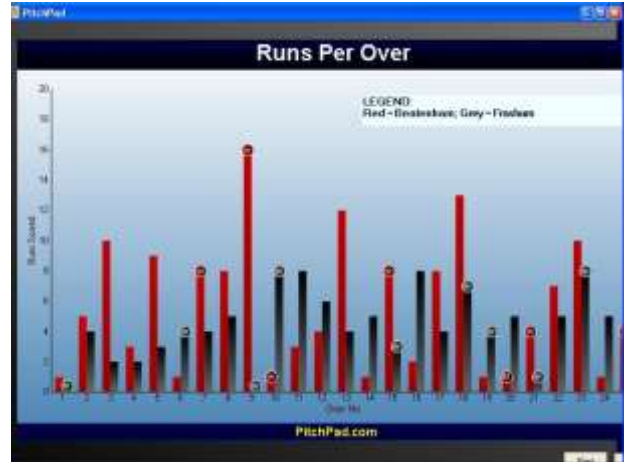
Manhattan Graph

Duckworth Lewis method

If a one day cricket match gets interrupted due to bad weather like rain or storm, it becomes difficult to complete the match in a single day. To complete the match, it becomes necessary to shorten it such that the delay doesn't advantage either team. This provided a real life problem for statisticians and mathematicians to solve for a long time. The methods used so far in one-day cricket are Average run rate, Most productive overs, Discounted most productive overs, PARAB and Clark curves. The current method used is Duckworth-Lewis method.

The method is the invention of FC Duckworth and AJ Lewis. FC Duckworth is a Statistical Consultant at Stinchcombe, Glos. and AJ Lewis, Mathematician at University of the West of England, UK. It is a method for fairly calculating revised targets and it has been the official method used in one-day international matches since 1997. It is based around the fact that batting sides have two types of resources used to score their runs - wickets and overs - and that their potential for run scoring depends on both these resources. They define a function $P(u,w)$ using exponential function that denotes the average proportion of runs yet to be scored by a side in an innings with u overs left to be bowled and w wickets lost. Extensive research and statistical methods led to the creation of this function, which is not disclosed by the inventors due to commercial confidentiality.

Overs left	Wickets lost				
	0	2	5	7	9
50	100	83.8	49.5	26.5	7.6
40	90.3	77.6	48.3	26.4	7.6
30	77.1	68.2	45.7	26.2	7.6
25	68.7	61.8	43.4	25.9	7.6
20	58.9	54.0	40.0	25.2	7.6
10	34.1	32.5	27.5	20.6	7.5
5	18.4	17.9	16.4	14.0	7.0

Table 1: Extract from the table of resource percentages remaining

Let R_1 and R_2 denote the resources available for team 1 and team 2 and $G(N)$ denote the average first innings score in N overs. If team 1 scores S runs, then the revised target T for team 2 is as follows:

$$T = \begin{cases} \dfrac{SR_2}{R_1} & \text{if } R_2 < R_1 \\ S & \text{if } R_2 = R_1 \\ S + G(N)(R_2 - R_1) & \text{if } R_2 > R_1 \end{cases}$$

Duckworth and Lewis have calculated revised target score in hypothetical 50 over examples as follows [1]

Table 2: Calculations of the revised target score in hypothetical 50 over examples

Hypothetical example no.	I	II	III	IV	V	VI
Team 2 score, chasing 250(= S), $R_1 = 1$	0	75	120	75	191	180
Wickets lost, w	0	0	0	2	9	4
Overs left at the stoppage, u_1	50	30	20	30	20	20
Overs left at the stoppage, u_2	30	10	0	10	0	0
Proportion available R_2	0.771	0.570	0.411	0.643	0.924	0.539
Revised target score T = SR_2	192.8	142.5	102.8	160.8	231.0	134.8
D/L target to win	193	143	103	161	232	135

CONCLUSION

As mathematics is used highly in Cricket, we can use it in classroom teaching for explaining very basic concepts like proportion, average, mean, probability, etc. We can also use it in teaching graphs like line graphs, bar diagrams and pie charts, to do analysis and comparison. Case studies or group projects can be given to students wherein students can apply the Duckworth Lewis method and to do analysis. Other applications of mathematics in cricket not discussed here include scheduling of tournaments (use of graph theory) and ranking players and teams (use of exponentially decaying average) which can also be used in classroom teaching.

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ASSESSMENT OF SOME HYDROLOGICAL PARAMETERS OF THANE CREEK, MAHARASHTRA

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ABSTRACT

Thane creek is an inlet in shoreline of Arabian Sea that isolates the city of Mumbai from Indian mainland. In present study, an attempt has been made to evaluate the physicochemical quality status of Thane creek. The samples were collected for its pH, Turbidity, Conductometry, Hardness, COD, BOD, Oil & Grease, Salinity, Dissolved Oxygen, Chlorinity. The study revealed that except for pH and Salinity all the other parameters in both the seasons exceeded the maximum permissible limits according to standards of MPCB. The significance of this study is to evaluate and determine the pollution status and health of Thane creek.

Key words: *Thane, Creek, Physico-chemical, MPCB*

INTRODUCTION

Coastline of India is long and about 8,000 km which includes shallow bays, creeks and estuaries rich in natural resources (Zingde, M.D, 2002). Creeks support complex food web for aquatic, terrestrial and avian wildlife (Kwak et al, 1997). Creeks being small tidal inlets are often first point of entry of non-point source runoff from upland areas (Van Dolah et al, 2003). Discharge from domestic, municipal and industrial waste water is the common practice in most of the coastal cities (Inkala et al, 1999). Depletion in oxygen level is due to urban runoff and untreated sewage leading to biological

changes (Wyer et al, 1994). A variety of illnesses are associated with exposure to polluted coastal waters (Dwight et al, 2004). Thus, there is a need to plan a monitoring programme to study the effect of pollution on creek water quality.

Thane creek is an inlet in the shoreline of Arabian Sea that isolates the city of Mumbai from the Indian mainland. It comprises of area between Mumbra Retibunder and the Mankhurd-Vashi Bridge. The creek is divided into two parts. The first part lies between Ghodbunder and Thane, a section from where Ulhas River flows from the North of Mumbai Island to meet the Arabian Sea at Trombay/Uran, before the Gharapuri Island. The objective of the study is to assess the impact of sewage and

wastewater discharges on Thane creek water quality through selective hydrological parameters.

MATERIAL AND METHODOLOGY

Sampling

The study was carried out at locations of Thane creek from June to October. The project comprises of 3 locations (Akashganga, Balkum and Kolshet) and one sample from each of these locations. Collection of water samples were done by random grab sampling method. The samples were collected in clean 5 litre polyethylene cans and were stored at 4°C. The frequency of sampling was on seasonal basis i.e 1] Pre-Monsoon sampling 2] Monsoon sampling.

Analysis

The samples collected were analyzed in the laboratory using the standard procedures from APHA and the values were compared with the standards given by MPCB. The parameters considered for the study were pH, Conductivity, Turbidity, Dissolved Oxygen, Chemical Oxygen Demand, Biological Oxygen Demand, Total Dissolved Solids, Chloride Content, Salinity, Total Hardness and Oil & Grease. The Dissolved Oxygen of the samples was fixed on site.

RESULT AND DISCUSSION

It was observed that conductivity, TDS, Turbidity, Oil and Grease, Salinity, BOD, COD of premonsoon was higher as compared to monsoon while DO, pH (Akashganga and Balkum) was observed to be higher in monsoon. Decrease in pH was mainly due to mixing of rain water. When pH falls below 6.5 or rises above 8.5, many of basic nutrients become died up, so that they are unavailable to plants and the overall productivity is lowered (Dwivedi P et al, 2014). Increase in conductivity are observed due to high levels of inorganic dissolved solids such as chloride, nitrate, sulphate, phosphate, sodium, magnesium, calcium, iron and aluminium. High values of TDS were may be due to presence of carbonates, bicarbonates, chlorides, phosphates, calcium, magnesium, etc. in abundance. The high content of dissolved solid increases the density, turbidity, hardness, salinity, etc and also decreases the solubility of oxygen in water (Desai 2015). Increase in turbidity in pre-monsoon was due to pollutant, garbage and settled particles. High turbidity was responsible for the reduction of light penetration properties thus affecting photosynthetic activity and primary productivity of the creek ultimately reducing the dissolved oxygen content of creek suppressing the aquatic flora and fauna. It also affects the gills of fish and thus, resulting in various respiratory problems which prove to be fatal for fishes (Desai 2015).High values of Oil and Grease may cause surface films and shoreline deposits leading to environmental degradation.

The values obtained are higher than Standards given by MPCB that is 0.1mg/l and is harmful for aquatic life as it damages fish eggs and larvae. Hardness of water may is dependent on domestic activities carried out along the creek.

Pre-monsoon:

Parameter	Obtained Values			Units	Not fit for Human consumption, Fish and wildlife propagation(category A-III)	Method
	Kolshet	Aakashganga	Balkum			
pH	8.06	7.79	8.0	-	6.5-9.0	IS:3025 (PART-11-2):2002
Conductivity	26.900	8.738	31.230	milli mho	1000	IS:3025 (PART-14):1996
Turbidity	24	20	23	NTU	-	IS:3025 (PART-10):2003
T.D.S	17520	5680	20300	mg/l	-	IS:3025 (PART-16):2002
Chloride	10650	3550	10650	mg/l	-	IS:3025 (PART-32):1988
Salinity	19.24	6.41	19.24	ppt	-	
Total Hardness	2400	800	2600	mg/l	-	IS:3025 (PART-21):2009
Oil and Grease	1.3	1.9	1.6	mg/l	0.1	
Dissolved Oxygen	2.6	2.2	2.4	mg/l	Not less than 3	IS:3025 (PART-44):2003
BOD	200	300	150	mg/l	10	IS:3025(PART-4):2001
COD	600	500	600	mg/l	-	

Monsoon:

Parameter	Obtained Values			Units	Not fit for human consumption, fish and wildlife propagation (category A-III)	Method
	Kolshet	Aakashganga	Balkum			
pH	8.11	7.5	7.87	-	6.5-9.0	IS:3025(PART-11-2):2002
Conductivity	7.261	3.669	12.053	milli mho	1000	IS:3025(PART-14):1996
Turbidity	10	5	8	NTU		IS:3025(PART-10):2003
T.D.S	4720	2385	7835	mg/l	-	IS:3025(PART-16):2002
Chloride	2716	1205	2565	mg/l	-	IS:3025(PART-32):1988
Salinity	4.9067	2.176	4.633	ppt	-	
Total Hardness	843	645	739	mg/l	-	IS:3025(PART-21):2009
Oil and Grease	0.95	1.4	1.0	mg/l	0.1	
Dissolved Oxygen	2.8	2.4	2.8	mg/l	Not less than 3	IS:3025(PART-44):2003
BOD	100	125	95	mg/l	10	IS:3025(PART-4):2001
COD	270	300	280	mg/l	-	

Since there are no standards set by MPCB for discharge hence there is no control

The BOD values for all the samples in both the seasons exceeded largely the standard given MPCB which is 30mg/l for Inland surface. This indicated high organic pollution in the creek water. This leads to deterioration of overall quality of the creek, reduced DO and fouling due to aerobic & anaerobic decomposition. Hence water should be monitored before discharging.

over the water which is drained into the Creek.

- The COD was high compared with the standards given by MPCB. COD is a useful indicator of organic pollution in surface water (Faith, 2006). COD pointing to a deterioration of the water quality caused by the discharge of industrial effluent (Mamais et al., 1993).The DO obtained was lesser than the Standards given by MPCB that is 5 mg/l. Concentration below 5 mg/lit

may adversely affect the functioning and survival of biological communities and below

- 2 mg/lit may lead to fish mortality (F.J. Thakor et al, 2011) .This may be due to the dumping of waste into the creek without being treated and therefore leading to depletion of Oxygen in water and harming the aquatic life. The increase in DO in monsoon was mainly due to mixing of rain water with the creek water.

CONCLUSION:

- All parameters for selected stations of the Thane creek were analysed during pre-monsoon and monsoon. From the obtained results it can be concluded that except for pH and salinity, all the parameters have crossed the permissible limits given by MPCB. In recent years, there is an increase in population, building debris and industries. This led to excessive amount of sewage and solid waste, which is been dumped into the creek water without proper treatment. Hence, the creek is been polluted. Mangroves are majorly affected and thus, the fish population; as it is the breeding ground for the fishes. In turn, the economic sector which is dependent on fishing for their livelihood is also affected to a greater extent. Proper treatment of sewage and industrial effluent should be strictly followed to overcome this problem. Dredging to clear accumulated silt and education of masses regarding conservation of creeks and estuaries, minimizing use of plastic, plantation of mangroves and sustainable use of resources will also help to control pollution.

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J BNB

Wild life in western Ghats of India hill station :Mahabaleswar

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Abstract:

It is amazing to see the wild life at hill station with   feeling of sympathy for tourist who are unaware of the presence of rich wild species around them. Hill stations in western ghats and as such entire western ghats are undergoing rapid urbanization . Habitat loss and deforestation is the greatest threat to the variety of wildlife in India. This activity includes the land and water resources destruction   by human beings for cultivation construction, mining activities, which changes entire ecosystems thereby causing threat to species which leads to classify them   as Threatened and Endangered.

INTRODUCTION:

There are lot of conservation program run by various organization at local, national, international level to save and protect wildlife. Lot of   lacunae are causing failure of conservation program. We as human are very new species on this planet and species which are put to threat by us are living on this planet before our existence . Question is why conserve wildlife, (Ehlrich and Ehlrich 1981), the ethical argument is wildlife has right to live despite they are of use or not to human being. Human have encroached the forest   which   belongs   to   wildlife. The Western Ghats region   is   one   such region which is a global biodiversity hotspot and the source of all the major rivers of peninsular India originate here. The shrinking habitat leads compressing the area,

beyond the carrying capacity .Many holiday resorts are constructed at hill station Mahabaleshwar and Panchgani our study area in western ghat. Notable destruction of habitat is done for construction of resorts and strawberry farming.   The Konya wild life sanctuary is nearby. Hill station lies in district of Satara , however boarders with Ratnagiri and Raigad district at west. Throughout year there is tourist crowd at the hill station being near to Pune and Mumbai. Hill station is famous for strawberry, mulberry farms, which are crop throughout the year. Bee keeping centre promotes the beekeeping entrepreneur progammes.   Hill station has different wild life species   we observed: M*acca radiata* (bonnet monkey) and *Semnopithecus entellus* (Hanuman langur) ,*Ratufa indica* (Malabar giant squirrel), *Bos gaurus* (Gaur Indian bison)

was spotted in one particular spot the river Savitri point forest, which is at west side of hill station. This animals are in vicinity to

MATERIALS AND METHOD:

Survey of various hill station points was done by direct observations, talking to the Observations :Photographed at site.

tourist and local vendors selling maize (corns), local fruits, confectionery etc.

local vendors, tourist adults and school children for picnic from nearby, talukas and districts.

Indian giant squirrel   **Bonnet monkey**   **Indian Bison**

OBSERVATIONS AND DISCUSSION: Mahabaleshwar has evergreen forest, high rain fall, great floral wealth. The place is undergoing rapid urbanization to satisfy the need of tourist. Tourism is major source of livelihood. Observation one,we spotted 4 Gaurs (Indian bison) along with calf, other were foraging on steep slope. According toDunbar Brander 1923, Hubback, T. R. 1937., Schaller 1967, Prater 1971, Sahai 1972, Pal and Guin 1986, the herd is unstable,s ometimes two or more animals may frequently associate. The typical herd size appears to be in the range of 5-12 animals and herds are rarely larger than 20. When inquired with the local vendor selling corn and other stuff , Gaur are regularly seen in herds in this area. The Gaur grazes aswell as browses, and are reported eating

mostly young green grasses but also leaves, fruit, twigs, bark of various woody species, as well as coarse dry grasses, and bamboo (Kumar 2010), Gaur also feeds on crops including corn, cassava, and young rubber trees, sometimes causing great damage (Wharton 1968, National Research Council 1983).In Mahabaleshwar they feed on maize cobs and corn husk, just besides the vendors. No attacks are done so far by herd of Gaur as per the vendors. When enquired with the tourist , they showed least interest in watching Gaur or wildlife, they hardly recognized it to be Indian Bison (Bos gaurus) they felt it to be domestic buffalo. The species has been listed as Vulnerable on the IUCN Red List since 1986. Karanth *et al.* (2010) estimated average local extinction rates of Gaur distribution at 60% over past

50 years in India with the rates varying from 7% from reasonably protected habitats to a high of 98% from unprotected habitats. The global distribution of the Gaur has reduced by over 80% in past 100 years and Gaur is now mostly limited to habitats within protected areas (Groves and Grubb 2011). The Gaur occurs from sea level up to at least 2,800 m asl (Wood 1937, Wharton 1968, Choudhury 2002). Thus were found in hillstation. .The animal requires good amount water in vicinity. Our observed hill station has ample natural water resources. The natural resources of water and grazing areas are equally shared by domestic animals, thereby are threat to gaur by spreading diseases. It was observed by Krishnan 1972, Pal and Guin 1986, Choudhury 2002), that Rinderpest and foot-and-mouth disease, transmitted by domestic cattle are a potentially serious threat. Foot-and-mouth is the most frequent, but rinderpest has had a particularly dramatic impact in India and several sub-populations of Gaur were nearly destroyed 1968. Also there is threat of Bovine tuberculosis spread in gaur. We observed only bonnets however Langurs were not seen, bonnets are in commensal with human whereas Langurs are shy and mostly herbivores, thriving on leaves. The bonnet macaques are generalist and feed on any thing. It was also observed that the tourist feed bonnet monkeys as fun but bonnet attacked the children as well as adult and snatched away food stuff. They

foraged on the leftover of the visitors which is severe threat to health of bonnets by reverse zoonosis and also zoonosis can be threat to humans.   Zoonosis is seen presently, a southward and northward spread of the Kyasanur Forest disease virus (KFDV Kyasanur Forest disease (KFD), a tick-borne viral hemorrhagic fever is maintained by ticks, mammals, and bird cycles. The black-faced langur (*Presbytis entellus*) and the red-faced bonnet monkey (*Macaca radiata*) act as sentinel animals, as they are very susceptible to KFDV, as humans are (Banerjee K. 1988, Pattnaik P. 2006) along the Western Ghats has been reported in the adjoining states of Kerala, Tamil Nadu, Goa and Maharashtra.(K. Ajesh1, B. K. Nagaraja2 and K. Sreejith1 2017). Reverse zoonosis cases are found in African wild life protected areas gorilla were infected by pathogens that caused measles and pneumonia. Spread of Poliomyelitis and measles in wild chimpanzees in Tanzania. Human tuberculosis (TB), caused by Mycobacteria tuberculosis, is another disease which affects a wide variety of wild animals, including chimpanzees, elephants and rhinoceros (AEDT http://theconversation.com). As per the enquiry at the bee keeping center, rearing Apis mellifera, it was found that the bonnet monkeys caused major threat to the beekeeping centre, the bonnets would lift the bee boxes though covered by heavy stones and agitated bees which made bees to leave

boxes and migrate forest, instead hiving in the boxes which caused loss to centre this lead to human animal conflict. Malabar Giant squirrels (Ratufa indica) are sighted at Mahabaleshwar are solitary animals,found feeding on ripe red betel nut in late afternoon. Purely arboreal and never come on ground . Indian Giant Squirrel feeds on petiole, leaf, flower, fruit, seed and bark from different plants   (Basant kumar et

CONCLUSION:

Taking advantage of Mahabaleshwar being hill station place of tourist. Public awareness can be effective tool for conservation. Organization of various campaigns in the vicinity of ecological important site. To inculcate environment consciousness amongst the tourist. To lessen the damage and destruction of ecosystem (to stop more cultivating farms) alternative methods like vertical farming can be implemented also

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Wildlife tourism can be developed in Mahabaleshwar keeping the conservation point of view and giving compulsory conservation mindset by awareness lectures or poster to tourist. Further regular survey of this species should be done   by keeping statistical data.

other ways of income should be encouraged and promoted to maintain the balance between natural resources. Statistical data analysis and documentation to record the present status of biodiversity. There is need of regular survey and analysis of eco-tourism parameters by government and NGO. Strict adherence to the measures suggested by forest department, construction of more holiday resort should not be permitted thus will help to conserve wildlife.

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SPECROSCOPIC ANALYSIS OF BIOACTIVE COMPOUND
FROM *LANTANA CAMARA* LEAVES

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ABSTRACT:

Lantana camara is rich sources of secondary metabolites that beneficial to biological activities hence bioactive molecule was extracted in aqueous medium from lantana leaves. Analysis of bioactive molecule was checked by TLC, UV and FTIR. Observed bioactive molecule may add benefit to the in recent scope of chemical sciences.

Keywords: *Lantana camara,* Verbenaceae, aqua solvent, natural product

INTRODUCTION

Lantana camara (Verbenaceae) naturalized in tropical and subtropical region of world. (Sharma O.P., et. al (1989). In India, it is a noxious weed observes across the country variety of environments and mostly found in Himalayan region. *Lantana camara* is used in several herbal medicines and also used by local communities for treatment against various diseases. Thousands of biomolecules produce through and are inducible chemical defence system. The important of natural product in medicine, agriculture, industry has late to numerous studies. *Lantana camara* is a rich source of many bioactive molecules such as triterpenes, steroids and flavonoids flavones, anthocyanins, coumarins, lignans, catechins, isocatechins, Alkaloids, Tannin, Saponins and triterpenoids.(S. Begum et al (2008), D. K. Verma et al (1997). Though it is waste land flowering weed used as ornamental plant (Neena Priyanka et al (2013), it possess antitumoral (Kumarasamyraja D et al 2012),

cytotoxic(Mahato, S.B.,et al (1999), Goswami–Giri A. et al (2011), Efren et al (2007), wound healing activity (SanjeebKalitaet al 2012, Mamta Saxena (2014),Anti ulcerogenic activity (Sathish R. et. al; 2011) , fungicidal (Eweis M.et. al; (2011); Goswami-Giri A.et. al; (2011),Zarrin Fatima Rizviet al 2013) activity. The bioactive molecules were isolated from arial part of lantana with solvent. Hence present paper focused on the bioactive molecule isolated from lantana leaves in aqueous medium and its spectroscopic analyse been presented which was monitored by TLC. The present green techniques may add in chemical and biological research of plants.

MATERIAL AND METHOD

Material:

Sources: Lantana camara Linn. was collected in the month of Jully 2016 from Thana college campus. Leaves were segregated and dried well, powdered and stored in seal bags till the used. Chemicals such as solvents substrate from loba chemical and all are analytically pure. Glass distilled water was used throughout the experiment.

Method:

Lantana camara leaves powder (100 gm) was treated with distilled water. The mixture of *Lantana camara* leaves kept for 24 hrs to observe the good amount of bioactive molecule.

Filtrate was dried well and its herbality requirement was checked by TLC with solvent system Toluene: ethyl acetate: formic acid: methanol (3:3:0.8:0.2) ratio. UV was checked on UV-1800 Shimadzu double beam spectrophotometer and FTIR analysis was on Nicolet's Thermo scientific 5S. Various concentration of extract was explored to 260 nm and 280 nm. The brown colour spot which was observed on point of application was dissolved in methanol and monitored under UV-Visible range.

RESULT AND DISCUSSION

Extraction of leaves parts of Lantana camara (100 gm) carried out by double distilled water with saturation. Water extraction contributed exceptionally low yield of bioactive molecule. The dry compound residue weight is 2.884 gm **(Figure 1).**

Figure 1 Isolated bioactive molecule in aqua solvent having brown in colour.

TLC of each sample was carried out separately using solvent system Toluene: ethyl acetate: formic acid: methanol (3:3:0.8:0.2) ratio. Five different colourd spot such as brown, faint yellow, dark yellow, Orange, Green and Brown colour was observed on TLC (Figure 2).The dissimilar colour spot exhibited its Rf values shown in (figure 2 and Table 1). UV of crude extract is shown in figure 3 and FTIR analysis shown in figure 4.

Table 1 Rf values of isolated bioactive molecule from leaves.

Sr. No.	Colour of the spot	Rf values
1	Faint yellow spot	0.53
2	Dark yellow spot	0.68
3	Orange colour	0.84
4	Green colour	0.88
5	Brown colour	0.93

Figure 2 TLC of isolated bioactive molecule from leaves in aqua solvent having brown in colour.
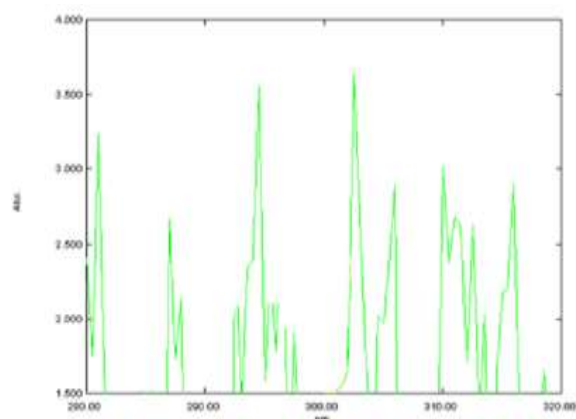

Figure 3 UV of isolated bioactive molecule (crude extract) from leaves in aqua solvent having brown in colour.

The water extract of Lantana camara leaves UV showed maximum absorbance 3.643 at 302.50 nm.

UV obtained 0.698 at 260 nm and 0.776 at 280 nm having 0.8 nm ratios which may exhibited broad peak at 70 µl volumes. From 10 µl to 100 µl volume at 70 µl observed the maximum absorbance **(Table 2).**

Table 3 UV maxima of *Lantana camara* leaves in aqua solvent.

Sr.No.	Wavelength	Absorbance
1	663.50	0.107
2	610.50	0.024
3	534.50	0.018
4	454.50	0.140
5	411.50	0.213
6	316.50	2.899
7	302.50	3.643
8	287.00	2.661
9	272.50	3.121
10	256.50	3.201
11	240.50	3.305
12	227.50	3.590
13	220.00	3.344

Table 2 Different concentration of crude isolated extract was explored to 260 nm and 280 nm.

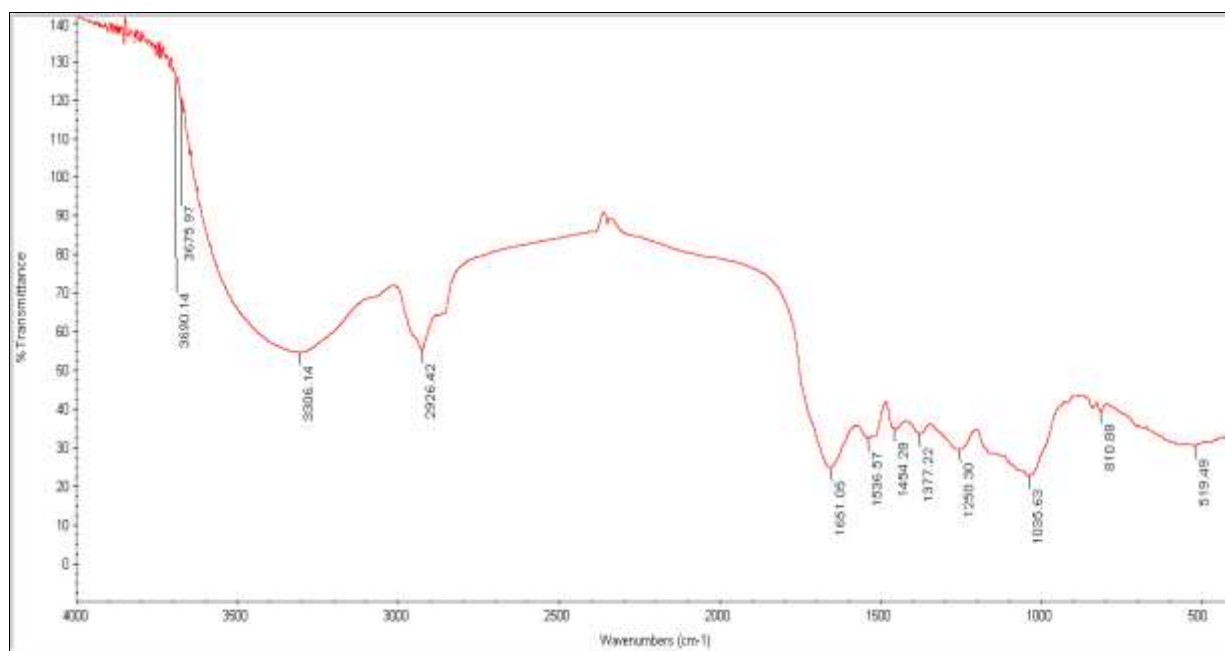| Sr. No.	Concentration	260 nm	280 nm
1	10 µl	0.397	0.772
2	20 µl	0.691	0.473
3	30 µl	0.697	0.474
4	40 µl	0.095	0.474
5	50 µl	0.695	0.474
6	60 µl	0.697	0.775
7	70 µl	0.698	0.776
8	80 µl	0.394	0.472
9	90 µl	0.396	0.174
10	100 µl	0.697	0.774

Figure 4 FTIR spectra of lantana camara leaves crude aqua solvent.

FTIR Analysis:

3675 cm^{-1} , 3690 cm^{-1} (O-H & free molecule, Medium/O-H Stretching), 3306 cm^{-1} (N-H group amines or amide), 2926 cm^{-1} (Saturated alkenes, C-H Bond), 1651 cm^{-1} (O-NO$_2$, Nitrates-NO- Nitrites, Amines N-H ,C=C Alkenes' Group, N-H Bending Stretching), 1536 cm^{-1} (Secondary amines in the solid state) , 1454 cm^{-1} (C=C Multiple bonds, Medium weak C=C stretching), 1377 cm^{-1} (Alkane- methyl group, Medium/C-H-Bending), 1250 cm^{-1} (C-N amines, Medium/ Stretching), 1035 cm^{-1} (C-O ether, Strong and stretch), 810 cm^{-1} (double bonds Vinyl, Vinylidene and 1,2,4-trisubstituted, Strong /C-H Bending), 519 cm^{-1} (C-Br, Strong /stretching).

CONCLUSION:

The Basic chemistry of plant bioactive molecules/natural product in relation to medicinal properties demanded great interest worldwide. It showed increased awareness on beneficial properties of it in public. Natural products are significantly constituted for economical recourses for the pharmaceutical, cosmetics and food industry. The bioactive molecules isolated in aqua solvent from leaves produced low

yield. But aqua extract is able to derive five different molecules which advancers the chemistry of plant.

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CELLULASE PRODUCTION BY SOLID STATE FERMENTATION

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ABSTRACT:

Every year tones of lignoceullosic waste are generated as agricultural by product. Cellulases are a group of enzymes that catalyze the depolymerisation of cellulose into fermentable sugar. The present investigation was undertaken to isolate the cellulase producing bacteria from soil. Seven bacteria were isolated and screened for their ability to produce cellulases. Corn cobs which are agro residues rich in cellulose, were used as the substrate in solid state fermentation. Maximum amount of enzyme production that was observed after 48 hrs of incubation was 46×10^3 micromoles/ ml/min.

Key words: Cellulase, cellulose, corn cob, solid state fermentation, enzyme activity.

INTRODUCTION:

Large quantities of lignocellulosic wastes are generated through forestry, agriculture and agro-allied industries. These wastes generally accumulate in the environment and might be disposed by burning, a practice considered as major factor in global warming. However, the plant biomass regarded as "wastes" are biodegradable and can be converted into valuable products such as biofuels, chemicals, cheap energy sources for fermentation, improved animal feeds and human nutrients (Okafor et al., 2007).

The most abundant renewable organic compound in the biosphere is cellulose, which accounts for 40-50% of plant composition and its production is expected to be 10^{10} tonnes from cell wall of plants per year. Three major structural polymers combined makeup the lignocelluloses; cellulose (a homopolymer of β-D glucosyl units), hemicelluloses (a cluster of heteropolymers which contain xylans, arabinans, mannans, galactans) and lignin (an intricate polyphenolic polymer) (Ijaz et al., 2011). Cellulases are a group of enzymes that catalyze the depolymerisation of cellulose into fermentable sugar (Lynd et.al., 2002). Cellulases break down the cellulose molecule into monosaccharides such as β-glucose, or shorter polysaccharides and oligosaccharides (Mkhize et al., 2016). Cellulose breakdown is of considerable economic importance, because it makes a major constituent of plants available for consumption and use in chemical reactions. The specific reaction involved is the hydrolysis of 1, 4-β-D-glycosidic linkages in cellulose (Li et al., 2015).

Microorganisms that produce cellulases include *Aspergillus niger, Clostridium thermocellum, Ruminococcus albus,*

Trichoderma viride, Schizophyllum commune, Streptomyces spp. Thermomonospora curvata etc.

Cellulases are subsequently used for a large variety of industrial purposes in the

textile industry, pulp and paper industry and food industry as well as an additive in detergents and improving digestibility of animal feeds (Kuhad et al., 2011).
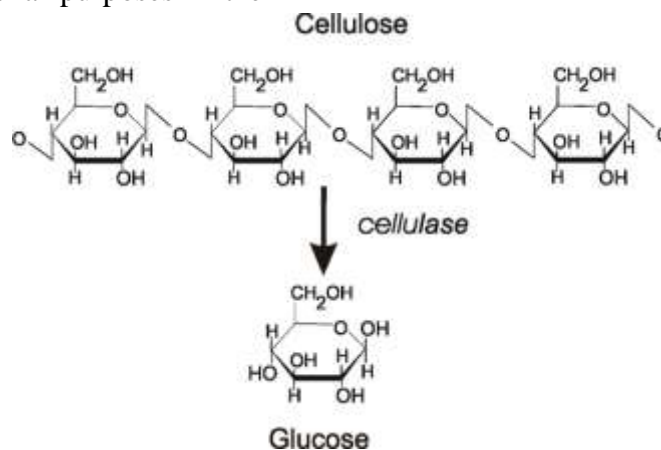

Figure 1: Breakdown of cellulose to glucose.

SSF from last decade has made its importance in the production of value added products i.e. secondary metabolites, alkaloids, enzymes, organic acids, biopesticides, biosurfactants, bio fuels, aroma compounds, bio pulping, degradation of toxic compounds, biotransformation, nutritional improvement of crops, biopharmaceuticals and bioconversion of agricultural waste (Pandey et al., 2000). Solid State Fermentation requires low energy and economical technology in synthesizing cellulose enzyme in response to submerged fermentation (Pandey, 2003).

The present study focuses on the isolation of cellulose degrading organisms from soil and production of cellulase via solid sate fermentation using low cost agricultural waste like corn cob.

MATERIALS AND METHODS:

Collection of Soil Sample:

Soil sample was collected from rhizosphere and from regions near dried and decaying plants in the campus of B. N. Bandodkar College of Science, Thane.

Enrichment of the sample:

Cellulase producing organisms were isolated from the soil samples by enrichment culture technique. For enrichment, 1g of soil sample was inoculated in 100ml of enrichment medium (i.e sterile McBeth's medium). The enrichment medium contained carboxy methyl cellulose as carbon source and mineral salt solution. Enrichment was carried out for 1 week at room temperature. At the end of first week, 1ml of the inoculated medium was transferred

into a fresh medium. Enrichment of the sample was repeated thrice. Aliquot from the third enrichment flask was used for isolation.

Isolation of cellulase producing organism:

After 3 weeks of enrichment, isolation of cellulase producing organisms was carried out on sterile McBeth's agar plate. Upon incubation for 24 hrs, seven different isolates were obtained. Colony characteristics and Gram nature of the isolates were observed. Pure culture of the isolates was maintained on McBeth's agar slant

Cellulase production by Solid State Fermentation:

10g of dried and grinded corn cob was taken in 250 ml Erlenmeyer flask, moistened with 25 ml of Mineral Salt media i.e MSM comprising the following components in g/l: 0.8 g NaCl , 0.8 g KCl , 0.1 g $CaCl_2$, 2.0 g Na_2HPO_4 , 0.2g $MgSO_4$, 0.1 g $FeSO_4$, 8.0 g Glucose, 2.0 g NH_4Cl, pH= 6.2 (Khan J. A. and Singh S. K., 2011).

Preparation of inoculum:

1ml of 0.1 O.D culture suspension was used to inoculate the fermentation medium which was then incubated at 37^oC for 48hrs. After the incubation, enzyme was extracted and enzyme activity was determined.

Extraction of crude enzyme:

The enzyme was extracted with 50 ml of 0.2 M Sodium phosphate buffer, pH 7.0 and squeezed through muslin cloth. The enzyme extract was centrifuged for 15min at 10,000 rpm and cell free supernatant was used as crude enzyme for analysis

Enzyme assay of crude enzyme:

Cellulase activity of crude enzyme was determined using carboxy methyl cellulose (CMC) as substrate. The reaction mixture consisted of 0.1ml of enzyme and 0.9 ml substrate (1% CMC in 0.2M Phosphate buffer pH 7). It was incubated for 30 minutes at 37°C. Cellulase breaks down the substrate into glucose. The concentration of reducing sugar generated was determined by DNSA method (Miller, 1959).

A standard graph was prepared using 0-10 millimoles glucose. Absorbance was noted at 540nm and a standard graph of absorbance v/s standard glucose was plotted. One unit Cellulase activity was defined as amount of enzyme that releases 1 micromoles of glucose per minute under standard reaction conditions.

RESULTS AND DISCUSSION:

Enrichment and isolation

Enrichment culture helps to enhance the growth of one or more types of organisms from a sample in which a number of different organisms may be present.

After 3 weeks of enrichment (Figure 2), cellulase producing organisms were isolated on McBeth agar plates (Figure 3). Seven predominant cultures were obtained.

These organisms were studied for their morphological and cultural characteristics. These characteristics are listed in Table 1:

Colony Charac-teristics	Isolates						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Size	2mm	3mm	1mm	Pinpoint	1mm	Pinpoint	Pinpoint
Shape	Irregular	Circular	Circular	Circular	Circular	Circular	Circular
Margin	Undulate	Entire	Entire	Entire	Entire	Entire	Complete
Elevation	Convex	Convex	Convex	Concave	Convex	Convex	Convex
Consis-tency	Dry	Dry	Dry	Dry	Sticky	Sticky	Sticky
Opacity	Opaque	Translucent	Translucent	Opaque	Translucent	Opaque	Opaque
Colour	Yellow	White	Colourless	White	Colourless	Yellow	Yellow
Gram nature	Gram positive	Gram positive	Gram positive	Gram positive	Gram negative	Gram negative	Gram positive
Morpho-logy	Cocci	Cocci	Cocci	Bacilli	Cocobacilli	Bacilli	Cocci

Table 1: Colony characters of isolates.

Figure 2: Enrichment of soil samples.

Figure 3: Isolation of cellulase producing organisms.

Cellulase production using solid state fermentation:

For cellulase production, corn cob was used as it has high cellulosic content (69.2 wt%) (Lu J. J and Chen W., 2014). Hence it serves as good substrate for cellulase production.

Also, the use of Solid State Fermentation has the great advantage over Submerged

Fermentation due to absence or near absence of aqueous phase that provides natural habitat for growth of microorganisms, economy of the space, simplicity of the media, greater product yields, easier scale-up of processes and lesser volume of solvent needed for product recovery (Motta et al., 2013).

Table 2:
Calculation of enzyme activity.

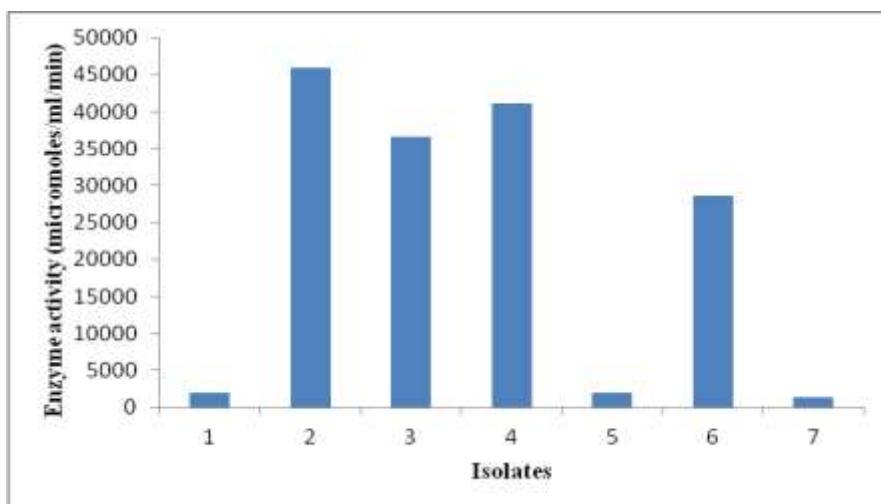| Isolates	Absorbance	Glucose concentration (mM/ml)	Enzyme activity (mM/ml/min)
1	0.01	3.0×10^3	2×10^3
2	**0.29**	**6.90×10^3**	**46×10^3**
3	0.23	5.50×10^3	36.6×10^3
4	0.26	6.20×10^3	41.2×10^3
5	0.01	3.0×10^3	2×10^3
6	0.18	4.30×10^3	28.6×10^3
7	0.09	2.10×10^3	14×10^3

Figure 4: Enzyme activity of the isolates.

Isolate number 2 produced the maximum amount of enzyme i.e 46000 micromoles/ml (Table 2 and figure 4). Since high enzyme activity was obtained in supernatant this indicates that the enzyme is extracellular.

CONCLUSION:

The use of agriculture residues as low-cost substrates for the production of industrial enzymes is a significant way to reduce production cost. Isolate number 2 showed maximum amount of enzyme production, hence it can be used for economical production of cellulase enzyme. Further optimization of various parameters, enzyme purification and enzyme kinetics studies should be conducted for more efficient enzyme production.

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Food Adulteration

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Abstract:

Food is one of the essentials to sustain life as it provides energy for the optimum functioning of body processes as well as for growth and development. The quality of the food consumed is an important factor that determines the nutrition content of the food and in turn affects the health of the consumer. Thus, food that we consume must be safe and free from harmful substances.
However, Food adulteration is a common malpractice and an age-old problem which causes adverse health effects on the consumers. The objective of this review article is to create awareness about the concept of food adulteration, commonly used food adulterants and its impact on consumer health.

Keywords: Adulteration, incidental, intentional, food additives, food adulterants, public health.

Introduction:

Adulteration is the act of adding extraneous substances /adulterants into food items or products, or reducing essential nutrients partly or wholly for financial gain or due to carelessness and lack of proper hygienic condition during processing, storing, transportation and marketing. This ultimately results in the consumer being cheated or often becomes a victim of diseases. (Anita and Neetu, 2013; Asrat Ayza et ;al 2015) .

Food adulteration consist of a large number of practices such as mixing, substitution, concealing the quantity, putting up decomposed foods for sale, misbranding or giving false labels and addition of toxicants (Park, 2007).

An adulterant is defined as a chemical substance which should not be contained within other substances. The word is appropriate only when the additions are unwanted by the recipient. Otherwise the term used would be 'food additive'.

Food additives are the substances intentionally added to food to increase the color, taste, texture, appearance and the shelf life. Commonly used food additives are preservatives, flavor enhancers, artificial sweeteners, leavening gents, anti-caking agents, pH control agents and acidulates, color additives, emulsifiers, humectants, flavors and spices, fat replacers, stabilizers, firming agents, gases etc. Food additives have a positive impact on the sensory attributes of the food.

Additive v/s adulterant

'Additives' are substances that are added to food items for beneficial reasons.
An 'adulterant' is a substance that is added deliberately and that has a negative impact.

Causes of food adulteration:

In general foods and drinks are adulterated for the following six reasons: [Narayan (2014)]

- When the demand is more than the supply in the market
- To come at par with the market competitors by lowering the cost of production
- The greed for increased profit margins
- The common man cannot afford food items with their original constituents
- Lack of trained manpower with outdated food processing techniques
- Ignorance about the disease outbreaks caused due to adulterated food products.

Types of adulteration

There are two types of adulteration that have been identified i.e. intentional/deliberate adulteration and unintentional/incidental adulterations.
[El-loly et. al. 2013); Asrat and Yilma (2014) and Narayan 2014)

Intentional/deliberate adulteration

Intentional adulteration is the act of adding, removing substances to food or altering the existing natural properties of food deliberately This is a kind of adulteration in which dishonest producers and traders deliberately adulterate different food

products in order to increase their profit margin by adding several chemicals like urea, melamine, and increase its volume by adding substances such as starch, flour, cane sugar, vegetable oils, , water, skim milk, sand, chalk powder, molasses, stone, brick powder, ergot, chicory, roasted barley powder, grinded papaya seeds, etc. into various food items.[El-loly et al.(2013)]

Incidental/unknown adulteration

This type of adulteration occurs due to lack of proper hygienic conditions of food products and drinks throughout the production site to the consumption table. The ways by which the products are produced, handled, passed, processed, stored, transported and marketed may be the places where they are contaminated or adulterated. It includes residual pesticides from cans, rodent droppings, preservatives, mercury from effluents, lead from water, etc. (Narayan, 2014) and Asrat and Yilma (2014).

Common food adulterants

Depending on the types of food and drinks , it is possible to see adulteration in four major categories like milk and milk products, fats and oils, food grains and others (animal and plant originated foods) .

List of different food items and extraneous substances added into them:

- Ghee is adulterated with Vanaspati, anatta, & oleomargarine to make theyellow colour intense.
- Milk is adulterated with water, skim milk to increase the volume.

- Condensed milk is adulterated with Paneer, khoya to give a rich texture.
- Ice cream is mixed with Starch, rice powder or wheat flour to thicken cream.
- Butter is adulterated with Vegetable oil, anatta, and banana, oleomargarine to increase volume & make it yellowish.
- Tea leaves are adulterated with Black/Bengal gram dal husk or dye to add color.
- Wheat is adulterated with Ergot (poisonous fungus).
- Red wine is often mixed with Juice of bilberries to attract/produce deep blue precipitate with lead acetate.
- Sugar is adulterated with Chalk powder to increase the amount.
- Turmeric, dals & pulses are adulterated with Metanil yellow (dye), Kesari dal to enhance the yellow color.
- Chili powder is adulterated with stones, grit, and brick powder to increase the weight.
- Jaggery powder is adulterated with Chalk powder to add bulkiness.
- Common salt is adulterated with white powdered stone, chalk to increase the amount.
- Mustard seeds are adulterated with argemone seeds to add bulk.
- Honey is adulterated with molasses, cane sugar to increase the volume and viscosity.
- Cinnamon adulterated with Cassia bark to increase volume.
- Coffee is adulterated with Chicory, roasted barley powder, tamarind seeds to add bulk and color.

- Black pepper is adulterated with Papaya seeds to add bulk.
- Green chillies and peas are adulterated with Malachite Green to give bright glowing green color.
- Mustard oil is adulterated with Papaya seeds to add bulk and increase theweight.

[Narayan (2014), Asrat and Yilma (2014), Lakshmi et al.(2012), Awasthi et al.(2014)]

Health impacts of food adulteration:

Hazardous effects of food adulteration is associated with diarrhea, abdominal pain, nausea, vomiting, eyesight problem, headache, cancer(prolonged exposure to adulterants), anemia, insomnia, muscular paralysis and brain damage, stomach disorder giddiness, joint pain, liver disorder, dropsy, gastrointestinal problems, respiratory distress, edema, cardiac arrest, glaucoma carcinogenic effects, kidney failure, digestive system disorders, etc .[Anita and Neetu (2013), Faraz et al.(2013) and Lakshmi et al.(2012)]

CONCLUSION:

Adulteration of food has become one of the serious problem .The causes for food adulteration is profit margin by increasing volume of the products and dishonesty of producers, retailers and processors.

This ultimately results in the consumer being cheated cheated or often becomes a victim of diseases. Consumption of adulterated food causes serious diseases like cancer, diarrhoea, asthma, ulcers and other gastro intestinal disorders. In order to curb the growing cases of food adulteration the following measures can be developed:

i. adequate laws, funding and staffing should be established to control above discussed challenges ii. Different stakeholders should play great role to develop appropriate sampling programs based on statistical validity and sound sampling methodologies iii. Further study should be conducted on quantification of adulterants iv. Effective analytical techniques to detect frauds must be developed. v) Well-structured and implemented educational programme on food adulteration to increase the awareness regarding food adulteration among students and consumers.

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FOOD SAFETY AND REGULATIONS

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ABSTRACT

Our health is dependent on our nutritional status. . Health depends on the food we eat and how we eat it. Implications of food contamination take place at various stages in food chain from farm to table. The common sources include presence of heavy metals, pesticides, preservatives, coloring agents, other additives and adulterants in food. For consumers around the world, access to safe and nutritious food is an essential requirement for maintaining their overall health and well being. Food safety is a scientific discipline describing handling, preparation and storage of food in ways that prevent food borne illness.;

 Keywords- food, food safety, food additives, food laws, fssai

INTRODUCTION

The federal Food, Drug, and Cosmetic Act defines a food additive as, "any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food *(*FFDCA, FDCA, or FD&C–USFDA)*.* Such substance is not generally recognized, among experts qualified by scientific training and experience to evaluate its safety, as having been adequately shown through scientific procedures to be safe under the conditions of its intended use. "Food safety" implies absence or acceptable and safe levels of contaminants, adulterants, naturally occurring toxins or any other substance that may make food injurious to health on an acute or chronic basis.It implies that when a suitable product which when consumed orally either by a human or an animal does not cause health risk to consumer.Assurance that food will not cause harm to the consumer when it is prepared and/ or eaten according to its intended use.

FACTS ON FOOD SAFETY BY WHO

More than 200 diseases are spread through food, Food borne diseases are increasing worldwide, Food safety is a global concern,   Chemical hazards can contaminate food (WHO 2016) due to these reason which make society harmful it is obligatory to design the regulations to meet the criteria for overall growth including increase in its nutritional values .Ultimately, the health and

wealth of society enhance effectively followed by economic growth of our country.

FOOD LAWS AND REGULATIONS

To meet a country's sanitary requirements, food must comply with the local laws and regulations to gain market access. These laws ensure the safety and suitability of food for consumers. Each country regulates food differently and has its own food regulatory framework.

The International Association for Food Protection (IAFP)- IAFP is an organization of 4,000 food safety professionals committed to Advancing Food Safety Worldwide® by providing members worldwide with a forum to exchange information on protecting the global food supply.

Food Safety and Inspection Service (FSIS), U.S. Food and Drug Administration (FDA), Joint Expert Committee on Food Additives (JECFA) are the regulatory agencies and Food Safety and Standards Authority of India (FSSAI) at national level.

Food Safety and Standards Authority of India (FSSAI)

The Food Safety and Standards Authority of India (FSSAI) has been established under Food Safety and Standards Act, 2006 which consolidates various acts & orders that have hitherto handled food related issues in various Ministries and Departments.

FSSAI has been created for laying down science based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food for human consumption. (FSSAI, 2006)

Functions performed by FSSAI

- Framing of Regulations to lay down the Standards and guidelines in relation to articles of food and specifying appropriate system of enforcing various standards.

- Laying down mechanisms and guidelines for accreditation of certification bodies engaged in certification of food safety management system for food businesses.

- Laying down procedure and guidelines for accreditation of laboratories and notification of the accredited laboratories.

- To provide scientific advice and technical support to Central Government and State Governments in the matters of framing the policy and rules in areas which have a direct or indirect bearing of food safety and nutrition.

- Collect and collate data regarding food consumption, incidence and prevalence of biological risk, contaminants in food, residues of various, and contaminants in foods products, identification of emerging risks and introduction of rapid alert system.

- Creating an information network across the country so that the public,

consumers, Panchayats etc receive rapid, reliable and objective information about food safety and issues of concern.

- Provide training programs for persons who are involved or intend to get involved in food businesses.

- Contribute to the development of international technical standards for food, sanitary and phyto-sanitary standards and to Promote general awareness about food safety and food standards.(FSSAI, FSS ACT 2006)

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J BNB

INORGANIC CONSTITUENT IN VARIOUS BRANDS TEA USING FES.

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ABSTRACT:
The contents of sodium, potassium, calcium were determined in five different tea samples of local brands using Flame Emission Spectroscopy (FES). The methods used for sample preparation, digestion, and quantificational analysis were established maintaining satisfactory analytical precisions. The quantitative method established in this work lays an easy yet effective method for estimation of various essential metals in very frequently consumed beverage tea. The results have shown this method can be an alternative method to AAS for the determination of various metals in the tea sample.

KEYWORDS -Sodium, Potassium, Calcium, FES, Tea Samples.

INTRODUCTION

Tea (*Camellia sinensis L.*) is one of the most popular nonalcoholic beverages, consumed by over two-thirds of the world's population for its medicinal, refreshment and mild stimulant effects [Karak,T Bhagat 2010]. Tea leaves contain polyphenols such as epigallocatechin 3-gallate, which has many medicinal properties, including antioxidant [Li X,Zhang Z,Li P,ZhangQ,Zhang W 2013], cholesterol-lowering [Srividhya B, Subramanian R Raj V 2011], hepatoprotective Issabeagloo E, Ahmadpoor F, Kermanizadeh P, Taghizadieh M 2012] and anticancer activities [Dufresne C, Farnworth E 2000]. Moreover, its detoxifying properties are essential in the elimination of alcohol and toxins [Dufresne C, Farnworth E 2000].However, considering that an estimated 18 billion cups of tea are consumed daily worldwide [Achudume AC ,Owoeye 2010], its economic and social importance is unprecedented. In fact, tea has been reported to be valuable in the treatment and prevention of many diseases [Achudume AC ,Owoeye 2010]

Inorganic constituents of plants and animals, such as Nitrogen, Potassium, Phosphorous, Calcium, Copper, Magnesium, Manganese, Molybdenum, Boron was observed hence, the present was exhibited tea sample was monitor by FES for its inorganic constituents.

MATERIALS AND METHODS

Volumetric flask(50ml,100ml),Beaker(100ml,250ml,500ml),Pipette(25ml,10ml), graduated pipette, wire guaze, watch glass, burner, various tea samples, stoppered bottle, funnel, Whattmann filter paper-42,

CHEMICALS:

Conc HNO_3 ,distilled water, KCL salt, NaCl salt, $CaCl_2$ salt from Loba chemicals.
Instrument: FES (EQ-855A)

METHOD:

SAMPLE PREPARATION:

Concentrated HNO_3 (30 mL) was added to the tea (3 g) and allowed to stand overnight at room temperature. The sample was then heated on a hot plate until the solution became clear and semi-dried. The solution was then cooled and filtered through Whatman No. 42 filter paper. It was then transferred quantitatively to a 50 mL volumetric flask by adding deionized distilled water [Du laing G, Tack FM, Veloo MG 2003].

Na, K and Ca contents in various brands of tea and standard

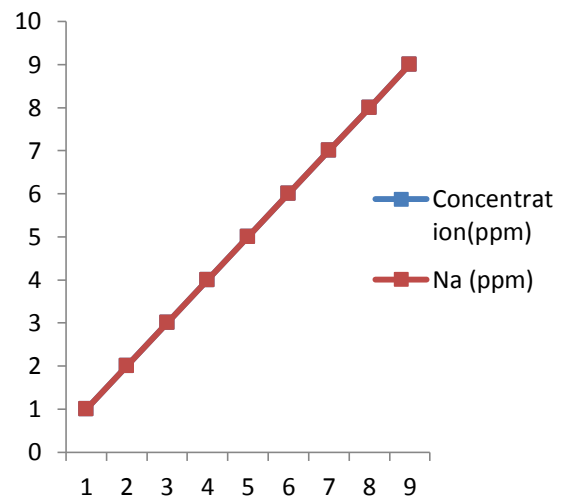| Concentration (ppm)	INSTRUMENT RESPONSE		
	Na (ppm)	K (ppm)	Ca (ppm)
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9
Society	2	12	5
Tata Agni	2	9	14
Tata Premium	5	10	26
Girnar Royal	5	8	32
Vagheri	19	11	20
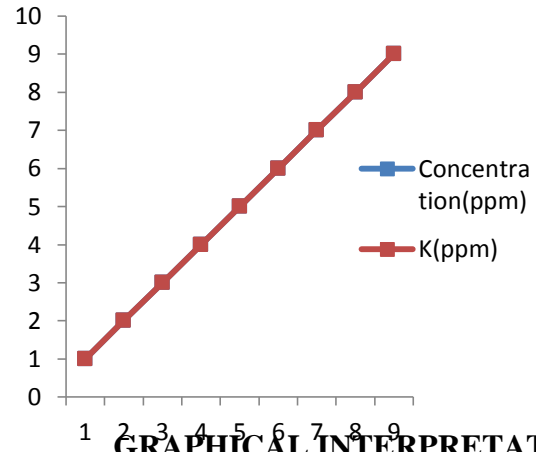
GRAPHICAL INTERPRETATION:
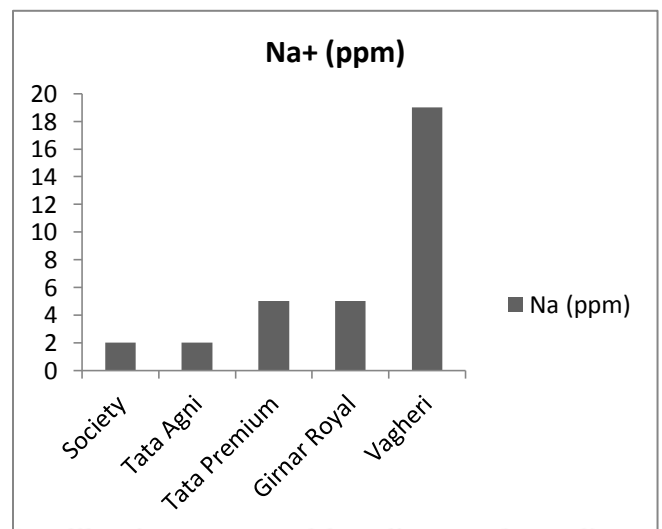
Figure 1 calibration curve and bar diagram for sodium content in various brands of tea
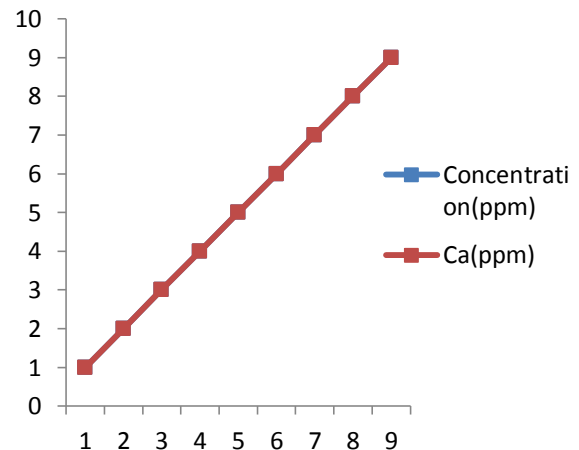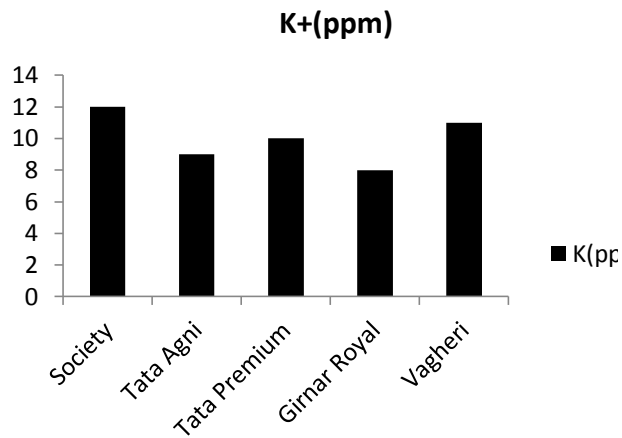
K+(ppm)

Figure 2 calibration curve and bar diagram for potassium content in various brands of tea

RESULT AND DISCUSSION:

According to figures and table data content of minerals in tea proves that the FES considered as an effective and précised method for the estimation of minerals like Na^+, K^+, and Ca^{+2}. The sample preparation is also easy and use of HNO_3 proves effective solvent for digestion of the Tea sample. further the method explore the effect of different acids over digestion of the tea sample. The analytical procedure FES was also compared with the analytical procedure of AAS which is much expensive and titrimetric method which is much time consuming and hence it proves a good alternative for both of this method.

 The most popular brand in local market that the content of Sodium in tea ranges from 0.33 to 3.166mg. (figure 1).

The most popular brand in local market that the content of Potassium in tea ranges from 13.33 to 20mg (figure 2).
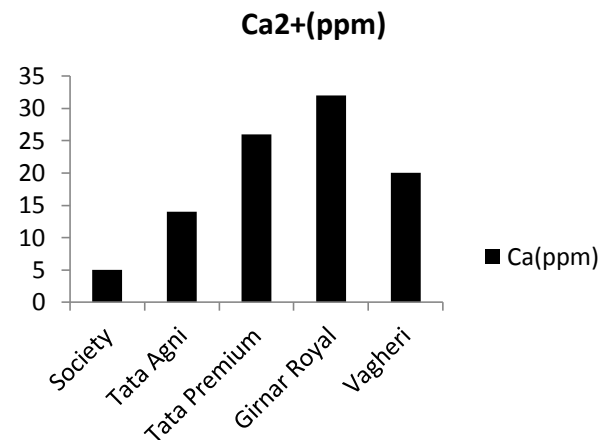

Ca2+(ppm)

 Figure 3 calibration curve and bar diagram for calcium content in various brands of tea

The most popular brand in local market that the content of Calcium in tea ranges from 0.833 to 5.33mg (figure 3).

Compared to all other brands, Vagheri has the maximum amount of Sodium, Society has the maximum amount of Potassium, Girnar Royal has the maximum amount of Calcium.

Overall if we compare all the data obtained during obtained through the test Vagheri is the brands which is rich in all the minerals more compare to any other brands. (Table 1)

CONCLUSIONS:
Overnight Digestion method followed by FES have been successfully optimized in the present study. An overnight digestion with nitric acid offered adequate time to digest the tea matrix and was the most efficient method for determining the proportions for sodium, potassium and calcium.
After drinking tea frequently it may cause accumulation of metals in the body causing harmful effect.

ACKNOWLEDGEMENT:

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J BNB

ANALYSIS OF CREEK WATER AROUND THANE DISTRICT

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Abstract:

In the present study focused on the physico- chemical parameter of water sample collected from different urban areas of Thane district (Ambernath, Thana College, Kachrali talav, Rayladevi talav, Rabodi Talav, Talavpali, Kalwa and Ganga Nile) during the Rainy season periods of June to November of 2015. The samples were analysed for Biochemical Oxygen Demand (BODs), pH, Hardness, conductivity in rainy season. Six of the Creek sample examined was found to be less unpolluted, two of them being polluted naturally. Analysis found that PH of all water sample were found almost neutral also BOD (biological oxygen demand) obtained for water samples found to be satisfactory for few sample and hardness of water found to be increasing towards urban area compared to rural area.

Keywords: P^H, Conductivity, BOD, Hardness of water etc**.**

Introduction:

Water plays vital role in human life. The main resource of drinking water is river, lake etc. Most of the river is naturally flow around metro cities where they have grown their own industrial zone. The water from industrial waste directly allows adding in rivers without any processing and hence the pollution level of most rivers found to be higher. On the basis of WHO report approximately 36% of urban and 65 % of rural Indian were without access to safe drinking water. Many of the rivers in these countries have therefore remained largely polluted. Increased industrial activities have led to urbanisation and pollution stress on the environment both from industrial and domestic sources (Akoto O. and Adiyiah, J. (2007).

The major streams in the industrial estates of big cities like rivers, Creeks, ponds and niles etc are already seriously polluted by wastes from industrial sources and all the streams flowing through the densely populated city like Thane are heavily polluted by industrial as well as wastes from domestic sources . Whatever action is taken in the future to control environmental pollution it will be aided by the availability of background quality data on the environment (Akpoveta O.V., et. al (2011), Accordingly programmes designed to collect present day base-line data of waters ample around thane region have been initiated. In this paper, data on the major pollutions parameters for some polluted Creeks and niles are reported.

Material and Methods:

The analytical grade reagents and chemicals were used without any purification. All glassware were cleaned with water and 1 normal sulphuric acid (H_2SO_4) and then rinsed with distilled water. The water sample were collected by different location from thane

district (Ambernath, ganga nile etc) to find the different physico-chemical parameter like PH, BOD, conductivity and total hardness of water. Eight Creek and nile water ample were studied. Local disturbing influences at sampling points were avoided as much as possible. Sampling was mainly carried out in the rainy season periods, starting from mid of June to November of 2015 .Each sampling point were visited once. All the samples

collected were analysed for Biochemical Oxygen Demand (BODs), Conductivity, Hardness and pH. The methods described by the text book of S.Y.B.sc, Department of chemistry, university of Mumbai were used for finding the parameters. The instruments like conductometer, pH meter were used to measure the mentioned physic-chemical properties of water samples Shown below-

Result and Discussion:

The variation in physico-chemical Parameter is represented in table.

Table 1 showing PH,BOD,Conductivity and hardness of water sample collected from various place of thane district.

Location	pH value	Location	BOD value
Ambernath	6.84	Ambernath	9.216
Thana college	6.7	Thana college	7.2
Kacharali talav	8.41	Kacharali talav	6.048
Rayladevi talav	7.26	Rayladevi talav	3.168
Rabodi talav	7.75	Rabodi talav	2.592
Talavpali	7.55	Talavpali	2.304
Kalwa	7.51	Kalwa	2.016
Ganga nile	6.12	Ganga nile	0.576

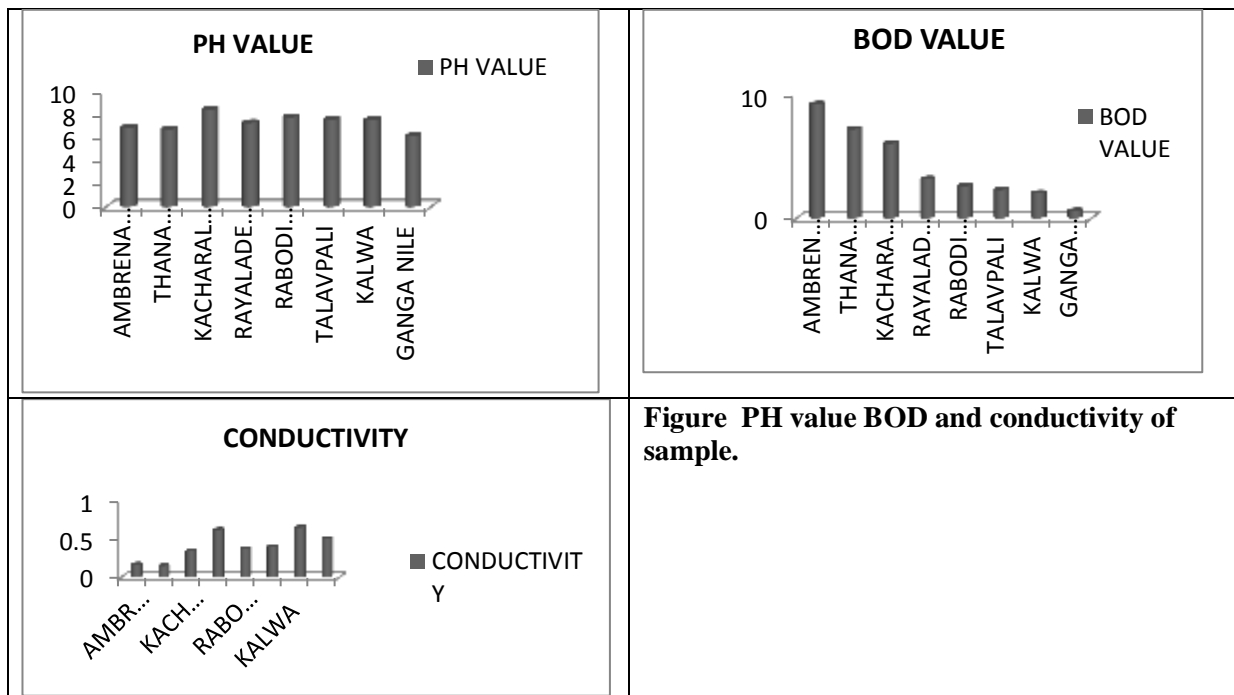| Location	Total hardness(mg/lit)	Location	Conductivity
Ambernath	56 ppm	Ambernath	0.17
Thana college	48 ppm	Thana college	0.15
Kacharali talav	144 ppm	Kacharali talav	0.34
Rayladevi talav	232 ppm	Rayladevi talav	0.62
Rabodi talav	112 ppm	Rabodi talav	0.37
Talavpali	104 ppm	Talavpali	0.4
Kalwa	144 ppm	Kalwa	0.65
Ganga nile	167 ppm	Ganga nile	0.5

Figure PH value BOD and conductivity of sample.

Conclusion:

In this study characterization of the physico-chemical parameters of water from different locations around thane Urban area was carried out to assess the quality of water. Each parameter was compared with the standard desirable limits prescribed by World health organization (WHO) From the study it can be concluded that Urban water is safe for drinking purposes from the point of view of levels of pH But the total hardness varied in between 56 to 167 mg/L which indicates that water in the urban area of Thane is moderately hard, so It is also necessary to find out the source of contaminants which is due to soil types, industrialization, water chemistry and other human activities. This study gave us an insight that urban water is harder and containing more dissolved ions.

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JBNB

PREPARATION OF PYRIDINE BY USING LOW MELTING SOLIDS

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ABSTRACT:
1, 4-dihydropyridine is used in pharmacology as an L-type calcium channel blocker. It is vascular selective in its mechanism of lowering blood pressure. It functions as an antihypertensive, vasodilator, antitubercular, anticonvulsant, antitumor, analgesic, and also as an anti-inflammatory. The present work constitutes of finding a new route to synthesize this multifunctional molecule. The synthesis of 1, 4-dihydropyridine is done using different solvent system involving tartaric acid and N,N-dimethyl urea.
Key words: 1,4-dihydropyridine, tartaric acid, ammonium acetate, N,N-dimethyl urea.

INTRODUCTION:

The first synthesis of dihydropyridine was reported by Hantzsch in 1882 in the course of developing his useful synthetic method for pyridine. This reaction yields 1, 4-dihydropyridines, as isolable intermediates, which are then oxidized to pyridines. 1, 4-dihydropyridine is useful in pharmacology as it functions as an L-type calcium channel blocker (CCB). Dihydropyridine (DHP) calcium channel blockers are derived from the molecule dihydropyridine. CCBs are used as antihypertensive drugs i.e., as medications to decrease blood pressure in patients with hypertension. It functions as a vascular selective medication in lowering blood pressure. The

activity of it as an antihypertensive, vasodilator, antitubercular, anticonvulsant, antitumor, anti-cancer activity(Hammam, et.al, 2001). analgesic, and also as an anti-inflammatory (Swarnalatha et.al,2011). Bhardwaj,et.al ,2016 explained its antimicrobial activity . The present project has been carried out to check the possibility of pyridine synthesis by making use of a solvent such as, tartaric acid and N,N-dimethyl urea which has not been used prior. These reagents are used as it also functions as a coolant in the reaction. The reaction was throughout monitored by thin layer chromatography and isolated by column chromatography.

MATERIALS AND METHODS:

The reagents used in the reaction were of high grade purity. Ammonia or ammonium acetate is frequently employed to supply nitrogen in the DHP synthesis. Saini, *et.al*, 2008 explained that urea, ammonium nitrate, formamide, hydroxylamine, primary amines, secondary amines and hydrazine can also been employed (Saini, *et.al*,2008).

Pyridine reaction with ammonium acetate, ethyl acetoacetate, formaldehyde tartaric acid and N,N-dimethyl urea

Condensation Reactions:

The Hantzsch synthesis of dihydropyridines has been revisited by numerous research groups over the years. This synthesis allows the efficient preparation of 1, 4 -dihydropyridines through a one-pot multicomponent condensation reaction of an aldehyde, ethyl acetoacetate and ammonium acetate performed at 80°C.
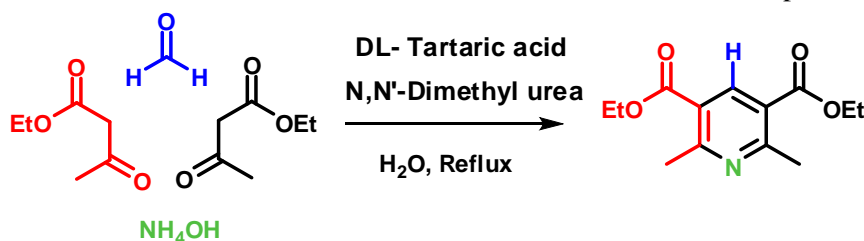
Pyridine reaction with ammonium acetate, ethyl acetoacetate, formaldehyde tartaric acid and N,N-dimethyl urea.

General procedure for the synthesis of substituted pyridines:

A 10 mL round-bottom flask was charged with 1.4g (70%) of N,N-dimethyl urea and 0.6g (30%) of tartaric acid, it was liquified by heating it at 110^0C for 15 minutes. Formaldehyde (10 mmol i.e. 0.750 ml), two molecules of ethyl acetoacetate (10 mmol i.e., 6.507 ml) and excess of 30% ammonium acetate were added to the round bottom flask. The mixture was stirred using a magnetic stirrer at 800 rpm on hot plate at 120^0
for 30 minutes. The reaction was monitored by TLC in regular intervals of 5 minutes. UV chamber was used to locate the exact position of the spot. The product was isolated by column chromatography and worked it up in ethyl acetate.

RESULTS AND DISCUSSION:

A reaction of synthesising pyridine by using low melting solids viz., N,N-dimethyl urea and tartaric acid has been developed. Product formation was monitored by taking TLC of the compound. After 16 hours of reaction, it was observed that there was only one spot of product and that all the reactants had been converted into productd. The spot of reactant had vanished off. By this method we can synthesize pyridine of high purity in short time and at low temperature over Hantzsch pyridine synthesis.

CONCLUSIONS:

 It is possible to synthesize pyridine and its derivatives using tartaric acid and N,N-dimethyl urea which are low melting solids that chill the reaction mixture; tartaric acid also provides acidic medium to initiate the reaction.

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METHOD DEVELOPMENT FOR SYNTHESIS OF BENZIMIDAZOLE USING LEWIS ACIDS

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ABSTRACT:
An efficient and convenient method has been developed for the synthesis of benzimidazole. The present work constitutes of finding a new route to synthesize benzimidazole. The synthesis have been done using N,N-dimethyl formamide and o-phenylenediamine in presence of Lewis catalyst like $AlCl_3$ and $FeCl_3$.
Key words:
 N,N-dimethyl formamide, o-phenylenediamine, catalyst; $AlCl_3$ and $FeCl_3$.

INTRODUCTION:

 Benzimidazoles have attracted considerable interest from organic chemists because of their occurrence in a wide variety of pharmaceutically important scaffolds in medicinal chemistry. Benzimidazoles are also key structures in various biologically active compounds that show antidepressant activities (Hadizadeh *et.al*., 2008). It also exhibits antifungal, antileukemic, antihypertensive, antiulcerative, antihistaminic, antitumor, antiviral, antidiabetic properties (Salahuddin *et.al*. 2017). Townsend *et.al*.,1990 explained its anthelmintic properties (Townsend *et.al*.,1990). Various methods have been developed for the synthesis of benzimidazoles. However, this method involves condensation–dehydration of *o*-phenylenediamines with carbonyl compounds, formic acid, derivatives of carboxylic acids, or alcohols in the presence of oxidants, or cyclization of thioanilides. The three-component reaction of 2-iodoaniline, aldehydes, and elemental sulfur, and an intramolecular cross-coupling using Lewis acids like $AlCl_3$ / $FeCl_3$/BF_3/ $TiCl_4$/ $ZnCl_2$ have been reported for the synthesis of benzimidazole derivatives. Likewise, benzothiazole and benzoxazoles have been synthesized by various methods. These include synthesis of benzimida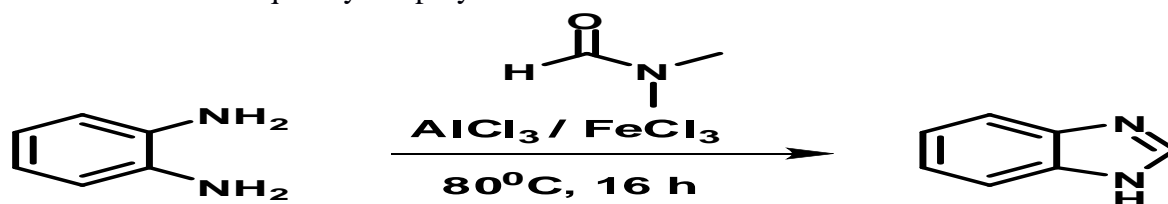zoles by using 1,2-arylenediamines and *N,N*-dimethylformamide in a highly acidic medium. However, most of the existing methods have disadvantages, such as a requirement for toxic or air-sensitive reagents, harsh conditions, or highly acidic media. Others show poor atom economy or involve multistep synthesis of pre-functionalized precursors, with limited success in terms of yield and selectivity. Much effort has been devoted to the development of less-expensive and cleaner protocols and, in this respect, Lewis catalyst like $AlCl_3$ and $FeCl_3$ emerges as an interesting catalyst in the view of its abundance and low cost. Here, an economical protocol for the synthesis of benzimidazoles, benzoxazoles, and benzothiazoles or substituted benzothiazole scaffolds is reported by using Lewis catalyst like $AlCl_3$ and $FeCl_3$.

    N, *N*-Dimethylformamide (DMF) is a versatile reagent which acts as a source of –CO, –Me, –NMe$_2$, –CONMe$_2$, –CHO, or –CN groups, depending on the reaction conditions. However, the synthetic utility of DMF as a source of formyl (–CHO) groups is prominent among the reported procedures. Some recent protocols include the formylation of N–H functional group by DMF with copper (II) acetate and *tert*-butyl hydroperoxide in an oxidative C–N bond

forming reaction. In continuation of our ongoing research, an efficient, mild, and environmentally benign protocol for the synthesis of benzimidazole derivatives by using a lewis acid catalyst under solvent-free conditions has been reported here. This protocol was also applied to the synthesis of various benzothiazole and benzoxazole derivatives.

MATERIALS AND METHODS:

The reagents used in the reaction were of high grade purity. o-phenelenediamine or its derivative were frequently employed with N,N-dimethyl formamide for preparation of benzimidazole. Different Lewis acids like $AlCl_3$ / $FeCl_3$./BF_3/ $TiCl_4$/ $ZnCl_2$ were used for initiation of this reaction .

CONDENSATION REACTION

The benzimidazole synthesis has been revisited by numerous research groups over the years. This synthesis allowed the efficient preparation of benzimidazole and its derivatives through a one-pot multicomponent condensation reaction of N,N-dimethyl formamide and o-phenelenediamine by using Lewis catalyst like $AlCl_3$ and $FeCl_3$.

Condensation reaction of N,N-dimethyl formamide and o-phenelenediamine by using Lewis catalyst like $AlCl_3$ and $FeCl_3$

General procedure for the synthesis of benzimidazole:
A 10 mL round-bottom flask was charged with 1.62g (15mmol) of o-phenylinediamine and 1.0 ml (15mmol) of N,N-dimethyl formamide. Yamamoto *et.al*., 2008 in his book explained that Lewis acids like $AlCl_3$ and $FeCl_3$ in presence of appropriate solvent has to be added to the round bottom flask (Yamamoto *et.al*., 2008). The round bottom flask was equipped with a magnetic needle and was attached to water condenser and kept in water bath. The whole assembly was heated on a hot plate with magnetic stirrer. The temperature was adjusted to 70^0C for 16 hours at 500 rpm. The reaction was monitored via TLC at regular interval of 2 hours. Himanshu *et.al.,* 2015 explained the use of UV chamber to locate the exact position of the spot (Himanshu *et.al.,* 2015). The product was isolated by column chromatography.

RESULTS AND DISCUSSION:

An efficient reaction of synthesising benzdimidazole by using Lewis acid like $AlCl_3$ and $FeCl_3$ has been developed. Product formation was monitored by taking TLC of the compound. After 16 hours of reaction, it was observed that there was only one spot of product and that all the reactants had been converted into products. The spot of reactant had vanished off. By this method we can synthesize benzimidazole of high purity in short time and at low temperature over conventional methods.

CONCLUSIONS:

 It is possible to synthesize benzimidazole and its derivatives using Lewis acid like $AlCl_3$ and $FeCl_3$ which provides highly acidic medium to initiate the reaction.

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NONDESTRUCTIVE FTIR ANALYSIS OF DYE OBTAINED FROM ROSE

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ABSTRACT:
Plants are natural resource of organic material, Rose is popular variety of flowers due to its scent which is majorly influenced by organic compound (-)-cis-rose oxide. rose oxide is contribute toward the fragrance to flowers include geraniol, nerol, (-)-citronellol, farnesol, and linalool. Hence present paper attenuated the respective dye isolated from sunlight, Dark and normal condition explored rose. Characterization has been done with TLC, UV and nondestructive method FTIR. The study may be utilized for food, cosmetics, pharmaceuticals and perfumery.
Keywords: Natural Dyes, Xanthophyll, Delphinidine, Anthocyanin , Chemistry of rose .

INTRODUCTION:

Nature expresses itself in a wide spectrum of colours. Currently, ecological considerations are becoming an important factor in the selection of consumer goods all over the world. Natural dyes are the colours derived from plants and animals or insect matter without any chemical processing (Chandan Kumar Jha et.al (2015). Arial parts of plants are rich source of various dyes stuff having diversified applications. Plants are one of five big groups of living things. The whole plant biodiversity is the largest source of herbal medicine (Monali U.et.al 2014).The study may support to extract the food colour as per desired material. Although this ancient art of dyeing with natural dyes withstood the ages of time, a rapid decline in natural dyeing continued due to the wide availability of synthetic dyes at an economical price. However, even after a century, Dyes are one of the useful stuffs used for various purposes in our daily life. They are commercially produced on a large extent. Some may be toxic or some may be in-toxic. It is necessary to make worthy practice of natural resources instead of chemicals which are toxic and hazardous to health. Rose is an ornamental plant used in various perfumery juices and beverages, cosmetics and food industry hence it very much important point of view utilized for some economic purpose.

Carotenoids produce the yellow colours, anthocyanins the reds, and a mixture of these two the modern oranges (Chem view 2014). The use of natural dyes never erodescompletely and they are still being used. They are eco-friendly, nontoxic, nonallergic, reasonable unlike synthetic dyes. The use of natural dyes never erodes completely and they are still being used.

The study focuses to promote the use of natural dyes over the toxic, allergic, costly synthetic dyes. Standard methods are available and have been adopted globally to determine the harmful aromatic amines in many of the consumer products. But a drawback in such methods is the use of chemical reagents which are hazardous to human health and environment. FT-IR

spectroscopy is widely used as a powerful analytical tool in consumables research (F. Ahmed et.al 2016). In the present paper

MATERIALS AND METHODS:

A bunch of roses purchased from local market of Thane Maharashtra, India. All petals were dried under sunlight, Dark and at normal conditions. The crushed air-dried rose flower petals were made to dissolve aqua solvent and ethanol stirred on magnetic stirrer for 2hrs by increasing temperature.

RESULT AND DISCUSSIONS:

Change in color was observed by naked eyes when the extraction of dyes was carried out using aqua well as organic solvents used for extraction. Increase in dilution of sample also changes in shade of the dyes. Hence to observe saturated solution of dye effective's conditions were maintained. Extraction of dyes was observed from one hr. The changes in color of Rose from red to cream in sunlight and orange to bluish black in day light to violet in dark at normal condition were observed. The dyes works as a sensitizer that is responsible in absorbing sunlight and triggering electrical conversion mechanism. Due to these characteristics ancient women may using these flowers as ornamental, beautification and also in other traditional therapies. The saturated aqua solution of rose filtrate was dried well and used for UV and FTIR analysis (figure 1& figure 2). Rf values of dyes extracted from sunlight was 0.35 Delphinidine with Pink colour appearance while 0.23 for dark yellowish tinch to pink and 0.27 for normal with orange red tinch spot was observed.

focuses on flower rose procure dyes at different atmospheric condition and its FTIR analysis.

The solvents are centrifuged for 25 minutes at 2500 rpm to obtain a homogenous dye solution with the debris collected at the bottom of the tube. The absorption spectra of the dyes were performed for filtration; the filtrate was examined under TLC, UV-1800 double beam spectrophotometer and FTIR (Model-Nicolet IS5) (ASTM 2007).
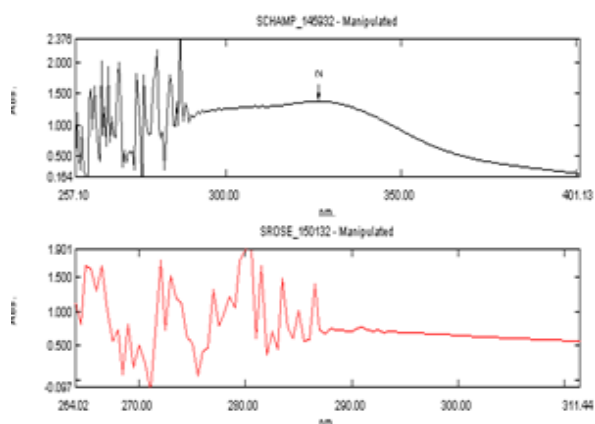

Figure 1 UV spectra of rose petal explored Sunlight and Normal conditions.

Characteristic peak of values from190nm to 290 nm may be due organic compounds absorb UV or visible light.Sunlight explored samples absorption varyin each analysis indicated number of organic dyes may be present in rose which may explored due to sunlight.

Dyes extracted at 60^0C stirred for 2 Hrs on magnetic stirrer exhibited UV maxima at 340nm for aqua sample and at 90^0C showed 290nm.The photon energy absorbed into the dye calculated by

$$E= hC/\lambda \quad \text{--------------------------(1)}$$

Where, h is the Planck's constant, λ is the wavelength and c is the speed of light. The numerical values of the symbols are; h = 6.63 x 10-34 Js, c = 3.0 x 108 m/s, 1eV = 1.60 x10-19 J. and absorption coefficient (α) indicated that how for sunlight penetrates before it's absorbed. The absorption coefficient of 290nm and 340nm wavelength is obtained by absorption is

Absorption coefficient (α) = 4πK /λ ------(2)

Rose dye at Sunlight

Where, λ (nm) is taken from the cutoff wavelength of the dyes and K is the Boltzman constant with the value of 8.617 ×10−5 eV.

IR analysis was used to identify the functional group of active components based on peak values in the region of infrared radiation (Figure 2).
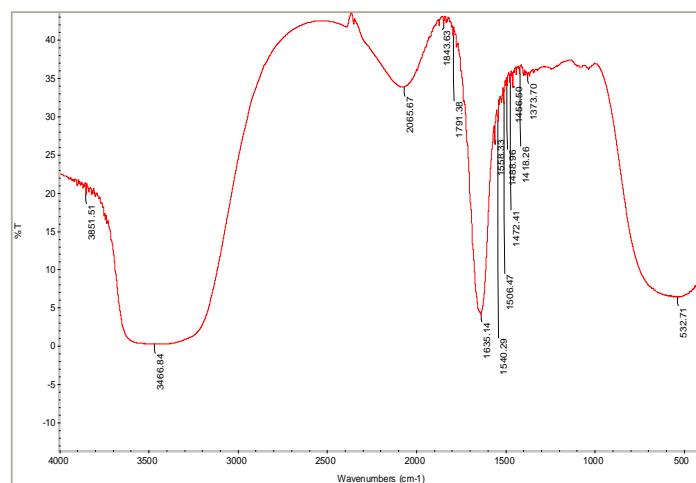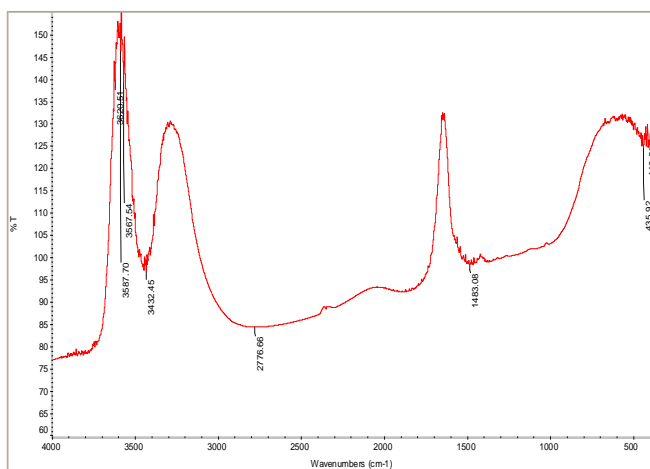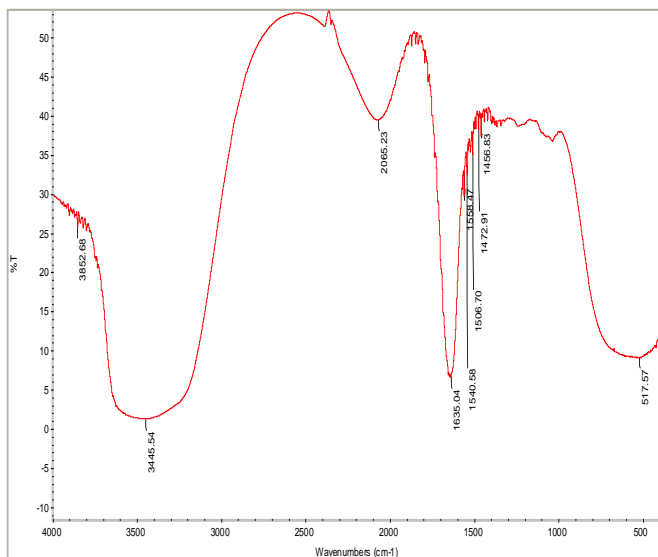
Figure 2 FTIR spectra of rose dye under different conditions.

Rose dye at DarK

Condition	Peak absorbance (nm)	Photon energy (eV)	Absorption coefficient KM-1
Extract sunlight	560, 290	2.26	1.97
Extract in dark	340	2.44	2.12
Extract in normal	560	2.29	2.02

Rose dye at Normal

FTIR Interpretation

SUNLIGHT-
3851cm-1, 3466 cm-1, 2065cm-1, 1843 cm-1,1791cm-1(C=C),1635cm-1,1558cm-1, 1540cm-1,1506cm-1(N-O symmetric), 1472cm-1,1456cm-1(C-H bend),1433cm-1, 1418cm-1,1373cm-1 532cm-1

DARK-
3852cm-1,3454cm-1(N-H symmetric twobands symetri and asymmetric strech), 2066cm-1,1635cm-1 (C=C stretch), 1558cm-1, 1540cm-1, 1506cm-1, (N-O symmetric),1472cm-1,1456cm-1(C-H bend)

NORMAL-3687cm-1,3620cm-1,3637cm-1, 3569cm-1,3432cm-1,1483cm-1,435cm-1 correspond to O-H stretching vibrations, 2776cm-1 NH Stretching, OH Stretching, Alkene Ortho Disubstituted.

The spectroscopic features which point downward are due to CO interacting with its local molecular environment before photolysis and those pointing upward are from photolysis CO observed at 2065cm-1 in sunlight rose dye. Peak at 1540cm-1 observed in all conditions sample indicates presence of nitrogen content. 1635cm-^{1}indicates presence amide group since dye is obtained from natural source may be indicates that the presence of proteinous N. After hydrolysis for normal temperature, it is disappear and appearance of broad peak at 2776 cm-1.

Plants are important source of potentially bioactive constituents for the development of new chemotherapeutic agents nearby all exhibited C=O of ketone at 1472cm-1 and at 1456cm-1 for sunlight explored sample. The band of 1635 cm-1 contributed by C=O (carbonyl C of ketone structure) N of amide and hence reduction of intensity observed

towards region 1450 cm-1 to 160cm-1. The broad peak at 3409cm-1 also corresponds to the O-H stretch and also vibrations due to changes in region up to 3587 cm-1. The presence of carbonyl carbon contain in pigments promotes strong hydrogen bonding towards characteristics and observed large shifting of peak to lower frequencies which is exactly match Delphinidine / anthocyanin with the UV spectra as well as with the Rf values observed such as shifting of 560 nm to 340 nm. This study indicates that the color obtained from rose is drug intercalated. It may be spectral change observed due to free radical reaction in sunlight explored rose dye sample or photo-reduction reaction in dark conditions. Change in hybridization is Sp^3 observed in all samples. Bands contributes was explained as -C-H bend, C=NOH (oxime), Deformation vibration, NO_2 (nitro compound assym), Amides, N-H stronger in amides than in amines (assym),C=C stretching, Strong alkenes, β-amino ketones,($-C \equiv C-$) Alkyne variable intensity, Little lower when conjugated , weak when symmetrically substituted.

Intermolecular distances and energy minimization in order to establish correlations between pigment binding mode and antioxidant activity that lead to the change in color (table) is observed during boiling optimization process. It was observed that smaller the particles, more accurate were the possible colour. The flowers rose is attractive colour in all the condition but in dark all the flowers produce darkest bright colour. Hence the dried flowers were boiled to retain its pigment. The vibrating or stretching of functional groups of the dye compounds procure good energy values.

CONCLUSION:

The note definitely helps in the food industries to observe the effect of environmental conditions in relation structural elucidation of dye for food, cosmetics and drug advancement.

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MATHEMATICAL CONTRIBUTION OF WOMEN: SOME GLIMPSES FROM HISTORY

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Abstract

In this paper we study the contribution of some famous female mathematicians in the development of mathematics from history. We study the major work and their achievements in the field of Mathematics. The purpose of the study is to explore the history of women in the field of mathematics, the impact and the experiences through literature review.

Introduction

The role of female mathematicians is very large, that it is difficult to pen down all the female mathematicians. In this paper we study the well known and highly esteemed female mathematicians, but the list doesn't stop here. Throughout history there have been numerous other women whose contributions to the field of mathematics have made significant impacts. In 1971 the Association for Women in Mathematics was formed with the intent of helping to establish and promote equal opportunities and treatment for girls and women in all areas of mathematics, while at the same time helping to encourage more to get involved with math. Some of these females were child prodigies, some were born in families with great academic achievements, while some had to struggle to become the inspiration that they are today to the countless aspirants who have to face obstacles in making a mark in society. We salute them for their determination, willpower, and their undefeated attitude towards achieving their goals.

1. Hypatia of Alexandria (AD 350 or 370-AD 417)

Born nearly 17 centuries ago, Hypatia of Alexandria was a brazen, highly intelligent woman who excelled in the fields of science, math and philosophy .she was one of the earliest known female mathematicians in the world, known not only for her excellence in mathematics and astronomy, but also for the brutal death she suffered from the hands of the early Christians due to her pagan beliefs and political involvement. She was the daughter of a renowned Greek mathematician Theon Alexandricus. Being born to an educator, Hypathia herself had all the qualities that an ideal teacher should have. She was a great orator and people from all across the globe came to gain from her teachings [**Kingsley, Charles**].

Contributions

She edited the book "On the Conics of Apollonius" where she contributed on the ideas introduced by Apollonius on conic sections. It was through this that the development of concepts such as hyperbolas, parabolas, and ellipses took place later. Some sources also attribute her to be the inventor of hydrometer; however, it was invented before Hypatia and was already known at the time. Apart from editing the existing works of renowned mathematicians of the time, most of her works are believed to have been in collaboration with her father's work.

2. Gabrielle Émilie Le Tonnelier de Breteuil, marquise du Châtelet
(17 December, 1706 - 10 September, 1749)

Émilie du Châtelet was a French mathematician and physicist who although lived a fairly short life, but lived it with full zest. However, being brilliant at academics, her father supported her studies, especially her love for mathematics [**Zinsser, Judith and Hayes, Julie**].

Contributions

She is primarily known for her book, Institutions du Physique, which was published in the year 1740. Her translation of Newton's Principia Mathematica, along with her commentary, is till date considered to be the best French translation of this book. It was published ten years after her death.

3. Maria Gaetana Agnesi
(16 May, 1718 - 9 January, 1799)

She was considered to be the first important female mathematician after Hypathia. This Italian mathematician and philosopher was a child prodigy, who was known as the "Seven-Tongued Orator" at the age of eleven. She could fluently speak Italian and French by the age of 5, and by her eleventh birthday, she mastered Greek, Hebrew, Spanish, German, and Latin. By the time she was 14, she was studying ballistics and geometry. Her love and dedication for mathematics gained her a position at the University of Bologna as a professor [**Mazzotti, Massimo**].

Contribution

She is known for her detailed explanation of differential and integral calculus in her book 'Instituzioni analitiche ad uso della gioventù italiana', translated as Analytical Institutions for the Use of Italian Youth in English, which was published in the year 1748 in Milan. She also gained fame for the curve called the "Witch of Agnesi", named after her. She wrote the equation of this curve, 'versiera' as it was previously known, which was originally studied and constructed by Pierre de Fermat and Guido Grandi. Her work was translated into English,

where the word versiera, which seemed very similar to the word 'avversiera' (meaning 'the wife of the devil') got translated as the word 'witch', hence the curve came to be known as the Witch of Agnesi.
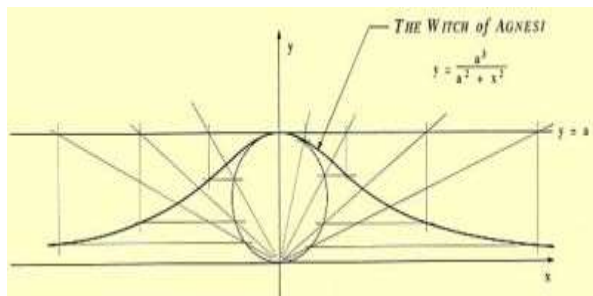

Fig: The Witch of Agnesi is a curve that is symmetric about the y-axis and approaches an asymptote on the x-axis. The Witch of Agnesi was originally called La versiera di Agnesi, or "The Curve of Agnesi." "Versiera" is very similar to the word "avversiera" in Italian, which means "woman contrary to God". This was interpreted as witch. The name of the curve was mistranslated.

4. Marie-Sophie Germain (April 1, 1776 – June 27, 1831):

Parisian born Germain was a passionate mathematician with a love of number theory and differential geometry .Sophie Germain's paper on elasticity theory made her the first woman to be awarded from the Paris Academy of Sciences

in 1816 and first unmarried woman to attend sessions at the Academy of Sciences and the Instit de France. She was also a major contributor in proving Fermat's Last Theorem. She learned under the tutelage of renowned mathematicians of the time including Joseph-Louis Lagrange, Adrien-Marie Legendre, and Carl Friedrich Gauss [**Case, Bettye Anne; Leggett, Anne M**].

Contributions
She became the first woman to win a prize from the Paris Academy of Sciences for her paper on elasticity theory, 'Recherches sur la théorie des surfaces élastiques', in 1816. She was also the first woman to attend the sessions of the Academy of Sciences', which was otherwise accessible by only male members and their wives.Because she was self-taught, the University of Göttingen gave her an honorary degree for her work and potential, as recommended by her former tutor Gauss. However, it was received six years after her death from a long battle with breast cancer.

5. Augusta Ada King, Countess of Lovelace (10 December, 1815 - 27 November, 1852)

Born as Augusta Ada Byron, the only legit daughter of Lord Byron, this English mathematician achieved quite a lot of fame and recognition for her analytical and computing abilities. In fact, she is widely known as the

world's first computer programmer. Her mother discouraged her to learn literature as she feared that Ada too, may turn out to be reckless and emotionally unstable as her father, with whom she separated soon after Ada's birth. However, Ada showed great interest in becoming an analyst and a metaphysician, and was highly intelligent and farsighted for her time. In fact, when she heard of Charles Babbage's idea of inventing a calculating engine, she was the only one who believed that computers could do more than just calculating. Babbage called her The Enchantress of Numbers [**Wade, Mary Dodson.Ada Byron Lovelace**].

Contributions

It was she who suggested Babbage to write a plan where the 'Analytical Engine' could calculate Bernoulli numbers, which later on developed as the very first 'computer program'. This is the reason why the U.S. Department of Defense named a software language of theirs, as 'Ada' in the year 1979. She translated the memoir of Italian mathematician Luigi Menabrea on Babbage's machine, the Analytical Engine. She also included her own notes explaining the functioning of the Analytical Engine.

6. Sofia Vasilyevna Kovalevskaya (January 15, 1850 - February 10, 1891)

She was the first Russian woman to be recognized as a mathematician. Sofia's interest in mathematics began when she observed her room's wallpaper that had calculus notes of her father. These papers were put on the wall for there was a shortage of wallpaper. Her passion for studies was such that she even agreed to marry, for a young and unmarried woman in those times was not allowed to travel alone to outside place, the nearest university being in Switzerland. She had to leave her homeland, Russia, to fulfill her dreams of becoming a teacher, for women there were not allowed to become lecturers in universities. Yet, after going through many hardships, she managed to attain a Ph.D. from the University of Gottingen, became a lecturer at the University of Stockholm, and won the Prix Bordin from the French Academy of Sciences [**Cooke, Roger**].

Contributions

She is best known for the Cauchy-Kovalevskaya Theorem, which was proven by French mathematician Augustin Cauchy in 1842. However, it was Sofia who simplified his method of proof and gave it a final result in the year 1875. In her paper 'Sur Le Probleme De La Rotation D'Un Corps Solide Autour D'Un Point Fixe', Sofia discovered what came to be known as the Kovalevskaya Top. It is an example of integrable rigid body motion.In her lifetime, she published ten papers in mathematics and mathematical physics. Most of her work was groundbreaking and paved the way for many future discoveries.

7. Amalie Emmy Noether (23 March, 1882 - 14 April, 1935)

Described by renowned scholars including Albert Einstein, Jean Dieudonné, Pavel Alexandrov, and Norbert Wiener as the most important woman in mathematical history, this German-born mathematician gave some irreplaceable contributions in the field of math and physics, which, as experts say, were groundbreaking, revolutionary, and beyond comparison. She was the daughter of a noted mathematician himself, Max Noether. Although she wasn't quite passionate about the subject initially, it was only at the age of 18 that she decided to pursue her studies in math. In spite of being the daughter of a mathematician who was also a lecturer at the University of Erlangen, she wasn't allowed to attend full-time classes because she was a woman. However, she was allowed to audit the classes. She obtained her doctorate from the university but couldn't find a teaching job because of her gender. She did teach under the name of her father and other male professors, but was never paid for her work by the university until 7 years later when she proved her worth and gained a teaching position. She was a kind and compassionate teacher and most of the time, her students were called, The Noether Boys [**James, Loan**].

Contributions

She is known for her revolutionary work in theoretical physics and abstract algebra (with special focus to rings, groups, and fields). The theorem named after her, Noether's Theorem successfully explains the relationship between conservation laws and symmetry. The term Noetherian Ring was coined in her honor, arising from her publication, Ideal theorie in Ringbereichen, which was called "revolutionary" by renowned algebraist Irving Kaplansk. Her findings changed the approach of abstract algebra! Her contributions in mathematics were highly significant. She worked on theories of algebraic invariants and number fields, calculus of variations, noncommutative algebras, hypercomplex numbers, and algebraic topology. She also developed the theory of ideals in commutative rings.She won the Ackermann-Teubner Memorial Award, along with Emil Artin for their contributions to mathematics. She also taught many renowned future mathematicians including Grete Hermann, Ernst Witt, and Max Deuring.

CONCLUSION

In this paper we study the achievements and contribution of some famous female mathematicians. Due to space constraints, we had to omit many illustrious names. Yet, we believe that each and every woman mathematician, irrespective of the fact of being included in this paper or not, is an inspiration to one and all, especially those women and girls who have been told that mathematics and science are not suitable fields for women to thrive. These women never gave up, never doubted their abilities even when their own family did, and as a result, they are remembered and honored by one and all for their contribution and achievements.

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TREATMENT OF PICRIC ACID USING CLOUD POINT EXTRACTION

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ABSTRACT:

Cloud point extraction (CPE) is carried out to extract picric acid (PA) from aqueous solution using TX-100 as a nonionic surfactant. The effects of different operating parameters, like concentration of the feed mixture (both PA and surfactant), pH, temperature, and the presence of mono- and di-valent salts on the extraction of both the PA and surfactant have been studied in detail. The solubilization behavior of the PA in the surfactant micelle has been observed in the temperature range of 75 C to 90 C. Concentrations of surfactant and PA have been considered in the range of 0.2g to 1.5g and 100 mg/L to 400 mg/L, respectively. An optimum set of surfactant concentration, temperature, and salt concentration is obtained for the removal of PA from aqueous medium.

KEYWORDS: Cloud point extraction; micellar solubilization; TX-100

INTRODUCTION:

Picric acid is an organic compound with the formula $(O_2N)_3 C6H2OH$. Its IUPAC name is 2, 4, 6-trinitrophenol (TNP). The name "picric" comes from the Greek πικρός (*pikros*), meaning "bitter", reflecting its bitter taste. It is one of the most acidic phenols. Like other highly nitrated organic compounds, picric acid is an explosive, which was once its primary use. It has also been used in medicine (antiseptic, burn treatments) and dyes. Effluents coming out from these industries contain remnants of picric acid and discharged to wastewater treatment plants where a larger proportion of it cannot be removed and finally is discharged into the surrounding aquatic environment. Different techniques such as adsorption, electrochemical reduction, degradation with oxidation, and biodegradation have been employed to remove picric acid from aqueous solution.[en.wikipedia.org/wiki/Picric_acid.]

Cloud point extraction (CPE) is a promising technique for the removal of a trace amount of organic pollutants from aqueous medium [Haddou, B.; Canselier, J.P.; Gourdon, C. (2006)]. Previously, CPE technique had been used for pre-concentration of toxic metal ion by forming a ligand with other compounds [Watanabe, H.; Tanaka, H. (1978)]. CPE has been popular in the field of bio-separation for the separation and isolation of protein [Saitoh, T.; Hinze, W.L. (1995)] and vitamin molecules [Sirimanne, S.R.; Patterson, D.G.; Ma, L.; Justice, J.B.; (1998)].

Above the cloud point temperature, aqueous solution of a non-ionic surfactant separates into two phases, namely a surfactant rich phase, which has a small volume compared

to the solution and is called the coacervate phase and the other is dilute bulk aqueous phase containing surfactant concentration slightly above the critical micelle concentration (CMC). The solute molecule present in aqueous solution of non-ionic surfactant is distributed between the two phases above the cloud point temperature. The actual mechanism behind phase separation is still not clear. Martinez et al. (2003) have proposed a phase separation phenomenon during CPE of organic compounds. Micellar interactions are repulsive at lower temperatures and become attractive at higher temperatures. The dielectric constant of water decreases at elevated temperature and water becomes a poor solvent for the hydrophilic part of the surfactant molecules leading to phase separation; at higher temperature, micellar aggregation number, and micellar size increases causing to phase separation. Phase separation in CPE is immensely effected by the nature of the solute. The presence of polar solute increase hydration and coacervate phase volume, non-polar or hydrophobic solute make coacervate phase water free and more compact. The hydrophilic and lyophilic balance (HLB) of a non-ionic surfactant can be changed by addition of electrolytes and additives to increase the effectiveness of CPE for a particular solute.

Efficiency of the CPE technique depends both on phase separation and micellar solubilization of solutes. So it is necessary to understand the mechanism of solubilization of solutes in the micelle. Studies on the mechanism of micellar formation and solubilization can be performed by estimating thermodynamic solubilization parameters. The surface chemical parameter is also useful to study the adsorption of the surfactant at water interface. The saturation property of the surfactant molecule at water interface, i.e., the extent of micelle formation in the presence of the solute can be understood by various surface chemical parameters. Although the CPE technique bears many advantages over the traditional liquid–liquid extraction process, very few works related to the separation of pollutants have been performed.

In this study, Cloud Point Extraction has been adopted to extract picric acid from aqueous solution using TX-100 as non-ionic surfactant. The effects of different operating parameters, such as solution pH, temperature, initial concentrations picric acid, TX-100, and salts (NaCl, CaCl$_2$,etc) on the extraction of picric acid have been studied.

MATERIALS AND METHODS:

All the glassware used are borosil made and caliberated and analytical grade chemicals and solvents are used . All the solutions are prepared in double distilled water and standardized by standard methods before use.

INSTRUMENTATION:
 UV spectrophotometer (MODEL- UV 1800 SHIMADZU) with optically matched quartz sample cells with 1 cm pathlength are used for absorbance measurement
 Organic compounds, especially those with a high degree of conjugation, also absorb light in the UV or visible regions of the electromagnetic spectrum. The solvents for

these determinations are often water for water-soluble compounds, or ethanol for organic-soluble compounds. (Organic solvents may have significant UV absorption; not all solvents are suitable for use in UV spectroscopy. Ethanol absorbs very weakly at most wavelengths.) Solvent polarity and pH can affect the absorption spectrum of an organic compound. [en.wikipedia.org/wiki/UV _spectroscopy.]

EXPERIMENTATION:

Triton X-100 (Iso-octyl phenoxy polyethoxy ethanol) containing approximately 10 ethoxy units per molecule 9wt. per mL at 20°C is 1.06g, Mol/ wt: 628,λ_{max}:226nm), supplied by Loba Chemie, India, has been used as nonionic surfactant. The critical micellar concentration (CMC) ofTX-100 is $2.8*10^{-4}$M at 25°C. The micellar molecular weight is in the range of 60.00 Da to 90,00 Da and a micelle has a radius of about $4.3*10^{-9}$m in aqueous medium. Cloud point of TX-100 in aqueous solution is 65°C.[en.wikipedia.org/wiki/Triton_X-100.] Picric acid $(O_2N)_3C_6H_2OH$ 9Mol. Wt: 229, λ_{max}:360nm). Sodium chloride (NaCl, purity: >99%) and calcium chloride (CaCl$_2$, purity: >99%) are procured from Loba Chemie, India.

METHODS:

In the CPE experiments, different concentrations of picric acid have been prepared by dissolving an accurately weighed amount in distilled water. Sodium chloride (NaCl) and calcium chloride (CaCl$_2$) are used as mono-valent and divalent salts, respectively. Experiments are conducted in 15 mL measuring cylinders containing different concentrations of TX-100 and PA solution in a constant temperature bath for about 10 min. After phase separation, the measuring cylinders are removed from the constant temperature bath. The volumes of coacervate phase and concentrations of TX-100 and picric acid in dilute phase have been measured.

OPERATING CONDITIONS:

For CPE, the concentration of picric acid in the feed is 100 mg/L. The concentrations of TX-100 in the feed are varied from0.2g to 1.5g. All the experiments have been conducted at four different temperatures (75°C, 80°C, 85°C and 90°C). To observe the effect of salt on the extraction of picric acid and the surfactant, NaCl (mono-valent) and CaCl$_2$ (divalent) are selected. The concentrations of each salt (NaCl and CaCl$_2$) have been chosen as 0.1, 0.25, 0.5, 0.75, 1.0, and 1.25 g. The pH values of all the solutions are adjusted to 2.0, 4.0, 6.0, and 10.0 by adding 0.1 M hydrochloric acid and 0.1 M sodium hydroxide as appropriate. Each experiment is conducted for about 10 minutes.

ANALYSIS:

The concentrations of TX-100 and PA in dilute phase are determined by UV visible spectrophotometer (UV-1800 SHIMADZU). Pure TX-100 and PA solutions are initially calibrated separately at different concentrations in terms of absorbance units at wavelengths of 226 nm and 360 nm, respectively. The standard techniques are used to find out the concentrations of PA and the surfactant from their mixture.

RESULTS AND DISCUSSION:

The extent of extractions of both PA and TX-100 with varying initial concentrations of PA and TX-100 ,temperature, pH, quantity of PA of the solutions have been discussed.

EFFECT OF TRITON X 100 QUANTITY :

For successful CPE of PA, it is desirable to use a minimum amount of surfactant for maximum extraction of PA. Figureure 1 shows the effect of quantity of TX-100 on the extraction of PA increases sharply when TX – 100 concentration increases from 0.5 to 1.5g. Beyond 0.9g, the increase in extraction efficiency becomes gradual. During experimentation there is negligible water loss as operating temperature is far below its boiling point and time taken is only 10 minutes. The decrease in extraction efficiency initially is due to the presence of a greater number of PA molecules in dilute phase.
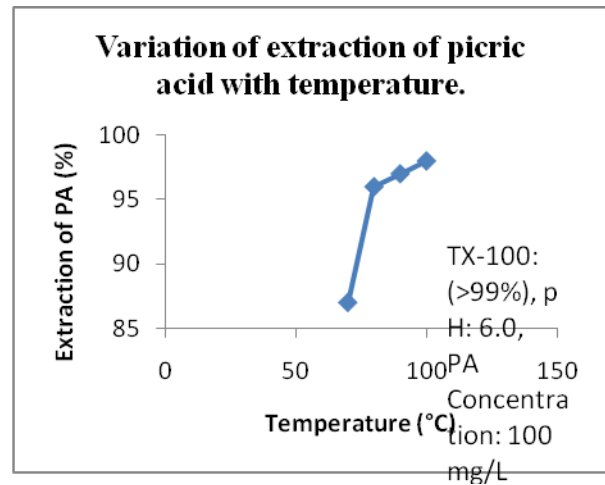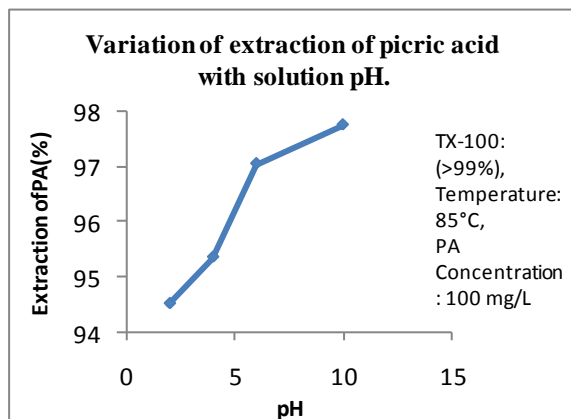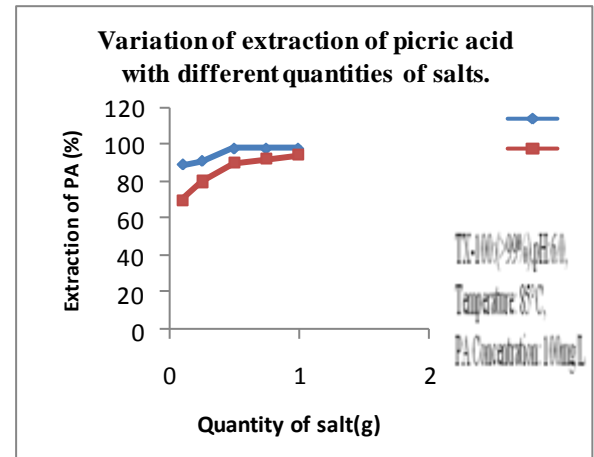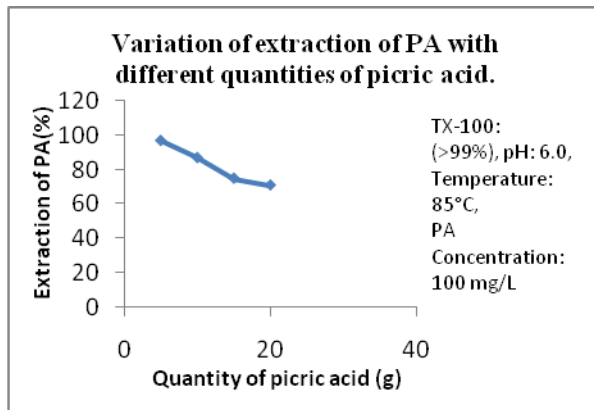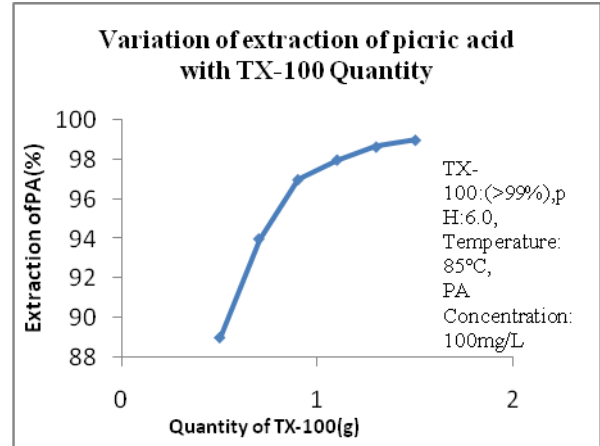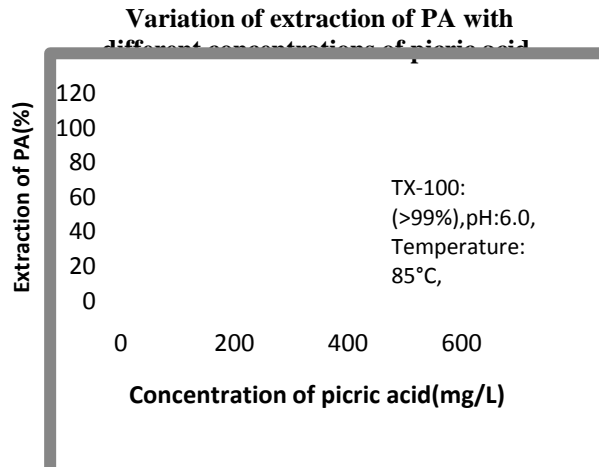
EFFECT OF SALT CONCENTRATION:

Figure 2 shows the variation of extraction efficiency with salt (NaCl and $CaCl_2$) concentrations. It has been observed from the figureure that the extraction of PA increases from about 87 to 99.7% when the concentration of NaCl increases from 0.1 to 1.25g at a fixed initial PA concentration (100 mg=L) and TX-100 (>99%). Beyond 0.5g, increase in efficiency becomes gradual. A similar trend of PA extraction has been observed with $CaCl_2$. The CMC of the non-ionic surfactants decreases in the presence of electrolytes which are known to be capable of ''salting out'', e.g., NaCl, KCl, $CaCl_2$, etc. Therefore, the number concentration and aggregation number of micelles increases with the addition of NaCl and $CaCl_2$. This enhances the amount of the solubilized PA. Beyond a salt concentration of 0.5g, the increase in the extraction efficiency is marginal.

EFFECT OF pH:

The effect of pH on the extent of PA extraction is shown in Figure. 3 for 100 mg/L of initial PA using 1.1g of TX-100(>99%) at 85°C. It is seen from the figureure that in acidic pH, the extraction of PA is less but the extraction increases with the pH for all the cases. The lower extraction at acidic pH is due to the increasing ionic character of the oxy group of the nonionic surfactant, which increases the CMC. This leads to a decrease in the micellar concentration and the aggregation number resulting in less solubilization of PA. On the other hand, at basic pH, CMC is lowered due to increasing hydro-phobicity of oxy groups that increase the size of the micelles as well as the aggregation number. Therefore, the PA solubilization is more at basic pH. of extraction of picric acid with solution pH.

Variation of extraction of PA with different concentrations of picric acid

Extraction of PA(%)

120
100
80
60
40
20
0

0   200   400   600

Concentration of picric acid(mg/L)

TX-100:
(>99%),pH:6.0,
Temperature:
85°C,

Variation of extraction of picric acid with TX-100 Quantity

Extraction ofPA(%)

100
98
96
94
92
90
88

0   1   2

Quantity of TX-100(g)

TX-100:(>99%),pH:6.0,
Temperature:
85°C,
PA
Concentration:
100mg/L

Variation of extraction of PA with different quantities of picric acid.

Extraction of PA(%)

120
100
80
60
40
20
0

0   20   40

Quantity of picric acid (g)

TX-100:
(>99%), pH: 6.0,
Temperature:
85°C,
PA
Concentration:
100 mg/L

Variation of extraction of picric acid with different quantities of salts.

Extraction of PA (%)

120
100
80
60
40
20
0

0   1   2

Quantity of salt(g)

TX-100:(>99%),pH:6.0,
Temperature: 85°C,
PA Concentration: 100mg/L

Variation of extraction of picric acid with solution pH.

Extraction ofPA(%)

98
97
96
95
94

0   5   10   15

pH

TX-100:
(>99%),
Temperature:
85°C,
PA
Concentration
: 100 mg/L

Variation of extraction of picric acid with temperature.

Extraction of PA (%)

100
95
90
85

0   50   100   150

Temperature (°C)

TX-100:
(>99%), pH: 6.0,
PA Concentration: 100 mg/L

EFFECT OF PICRIC ACID CONCENTRATION:

Figure 4 displays the effect of different concentrations of picric acid on extraction of PA using 1.1g of TX-100 (>99%), pH: 6.0, temperature: 85°C and about 0.5g of salt. It can be observed that with increase in concentration of picric acid, extraction of PA decreases. This is because of increase in picric acid molecules in dilute phase.

EFFECT OF PICRIC ACID QUANTITY:

Figure 5 displays the effect of different quantities of picric acid of concentration 100mg/L on extraction of PA using 1.1g of TX-100 (>99%), pH: 6.0, temperature: 85°C and about 0.5g of salt. It can be observed that with increase in quantity of picric acid, extraction of PA decreases. This is because amount of surfactant used becomes inadequate to solubilize PA molecule from dilute phase

EFFECT OF TEMPERATURE:

The effect of temperature on efficiency of PA extraction is shown in figure.6. It is clear from the figure that the extraction of picric acid increases with temperature and TX-100 concentration. It is observed that when the temperature increases from 75°C to 90°C (for 100 mg/L of feed PA and 1.1g of TX-100), the extraction of PA increases from about 87% to 99%.

At higher temperatures, CMC of non-ionic surfactants decreases. Moreover, non-ionic surfactants appear rela-tively more hydrophobic at higher temperatures due to an equilibrium shift that favors dehydration of the ether oxygens . This leads to an increase in the number of concentration of the micelles. Therefore, the solubilization capability of the micellar solution increases with the temperature leading to an increase in PA extraction.

CONCLUSION:

Cloud point extraction is successfully used to remove PA from synthetic wastewater using TX-100 as non-ionic surfactant. The effect of pH, temperature, concentration of salts, surfactants, and PA on the extraction of PA has been studied in detail. It is observed that the extraction efficiency increases with temperature, surfactant, and salt concentration. It is also observed that for 100 mg/L of PA, the TX-100 dose is about 1.1g for 98% extraction at 85°C. PA extraction increases significantly with temperature (from 75°C to 90°C). Extraction is more in basic medium. The additions of electrolytes enhance the extraction efficiency. PA extraction is more in the presence of sodium chloride. The optimum salt concentration is found to be about 0.5g.

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COMPARISON OF CONVENTIONAL AND MICROWAVE-ASSISTED SYNTHESIS OF ACETANILIDE WITH SPECTROMETRIC ANALYSIS.

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ABSTRACT
The objective of the study is to review utility of microwave assisted green chemistry synthesis of Acetanilide. The reaction was established to extensively obtain a pure form of product in short time duration with maximum yield which was not possible by conventional method.
The main aim of this ecofriendly reaction was to uplift the use of microwave over conventional method.
KEYWORDS: Microwave assisted chemical synthesis, FTIR

INTRODUCTION:

Over the past few decades, many significant advances in practical aspects of organic chemistry have included novel synthetic strartegies and methods as well as advent of a vast array of analytical techniques. In these environmental conscious days, the developments in the technologies are directed towards environmentally sound and cleaner procedures. Hence, the present day chemists are no longer confined to using only thermal energy for driving chemical reactions.Microwavehave been used to speed up chemical reactions in laboratories which lead scientists to investigate the mechanism of microwave di-electric heating and to identify the advantages of techniques of chemical synthesis.During recent years, microwaves have been extensively used for carrying out chemical reactions and have become a useful non-conventional energy source for performing organic synthesis. This is supported by a great number of publications in recent years, particularly in 2003, related to applications of microwaves as a consequence of a great availability of dedicated and reliable microwave instrumentation. The microwave-assisted organic reactions are proved to be eco-friendly with higher yields. Thus, one-amongst-the accepted fields in the green chemistry. Short reaction time, wide range of reactions, minimum exposure of hazardous chemicals and maximum utilization of energy; these features enables microwave assisted synthesis an effective and handy tool for industry as well as academic research. Acetanilide has application as an inhibitor in hydrogen peroxide. This compound is also used in stabilizing cellulose ester varnishes. It is applied in the intermediation in accelerator synthesis of rubber. This organic compound is used for manufacturing 4-acetamidobenzenesulfonyl chloride which is one of the key ingredients for producing sulfa drugs. This compound is used as a precursor for synthesizing pharmaceuticals like penicillin. It was experimentally used as a photographic developer in the 19th century. Microwave synthetic instrument was

available in our laboratory with all the reagents which is required for the synthesis

of acetanilide, it is also less time consuming with economical importance.

MATERIAL AND METHODS:
INSTRUMENTS AND MATERIALS USED:

Microwave, Round bottom flask, 100 cm^3 Beaker, IR Instrument (Model-Nicolet is5), Measuring cylinder.

All commercial reagents aniline 1.5cm3, Zn dust 0.15g glacial acetic acid 4.5cm3 were used as received without purification, and all solvents were of reagent grade. Reactions were carried out in domestic microwave oven (Samsung model). Melting points were taken in open capillaries. The IR spectra were recorded on a Nicolet is5 using KBr discs.

RESULTS AND DISCUSSIONS:

SYNTHESIS OF ACETANILIDE:
A. Microwave assisted synthesis:

An intimate mixture of 1.5 cm^3 aniline, 0.15 g Zn dust with 4.5 cm^3 of Glacial Acetic Acid was exposed to MW irradiation.The reaction mixture was subjected to microwave at 160 watts for 5 mins 30 seconds and cooled to room temperature (Madhvi A et al 2012).

B. Conventional synthesis:
Approximately 40 mins of reflux is required to obtain the product using the equimolar quantities.
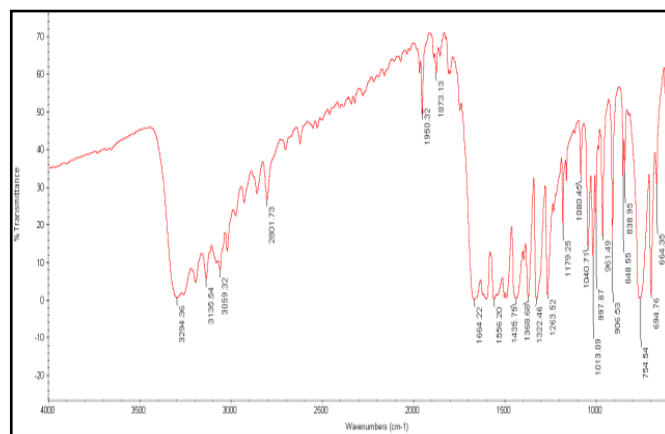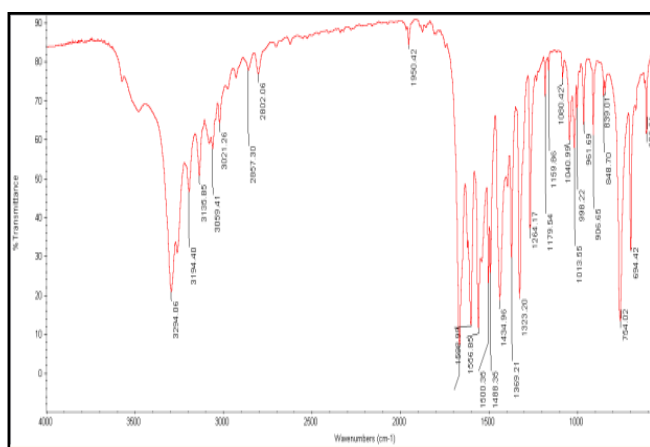

Figure 1 IR Spectral Graph of Acetanilide by Microwave Synthesis and Conventional Method .

Table 1 Time taken by Microwave Irradiation and by Conventional Synthesis.				
Name of compound	% yield From MWI	% yield From Conventional Method	Time taken by Conventional Synthesis in mins	Time taken by MWI in seconds
ACETANILIDE	80	68	35	330

Conventional Method			Microwave Synthesis		
Characteristic Peak No.s	Wavenumber	Functional group	Wavenumber	Functional group	
1	3294.36	Amine N-H stretch	3294.06	Amine N-H stretch	
2	3135.54	Amide N-H stretching	3194.40	N-H stretching vibration	
3	3059.32	Aromatic C-H stretch	3135.85	N-H stretching vibration	
4	1664.22	Aromatic C=C bending, Amide C=O stretching	3059.41	Aromatic C-H	
5	1556.20	Aromatic C=C bending	2857.30	Aromatic C-H	
6	848.55	Aromatic C-H bending	1598.99	Aromatic C=C	
7	838.95	Aromatic C-H bending	1556.85	Aromatic C=C	
8	754.54	Aromatic C-H bending	1500.35	Aromatic C=C	
9	694.76	Aromatic C-H bending	848.70	Aromatic C-H Bending	
10	664.35	Aromatic C-H bending	839.01	Aromatic C-H Bending	
11			754.02	Aromatic C-H Bending	
12			694.42	Aromatic C-H Bending	

Table 2 IR Interpretation of Acetanilide by Conventional and **Microwave Synthesis** Method.

Table shows comparison of the time taken by microwave assisted synthesis and also by Conventional methods; the compounds were obtained in good yields also the compounds were compared for spectral characterization

IR: IR analysis showed the following characteristic peaks:
3294.06 cm-1(N–H stretch), 3059.41 cm-1 (Aromatic C-H stretch) ,
1556.85/cm (Aromatic C=C), 848.70)/cm (Aromatic C-H bending)(acc to Fig2)

CONCLUSION:

We have developed a simple and efficient MW assisted synthesis of pharmaceutically active acetanilide by using a household oven. The procedure involves the use of aniline and glacial acetic acid with few grams of Zn dust. The product (acetanilide) with 80% of yield was obtained by microwave assisted synthesis which was not obtained by conventional method.

Microwave takes only 5 min 30 sec while conventional method took 35 min.The use of MW irradiation offers many advantages: it remarkably decreases reaction time, requires less solvent, thus facilitating reaction workups, and increases yields

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