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Jayashree S. Patil

Study the Effect of Salinity Stress on Plant Growth

Dr. Swati Khrade¹, Miss. Muskan K. Daroge², Miss. Zainab S.Z. Kadiri³, Miss. Shifa I Dakhani⁴

Department of Botany

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2,3,4}

Abstract: Salinity is a major stress limit growth and productivity of plants in many areas of the world due to increasing use of good quality of water for irrigated and soil salinization. Plant accommodates or sufferance to salinity stress involves composite physiological characteristic, metabolic progressions and molecular or gene complex. An inclusive understanding on how plants respond to salinity stress at different levels and an integrated attitude of combining molecular tools with physiology and biochemical techniques are authoritative for the developmental varieties of plants in salt-affected areas.

Keywords: Microbiome, Plant Growth-Promoting Bacteria, etc.

I. INTRODUCTION

Salinity affects plant growth by ionic toxicity, osmotic stress, hormonal imbalance, the reduction in nutrient mobilization, and the production of reactive oxygen species. Therefore, salinity causes wilting, drying, and death of plants. Salinity stress induced osmotic stress tolerance mechanism in plants. Salinity leads to build up of Na in soil, consequently lowering the soil water potential as compared to water potential of plant cells. This leads to reduced water uptake by plants and eventually causes cellular dehydration. Salt stress is the accumulation of excessive salt contents in the soil which eventually results in the inhibition of crop growth and leads to crop death.

Salinity affects production in crops, pastures and trees by interfering with nitrogen uptake, reducing growth and stopping plant reproduction. Some ions (particularly chloride) are toxic to plants and as the concentration of these ions increases, the plant is poisoned and dies.

II. METHODOLOGY

The method of Salinity stress on plant growth: Ion transport, Biosynthesis of osmoprotectants, Nitric oxide, Synthesis of polyamines, Hormone modulation and Activation of antioxidant enzymes. Salinity composes stress by damaging ionic and osmotic balances in plants. Osmotic stress caused by increasing the amount of salt in soil, decreases the amount of water that plant use and as a result physiological drought occurs. After these conditions, ionic stress occurs in the plant with deterioration of plant ion balance. Na and Cl ions which increases in medium with ionic stress, get in competition with essential nutrients such as K⁺, Ca²⁺, Mg²⁺ lead to nutrient deficiency in plant. While the direct effect of salinity is osmotic and ionic stresses, deteriorations in structure and synthesis of toxic components composes secondary effect.

III. LITERATURE REVIEW

Salt stress occurs as a result of excessive salt accumulation in the soil and the plant cannot take water it needs with roots. Salt stress affects plants by toxicity caused by osmotic stresses and ions. As a result of these effects, some negative changes occur in plants.

The severity of the soil salinity needs to be determined in order to make informed decisions on best cropping practices. Salinity is a major threat to modern agriculture causing inhibition and impairment of crop growth and developmental. The conducted study on every senior plant is not able to tolerate long time mean salinity stress while in short time they show positive responses like root length.

IV. RESULT AND DISCUSSION

Differential response of non- mycorrhizal and mycorrhizal plants under salt stress. Accumulation of salt in soil creates competition for nutrient uptake and transport. This leads to imbalance of the ionic composition of plant, thereby affecting plant's physiological traits. AMF increase the volume of soil explored by plant roots, upregulate several cation transporters, leading to improved nutrient uptake, and also maintains ionic homeostasis. Salinity lowers soil water potential causing cellular dehydration due to decrease in water uptake. Am negates this effect by mediating accumulation of osmolytes and also improve plants water status by improving root hydraulic conductivity. Salinity induces oxidative stress due to imbalance in ROS generation and the quenching activities of antioxidants. and known to improve both enzymatic and non- enzymatic antioxidant systems of plants. Photosynthesis is also negatively affected by salinity. AM has a positive effect on photosynthesis under salt stress. Overall, AMF improve the performance of plant under salt stress.

V. CONCLUSION

We discuss how to suit the concussion of salinity on different attribution, such as relative growth rate, water relations, transpiration, transpiration use productivity, ionic relations, photosynthesis, replicative, yield and yield elements. We also intimate some recommendations to help with the selection of appropriate experimental systems, imposition of salinity stress, and obtaining and analysing relevant physiological data using proper indications. We demonstrate how these indications can be used to determine dependence amongst the proposed characteristic to determine which habit are the most important developer to salinity resistance. Salinity resistance is composite and include many genes, but development has been made in studying the appliances underlying a plant's response to salinity.

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Effects of Freezing on Seed Germination of Orchids Plant

Dr. Swati Kharade¹, Miss. Fariha K. Khatib², Miss. Aqsa A. Sonde³

Department of Botany

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2,3}

Abstract: During the cold-moist conditions of winter, stratification occurs that alleviates dormancy in many species enabling spring germination. Orchid seed were first germinated at the base of wild collected potted orchid but germination was unreliable and seedling mortality rates were high. Winter in southeaster United states frequently have warm spells, lasting a few days, interrupted by cold freezing period in this study, the effects of a freeze during stratification and following a warm spell on and seedlings of locally common exotic and native plants were determined. In the laboratory, were exposed to freezing temperatures, following stratification and stratification warm spell, that simulated a cold and then they were incubated at warm temperatures. In a common garden, had cotyledons before a freeze; other species only had roots. Seedlings of had moderate survivorship, whereas those of had low survivorship. In the field, were sown inside and outside (control) of open top chambers. Viability of four species did not differ, probably due to the failure of the too warm above ambient conditions. Thus, freezing may differentially affect seed viability and germination and seedling survivorship of exotic native species and potentially influence competitive interactions between them. The types of method that are used for cryopreservation and the large variation in response of orchids to the cryopreservation method observed in the study emphasize the need for the development of more appropriate protocols for the preservation of orchids. Having flower and then seeds are characteristics of gymnosperm and angiosperm plants. In seed plant the process of reproduction is completely by the formation of the seed. Nutritive tissues of seed provide food for the development of embryo until the new born plant can photosynthesis.

Keywords: Seed, Freeze Effect, etc.

I. INTRODUCTION

In this, the freezing tolerance of seeds and seedling of native and exotic species of locally common trees, shrubs and vines were determined in the laboratory. The relevance of the laboratory results was tested in the field using a common garden experiment and open top chambers that function as miniature greenhouses and simulate warming with climate change episodes that may occur in late winter. Germination is the process of seed developing into new plant first environmental condition must trigger the seed to grow. Usually, this is determined by how deep the seed is planted in the water availability, and temperature. When water is plentiful in the seed fills with the water in a process called an imbibition. A defining characteristic of the orchids is their seeds, which are adapted the wind in dispersal. Orchid seeds are an incredible small and it contains an undifferentiated embryo.

Orchidaceae represents one of the largest families of the plant kingdom and its very specialized traits confer high adaptive ability to different environments with flower that exhibit marked particularity and perform an important role in attracting pollinators. Orchidaceae are slow growing plant with a long juvenile period requiring four or five years of average for the evaluation of flower quality of the progeny and for the acquisition of new seeds. This singular technique has the potential to guarantee the long-term conservation of the germplasm of species threatened with extinction and represent a valuable method for the conservation of the genetic resources of many orchid specimens. The simple method with low initial and maintenance costs, which allow for the storage of biological material for long period of time constitute a technological investment that will provide for considerable growth and trade in orchids.

Orchid flower are known for their natural beauty and for attracting the interest of various producers, making information about their cultivation and storage increasingly revealed. As germination occurs, water is absorbed and the seed coat break allowing the radical to first emerge from the seed.

II. METHODOLOGY

Seed should be thoroughly dried before being frozen as the freezing process can cause moist seed to crack or split. Orchid seeds are easily flushed by rain due to their small size and require a moist fertile. The dry seeds should then be placed in an airtight container to prevent them from absorbing any humidity and taking on any damaging moisture. Read more at Gardening Know Information on Using Seeds That Are Frozen Seeds stored in a refrigerator should be placed near the back of the fridge where they will be less exposed to temperature fluctuations from opening and closing the door. Storage seeds in the freezer will provide seeds with more consistent temperature than refrigerator storage life. Likewise, every 10-degree F. (-12C) increase in temperature can also cost seeds half their storage.

It is the simplest method of the vegetation propagation. New growth of orchid is separated from the plant in monsoon and replanted. The mother plant is cut and separated in two or more parts so that each one has 2-3 buds and one growing shoot. Separation improves the growth of all individuals' plants as space availability improves. New shoots flower in the following seasons. Being wind-dispersal in orchid seeds are naturally dry at released and appears to be desiccated tolerant. The latter is essential for us to be able to preserve in under the very dry and the very cold freezing.

Symbiotic germination used for propagation of temperate Terrestrial Orchids. Seeds are germinated in association with mycorrhizal fungus. Fungus absorbs complex nutrient from the medium and make them available to developing protocol. A symbiotic germination used for propagation of tropical orchid. Seed are germinated in absence of its mycorrhizae association. Media used in complex to improved availability of organic and inorganic nutrients the growing plant. The full-grown new plants should be removed from the aerial cutting is an easy method of orchid propagation seed is quite difficult. Orchid produces vast numbers of tiny seed. Orchid thrives in the sunshine.

III. LITERATURE REVIEW

The literature on the effect of freezing temperatures on the germination of orchids seeds. Some seeds are actually need a cold dormant of the period in order to sprout. Several treatments are effective at the breaking dormancy in mature orchid seed including cold stratification. Other can be held over the winter in the freezer and planted of the following spring and it will still sprout but with a lesser of yield. The first year of perhaps is 80% of seeds will sprout but after freezing only 60%. It varies according to the plant species. Orchid's seed are small with only an undifferentiated embryo. The Moderate freeze 25° to 28° is widely in the destructive to most of vegetation. Severe or hard in freeze and colder causes the heavy damage to most of the plants. Orchid seed are very small extremely light do not contain endosperm and typically have low germination rate 5% under natural condition. Orchid seed are small with only an undifferentiated embryo. Orchid flower are pollinated by the great variety of floral structures temperature effect on germination are unclear as in different species is show different response to cold and warm temperatures. Orchid seed are very small an extremely light do not contain endosperm and typically have lower germination rate 5% under natural condition making them difficult to propagated with conventional method. Orchid flower are pollinated by a great variety of flying animal and their great variety of floral structures. Orchid are single species on insect.

IV. RESULT AND DISCUSSION

It shows that freezing in the liquid air has no appreciable effect on the keeping power of the seeds. It is well known that the seed of orchid species require compatible mycorrhizae fungi for germination. In some germination a test, both on the filter papers and in the soil, it was found in that the freezing not only increased but the germination but it also stimulated in the growth of the seedling. Orchid germination is also relying on factor that generally influence in the success of plant seed. Orchid thrives in sunlight.

In the process of seed germination water is absorbed by the embryo which is result in the rehydration and expansion of the cells. Orchid seed are very minute and range in length. These orchids grow on moist and shaded rocks. Shortly after the beginning of water uptake or imbibition of the rate of respiration to increases and various metabolic a process or suspended or much reduced during in dormancy resume. Orchid germination can take from one to nine months. Seed germination is process of absorb water by the embryo, which resulted in the rehydration and expansion of the cells. The beginning of water uptake or imbibition the rate of respiration increases and various metabolic process suspended or much reduce during the dormancy. After 5 weeks of culture orchid seeds in the flask's embryo were completely discharge from the seed coat and rhizoid. some characteristics such as colour hardness round shape of artificial coated seed.

V. CONCLUSION

The Seeds have the ability to germinate in the presence of the moisture, air, and light under the right temperature, an even in the absence of soil. Our hypothesis stated that freezing seeds for extended the amounts of time would stunt growth and increase. Improper freezing is an also can kill the sum of seeds but in the other seeds may have to be less in fussy spring rising of temperature and moisture and it will be trigger in it. these seeds are to be sprout. Without the preceding cold dormant is period though seeds like these will not sprout.

A symbiotic germination is an excellent technique to study the biotic and abiotic factor of orchid seed. using vitro culture to germinate orchid seed encapsulating these seedlings in alginate gel to make artificial in coated seed. Comprise an embryonic plant and reserve. Preserving were the main work of study. Seed are alive dormant. Outcome of successful of germination is a seedling capable of independent growth.

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The Role of Soil PH on Plant Growth

Miss. Samiksha R. Mali¹ and Miss. Darzi Shamsunnisa Waqar²

Department of Botany

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2}

Abstract: *In the natural atmosphere, soil hydrogen ion concentration has a huge influence on soil biogeochemical processes. Soil pH is, therefore, delineated because the “master soil variable” that influences myriads of soil biological, chemical, and physical properties and processes that have an effect on plant growth and biomass yield. This paper discusses however soil hydrogen ion concentration affects processes that square measure interlinked with the biological, geological, and chemical aspects of the soil atmosphere yet as however these processes, through anthropogenesis interventions, induce changes in soil hydrogen ion concentration.*

Keywords: Soil pH, Plant Growth, Biogeochemical, etc.

I. INTRODUCTION

To many, soil pH is simply essential for the chemistry and fertility of soils. However, the popularity of soil functions on the far side plant nutrient offers and also the role soil as a medium of plant growth needed the study of the soil and its properties in lightweight of broader scheme functions through a multidisciplinary approach. this permits scientists to look at processes from landscape to regional and world levels. One method that denotes the multidisciplinary approach to soil science is soil biogeochemistry, that studies biogeochemical processes. The scheme functions of soil, to some extent, have a powerful relationship with soil bio geochemical processes, that area unit linkages between biological, chemical, and earth science processes.

II. METHODOLOGY

For many decades, intensive analysis has unconcealed that soil hydrogen ion concentration influences several biogeochemical processes. Recent advances in analysis have created intriguing revelations regarding the vital role of soil hydrogen ion concentration in several soil processes. This vital soil property controls the interaction of xenobiotic at intervals the 3 phases of soil furthermore as their fate, translocation, and transformation. Soil pH, therefore, determines the fate of drugs within the soil surroundings. This has implications for nutrient usage and handiness for crop production, distribution of harmful substances within the surroundings, and their removal or translocation.

III. LITERATURE REVIEW

Trace Element Mobility:

Soil pH scale controls the solubility, mobility, and bioavailability of trace parts, that verify their translocation in plants. This can be mostly keen about the partition of the weather between solid and liquid soil phases through precipitation-dissolution reactions as a result of pH-dependent charges in mineral and organic soil fractions. as an example, negative charges dominate in high pH scale whereas positive charges prevail in low pH scale values.

Mobility of Soil Organic Fractions:

Soil organic matter exists in numerous fractions starting from easy molecules like amino acids, monomeric sugars, etc. to chemical compound molecules like polysaccharide, protein, lignin, etc. These occur at the side of unrated and part rotten plant and microbic residues. The solubility and quality of the fractions disagree throughout and once decomposition and will result in the leach of dissolved organic carbon and element in some soils.

IV. RESULT AND DISCUSSION

Biogenic Regulation of Soil hydrogen ion concentration Soil biological processes from living organisms and organic chemistry transformations of the remains of dead organisms induce changes in soil hydrogen ion concentration. this could either occur through the direct result of organic chemistry processes occurring within the living organisms within the soil system, principally through rhizosphere processes or through the direct and indirect effects of applied organic residues, whether or not in unburnt, burnt, or burn forms also as their decomposition.

Rhizosphere Processes:

The rhizosphere is that the volume of soil within the neighbourhood of roots that's influenced by root and microbic activities Hiltner 1904 cited by. it's a longitudinal and radial gradient, starting from zero to two.0 mm from the basis mat. during this little soil volume, roots take up water and nutrients, bear root elongation and growth, unleash exudates, respire, and therefore have higher microbic activity.

V. CONCLUSION

The content of this paper highlights the role of soil hydrogen ion concentration as a master soil variable that encompasses a duplex relationship with soil biogeochemical processes. though not all biogeochemical processes were mentioned during this paper, those mentioned have substantial influences on soil health, nutrient convenience, pollution, and potential hazards of pollutants also as their fate within the organic phenomenon. The quality of vile substances through the hydrological cycle cannot be unmarked here owing to the intimate relationship between soil and water. Thus, associate degree understanding of this could type a basis and a guide to choices and decisions of soil management, rectification, rehabilitation, and therefore the maintenance of soil quality. The discovered soil pH-biogeochemistry relationships offer insight for future applications for inflated yields for specific crops through nutrient utilization and convenience, which reinforces crop growth.

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Impact of Plant Disease on Food Production

Miss. Samiksha R. Mali¹, Miss. Sadiya I. Dakhani²

Department of Botany

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2}

Abstract: *Plant pathology appears to be significantly de funded in comparison to its relevance because facts to managers and representatives we hope that this analyse will encourage crop pathologies especially those in developing countries to concentrate on collection of data due to many reasons world is facing shortage of food one of the major reason in the decrease products of crops are the plant disease plant disease may contest for light nutrition soil and for many other resources with crops and eventually decrease their production .The cumulative output of crops can be attend by plummeting the crop yield which is done by the identification and elevation of measured impairments plant diseases.*

I. INTRODUCTION

Due to many reasons, world is facing shortage of food. This low output of crops and high prices which shake the budget of the country. The cumulative output of crops can be attained by plummeting the crop yield gap which is done by the identification and alleviation of major impairments plant diseases. Plant disease has been a major factor influencing food production and human socialist development 4000 of years throughout the early agriculture Era the occurrence of plant.

Disease was same as a punishment from the gods and over plant disease management approach where extremely limited. Yielthe output of crops which eventually fulfill of food security. Plant pathology is a branch of agricultural sciences that deals with the study of fungi bacteria, viruses, nematodes and other microbes that causes disease of plant.

II. METHODOLOGY

As agriculture struggles to support the rapidly growing global population, plant disease reduces the production and quality of food, fibre and bio fuel crops. Study of plant disease is important as they cause loss of the plant as well as plant produce the various type of losscur in the field in storage or any between sowing and consumption of produced. Plant disease are recognised by the symptoms produce by them or bicycle appearance of the plant the term plant disease signifies the 1. Baldauf SL, Roger AJ, Wenk-Siefert I, Doolittle WF. 2000. A kingdom-level phylogeny of eukaryotes based on com- bined protein data. Science 290:972–77.

III. LITERATURE REVIEW

In the paper - Deep learning for Image-Based Plant detection has proposed an approach to detect disease in plants by training a convolutional neural network. The model achieved an accuracy of 99.35% on test set data. When using the model on images procured from trusted online sources, the model achieves an accuracy of 31.4%, while this is better than a simple model of random selection, MalvikaRanjanetal.inthepaper - Detection and Classification of leaf disease using Artificial Neural Network” proposed an approach to detect diseases in plant utilizing the captured image of the diseased leaf.

IV. RESULT AND DISCUSSION

As agricultural struggles to support the rapidly growing global population, plant disease reduces the production and quality of food, fibre and biofuel crops. Losses may be catastrophic or chronic, but on average account for 42% of the production of the six most important food crops.

V. CONCLUSION

Plant account for about 80% of the human nutrition even so they are necessary for food security or the ongoing access to adequate accessible secure and health food for all of us to live active and healthy lives. Food safety is threatened and by plant paste and disease because they can damage crops. Our result indicate that mixing crop varieties can significantly reduce disease epidemics in the field but planting varieties in equal proportion.

ACKNOWLEDGEMENT

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Effects of Acid Rain on Trees

Miss. Nameera I. Gazge¹ and Miss. Mariya M. Fahim²

Department of Botany

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Dist. Raigad^{1,2}

Abstract: Acid rain is a rain form or any other form of precipitation that present acidic and possesses elevated levels of hydrogen ions (low pH). Acid rain is caused by emissions of Sulfur Dioxide and Nitrogen Oxide, which react with the atmospheric water and water vapours to produce acids. Trees and soil are the prime receptor of acid deposition and function as sink. Monocotyledons plants are reported to be relatively less affected by acid rain as compared to dicotyledons plants and young rootlets, leaves and shoots are typically more sensitive to low pH conditions. It also effects the compositions of soil water which is the main medium of nutrient supply for the plants and soil microflora. Acid rain solutions make their entry into the leaf tissue through the cuticle and produce marked effects on tress. Acid rain generally retards the growth of trees by stimulating abnormalities in metabolism of the trees, like photosynthesis, nitrogen and sulphur metabolism, however, there are exceptional cases of promoting growth as well. Studies conducted globe on the exposure of various crop plants to acid rain and its ultimate effects on plant growth and reproduction and draws attention for development of plant types suited to acid rain affected lands.

Keywords: Acid rain, Air pollution, Development, Growth, Plants, Yield, Trees, Global, Water, Soil, etc.

I. INTRODUCTION

Environment suffers many acute problems including pollution due to undesirable change in the physical, chemical and biological characteristics of world. The world is concerned about the increasing environmental pollution. Rapid development of techniques changes on a globe scale cause rapid environmental changes and increase in material needs. Modern tendencies give preference to meeting the material and social needs of populations. Occupants in the vicinity of the industrial units suffer due to intolerable pollution from industrial discharges injurious to health. The environment comprises material factors whose presence is decisive for survival and development of living organisms like oxygen, carbon, hydrogen, nitrogen, and factors regulating the life processes.

Environmental change can also be polluted due to other reasons like application of new materials and plastics in building for the production of furniture, clothes, shoes, household and poisonings etc. Due increase in air pollution is indeed of major effects on global concern as whenever the balance of natural composition of air is also disturbed, it has an adverse effect on environment and living beings. The new evidence is increasingly implicating it as a cause of the rarer but virulent cutaneous malignant melanomas. It impairs the body ability to fight it off and suppresses the efficiency of immune system, making it easier for tumours to take hold and spread. Problem in eyes disease produces like cataracts, eye disorders, damages crops, ecosystem and materials. Air pollution is created by all over the earth crust by burning fossil fuels to run factories, machinery and all forms of transportation as a result the byproducts such as smoke and invisible pollutants which contaminate our atmosphere.

The toxic pollutants present in automobile discharges affect the physiology and biochemistry of living organisms. The impact of such a change could be of sufficient to produce major physical, economic and social dislocations on a global scale. Main air pollutants are Sulphur dioxide derived from coal and fuel oil used in the industry, dust and soot from the industry which represent nuclei for smoke formation, and CO₂ from motor vehicle exhausts which is toxic, causing headaches and even death at high concentrations. The pollutants include oxidants derived from motor vehicle exhaust and industry cause smog which irritates the eyes and reduces visibility, and NO₂ and lead added to fuel and expelled from exhaust which accumulate in the body, smells and

odours may cause discomfort and some are distinctly noxious to the health and general well-being. The industrial sources of odours involve craft mills, oil refineries, cellulose plants, fish meal plants, food processing installations etc. Industrial waste smells and odours usually originate from refuse containers and sewage system. SO₂ is produced in burning of fossil fuels in industries, thermal plants, homes, fertilizer industries and during smelting of metallic ores.

The gaseous SO₂ to SO₃, which in combination with water forms sulphuric acid. The major sources of SO₂ are coal burn in petroleum products, refuse burning, refinery operations and metallurgical operations. SO₂ and SO₃ react with water to form H₂SO₃ and H₂SO₄. Aerosols are chemicals in the form of vapours or fine mist which are present in air, they are used as disinfectants. Fluorides are released air during refinement rocks of aluminium, rock phosphates etc. Gaseous fluorides cause necrosis, chlorosis and abscission of leaves of trees etc. Air is normally used as the source of oxygen and nitrogen which combine in temperature normally reached in the combustion process to form NO and then much of NO gets converted into NO₂. NO is produced in the atmosphere electro-photo-chemically from nitrogen and oxygen. The major source of NO is automobiles, furnaces, boilers etc. Fired furnaces of Gas and coal, power station and common source combustion of wood as well as refuse waste also produce NO and ammonia.

Affected Areas

Affected areas pressed firmly together by acid rain around the globe include most of Eastern Europe from Poland northward into Scandinavia, the eastern third of the United States, https://en.wikipedia.org/wiki/Acid_rain - cite_note-82 and Canada. Distressed areas due to acid rain include the south-eastern coast of China and Taiwan.

II. METHODOLOGY

Technical Solutions

In industries, FGD will remove 95% or more of the SO₂ in the flue gases release in air. A Focus Group Discussion (FGD) is the wet scrubber which is commonly used, is basically machine reaction tower with a fan that extracts hot smoke stack gases from a power plant into the tower release in air. Lime or limestone in slurry form is also used into the tower to mix with the stack gases and combine with the sulphur dioxide present. The CaCO₃ of the limestone produces pH-neutral calcium sulphate that is separated from the wet scrubber. In some areas the sulphates are sold to chemical companies as gypsum, when the density of CaSO₄ is high. In others, they are placed in landfill. The effects of acid rain on trees can last for peer group, as the effects acid rain of pH level change can stimulate the continued leaching of undesirable chemicals into water sources, destroys our nature.

III. LITERATURE REVIEW

Acid Rain and Trees

The minerals and nutrients from the soil that trees need to grow are removed by Acid Rain. Acidic fog and clouds might strip nutrients from plants foliage, leaving them with brown or dead leaves and needles due to Acid.

IV. RESULT AND DISCUSSION

The best solution is not to let the plants come in contact with acid rain which is nearly impossible. So, grow small plants under the shed of a big tree, in the way you will be able to lessen the effect of acid rain on small plants while the big plants can counter it due to the high volume of nutrients and foliage.

V. CONCLUSION AND FUTURE SCOPE

The above survey of literature demonstrates that natural and simulated acid rains effect the germination, growth, biomass, behavior of budding, flowering and leaf abscission, photosynthesis, metabolic processes, enzymes activities, pollen behavior and yield in range of plant species.

An important aspect of tress life is the germination process and seedling growth that forms the health/foundation for subsequent stages. SAR effects at these stages are likely to have effect on plant life. It is evident from the review that most of the crop plants are sensitive to acid rain; there is an urgent need to identify/develop suitable plants cultivars suited to acid rain affected zones. The acid rain may further increase due to an extent causing an acidification of cytoplasm to decrease intracellular pH. The volume of acidic buffering and the mechanism(s) involved in SAR treated plant systems are still unclear and require deeper investigations.

ACKNOWLEDGEMENT

I would like to express my special thankfully of recognitionto Miss. NameeraGazge and our principal Mr.Sajid Shaikh who gave me the golden opportunity to do this project on the topicEFFECTS OF ACID RAIN ON TREES. This Research helped me lot and I came to know about a lot of things related to this topic.Finally, I would also like to thank my parents and friends who helped me a lot in this project.

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Smoke Treatment on Seed Germination

Miss. Namira I. Gazge¹ and Miss. Ayesha S. Mukadam²

Department of Botany

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2}

Abstract: Smoke is thought to be one of the most important for the betterment of ecosystem and impact of smoke treatment on seed germination of species at community level. Smoke shows to stimulate seed germination and growth of seedlings of economically important plant species. Smoke treatment can be used to improve growth and crop yield.

Keywords: Smoke Treatment, Ecosystem, Crop Yield, Seed Germination, etc.

I. INTRODUCTION

Smoke, as a fire by product, in fire-prone areas, was identified as a seed germination promoter in 1910. Smoke affects the water uptake process in seed germination by changing the permeability of the internal cuticle via increased the number and size of stomata. Potential use as a management tool in a tested ecosystem.

II. METHODOLOGY

Identified species tested for the effects of smoke or its active compound on seed germination. Evaluated the effects of smoke on seed germination or seedlings density through tests such as a paired t-test, ANOVA and MNOVA. Smoke water can be created by:

1. Using drum technique containing water.
2. Using small grill, charcoal and native vegetation.
3. Using commercially smoke available product.

III. LITERATURE REVIEW

Smoke, as a fire by-product, in fire-prone areas, was identified as a seed germination promoter in 1990 (de Lange and Boucher 1990). Research addressing germination response to smoke has occurred in fire-prone areas, such as Fynbos in Africa (see Brown et al. 2003 as a review), California chaparral in America (Keeley and Fotheringham 1998). Some in-situ smoke-stimulated seed germination tests have shown that smoke application has a potential role in large-scale restoration.

IV. RESULT

Binary Logistic Regression Analysis of all recorded species I found 1662 qualified seed germination tests, which included 974 species from 105 families in 39 orders (Appendix B). Nine orders (Saxifragales, Sapindales, Rhamnales, Proteales, Liliales, Lamiales, Dioscoreales, Dilleniaceae, and Cornales) had over 50% of species tested respond to smoke application. The binary logistic regression model was not well fit (based on the -2 Log likelihood, estimation 2097.471), but seed source and smoke application were identified.

*Identified Species Figure Parameter Tests Identified species characteristics (order, growth form, and fire-relation *order) were used in a binary regression (all parameters entered at once) to detect the main. The prediction model of Caryophyllales, Lamiales, Myrtales, Asterales and Ericales with the parameters of order, growth form, and order *fire-relation showed that though the overall percentage of prediction was low (68.1%), the model had a 93.8% correct prediction of the smoke response.

V. CONCLUSION

It is concluded that the present work of plant derived smoke significantly increased seed germination, seedling and root shoot growth. The positive response in germination, seedling.

ACKNOWLEDGEMENT

I would like to express thanks of gratitude to my teacher Miss Namira Gazge, for their able guidance and support in completing the research paper on smoke treatment on seed germination. Secondly, I would like to thank the Principal of Anjuman Islam Degree College of Science for providing all the facilities which require for completion of research paper.

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Sustainability Assessment of Food Waste Prevention

Miss. Tasnim J. Malbari¹ and Miss. Ayesha Z. Takey²

Department of Chemistry

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2}

Abstract: *The last few years, a lot of measures addressing food waste have been proposed and implemented. Recent literature reviews call for more evidence on the effectiveness or food waste reduction potential of these measures. Furthermore, very few information is available on the extent to which food waste measures have been evaluated based on their economic, environmental and social performance. This review closes this knowledge gap by looking at the methodologies currently used in literature to evaluate food waste prevention measures, using a pre-defined assessment framework with quantitative evaluation criteria. In total, evaluations were examined for 25 implemented measures with measured outcomes and 23 proposed measures with projected outcomes. The paper concludes that there is a great variety in how an evaluation is performed. Additionally, in many cases, economic, environmental, or social assessments are incomplete or missing, and efficiency is only seldom calculated. This is particularly true for implemented measures whereas proposed measures with projected outcomes tend to have a more thorough evaluation. This hampers practitioners and decision-makers to see which measures have worked in the past, and which ones to prioritize in the future.*

Keywords: Food Waste, Prevention, Measures, Evaluation, Performance, Effectiveness, Efficiency, Sustainability, etc.

I. INTRODUCTION

Food losses and wastes are generated throughout the food chain, from cultivation, over harvest, processing, storage and distribution up until the final consumption by private households and the food service sector. In 2011, the FAO provided a comprehensive overview of the amount of food losses and waste generated at global level. Globally, about 1.3 billion tons of edible food, or about one third of the mass of edible food produced for human consumption, is annually lost or wasted.

Based on the 2011 Food Balance Sheets, the FAO estimates that the annual global volume of food wastage generated has a carbon footprint of 3.6 Gt of CO₂ eq (excluding land use change). If food wastage were a country, it would be the third largest emitter in the world.

In order to reduce or prevent food waste, many measures have been put forward of which a great deal of them has been implemented. To know which measures, provide the best opportunities and what actions are the most promising, a thorough evaluation of food waste interventions is needed.

For businesses, applying food waste prevention measures only makes sense if there is an economic incentive to do so. As preventing food waste comes at a cost, actors along the food chain could be expected to only implement a certain measure if the benefits resulting from saving food gone wasted outweigh the costs associated with the implementation of the measure.

II. METHODOLOGY

Food Waste Definition and Categorization of Food Waste Measures.

The definition of food waste used within this paper follows the definition proposed by the European FUSIONS project: "Food waste is any food, and inedible parts of food, removed from the food supply chain to be

recovered or disposed (including composted, crops plowed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)".

The food supply chain hereby consists of a "connected series of activities used to produce, process, distribute and consume food," starting with raw materials and products ready for harvest or slaughter.

Thus, including those products that are in the end not harvested/slaughtered and for example left on the field.

Using this definition, food (or inedible parts of food) that is removed from the food supply chain and sent to animal feed, bio-material processing or other industrial uses is not considered as "food waste," but as "valorization and conversion."

Measures Preventing Food from becoming Food Waste

Category 1:

Avoidance measures aimed at reduction of food surplus at source, such as avoiding food overproduction and avoiding purchasing more than what is needed;

Category 2:

Redistribution or donation measures such as redirecting food surplus to people in need;

Category 3:

Valorization or conversion of food and inedible parts of food removed from the food supply chain, such as redirecting food waste to the bio-based industry or to animal feed;

Measures Managing Food Waste:

Category 4:

Recycling (anaerobic digestion or composting) and recovery (energy recovery) of food and inedible parts of food removed from the food supply chain in order to avoid landfilling.

III. LITERATURE REVIEW

The literature search was conducted the methodology used for the literature search is based on the rapid review approach as a less time-consuming alternative to a systematic review. The search and subsequent analysis followed a three-step approach Step 1 aimed at collecting measures dealing with food waste throughout the food chain, in order to get an insight in the measures that have been proposed in literature. In total, the search resulted in a collection of 88 sources (academic and gray literature) listing in total over 200 food waste prevention measures, with the majority of sources proposing or describing more than one measure. All found sources (with the exception of two studies) were published after 2010.

The search narrowed the sources to those studies or reports containing an evaluation of implemented or proposed measures to prevent food waste. In total, 39 sources were retained containing some sort of evaluation of one single measure or of combined measures. Combined measures hereby refer to measures applied and evaluated simultaneously or grouped into for example a voluntary agreement or a large-scale campaign.

During the process, the methodologies and criteria used for evaluating food waste measures were put against a predefined framework for evaluating measures.

The assessment done hereby focussed on the methodologies used in literature, rather than on identifying the best performing measure. Additionally, no attempt was made to evaluate the measures ourselves; only readily available information on the performance of the food waste measures was collected. The evaluation assessment itself comprised looking at the extent to which each of the evaluation criteria was taken into account.

IV. RESULT AND DISCUSSION

A wide range of measures was found, covering the various players and actors along the food chain from primary production, over storage and processing, retail and wholesale to private consumers and OoH consumption. To deal with the multitude of measures and/or descriptions of measures found, measures were organized and grouped based on the main theme or aspect the measures focus on. The "Food service - Portion sizes and side

dishes” group. The literature search resulted in a list of 48 measures for which an evaluation could be found, out of the 48 (combined) measures, 25 refer to implemented single and combined measures.

The other 23 cases concern single interventions that have been proposed but have not necessarily been implemented and for which the evaluation data refers to projected (not measured) food waste reductions, complemented with foreseen (not measured) environmental, economic, and social impacts where applicable.

V. CONCLUSION

The evaluation criteria considered in the present paper are limited to quantitative criteria such as effectiveness, sustainability across three dimensions, and efficiency. Both effectiveness and sustainability across three dimensions are also taken up in the JRC reporting template for evaluating food waste prevention measures under the overarching heading of the evaluation criterion “efficiency”.

It is not clear if specific efficiency calculations as considered within the context of the present paper are also to be reported within the JRC reporting template. The JRC template further includes the additional aspect of “outreach impact” as one of the sub-criteria for assessing efficiency of measures.

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Glycerol as Green Solvent in Organic Synthesis

Mr. Khan Shoyeab Mutalib and Mr. Kable Umar Abdul Rahim

Department of Chemistry

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad

Abstract: *Glycerol came out as favourably green solvent. Physio chemical properties are used for different applications. short analysis of organic reactions which engage glycerol as a green solvent are presented. Organic modification in glycerol medium arises with or without any catalytic material. Glycerol is also used as hydrogen donor to carry out hydrogenation reaction of organic compound. The supremacy of glycerol over other solvents turned out to be described in terms of its solubility, availability, non-toxicity and chemical reactivity. Organic synthesis is exothermic reaction in which both reactants and catalyst are dissolved in solutions. In this paper, glycerol. Is appeared as nontoxic, recyclable and eco-friendly liquid, which is manufactured from renewable sources. It has very high potential to serve as alternative green solvent in many organic reactions.*

Keywords: Microbiome, Plant Growth-Promoting Bacteria, etc.

I. INTRODUCTION

Glycerol also termed as glycerine. It is a simple Poly alcohol compound. Glycerol is usually colourless, order less and it is viscous liquid which is sweet tasting and non-toxic compound.[1] Glycerol backbone is found in lipids known as glycerides. As it contains antimicrobial and antiviral properties it is generally used in Food and Drug administration. which is approved for wounds and burns treatment.

Glycerol is commonly used as Sweetener in food industry and also used as humectant in pharmaceutical formulations. Due to presence of three hydroxyl group glycerol easily get dissolved with water and it is hygroscopic in nature.[2] Boiling point of glycerol is 290 degree Celsius. Melting point of glycerol is 17.9 degree Celsius. Molecular weight is 92.094 g/mol Relative density is 1.261 g/ml. It is insoluble in volatile oils and fixed oils. In water it is miscible.[3]

Glycerol has a unique combination of physical and chemical properties which include polarity, low toxicity, and flammability, high boiling point and ability to produce strong hydrogen bonds. It also has the ability to dissolve organic and inorganic compound and it is also easily available. Due to these characteristics in recent times green solvent is used in organic synthesis.[4]

Glycerol is generally produced as by-product of transesterification of triglyceride in the formation of natural fatty acid derivatives. The derivatives which are formed are used in many different areas from pharmaceuticals and food industry as an alternative fuel for example bio diesel.[5].

The severe damage for humanity and its environment of our planet is global warming. The primary cause of climate change are the emissions of greenhouse gas and this is because of the increase in population. Therefore, the need in food and industrial development is increasing day by day. In this way, solvents emerge. To replace some fossil energy sources with the renewable energies, which are more respectful to the environment.[6] According to the study of U.S. Department of Energy, Glycerol is the fastest growing industrial molecule. Glycerol act as a building block to produce bio-based molecule.

Nowadays, liquid phase organic synthesis reactions are highly demanding. Liquid phase reactions. Are better than solid or gas phase reaction. As they Have high conversion efficiency, better yield and improved product selectivity. Glycerol was discovered by. The chemist Carl W. Scheele in 1779, Which was obtained accidentally.[7] Is a new transparent and sweet-smelling liquid. The new liquid, which was found is completely soluble in alcohols and water. But this is insoluble in hydrocarbons. The IUPAC name for glycerol is Propane-1,2,3-triol.[8]

II. LITERATURE REVIEW

The literature review comprises of the research done on the following topic.

Yan long GU and Francois Jerome (2010) The marriage mistake teen conducted a review on study of glycerol as a sustainable solvent for green chemistry. Firouzeh Nemati and Hossein Kiani (2013) Conducted a review on study of glycerol as a green solvent for efficient one-pot and catalyst free synthesis of 2,4,5-triaryl and 1,2,4,5-Tetra aryl imidazole derivatives.

Adi Wolfson, Christina Dlugy and Yoram Shotland (2007) conducted a review on study of glycerol as a green solvent for high product yield and selectivity. Navneet Kumar and vimal Chandra Srivastava (2019) Conducted a review on study of glycerol as a green solvent in organic reaction.

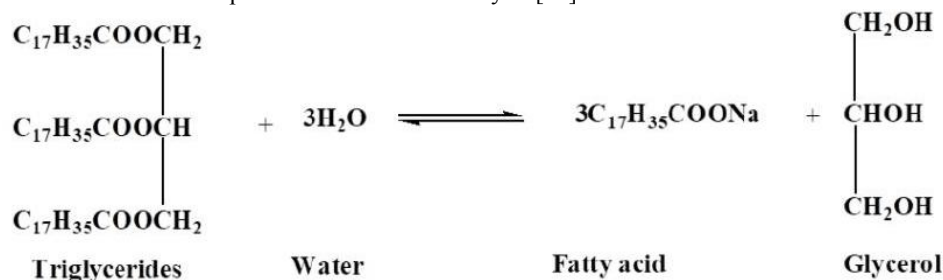
Zhanying Zhang, Darryn W Rackemann and Lan M O'Hara (2013) Conducted a review on study of glycerol carbonate as green solvent for pre-treatment of sugar cane bagasse. Alba E. Diaz Alvarez, Javier Francos, Pascale Crochet and Victoria Cadierno (2014) Conducted a review on study of recent advances in the use of glycerol as green solvent for synthetic organic chemistry.

Manish Pathak, Lubhan Singh, Amit Kumar, Gaurav Upadhyaya (2020) Conducted a review on study of green solvents and their importance in medicinal chemistry. M.N William (2003) conducted a review on study of green solvents for chemistry-perspective and practice. M. Pagliaro and M. Rossi (2000) conducted a review on study of Glycerol-properties and production.

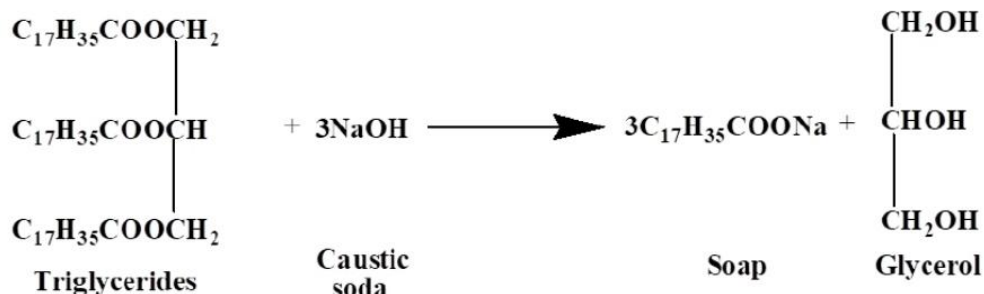
S. Ahmed (2010) conducted a review on study of Hydrogen from glycerol. A.E Diaz-alvarez and V. Cadierni (2013) conducted a review on study of Glycerol-A promising green solvent and reducing agent for metal-catalysed transfer hydrogenation reactions and nanoparticles formulations.

2.1 Glycerol Synthesis

Glycerol can be easily found in lipids of plant oil and fats. They are the commonest sources for biodiesel production. With the help of oils and fats by doing certain chemical reaction we can obtain the crude alcohol as product. [9] Within the chemical reaction of triglycerides, alcohol is obtained as side product. Chemical reaction of alcohol could be a process during which a water molecule breaks triglycerides into free carboxylic acid and alcohol. The obtained product could be a mixture of 2 phases wherever the less dense higher layer contains fatty acids. And also, the heavier bottom layer consists of crude alcohol and alternative impurities. Alcohol is obtained once the removal of impurities from this lower layer. [10]



We can obtain glycerol from triglyceride by the process of Saponification. Conversion of glycerol from triglyceride is also similar method to hydrolysis but here, Sodium hydroxide is used as solvent instead of water. In this process, the bond of triglyceride gets broken by sodium hydroxide to release glycerol and sodium salts. The product contains 3 soap molecules and one molecule of glycerol. [11] The glycerol can be easily separated from the product by using simple filtration. Where the glycerol is present in form of filtrate with other impurities.

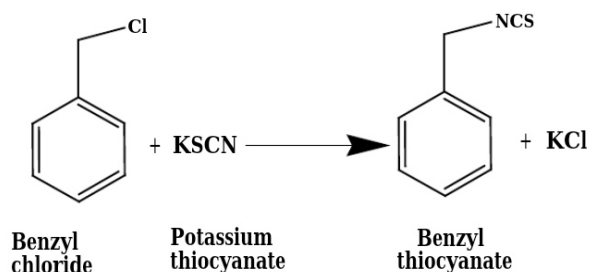


In the method of transesterification, the reaction between triglyceride and methanol is carried out in presence of catalyst. The reaction product is composed of methyl Ester and glycerol as a by-product. For the production of glycerol by transesterification process. Catalyst which are used. [12] Such as heterogeneous as well as homogeneous catalyst. The benefit of using heterogeneous catalyst. Over homogeneous catalyst is very easy to separate after the use of reaction. When we use the homogeneous catalyst Then it is very difficult to regenerate and reuse the catalysts.[13] And it often leads to the contamination of the product.

According to the literature, Homogeneous catalyst, such as sulphuric acid and hydrochloric acid. Are generally used in the process of Transesterification. In the method of production of glycerol by using homogeneous catalyst is very slow process and generally, Followed by loss of catalyst. To overcome such types of drawbacks, heterogeneous catalyst such as oxide of zirconium tin etc have been used. These types of metal oxide best catalyst do not React with the fatty acid and oils and they are also insensitive to water. The regeneration and reuse of heterogeneous catalyst is very simple process.[14]

2.2 Catalytic Method

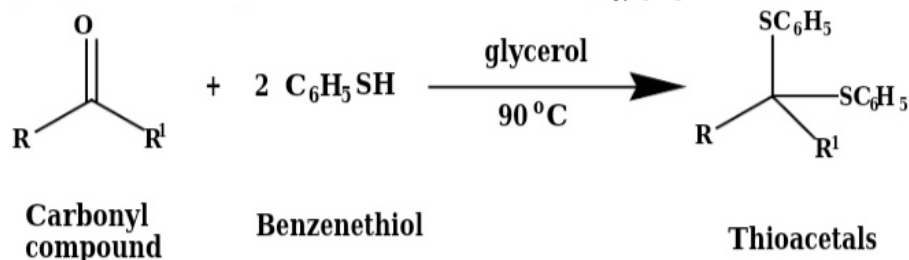
The appeal of glycerol solvent for carrying out organic reaction has been explored by various investigators. In 2007, Wolfson and Coworkers announced the combination of benzyl thiocyanate by Responding benzyl chloride with potassium thiocyanate in glycerol.[15] The response appliance required the change of chloride by thiocyanate Batch. Glycerol not only permit dissolution of pair of the substrates ion period but also calculate in large consequences yields with a large change rate of 95%.The response was carried out at 80°C, and the periods need to performed the nucleophilic exchange producers was 5hour.Wolfson's batch also response the utilize Off glycerol as a solvent for reduction of benzaldehyde with sodium borohydride to give benzyl alcohol[16].



2.3 Non-Catalytic Method

Glycerol has been conjointly used as in experience solvent to facilitate organic process within the absence of any chemical change material. Perin and colleagues studied the employment of alcohol in activity thioacetalisation of carbonyl compounds to offer corresponding thioacetals reaction at 90 degrees Celsius favoured the whole method and therefore the product yield was 96% [17]. Alcohol not solely fixed the reaction method and allowed straight forward product separation, however it can even be recycled and used for carrying additional thio-acetalisation reaction. In another report revealed by In gale Et Al, a novel, economical and catalyst free one-pot protocol was developed for the synthesis of nitriles from aldehydes in alcohol as

inexperienced medium. The synthesis was disbursed while not the employment of any catalyst. Different kinds of substituted aldehydes were chosen to check the effectiveness of the protocol to offer organic nitriles. Quite 80th product yield was achieved that showed the effectiveness of the strategy [18].



III. CONCLUSION

Organic reactions in presence of liquid solvents are of great importance in chemistry due to their applications in cosmetics, industries, and refineries. Water is the most promising and green solvent for such reaction, however, at the same time, it suffers from several drawbacks such as high polarity, hydrophilicity, and difficulty in product separation. Organic solvents are widely used in the field of synthetic organic chemistry; however, they have toxic nature, high cost, and carcinogenicity. Therefore, there is a high demand for some novel solvents that possess characteristics of a green solvent. In this context, glycerol, a by-product obtained in biodiesel industries has all the properties of a green solvent.

Several organic transformations such as Suzuki cross-coupling, Heck reaction, asymmetric hydrogenation, reduction, and transesterification have been carried out in glycerol medium with or without any metal catalyst. Glycerol-catalyst system not only gives the desired product with high yield but also favour the product selectivity. Glycerol can also promote hydrogenation reactions of organic compounds where the three hydroxyl groups of glycerol donate their hydrogen to bring the transformations. Loss of hydrogen from glycerol gives dihydroxyacetone as a side product. Glycerol derivatives have also been used as green solvents for organic synthesis. Apart from synthetic organic chemistry, glycerol has also found application in the synthesis of nanoparticles and other important reactions. Thus, it can be affirmed that glycerol and its derived solvents can be efficiently employed as green solvents without any adverse impact on the environment.

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Baker Yeast a Greener Catalyst for Synthesis of Diverse Heterocyclic Compound: A Review

Mr. Khan Shoyeab Mutalib¹ and Mr. Gokul Jaykisan²

Department of Chemistry

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2}

Abstract: *Saccharomyces cerevisiae*, usually referred to as baker's yeast, has gained important importance as a gentle, low-cost, environmentally benign catalyst. at the start it had been largely used as AN economical catalyst for the enantioselective reduction of carbonyl compounds. Over the last decade, baker's yeast has found versatile chemical change applications in numerous organic transformations. several multicomponent reactions were conjointly catalyzed by baker's yeast. numerous heterocyclic scaffolds with huge biological activities were synthesized by using baker's yeast as catalyst at temperature. during this communication, we've got summarized baker's yeast catalyzed numerous organic transformations focusing totally on heterocyclic synthesis.

Keywords: Microbiome, Plant Growth-Promoting Bacteria, etc.

I. INTRODUCTION

The art of organic synthesis has advanced staggeringly over the last decade. However, the conception of ideal synthesis is nevertheless to be complete for the synthesis of advanced natural product. Among several reactions, multicomponent reactions (MCRs) cover several aspects of "ideal synthesis" and, are shown to be a detailed match.[1] In MCRs, 3 or additional reacting parts type a product during which majority of the atoms from reacting parts are incorporated. the ultimate product arises through many elementary steps that are generally reversible except one irreversible step that drives the reaction within the forward direction. Therefore, MCRs are categorized as special class of cycle successive reaction. [2]

The first MCR was discovered by Laurent and Gerhard in 1838 and, currently MCRs have become a mainstay in combinatorial synthesis as well as diversity-oriented synthesis (DOS) for rapid library development.[3] The development of Passerini three component reaction (P-3CR) in 1921[4] and Ugi four component reaction (U-4CR) in 1959,[5] inspired the scientific community to develop many new isocyanide-based multicomponent reactions (IMCRs) as well as non-isocyanide based MCRs (NIMCRs).[6] Over the past decade, MCRs in particular IMCRs and, recently NIMCRs played a pivotal role in medicinal, peptidomimetic chemistry, and drug discovery with the recent advancement of high-throughput screening (HTS). [7]

An ideal MCR is usually administered in an exceedingly single vessel during which all the reactants still as reagents square measure value-added at the same time. beneath same reaction conditions, ordered elementary steps permit coupling of all reactants to create the ultimate product. However, the reversible and irreversible nature of each elementary step determines the success of one-pot MCRs. [8].

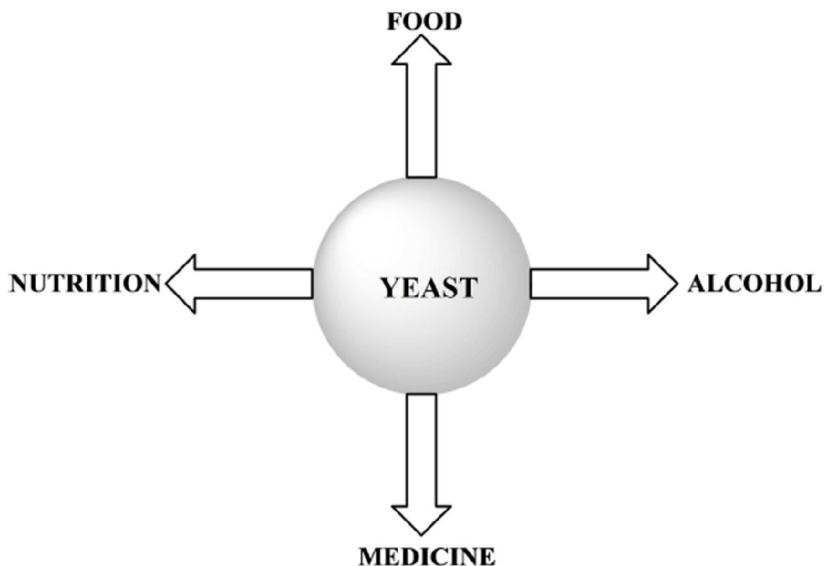
It is noteworthy that, except the well-established MCRs, majority of the new MCRs needs catalysts [9] (e. g. Lewis acids, Bronsted acids) and additives now and then to drive the general equilibrium into the forward direction. usually times, property is Associate in Nursing obstacle to seek out the correct catalyst. Therefore, chemical synthesis needs a tedious and long screening of many catalysts (50-100 or additional) to attain a minimum of ninety fifth or more enantioselectivity. it's noteworthy that, biomimetic reactions during which every elementary step square measure irreversible, fall under the special Type-III MCR class during which every elementary step issue irreversibly to create final product.[10] In contrary to chemical catalysts, enzymes catalyse several transformations in nature with high degree of selectivities. In their extraordinary discoveries within the Eighties, Klivanov and Büchner tried that protein chemical process (e. g. fermentation) doesn't essentially ought to have live cell conditions. [11]

Enzymes have the flexibility to face-recognize enantiotropic teams of racemic compounds and so, will turn reactions stereo selectively.[12] to the current finish, combinatorial bio-catalysis has been utilized for the event of natural product derivatives.[13] Few enzymes are used for dynamic kinetic resolution (DKR) of racemates (meso compounds) via the reaction of their organic compound functionalities, N/O-acylation, amino transfer to call many.[14] many catalyst approaches are utilized for the DKR of MCR merchandise or beginning materials for development of diastereoselective MCRs.[15] but, enzymes were comparatively underexplored as potential catalysts in MCRs because of their sleeping around, unstable nature and, usually times the need of co-factors.

II. BAKER'S YEAST

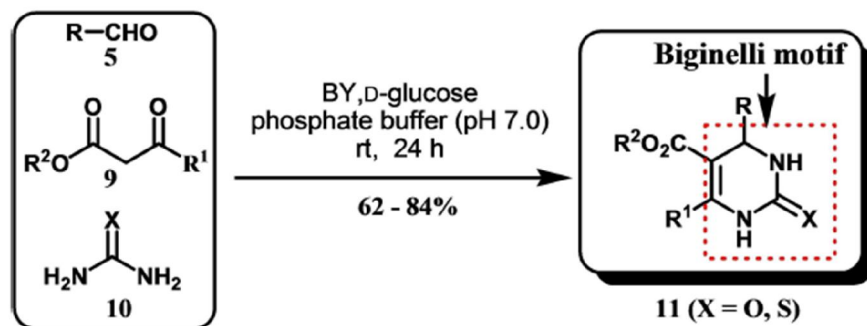
Yeasts square measure a member of fungi family and being single whole-cell organism. relying upon species and surroundings, their size might vary from 3-4 μm with few exceptions. These prolate cells square measure one in all the earliest microorganisms that were domesticated. usually they're classified into four categories: (a) organic process yeast, (b) Distiller's and Wine yeast, (c) Brewer's yeast, (d) Baker's yeast. they are available from totally different strains of genus *Saccharomyces cerevisiae* (SC) that is that the common scientific name of yeast.

Majority of famous yeasts square measure mesophilic and grow either in slightly acidic or neutral pH scale surroundings. Typically, industrially used SC grows best at 37°C. Brewer's yeast (BRY) basically differs from Baker's yeast (BY) in terms of composition. The bitter tasting BRY contains strains of SC having additional alcohol manufacturing capability. BRY was conjointly wont to treat several medical conditions e.g., eczema, urns, diarrhoea and polygenic disease to call a number of. [16]

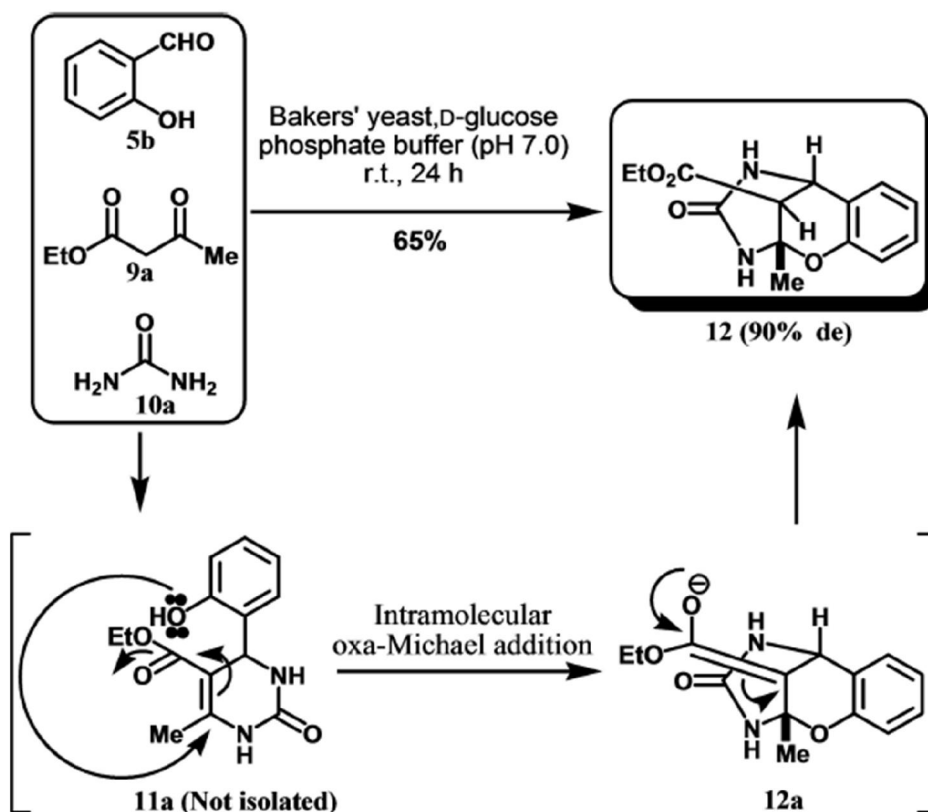


III. BIGINELLI REACTION

In 1993, Biginelli and co-workers discovered a straightforward one-pot three component reaction (B-3CR) for the synthesis of biologically relevant 3,4-dihydropyrimidin-2-(1H)-ones or 3,4- dihydropyrimidin-2-(1H)-thiones by employing benzaldehyde, ethyl acetoacetate and urea in the presence of a strong acid.[17] The product 3,4-dihydropyrimidin-2-(1H)-one, Scheme 1) is commonly referred to as the Biginelli compound. Since then, the B-3CR has become an important NIMCR for the synthesis medicinally important compounds containing the Biginelli motif.



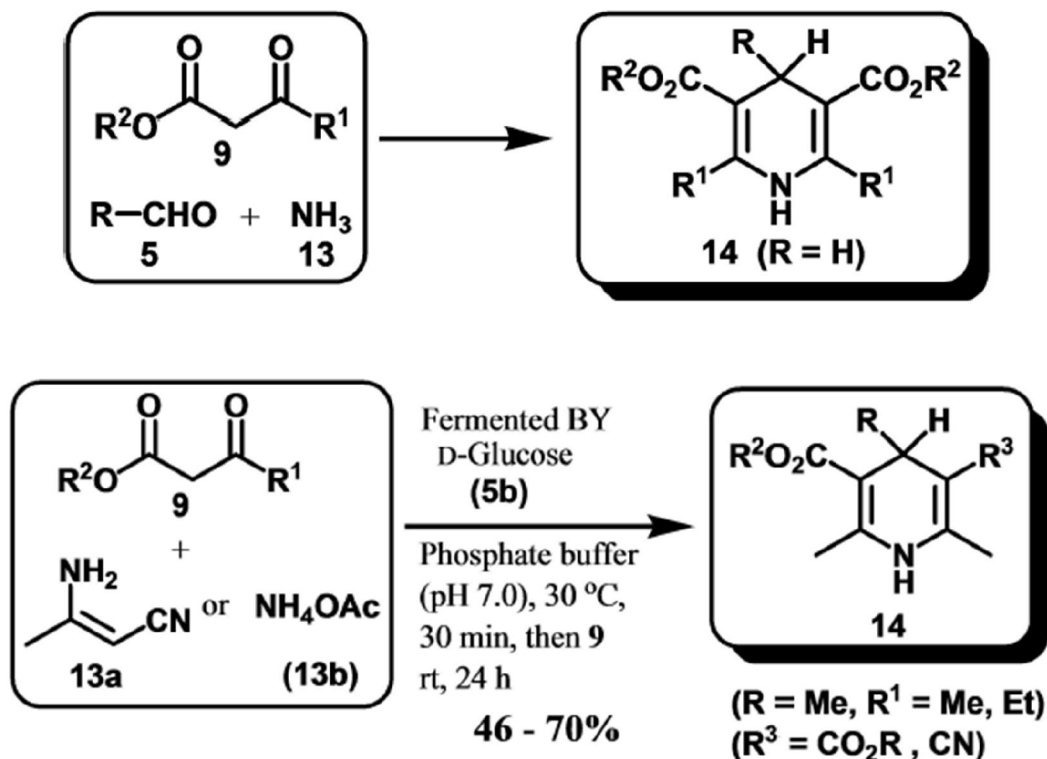
Scheme-1



IV. HANTZSCH REACTION

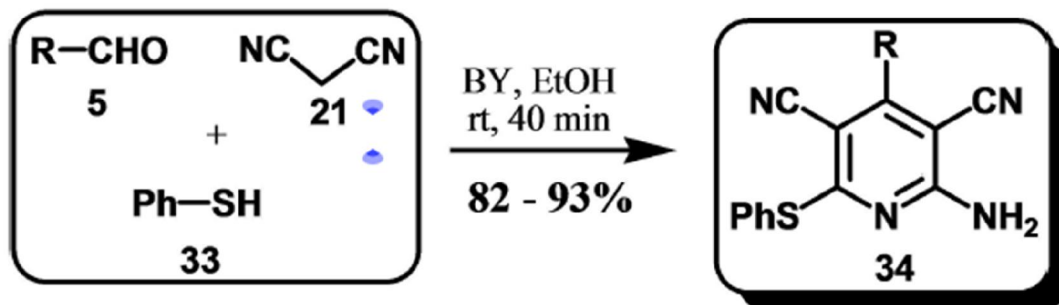
In 1881, Arthur Rudolf Hantzsch discovered a convenient synthesis of 1,4-dihydropyridines by employing two equivalents of β -diketoester, one equivalent of formaldehyde in the presence of ammonia.[18] 1,4-dihydropyridine dicarboxylate is commonly known as the Hantzsch compound or 1,4-DHP.[26] The 1,4-DHP motif is an important pharmacophore which is present in many medicinally active agents. Interestingly, the 1,4-DHP motif can be aromatized in aqueous solution using various catalyst including ferric chloride, chromic oxide, manganese dioxide or potassium permanganate, to obtain pyridine compounds.[19]

In 2005, Lee reported a convenient method of synthesizing 1,4-DHP motifs 14 in moderate yields using fermented BY, glucose (5b) and 3-aminocrotononitrile (13a) or ammonium acetate (13b) at room temperature in phosphate buffer (pH 7.0).[20]



V. MISCELLANEOUS REACTIONS

Most recently, a one-pot protocol for the synthesis of pent substituted thiopyridones catalyzed BY was reported by Chavan and co-workers.[21] The reaction works in a number of protic as well as aprotic solvents and provided moderate to excellent yield. It is noteworthy that a lower yield has been reported when water was used as a solvent compared to other solvents. However, the reaction provided best yield (93%) when ethanol was used as the solvent and 1 g of BY was employed and the reaction was carried out for 40 minutes.



VI. CONCLUSION

The preceding survey of BY catalyzed multicomponent reaction shows that it's growing space of analysis within the field of organic synthesis and biocatalysts. during this minireview, the reactions are classified in step with the name reaction MCRs. Whenever attainable, plausible mechanism of reactions likewise as at the situation of

the catalyst projected by the authors, has been represented. it's expected that this minireview can stimulate more analysis within the space of accelerator. Since BY consists of the many enzymes, and, therefore, more study is needed to pinpoint role of individual enzymes within the chemical {process chemicalchange chemical action} process and therefore the organic compound residues in their situation.

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A Review Article on Chemistry, Synthesis and Therapeutic Importance of Thiazole Derivatives

Mr. Nitin Shivaji Pawar¹ and Marwah Chougale²

Department of Chemistry

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2}

Abstract: Thiazole is a heterocyclic compound containing nitrogen and sulphur atoms, and has very important applications in medicinal chemistry. It is necessary scaffold present in most of the natural and synthetic medicinal important compounds. Thiazole is an essential part of penicillin nucleus and its derivatives which have shown antimicrobial (sulfazole), antiretroviral (ritonavir), antifungal (abafungin), antihistaminic and antithyroid activities. Thiazole chemistry has developed after the pioneering work of Hofmann and Hantsch. Bogert and co-workers has significant contribution to expand this field. Mills gives the importance of thiazole nucleus in cyanine dyes which is used as photographic sensitizer. Benzothiazole, a fused derivative of thiazole has also commercial value. This review article gives the literature documents available on the methods of preparation of thiazole derivatives and their biological activities.

Keywords: Thiazole, Heterocyclic Compound, Medicinal Chemistry, Antimicrobial, Antifungal, Benzothiazole, etc.

I. INTRODUCTION

The exploration of new compounds with multifunctional biological behaviour is an interest research area due to its cruciality and significance. Several inorganics [1], polymer [2], and organic compounds [3] were synthesised and the isolation of natural products [4] have been proved to possess biological activities.

Among these compounds, the organic compound appears to be the most favorable in the biological field due to its facile synthesis methods [5] and a high percentage yield [6]. One of the main research areas that focuses on organic chemistry to develop an antimicrobial drug is the synthesis of heterocyclic compounds.

Heterocyclic compound is a cyclic compound with at least two different atoms as the members in the ring and has been extensively applied in medicinal and biological applications. For example, benzimidazole, pyrimidine and oxazole were claimed to possess antimicrobial [7], antifungal [8], anti-inflammatory as well as antitumor [9] properties.

Over the years, research on a small molecule of heterocyclic ring integrated with nitrogen and Sulphur such as thiazole [10, 11] and triazole [12,13] have been extensively studied based due to their synthetic and biological applications. Thiazole is the most commonly reported compound in the literature. Thiazole is a 5- membered ring moiety containing nitrogen and Sulphur at position 1 and 3, respectively. The structural pattern of thiazole derivatives as active compounds is predominantly focused on the substitution of hydrogen atoms with desired moieties at position 2, 4, 5 [14,15].

The derivatives were reported to demonstrate anti-inflammatory [14], antifungal [17], anticancer [14, 20], antibacterial [14, 16], anticonvulsant [19], antiviral [17], and antitumor [14, 20] activities. This has generated an urge to extend the study by synthesizing new thiazole derivatives as potential candidates for drug discovery prospect.

II. METHOD

The search for literature related to thiazole derivatives and their application in biological activities were retrieved from Science Direct, Scopus, Springer, and Google Scholar databases. The articles chosen for this study were articles published from 2009 to 2018 covering thiazole and its derivatives, synthesis, and applications.

Chemistry of Thiazole

Thiazole employs both an electron-donating group (-S-) and an electron accepting group (C=N) and these create a stable heterocyclic compound [21]. Thiazole and its analogue such as oxazole are considered as an important group of heterocycles possessing several biological properties [22]. Thiazole compound is isomeric with an azole compound such as isothiazole that comprises similar atoms compound (nitrogen and sulphur) but at a different position. Thiazole is a clear pale-yellow liquid with a boiling point of 116 -118 °C [17], soluble in alcohol and ether but moderately soluble in water [23]. The heterocyclic ring of thiazole contains a delocalisation of 6 π electrons corresponding to Huckel's rule from the lone pair electrons, which is the sulphur atom [24]. Figure 1 shows the resonance forms of thiazole (1).

Thiazole derivatives are desirable model compounds for chemistry study due to its planar and aromatic structure that exhibits larger π -electron delocalisation compared to oxazole [23]. The aromatic behaviour of the thiazole ring was verified using ¹H NMR spectroscopy whereby the chemical shift of the protons is spotted between 7.27 and 8.77 ppm [21]. The reactivity of the thiazole derivatives ring was strained due to the addition of different substituents at C-2, C-4, and C-5 positions, which could lead to further structural consideration [25]. For example, the effect of the methyl group (electron donating group) substituent was recognised when it was located at any position of the thiazole ring, leading to an increase in its basicity and nucleophilicity properties. However, the basicity and nucleophilicity reductions occur when a strong electron withdrawing group such as a nitro group was incorporated into the molecule [26, 27]. The molecular frame of thiazole is unique due to its versatile building blocks as bioactive compounds [28]. Several studies have reported that the thiazole ring is present in most natural and synthetic products with an extensive range of biological properties [29, 30]. One of the examples is vitamin B1 or known as thiamine involving thiazole moiety where it naturally supports the nervous system by connecting its role in acetylcholine synthesis [31].

Moreover, thiazole derivatives (2) that are shown in Figure 2 possessed amphiphilic character due to having both hydrophobic (lipophilic) and hydrophilic (lipophobic) parts. This property increases its potential to diffuse facily into the cell membrane of bacteria for inhibition activity [32]. Compound with both hydrophilic and lipophilic sections is beneficial against both Gram-negative and Gram-positive bacteria [33] by breaking through the cell membrane of bacteria for an inhibition process. This penetration leads to cytoplasmic materials leakage, cell physiology disturbance, and apoptosis [34].

Synthetic Approach of Thiazole Aerivatives

The explorations of thiazole derivatives have emerged as an important topic throughout the years due to its various applications. The most appealing characteristic is the derivatives can be synthesised with a good yield from the starting material by a simple synthesis method [35]. The unique structure and significance of thiazole compounds have led to the expansion of methods by applying various conditions, catalysts, and approaches.

Hantzsch Synthesis

The most notable method to synthesize thiazole is the Hantzsch thiazole synthesis [35], which was invented in 1887 by a German chemist named Hantzsch. This method utilizes the condensation reaction of α -haloketone with nucleophilic reagents such as thioamide, thiourea, ammonia thiocarbamate or dithiocarbamate derivatives [38,39]. Moreover, Hantzsch thiazole synthesis was suggested to be the most productive method for the synthesis of thiazole derivatives [20]. In this method, four thiazole derivatives were prepared by employing the Hantzsch reaction of thionicotinamide (3) with four types of α -haloketone namely chloroacetone (5), 3-chloroacetylacetone (6), 3-bromoacetyl coumarin (7), and p-chloroacetylacetanilide (8) in the presence of catalytic triethylamine (4). The reaction produced 2-(3- pyridyl) thiazole derivatives (9-12) as shown in Scheme 1.

Several studies reported that this method has major drawbacks such as low percentage yields, harsh reaction condition, prolonged reaction time, and employs expensive catalysts [5, 41, 42, 43]. In contrast, it was reported by another researcher that this method gives high yields via dehalogenation of the haloketone during the reaction [24]. The nature of halide as a good leaving group has promoted the vacant site for a nucleophilic attack to furnish the reaction.

The Hantzsch cyclisation method was proposed by synthesizing thiazole derivatives, in which the tetrafluoroethoxy moiety was directly attached to the carbon atom of the heterocyclic ring [25]. In their research, α -bromo- α - tetrafluoroethoxy acetophenone (13) was heated with thiobenzamide (14) at 60 °C in dioxine that led to the formation of 2,4-diphenyl-5-(1,1,2,2-tetrafluoroethoxy)- thiazole (15) (Scheme 2). However, the percentage of yield is low (18-20%) due to the unstable thiobenzamide in an acidic medium.

Cook-HeilbronSynthesis

In addition, thiazole ring can also be synthesized from α -aminonitriles or α -aminoamides and carbon disulfide as the reactants, known as Cook-Heilbron synthesis that is discovered by Cook and Heilbron [26]. The CookHeilbron method produced 5-aminothiazoles in which substitution occurred at position 2 by the reaction of aminonitrile with salt and esters of thioacids, carbon disulfide or isothiocyanates under mild conditions [29]. Scheme 3 depicts the reaction of α -aminonitriles (16) with carbon disulfide (17) to form 5-amino-2-mercaptothiazole (18).

Gabriel Synthesis

Another alternative of a synthetic approach to synthesize thiazole derivatives is Gabriel synthesis. This method focuses on the closure of the thiazole ring by reacting acylamino-ketone with phosphorus pentasulfide producing 2,5- disubstituted thiazole derivatives [28]. This study was promoted by Kotadiya [29] whereby the synthesis of the desired compound involved heating of acylamino compounds namely N-(2-oxopropyl) acetamide (19) with phosphorus pentasulfide (20) to produce 2,5-dimethylthiazole (21) as shown in Scheme 4.

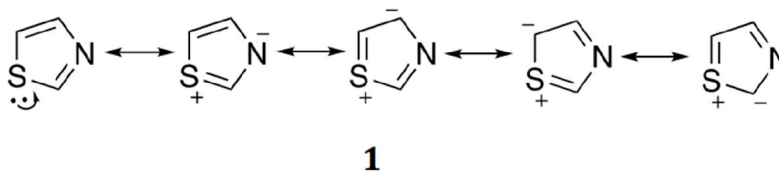


Figure 1. Resonance forms of thiazole compound

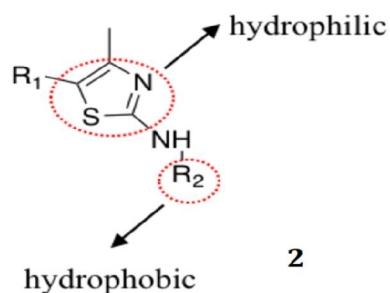
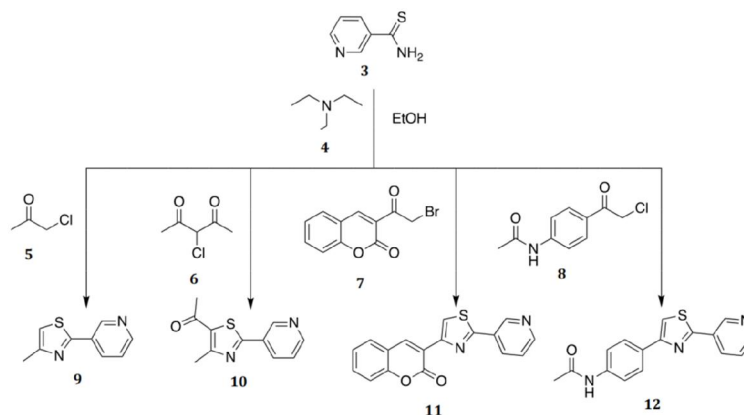
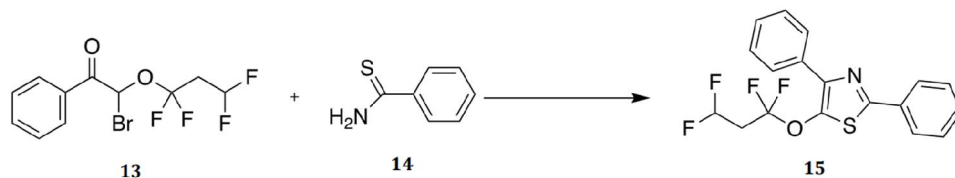


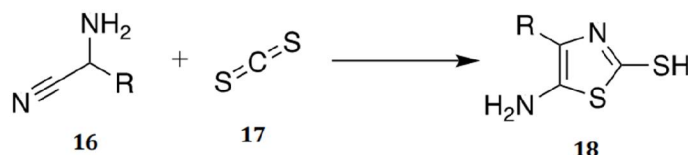
Figure 2. Structure of thiazole derivatives



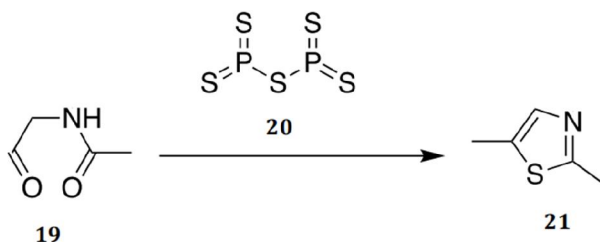
Scheme 1. Reaction synthesis of 2-(3-pyridyl) thiazole derivatives [40]



Scheme 2. Hantzsch type synthesis of 2,4-diphenyl-5-(1,1,2,2-tetrafluoroethoxy)-thiazole

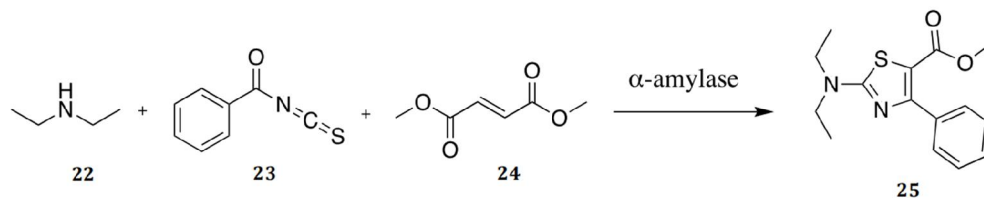


Scheme 3. The Cook-Heilbron thiazole synthesis [26]



Scheme 4. Synthesis of thiazole compound *via* Gabriel reaction [48]

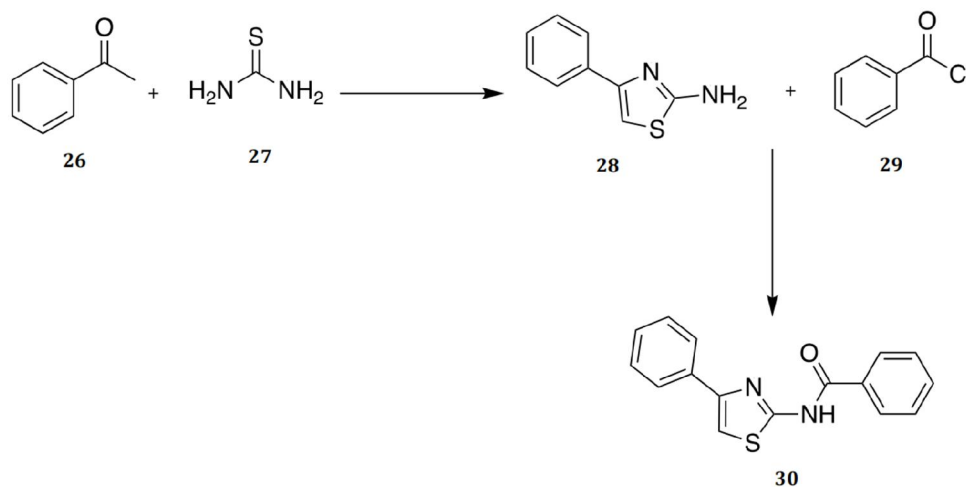
However, Hantzsch cyclisation, Cook-Heilbron, and Gabriel synthesis methods have major drawbacks in terms of time consuming and unsatisfactory percentage yields. Hence, several studies have improved the method. For example, the synthesis of thiazole derivatives by occupying the chemoenzymatic organic reactions or known as an enzymatic synthesis of heterocyclic compounds were designed [49]. In the study, a medium condition of chemoenzymatic was applied in a one-pot multicomponent reaction. The reaction of the starting materials such as secondary amine (22), benzoyl isothiocyanate (23), and dimethyl acetylene dicarboxylate (24) was catalyzed by α -amylase derived from *Aspergillus oryzae* in ethanol (Scheme 5).



Scheme 5. One-pot multicomponent synthesis of thiazole derivatives using derived enzyme [49]

Furthermore, the synthetic pathway improvement of thiazole synthesis coping with environmental-friendly and practical methods have been also investigated. The designation of N-substituted 2-aminothiazole analogue namely N-(4-phenyl-1,3-thiazol-2-yl)-benzamide (30) comprises two stages of reaction synthesis was developed [30] whereby phenylthiazole was reacted with benzoyl chloride with continuous stirring at room temperature. Scheme 6 displays the synthetic routes to synthesize the thiazole compound in ethanol with continuous heating and stirring for 8 hours.

A simple but potent synthetic route of thiazole derivatives is still under investigation and improvement. The prominent method should exert low energy consumption, less waste generated, high percentage yield, and involve a one-pot reaction.



Scheme 6. Synthesis of thiazole derivatives in two stages of reaction

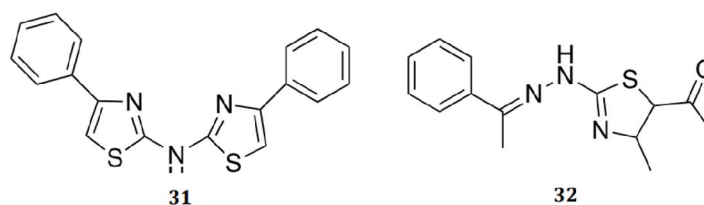


Figure 3. Chemical structures of 2-aminothiazole derivatives as an anti-inflammatory agent

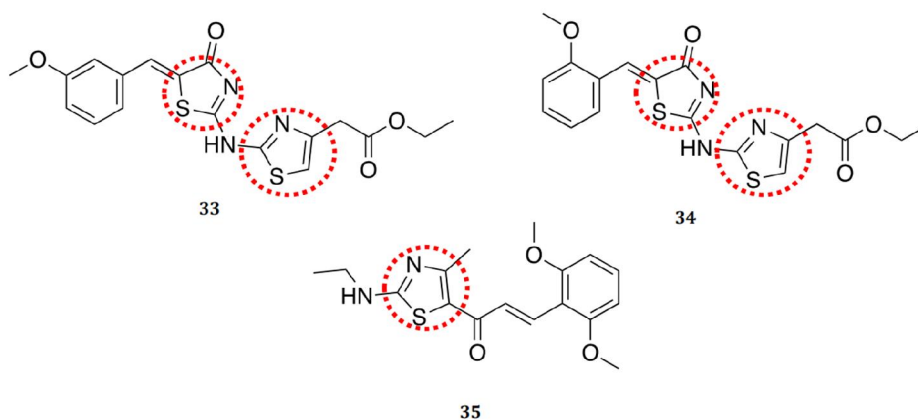


Figure 4. Chemical structures of thiazole derivatives possess antioxidant activities

Biological Application of Thiazole Derivatives

Thiazole derivatives have been comprehensively applied in the field of biology as well as pharmacology with a well-established ability in pharmaceutical drugs. They were reported to exhibit antimicrobial [31], antioxidant [32], anticancer [33], and antitubercular [34] behaviour. Thiazole compound namely bis-(4- phenylthiazol-2-yl) amine (31) and 1-(4-methyl-2-(2-(1- phenylethylidene) hydrazineyl)-4,5-dihydrothiazol-5- yl) ethenone (32) as shown in Figure 3 possess antiinflammatory due to the presence of nitrogen and sulphur atoms in the molecules [33]. Besides that, a compound with thiazole as the core structure demonstrated an antioxidant agent [34].

The antioxidant properties of the synthesised thiazole derivatives (33, 34 and 35) were evaluated using DPPH (1,1-diphenyl-2-picrylhydrazyl) scavenging capacity test. The results showed that the DPPH radical inhibition for compound 33 and 34 were 18.73% and 15.62%, respectively. No antioxidant activity was seen from compound 35, which could be due to the lack of several active atoms leading to a decrease in possible resonance in the structure. The chemical structures of compound 33, 34, and 35 are shown in Figure 4.

In another application, thiazole compounds have also been explored as a drug candidate for an antibacterial agent. The appearance of antibiotic (drug) resistance against bacterial strains has captivated outstanding concern in the discovery and development of a new suited antimicrobial drug. Since thiazole moiety is widely known in biological activity, investigations on thiazole derivatives as an antimicrobial agent have been vigorously conducted. Introduction of various substituents in the main molecular framework of thiazole showed optimistic result towards the tested bacterial strains [10].

A number of studies have been extensively performed to improve the chemical structures of thiazole derivatives for antimicrobial applications. In particular, trichlorophenyl thiazole compound exhibited considerable inhibitory effect against numerous Gram-positive and Gram-negative strains such as *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus epidermidis*, *Staphylococcus aureus*, and *Pseudomonas fluorescens* [26]. Prolongation synthesis of active antimicrobial agents resulted in a series of 2,4-disubstituted-1,3-thiazole derivatives (Figure 5) designation with identifiable invitro antimicrobial activities [35]. The synthesised analogues of 36 and 37 comprising nitro group at phenyl substituents exhibited active results towards *B. subtilis*, *S. aureus* and *E. coli* with MIC values of 3.92-4.01, 3.39-4.11 and 3.59-4.23 $\mu\text{M/mL}$, respectively compared to compound 38 with values of 4.51, 4.60 and 4.32 $\mu\text{M/mL}$, respectively. This is a result of the existence of nitro moiety at the para position, which makes a strong hydrogen bonding with the amino acid residue in the tested microorganisms.

Therefore, it can be concluded that the thiazole ring with nitro at position 4 played crucial roles to inhibit microorganism activities as well as the optimization of the substituent at the ring [26]. In another study, the -C=N spacer in the thiazole was reported to be the advantageous factor for the antifungal behaviour of the compounds [35]. The synthesized compounds of 39 and 40 (Figure 6) demonstrated high antifungal activity against *U. tritici* and *P. striiformis*.

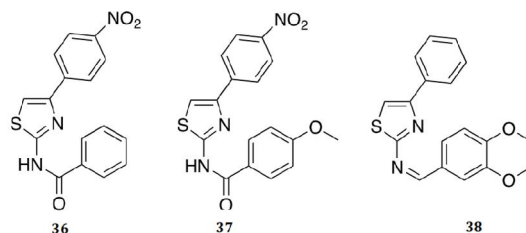


Figure 5. Series of 2,4-disubstituted thiazole derivatives as antimicrobial agents

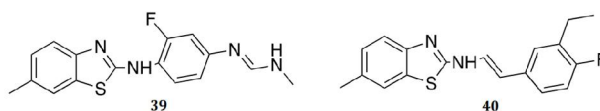


Figure 6. Chemical structures of fluorinated benzothiazole-2-yl-1,2,4-triazoles derivatives

III. CONCLUSION

In summary, there were numerous methods reported on the synthetic pathway of thiazole derivatives. A new practical method can be designed to synthesize thiazole derivatives with a high yield. In biological application, several new structures were designed and synthesized by modifying the substituent at thiazole ring with suitable substituent groups in order to improve the biological activities. Therefore, research on thiazole derivatives can be the focal point for future exploration due to its special attributes and potential.

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Study of Intermolecular Interaction of Allyl Bromide with Acetone Through Dielectric and Thermodynamic Properties

Y. S. Sudake¹ and S. P. Kamble²

Department of Physics, New Arts Commerce and Science College, Shevgaon, Ahmednagar, Maharashtra¹

Department of Physics, C. T. Bora College, Shirur, Pune, Maharashtra²

Abstract: The dielectric constant (ϵ_s) and Relaxation time (τ) for binary mixtures of Allyl Bromide (ALB) with Acetone (ACE) were determined for eleven concentrations at temperatures 293.15 K, 303.15 K and 313.15 K in the frequency range of 10 MHz to 10 GHz using time domain reflectometry (TDR). Density and refractive index of same mixture at same temperature are also obtained which are further used to known excess molar volume and excess molar refraction respectively. These excess parameters are compared with excess dielectric parameter. Comparison confirms that there is intermolecular interaction between AL Band Acetone ACE. The values of Kirkwood factors indicate antiparallel dipoles in ALB and parallel dipoles in ACE.

Keywords: Static Dielectric Constant, Relaxation Time, Density, Refractive Index, etc.

I. INTRODUCTION

Dielectric study of binary mixture of liquids is very interesting subject in chemistry, Physics, biochemistry, pharmaceutical material science and engineering. This is due to the variation of dynamic properties with concentration of solute and temperature of mixture. Now day, drug design is an important and challenging aspect for new researcher. Dielectric properties of drugs or solution is directly related to solubility of drug in solvent which are affected on its rate of dissociation in body. We know that slightly changing any one of parameter among the, concentration of solute, temperature, pressure and environmental condition there is changing physical chemical, thermodynamic, dielectric properties. The density and refractive index are fundamental properties which gives important internal information of solution.

Allyl bromide basically used as alkaline agent for many syntheses such as pharmaceutical, polymer etc. while Acetone are used from household cleaning to pharmaceutical. In Ally bromide, carbon-bromine covalent bond in which bromine has significantly greater electronegativity than carbon, that is carbon is electrophilic and bromine is nucleophilic, double bond present will have restricted to reorientation of dipole moment of molecule. Carbonyl group of acetones play an important role in their properties.

Many research groups throughout world active in this research area. There are many methods used to study the dielectric behavior of binary mixture of liquid. Among the all technique, Time domain reflectometry technique is one of widely used technique due to their precise, reproducibility varies with wide frequency range.

We are reported the dielectric behavior of Ally chloride with Acetone, Allyl chloride with 2-Butanone and 2-Pentanone, Allyl chloride with 2-Hexanone with different temperature in frequency range 10 MHz to 20 GHz [1-6]. As continuous study of Allyl Halide with ketone. As part of our research work, in this paper we reported study of Allyl Bromide with Acetone at temperature 293.15K, 303.15K and 313.15 K. Dielectric constant and dipole moment of acetone We are extended our work for measurement of excess molar refraction and excess molar volume for confirmation of intermolecular interaction between two solute and solvent.

Chemicals: The chemical used in this work are AR grade ALB, ACE with purity 99%. Chemical used without further purification. The solution was prepared at 11 different volume concentration by adding ACE in ALB starting from 0% to 100% in step by step 10% by micropipette with accuracy of ± 0.0006 ml.

II. EXPERIMENTAL SECTION

The Hewlett Packard HP54750 A Sampling Oscilloscope with HP54754ATDR plug in module has been used for experimental measurement of complex permittivity data of sample. A fast-rising voltage pulse about 39picosecond rise time generated by tunnel diode are propagated through flexible coaxial cable with impedance 50Ω. The sample is placed at end of coaxial cable in standard military application (SMA) coaxial cell. The data acquisition of eleven concentration sample at temperature 293.15K, 303.15K and 313.15K. The detail about experimental setup, procedure and data analysis are explained as earlier [6].

The refractive index and density of same concentration and temperature are determined by Abbe's Refractometer and Pyknometer with accuracy ± 0.001 and ± 0.0001 respectively.

III. RESULT AND DISCUSSION

The dipole moments of Allyl Bromide and Acetones in gas phase are 1.90 D and 2.28D, respectively. Using these values of dipole moments, the values of the Kirkwood factors are 0.78 and 1.12 respectively. It indicates that the dipoles in ALB have tendency to be in antiparallel, whereas dipoles have tendency to remain parallel in pure Acetone. As these molecules are not hydrogen bonded liquids, the tendency will be due to dipole-dipole interaction. The excess properties can provide information regarding change in these opposite tendencies in mixtures.

The values of the static dielectric constant and Relaxation time of the binary mixtures are tabulated in table 1 while density and refractive index are reported in table 2. From table non-linear variation of all parameter confirm the dipole-dipole complexes. ALB form dipole –dipole association through Br atom with carbonyl of Acetone. Table also show that both values of static dielectric constant and relaxation time increase with increase of ACE concentration in the mixture, whereas these values of density and refractive index have opposite trend that is decreases with concentration. The variations with respect to temperature in these parameters have also got usual trend, i.e., static permittivity, relaxation time, density and refractive index all parameters decrease with increase of temperature. The correlation among neighboring dipoles are decreases.

Table 1: Static dielectric constant and Relaxation time of Allyl Bromide +Acetone binary system

Mole fraction of ACE	293.15 K		303.15 K		313.15 K	
	ϵ_s	τ	ϵ_s	τ	ϵ_s	τ
0	7.14	13.20	6.74	12.24	6.54	11.39
0.1158	9.26	14.64	8.57	13.64	8.32	12.77
0.2277	10.89	16.06	10.10	15.03	9.78	14.14
0.3357	11.89	17.51	11.24	16.39	10.67	15.45
0.4401	12.70	18.81	12.06	17.68	10.96	16.62
0.5411	13.26	20.10	12.73	18.90	11.40	17.85
0.6388	13.99	21.34	13.23	20.11	12.00	19.20
0.7334	15.12	22.91	14.13	21.51	13.06	20.35
0.8251	16.61	24.83	15.45	23.22	14.70	22.08
0.9139	18.57	28.22	17.21	26.14	16.55	24.62
1	20.73	33.64	19.66	31.29	18.80	29.22

Table 2: Density (gm/cm³) and Refractive index of Allyl Bromide +Acetone binary system

Mole fraction of ACE	293.15 K		303.15 K		313.15 K	
	ρ	n_D	ρ	n_D	ρ	n_D
0	1.3980	1.467	1.3813	1.460	1.3645	1.455
0.1158	1.3201	1.453	1.3043	1.446	1.2888	1.440
0.2277	1.2399	1.439	1.2237	1.432	1.2093	1.426
0.3357	1.1914	1.426	1.1766	1.420	1.1623	1.414
0.4401	1.1496	1.418	1.1344	1.412	1.1201	1.406
0.5411	1.1143	1.412	1.0994	1.406	1.0853	1.400
0.6388	1.0707	1.405	1.0558	1.399	1.0426	1.393
0.7334	1.0210	1.397	1.0071	1.391	0.9940	1.386
0.8251	0.9716	1.385	0.9581	1.380	0.9453	1.374
0.9139	0.9065	1.372	0.8941	1.367	0.8817	1.361
1	0.7913	1.358	0.7799	1.353	0.7688	1.348

Table 3: a_j coefficient and standard deviation (σ) of excess parameters

	a_0	a_1	a_2	a_3	σ
		293.15 K			
ϵ_s^E	-3.7293	-15.3382	0.0323	6.2665	0.0319
$(1/\tau)^E$	-0.0064	0.0276	0.0120	-0.0016	0.0001
V^E	-1.1259	-29.6410	-21.1777	-15.0860	0.4752
R_m^E	-0.5921	-3.5675	-3.2040	-6.4329	0.1176
		303.15K			
ϵ_s^E	-3.0999	-14.1115	-5.5238	3.1480	0.0384
$(1/\tau)^E$	-0.0100	0.0281	0.0147	0.0051	0.0001
V^E	-1.0467	-29.8814	-21.7952	-15.9490	0.4933
R_m^E	-0.5594	-3.6550	-3.3502	-6.0128	0.1163
		313.15K			
ϵ_s^E	-5.7278	-17.3217	0.9493	9.3268	0.0589
$(1/\tau)^E$	-0.0141	0.0278	0.0119	0.0103	0.0002
V^E	-1.2531	-30.3478	-22.5073	-15.6938	0.4947
R_m^E	-0.7497	-3.4214	-3.7520	-6.2295	0.1265

The excess parameters of binary mixture were calculated using following equation

$$A^E = A_{mix} - (A_1X_1 + A_2X_2)$$

Where A^E - represent excess dielectric constant, excess inverse relaxation time, excess molar volume, excess molar refraction.

A_1, A_2 and A_{mix} represent static dielectric constant, inverse relaxation time, molar volume, refractive index of liquid 1 and liquid 2 and binary mixture resp.

X_1 and X_2 represent mole fraction of liquid 1 and liquid 2 of mixture.

The dipole moments of Allyl Bromide and Acetones in gas phase are 1.90 D and 2.28D, respectively. Using these values of dipole moments, the determined values of the Kirkwood factors are 0.78 and 1.12 respectively. It indicates that the dipoles in ALB have tendency to be in antiparallel, whereas dipoles have tendency to remain parallel in pure Acetone. As these molecules are not hydrogen bonded liquids, the tendency will be due to dipole-dipole interaction. The change in effective Kirkwood factor with respect to temperature is not more significant instead of these agree with variation of static dielectric constant with temp. The excess properties can provide information regarding change in these opposite tendencies in mixtures. The graphical representation of excess static dielectric constant of ALB+ACE are shown in fig1. In Allyl Bromide rich region, the interaction of acetone molecule with ALB is such that the antiparallel tendency of ALB gets reduced. In ACE rich region, the interaction between ACE and ALB is such that the dipoles of ACE have tendency to be less parallel. It is interesting to see the different behavior at both end of the concentrations.

The excess inverse relaxation time as function of mole fraction of Acetone is shown in figure 2. The negative excess inverse relaxation in ALB rich region, this indicates that addition of ACE in ALB has created hindered field such that effective dipole rotates slowly. Whereas positive excess inverse relaxation time in ACE rich region, it indicates that molecular interaction produce field such that effective dipole rotates faster, i.e., the field cooperates in the rotation of dipoles. The perusal of figure 2. shows that, the negative value of excess inverse relaxation time indicates that reorientation of dipole influenced by heterogeneous interaction through dipole-dipole interaction (Carbonyl group of ACE and Br atom of ALB).

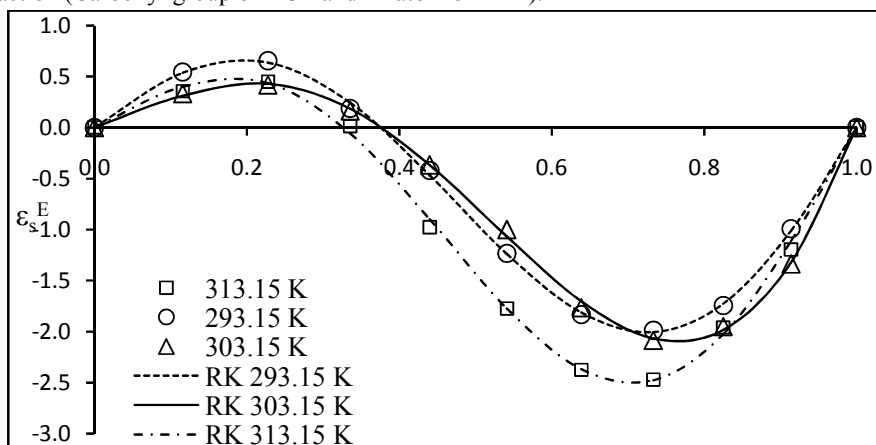


Figure 1: Excess static dielectric constant (ϵ_s^E) of Allyl Bromide + Acetone binary system

From figure 3, it is observed that excess molar volume is positive in nature below 0.4 mole fraction of ACE and negative above it. The positive V^E indicates that predominant effect of expansion consequent on rupture of dipole-dipole interaction between ACE molecules in ALB rich region while negative V^E in ACE rich region is nevertheless indicative of important interaction between unlike molecule and geometrical fitting on one component into another component. The maximum deviation of positive excess molar volume is about 0.2 mole fraction of ACE while maximum negative deviation is about 0.8 mole fraction of ACE [7].

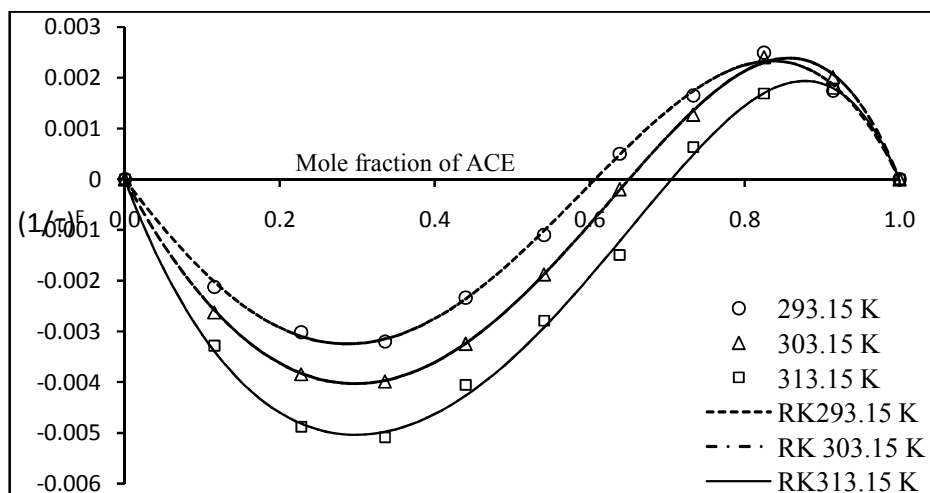


Figure 2: Excess inverse relaxation time $(1/\tau)^E$ of Allyl Bromide + Acetone binary system

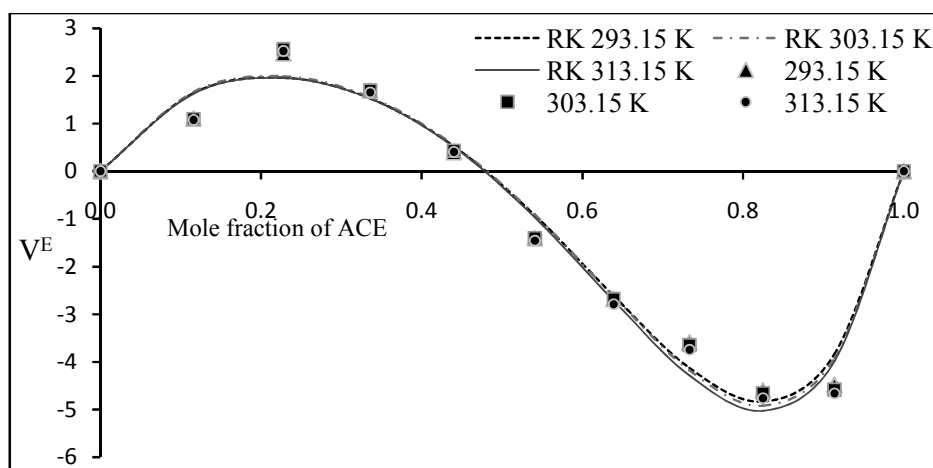


Figure 3: Excess molar volume (V^E) of Allyl Bromide + Acetone binary system

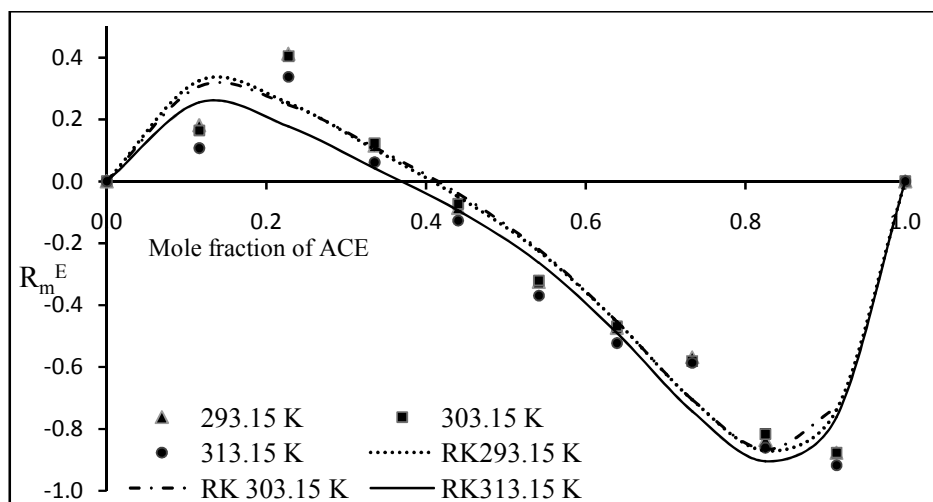


Figure 4: Excess molar refraction (R_m^E) of Allyl Bromide + Acetone binary system

The R_m^E values represent the electronic perturbation due to orbital mixing of the molecule. Figure 4 show R_m^E is positive in ALB rich region and negative in ACE rich region. The values of V^E and R_m^E of system supported to each other. There is slightly variation of V^E and R_m^E values with increasing temperature suggest that molecular interaction decreases with increase temperature [8].

The result of excess static dielectric constant, excess molar volume and excess molar refraction are supported to each other. They suggest that in ALB rich region hetero molecular interaction is not effective as compare to ACE rich. The excess parameters are fitted to Redlich-Kister equation to determine the values of a_j coefficients (RK) and standard deviation (σ) are tabulated in table 3.

The values of effective Kirkwood correlation factor are plotted in fig 5. The value of g^{eff} is less than one upto the 0.8 volume fraction of ACE while greater than one for 0.9 volume fraction of ACE and pure ACE. In pure ALB, the interaction is such that the dipoles have tendency to align in antiparallel direction, whereas the interaction in ACE is such that the dipoles have tendency to align in parallel direction. In mixtures, these two tendencies get mixed, i.e., in ALB rich region, ACE molecules reduces the intensity of the anti-parallelism tendency resulting increase in values of g^{eff} . Similarly, in ACE rich region, ALB molecules reduces the intensity of parallelism tendency resulting decrease in values of g^{eff} [9].

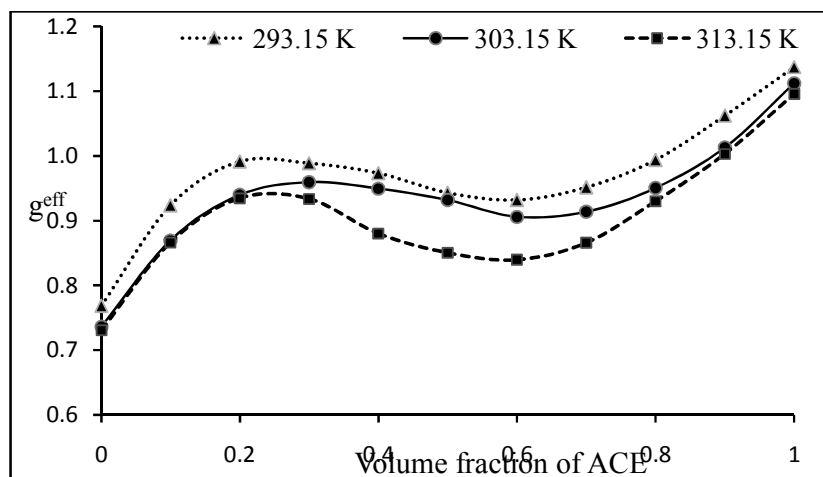


Figure 5: Effective Kirkwood correlation factor (g^{eff}) of Allyl Bromide + Acetone binary system

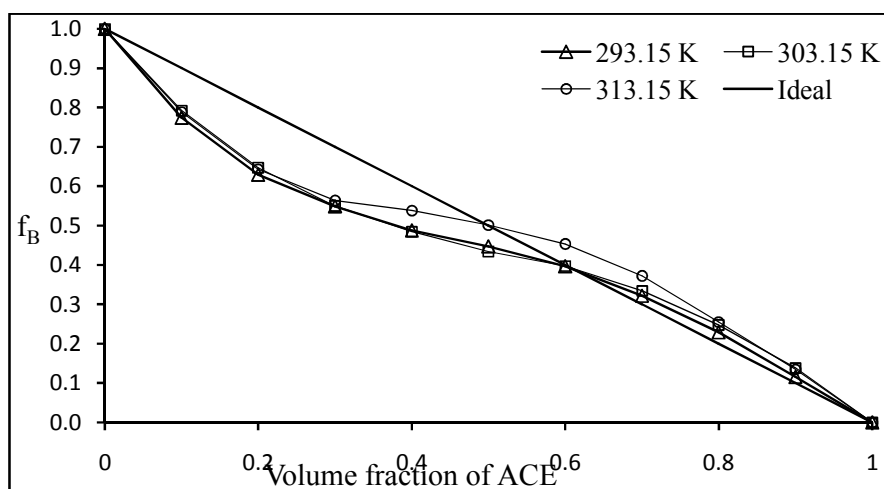


Figure 6: Bruggeman factor (f_B) of Allyl Bromide + Acetone binary system

The information about the solute–solvent interaction is also obtained by Bruggeman factor (f_B). The effective volume of solute gets modified by solute–solvent interaction and is best illustrated by nonlinearity of Bruggeman equation.

$$f_B = \left(\frac{\epsilon_m - \epsilon_B}{\epsilon_A - \epsilon_B} \right) \left(\frac{\epsilon_A}{\epsilon_m} \right)^{(1/3)} = 1 - V$$

Where, V is Volume fraction of ACE, which is a qualitative measure of volume of the solute in the mixture. ϵ_m , ϵ_A and ϵ_B are the values of static dielectric constant of mixture, ALB and ACE, respectively. Bruggeman plot of system is given in figure 6. It suggests that volume of complex increases in Allyl Bromide rich region and decreases in acetone rich region. This result correlates with result of excess molar volume and excess molar refraction [10].

IV. CONCLUSION

The nonlinear behavior of static dielectric constant, Relaxation time density and refractive and their excess properties are reported. There is confirmation of intermolecular interaction through the dipole –dipole interaction between ALB and ACE.

ACKNOWLEDGEMENT

The authors are thankful to Dr. P.W. Khirade, Dept. of physics and Prof. S. C. Mehrotra, Dept. of computer science & IT, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad for fruitful discussion and guidance.

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Reviews of Synthesis and Characterization of Some Pyrazine Ring Containing Heterocycle's

Dr. Shrikrishna D Tupare

K. E. S. Anandibai Pradhan Science College, Nagothane, Maharashtra, India

Abstract: Heterocyclic chemistry has numbers of applications in the field of pharmaceutical chemistry. These compounds are synthesized worldwide by different synthetic methods. Two or more hetero elements containing heterocycles are synthesized and all these compounds were found stable. Chalcones a precursor has great importance in natural as well as synthetic heterocyclic compounds. Nitrogen atom containing heterocycles has very important role in medicinal field due to their biological activities. After reviewing literature, it was found that, nitrogen containing five membered heterocycle like pyrazoles, six membered Pyrimidines, seven membered benzodiazepines were synthesized by different synthetic methods. This literature survey promoted us to prepare highly stable five, six and seven membered ring structure using pyrazine ring containing derivatives and check their pharmacological activities. These compounds were characterized using IR, ¹H-NMR and Mass spectra and Elemental analysis. The compounds were found to be the most active against bacterial & fungal human pathogens.

Keywords: Benzodiazepines, Chemistry, Heterocycles, Pyrazole, Pyrimidine, etc.

I. INTRODUCTION

Heterocyclic compounds were prepared in different synthetic methods. But if they are prepared from chalcones, found more stable and potent. Chalcones are common natural pigment & one of the most important classes of flavonoids & iso-flavonoids across the whole edible plant kingdom. [1, 2] It is one of the oldest but remain popular in 21st century due to the large number of replaceable hydrogens that allows a large number of derivatives and a variety of biological activities such as anticancer, anti-inflammatory, antioxidant, antiplatelet, antibacterial, antifungal, antileishmanial, antimalarial, antiviral etc. Chalcones are also key precursors in the synthesis of many biologically important heterocycles such as benzothiazepine, pyrazolines and flavones. Hence, the synthesis of chalcones has generated vast interest among organic as well as medicinal chemists. Some of their derivatives are used as sweeteners, drugs, and sunscreen agents. [3] Several methods are available for the synthesis of chalcones. The most widely used method is the base-catalysed such as sodium hydroxide (NaOH), potassium hydroxide (KOH), barium hydroxide Ba(OH)₂ and lithium hydroxide (LiOH·H₂O). The acid-catalysts had been also used to synthesize chalcones includes aluminium trichloride (AlCl₃), dry HCl, boron trifluoride-etherate (BF₃·Et₂O), titanium tetrachloride (TiCl₄) and ruthenium trichloride (RuCl₃).

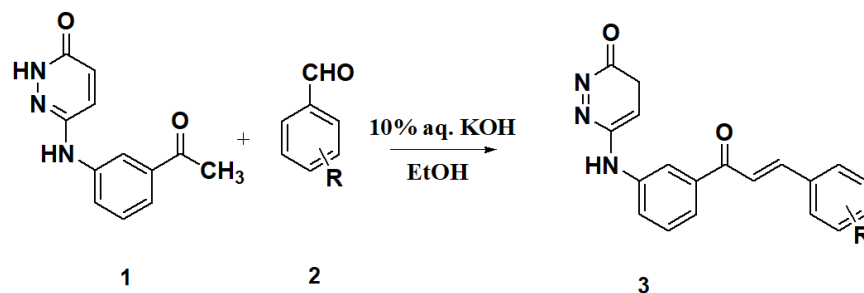


Figure 1

Pyrazolines are five membered ring heterocyclic compounds containing three carbon atoms and two adjacent nitrogen atoms. Partially reduced form of pyrazole is called as pyrazoline which exists in tautomeric forms. These pyrazolines possess interesting pharmacological properties and hence they are used as raw materials in drug synthesis.

We have been synthesized Pyrazoline derivatives from heterocyclic chalcone derivatives using ethyl acetate as a solvent which help to reduces reaction time. 1, 3, 5 triphenyl -1H- Pyrazole containing 6-aminopyridazin-3(2H)-one derivatives [4], which possess potent biological activities.

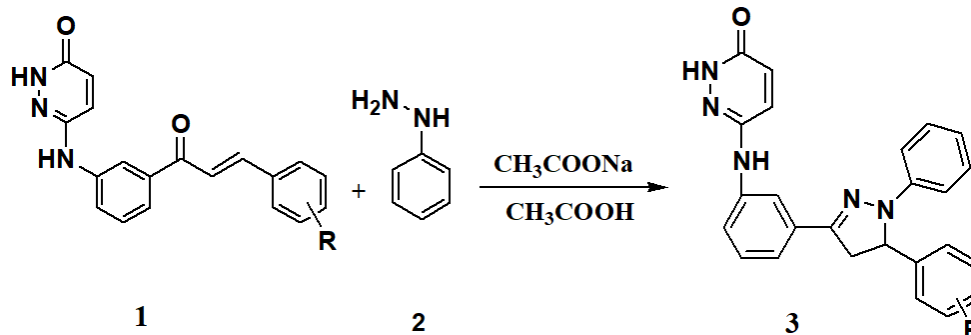


Figure 2

Benzodiazepines and benzodiazepines have been attracted as an important class of heterocyclic compounds in the field of clinical research. These compounds are widely used as anticonvulsant¹, Antibacterial and antifungal 2-4 properties of 2, 4-diaryl, 2,3- dihydro-1,5-benzodiazepines have been reported. They also possess a wide range of pharmacological properties. [5-6] including anti-HIV [7], anticoagulant [8] and anti-allergenic [9]. The 1, 5 - benzodiazepines moiety is a privileged class of pharmacophores, as compounds bearing this structural unit possess a broad spectrum of biological activities. The common strategy for synthesis of the 1,5 -benzodiazepines moiety is the reaction of Chalcones with o-phenylene diamine [10].

The various methods of synthesis involve use of ethanol as a solvent, but we had used few drops of piperidine under reflux condition or microwave irradiation. Many of these processes suffer from some limitations such as requiring harsh conditions. Using this we have prepared some novel 1, 5]- benzodiazepines by using 6-(3-((E)-3-phenylacryloyl) phenyl amino) pyridazin-3(2H)-one [11] earlier prepared biologically active chalcones¹¹ and o-phenylene diamine & few drops of piperidine in methoxy ethanol by microwave irradiation. TLC indicated formation of the products. The crude product was subjected to crystallization from benzene. This method represents a convenient, economic, green, highly efficient process for synthesis of 1, 5-Benzodiazepines under microwave irradiation. It also shows moderate to better antibacterial activities.

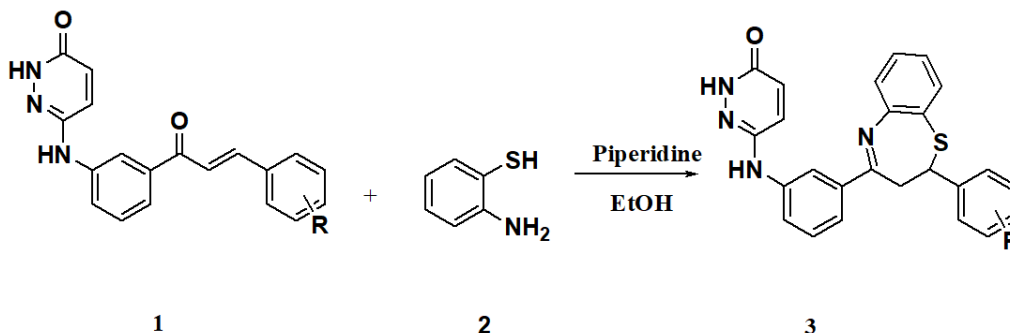


Figure 3

Organic compounds containing pyrimidines as a core unit are known to exhibit various biological and pharmaceutical activities [12]. In this regard we have synthesized some substituted pyridazone derivative of Chalcones are used for the synthesis of di-aryl pyrimidines. Organic compounds containing pyrimidines, thiopyrimidines as a core unit are known to exhibit various biological and pharmaceutical activities.[13]

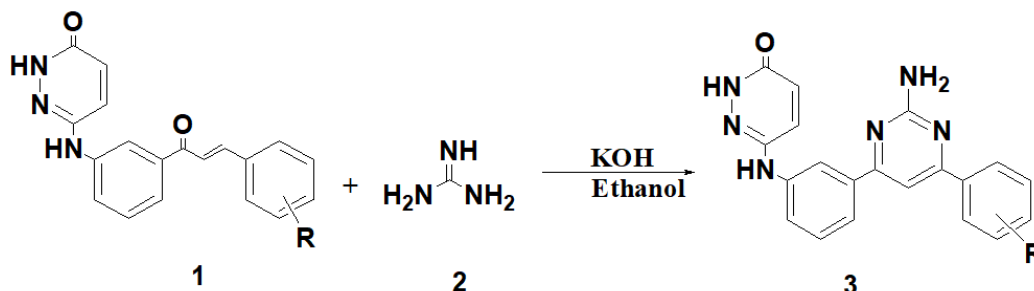


Figure 4

II. RESULT AND DISCUSSION

All of the novel synthesized pyrazoline compounds were screened for their antifungal and antibacterial activity against the Gram -ve bacteria *Escherichia coli* (ATCC 8739) and Gram +ve bacteria *Staphylococcus aureus* (ATCC 6538), in addition to their antifungal activity against *Aspergillus Niger* (ATCC 16404) *Candida albicans* (ATCC 10231) using agar diffusion method [14,15] at a concentration 20 mg/mL. DMSO used as a solvent. Some compounds show highly efficient antibacterial activity against *S. aureus* (ATCC 6538). We have synthesised 1,5-benzodiazepines by microwave irradiation method by using few drops of piperidine in methoxy ethanol as a solvent. This method of synthesis has many advantages over conventional methods of synthesis, including high yield, simple work-up shorter reaction span, no side reactions. So, it represents a convenient, economic, green, highly efficient process for synthesis of 1, 5-Benzodiazepines under microwave irradiation. It also shows moderate to better antibacterial activities. Many synthetic methods of pyrimidine have been reported from urea, thiourea and Guanidine Chalcones.

But synthesis of pyrimidines from Guanidine gives very good yield as compared to urea & thiourea. In the present work, we describe the synthesis of 2-amino pyrimidines which have biological important in chemistry by using 6-(3-((E)-3-phenylacryloyl) phenyl amino) pyridazin-3(2H)-one to give 6-(3-(-2 amino-6-phenyl pyrimidin-4yl) pyridazin-3(2H)-on. by conventional method. The product obtained in 55 to 72 % yield within around seven hours by refluxing. Best result in terms of yield and reaction time was reduced with small amount of alkali (Aqueous KOH).

III. CONCLUSION

All the heterocyclic compounds have wide application due to their pharmacological activities. In this short review we viewed some heterocyclic derivatives synthesized by condensing it with very active compound pyridazine through imido group which acts as electron releasing group. This methodology is maintaining environmentally friendly approach for the synthesis of pyridazin-3(2H)-one. Derivatives using sodium acetate and acetic acid. But by increasing the molar ratio to 1:2 and 1:3 the yields of increased, it may be that sodium acetate is in favour of release of phenyl hydrazine from phenyl hydrazine hydrochloride. So, reaction condition we chose were the molar ratio of chalcone: phenyl hydrazine: sodium acetate was 1.0:3.0:0.15. We have performed the reaction of chalcones with phenyl hydrazine hydrochloride by refluxing at 110°C, the moderate to good % yield of pyrazoline derivatives is observed. The synthesized compounds were further subjected for biological screening.

All synthesized derivatives have good yield by conventional, greener and microwave irradiation methods. All these compounds were found active against anti-bacterial and anti-fungal activities.

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Step towards Better Future: Treating the Waste Water Generated from Dairy Industries using Fruit Peels

Sajid F. Shaikh¹, Ulde Tanzeel Taqueyullah², Midhat Dhanse³,
Mukadam Juveriya⁴, Subedar Fatima⁵

Department of Chemistry

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,2,3}

Abstract: Now-a-days water scarcity is the major problem faced by world; hence it is important to treat waste water generated from various sources before it is discharge. Among various techniques, adsorption is a fast, inexpensive and universal method. The method followed for removing the useful organic substance include Dehydration and carbonization, investigating effect of pH, time, adsorbent dosage and particle size. The review of study on removal of organic substance from dairy waste using de-hydration, carbonization and batch extraction method is discussed in this paper. As noted, most researchers deal with the batch extraction, as this process shows good result for removal of different organic and inorganic contaminants from dairy waste. In batch extraction it was observed that the combination of banana and orange peel provides the better results. The carbonization method is found to be more efficient than the de-hydration method. The carbonization method is efficient because carbon is strong oxidant and has a unique pores structure with absorbs the organic substance on its surface easily. For the removal of turbidity, total suspended solids [TSS], biochemical oxygen demand [BOD] and chemical oxygen demand [COD] orange peel was found to be more efficient than banana peel in all the methods this is due to the characteristics of orange peel, the orange peel contain fibre which has more hydroxyl radical, hence more adsorption capacity. But the combination of orange and banana peel in 1:1 proportion act as a best adsorption, even better than orange peel alone.

Keywords: Fruit Peels, BOD, COD, TSS, Turbidity, etc.

I. INTRODUCTION

India is known to be house of dairy industries it contributes 23% of the total milk production in the world the dairy industries owner does not have any use of the waste water generated from the dairy, hence after giving the primary treatment they discard them in the nearby water bodies, without even thinking about the cons society will face after. This review research paper has been designed to give something back to the society and the generations to come. The water is very precious gift for the mankind, life without water cannot be imagined the carelessness of the industrialist is not just polluting a water body but also aquatic species and mankind. [1]

Pranav D. Pathak et.al. perform a study on fruit peel waste as a novel low-cost bio-adsorbent where banana and orange peel and combination of both and removed different organic and inorganic contamination form aqueous effluent [2]. Rizki Ibtida Prasetyaningty et.al. conducted a study on fruit peels as natural adsorbents to remove chromium (Cr⁶⁺) from synthetic textile wastewater [3]. Pongthipun Phuengphai et.al., conducted a study on removal of copper (II) from aqueous solution using chemically modified fruit peel as adsorbent [4]. Naba Kumar Mondal made study on fruit peel as an adsorbent for removal of fluoride from aqueous solution by doing batch study [5].

Mohapatra, et al., discusses about the usefulness and characteristics of banana peel, and it was concluded that banana peels are strong antioxidant and color absorber [6]. Jatto, et al. studied treatment of wastewater from food industry using snail shell. It concluded that snail shell act as a good adsorbent in treatment of wastewater

[7]. Velmurugan P, et al conducted a study on dye removal [methyl blue] from aqueous solution using low-cost adsorbent. It used adsorbent of combination of orange, banana and neem leaves. It was concluded that orange peel act as a novel adsorbent [8].

All the food that we eat in a day compromise at least one element of dairy. Demand of dairy products is increasing in different countries, which result in the development of the dairy industry and increases in the generation of waste. The major waste generated from dairy is waste water. The waste water generated has high nutrient concentration, biological oxygen demand [BOD], chemical oxygen demand [COD], various organic and inorganic content. There are many methods for water purification, the easier and cost-efficient method is adsorption [9]. This review paper focus on adsorption technique to remove all the impurities present in the water hence making it suitable to reuse. The research paper has been designed by keeping in mind to purify wastewater generated by dairy industries and making it suitable for daily use by suggesting optimize technique with a simple and affordable.

II. EXPERIMENTAL

A. Materials

Material will be use in this work is dairy waste sample, banana and orange peels.

B. Experimental Procedure

Method which are used in this review paper are listed below: De-hydrated method, Batch extraction method and Carbonization Method

1. De-hydrated Method



The collected banana and orange peels were cut into small 0pieces, washed with distilled water to remove dirt and suspended impurities and then dried for 48hrs in an oven at 100°C in order to remove the moisture content of the peel. After the drying process, the peels are kept in desiccator for 30 minutes the desiccator cools the peels, after that the peels are ground to fine powder and sieve through 600µm, 425µm, 300µm for different particle size. These dehydrated peels were directly used as biosorbent in experimental investigation.

2. Batch Extraction

In this process 250ml Erlenmeyer flask is used to carry out batch Experiments. Take 100 ml of the dairy wastewater of COD, BOD and pH determined, to that we have to add a dose of adsorbent. Different doses i.e., 5g, 10g, 1.5g, 20g of adsorbents are taken for analysis. Using a digital pH meter, pH has been measured.



At a desired temperature, in water bath agitate it at a constant speed of 150rpm in flask. The temperature usually maintained between 25-30 °C for 1-3 hours. Centrifuge or filter the mixture and determine the concentration of pollutant in the aqueous phase. Calculate the amount of pollutant adsorbed from the aqueous solution by determining the equilibrium concentration in solution.

3. Carbonization Method

The collected banana and orange peels were cut into small pieces, washed with distilled water to remove dirt and suspended impurities and then dried for 48 hours in an oven at 100°C in order to remove the moisture content from the peels. After the drying process, the peels are kept in the desiccators for 30 minutes and then the dried peels kept in the furnace for 3 hours at 200°C to convert it into carbon. After that the peels were removed, cooled and ground to fine powder and sieve through 600µm, 425µm, 300µm for different particle size.

III. RESULTS AND DISCUSSION

A. Removal of Turbidity

The impurity or dirt observed in water is due to turbidity. Turbid meter equipment is used to analyze it. By using various dosage of banana and orange peel as an adsorbent turbidity is removed. The percentage of removing turbidity at 1g for banana adsorbent is 86%, for orange adsorbent is 9% and the highest 95% was achieved when both orange peel and banana peel was taken in equal proportion.

B. Removal of Total Suspended Solids

Total suspended solids are those constitute of water which are not filterable. The percentage of removing TSS at 1g for banana adsorbent is 88%, for orange adsorbent is 89% and highest 93% was achieved when both orange peel and banana peel was taken in equal proportion

C. Biochemical Oxygen Demand [BOD]

BOD is the amount of oxygen required to microorganism to decompose the organic matter. The percentage of removing BOD at 1g dosage for dairy wastewater is maximum in case of orange adsorbent i.e. 90%, for banana adsorbent the removal of BOD is 89% and highest 95% was achieved when both orange peel and banana peel was taken in equal proportion.

D. Chemical Oxygen Demand [COD]

COD is the amount of oxygen consumed by organic matter in a solution. The percentage of removing COD from banana peel was taken in equal proportion.

IV. CONCLUSION

The study was made to review on removal of organic substance from dairy waste using de-hydration, carbonization and batch extraction method. As noted, most researchers deal with the batch extraction, as this process shows good result for removal of different organic and inorganic contaminants from dairy waste. In batch extraction it was observed that the combination of banana and orange peel provides the better results. The carbonization method is found to be more efficient than the de-hydration method. The carbonization method is efficient because carbon is strong oxidant and has a unique pores structure with absorbs the organic substance on its surface easily.

For the removal of turbidity, total suspended particle [TSS], biochemical oxygen demand [BOD] and chemical oxygen demand [COD] orange peel was found to be more efficient than banana peel in all the methods this is due to the characteristics of orange peel, the orange peel contain fibre which has more hydroxyl radical, hence more adsorption capacity. But the combination of orange and banana peel in 1:1 proportion act as a best adsorption, even better than orange peel alone.

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BIOGRAPHY

Dr. Sajid Fakirmahamad Shaikh is having 10 years academic and administrative experience in degree senior colleges of University of Mumbai. Now working as I/C Principal and Head of Chemistry Department of Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad, Maharashtra. The qualification hold by him is B.Sc (Chemistry) in 2010, M.Sc.(Physical Chemistry) in 2012 from University of Mumbai. He is awarded with Ph.D. degree in December 2018 from University of Mumabi. He is recipient of BEST NSS PROGRAMME OFFICERS Awards of University of Mumbai in 2014-15 by the hands of Hon. Sanjay Deshmukh, Vice Chancellors, University of Mumbai. As sole author, he published six books, as editor he published 03 books including this. He organized Three and 35 attended National-International Conferences-Seminar and published 27 research papers in international journals. Felicitation of Dr. Sajid Fakirmahamad Shaikh by State Level Best Teacher award as Rashtrapita Mahatma Jyotirav Phule Rajystariya Gunvant Satyashodhak Aadarsha Shikshak Pursaskar by Rashtriya Mulnivasi Bahujan Karmachari Sangh (Trade Union) PROTON wing, Maharashtra.

Dirty Water Treatment and Unwanted Metal Content Removal using Aloe Vera Extract

Sajid F. Shaikh¹, Admane Namra², Kable Maryam³, Ansari Nauf⁴, and Dr. Bhagwan V. Jadhav⁵

Department of Chemistry

Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad^{1,5}

Changu Kana Thakur College, New Panvel, Raigad, Maharashtra, India^{2,3,4}

Abstract: During rainy season it is found that there is lot of contamination in the water which is replicated by change in colour as well as lot of turbidity. The drinking water which is contaminated can be purified successively by using natural resource nothing but Aloe Vera Plant. In this paper, the use of Aloe vera extract to purify dirty drinking water was investigated. Analysis of the heavy metals lead and cobalt were performed before and after treatment of water with the Aloe vera extract. The results showed that Aloe vera extract was capable of absorbing the heavy metals from water samples.

Keywords: Microbiome, Plant Growth-Promoting Bacteria, etc.

I. INTRODUCTION

The botanical name of Aloe vera is *Aloe barbadensis* miller. It belongs to Asphodelaceae (Liliaceae) family, and is a shrubby or arborescent, perennial, xerophytic, succulent, pea-green color plant. The aloe plant has long (up to 20 inches long and 5 inches wide), triangular, fleshy leaves that have spikes along the edges. The fresh parenchymal gel from the center of the leaf is clear; this part is sometimes dried to form aloe vera concentrate or diluted with water to create aloe juice products.

Unsanitary drinking water is a continuing issue in the world [1]. Contaminated water remains an important problem in certain countries, as it is a cause of waterborne diseases. Although some treatments have been found to eliminate certain contaminants, this experiment focused on purifying water from contaminants. It is vital to have access to clean water to meet the basic necessities, to increase the living standard, and to avoid diseases. Fertilizers are used to increase crop production, but the use of these fertilizers has led to contamination of the drinking water [2]. Common contaminants in the water include arsenic, lead, phosphate, copper, cobalt, iron, chlorine, and nitrate [3, 4]. This study identifies aloe vera gel as a purifying agent of water and to remove cobalt and lead metals from water by adsorption.



Lead in water arises from a number of industrial and mining sources and is the most widely distributed of all toxic metals [5]. Lead in water causes serious problems such as anaemia, kidney disease and affects the nervous system [5]. Placental transfer of lead in humans affects babies and young children absorb 4–5 times as much lead as adults [6]. The lead toxicant accumulates in the skeleton and causes adverse health effects and interferes with calcium metabolism and with vitamin D metabolism [7].

However, evidence from studies in humans show adverse neurotoxic effects other than cancer occurring at very low concentrations of lead [6]. Therefore, there is need for the removal of lead from all drinking water. This

paper evaluates Aloe vera extract as coagulants and reports an economical and environmentally safe method of water purification. This will show the way to improve the quality of drinking water in the rural areas.

II. EXPERIMENTAL SECTION

2.1 Application of Aloe Vera in Dirty Water Treatment

2.1.1. Aims and Objectives

- Purification of dirty/contaminated water using Aloe vera extract.
- Removal of pollutants nothing but metals such as Cobalt and heavy metals such as lead from contaminated water using aloe vera extract.

2.1.2. Materials

- Aloe Vera Extract
- Dirty/Soiled /contaminated Water'
- Beakers
- Stirring Rod
- Standard solutions of lead and cobalt salt solution.
- Conical flask
- Burette with stand

2.1.3. Method

Steps involved

- Put the Dirty/Soiled /contaminated water in the beakers.
- Added a suitable varying amount of the Aloe extract to the beaker.
- Stirred the mixture for about 10 minute and leaved it to settle.
- After that dirt was settled at the bottom of the beaker, the clean water at the top.
- Clean water decanted into the second empty beaker.
- Standardization of lead and cobalt salt solution using volumetric analysis by Vogel.
- Added standard salt solution in water in the beakers.
- Added a suitable varying amount of the Aloe extract to the beaker.
- Stirred the mixture for about 10 minutes.
- After 24 hrs. and 48 hrs., water sample was pipette out in conical flask.
- Metal amount estimation carried out using volumetric analysis by Vogel.

III. RESULTS AND DISCUSSION

3.1. Application of Aloe Vera in dirty water treatment

The Aloe extract attract the dirt (soil, dust, leaves & other impurities) and separate them from water and finally it will settle at the bottom of the beaker.



Figure 1: Dirty water (rainy season) before addition of aloe vera extract

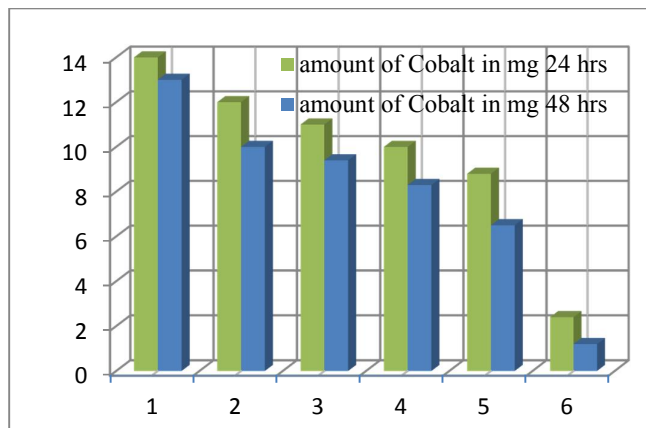
Figure 2: After addition of aloe vera extract in dirty water

3.2. Application of Aloe Vera in Removal of Pollutants

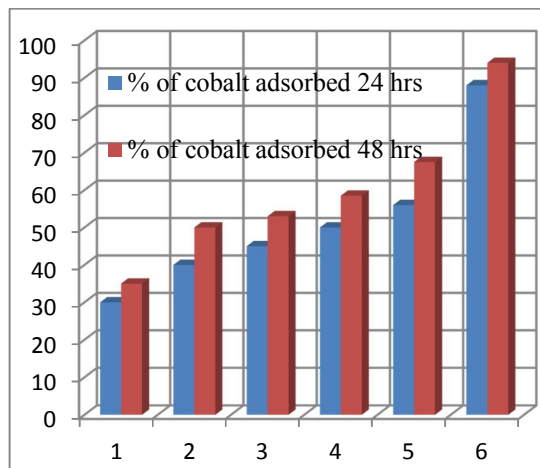
Aloe Vera extract interact with the pollutants and provide surface for adsorption that means it act as an adsorbent. It provides a simpler way to purify contaminated water with natural material.

3.2.1. (a) Removal of Cobalt Metal

Amount of aloe vera in cm ³	Amount of Cobalt in mg		% of cobalt left		% of cobalt loss	
	24 hrs	48 hrs	24 hrs	48 hrs	24 hrs	48 hrs
1	14	13	70	65	30	35
2	12	10	60	50	40	50
3	11	9.4	55	47	45	53
4	10	8.3	50	41.5	50	58.5
5	8.8	6.5	44	32.5	56	67.5
10	2.4	1.2	12	6	88	94



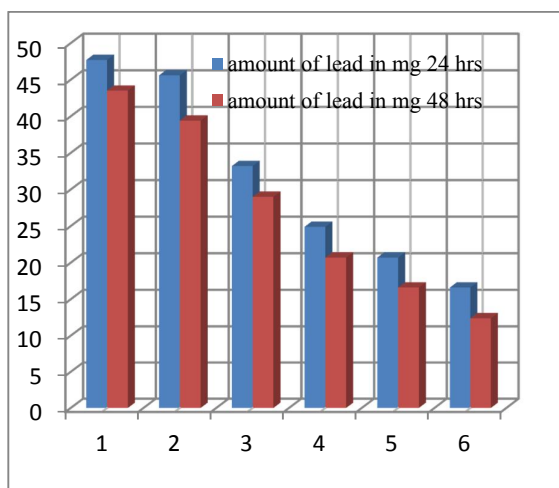
3.2.1. (b) Plot of amount of aloe vera extract against concentration of cobalt



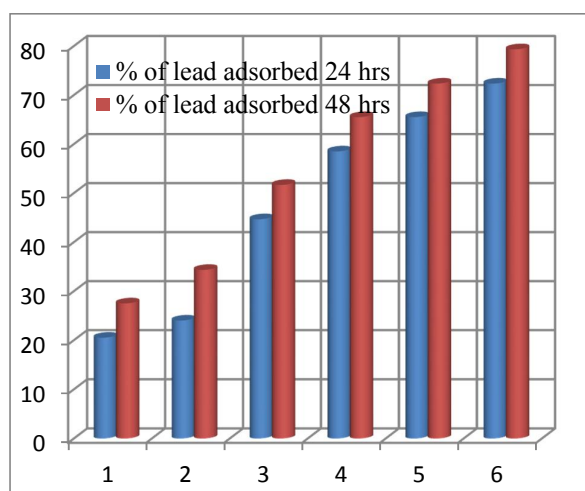
3.2.1. (c) Plot of amount of aloe vera extract against % of Cobalt adsorbed

3.2.2. (a) Removal of Lead metal

Amount of aloe vera in cm ³	Amount of lead in mg		% of lead left		% of lead loss	
	24 hrs	48 hrs	24 hrs	48 hrs	24 hrs	48 hrs
1	47.7	43.5	79.5	72.5	20.5	27.5
2	45.6	39.4	76	65.6	24	34.3
3	33.2	29	55.3	48.3	44.6	51.6
4	24.9	20.7	41.5	34.5	58.5	65.5
5	20.7	16.6	34.5	27.6	65.5	72.3
10	16.6	12.4	27.6	20.6	72.3	79.3



3.2.2. (b) Plot of amount of aloe vera extract against concentration of lead



3.2.2. (c) Plot of amount of aloe vera extract against % of Lead adsorbed

IV. CONCLUSION

- One can easily treat the dirty/soiled/contaminated water using Aloe Vera.
- Aloe vera is good dirt settling agent.
- Dirt settlement in water is independent of amount of aloe vera extract.
- Aloe vera contains 75 potentially active constituents: vitamins, enzymes, minerals, sugars, lignin, saponins, salicylic acids and amino acids.
- This method and material are very cheap.
- The benefit of this method of cleaning dirty water is the fact that the Aloe plant grows well in dry areas where water scarcity is biting.
- One can easily grow Aloe Vera plants in their own land and use it.
- The Aloe Vera gel reduced cobalt and lead concentrations.
- Aloe Vera doesn't consist of a harmful species with respect to human being.
- Aloe Vera has so many uses in medicinal fields also.

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Morphological Studies and Classification of Mantis of Genus *Gongylus Thanberg*

Mirza Shaheena Sarwat

G. M. Vedak College of Science, Tala, Raigad, Maharashtra, India

Abstract: The present study was conducted to study the Praying mantids (Mantodea) from Mangaon area in relation to their morphological characteristics and classification. Here focussed was only on one species of Mantis. Mantids play both positive and negative roles in ecosystem. Mantids are generally large insects ranging in size from 1 cm to more than 17 cm. Females are usually larger than males. The two front legs of mantids are highly specialized for catching the prey and during hunting they assume a praying position, folding the front legs under their head, hence derived the name 'Praying Mantis'. Globally 2400 species of mantids are known belonging to 142 genera and 18 families. A total 162 species exist in India belonging to 68 genera. The study was conducted in rainy season of 2021 from June to September in Mangaon area. Around 35 Mantids were collected belonging to Empusidae Family, and Genus *Gongylus Thanberg* found in grassland ecosystem.

Keywords: *Gongylus Thanberg*, Praying Mantis, Mangaon

I. INTRODUCTION

Mantids, popularly called 'Praying mantids' are insects classified under the order Mantodea of class -Insecta in Phylum -Arthropoda. These are insects of economic importance, playing both positive and negative roles in the terrestrial ecosystem. They help in the control of noxious insect pests like aphids, crickets, moths, small birds, butterflies and even their own species because they are cannibalistic organism. The two front legs of mantids are highly specialized for catching the prey and during hunting they assume a praying position, folding the front legs under their head, hence derived the name 'Praying Mantis' (Sureshan 2009). The order Mantodea are associated with forest and agro ecosystems (Mukherjee et.al.1985 ; Mukherjee et.al. 1993). These Insects show vivid behaviour. They can be seen on flowers, vegetation, twigs, , grass. Leaves and on walls as well as in homes. Except the rotation of their head, they generally remain motionless. Their food includes flying insects like aphids, grasshoppers, butterflies, moths, small birds and other insects. Mantids have enormous appetites, eating various aphids, leafhoppers, mosquitoes, caterpillars and other soft-bodied insects when young and later they eat even larger insects such as beetles, grasshoppers, crickets, other pest insects and even small vertebrates like mice, small birds, lizards and frogs. (Shveta Patel et.al.2016). Camouflage coloration allows mantids to blend in with the background as they sit on twigs and stems waiting to ambush prey. They use front legs to strike out and capture their prey. Long sharp spines on the upper insides of their legs allow them to hold their prey firmly. The impaled prey is held firmly in place while being eaten. Known for being cannibals, mantids consume each other if the opportunity arises. Large eyes and extraordinarily quick foreleg strikes enable them to capture prey in 1/20 of a second. Various observations were made on the ecology and predatory behaviour of mantids (Frederick *et al.*, 1999, Edmund, 1972, Kramer 1960). They are known to lay eggs in complex ootheca. Mantids play an imperative role as prey and predator to maintain the balance of trophic levels of food chain. These insects often remain motionless for hours, in search of prey, and only the head rotates about 180 degrees to watch any disturbances caused by flying insects. (Sathe et.al. 2014). Like their relatives, mantids undergo simple or incomplete metamorphosis. Praying mantids exhibit a remarkable range of behavioural and morphological adaptations associated with their habitat-specific predatory lifestyle. (Shveta Patel et.al.2016). They also vary in colour which is useful for their defence or capture strategies. The variation in size, shape and colour of mantids provide remarkable camouflage. *Pseudopogonogaster* Beier, 1942 have abdominal lobes that make them invisible in the substrates where they live (Fatimah et.al.2016), the member of Acanthopidae resemble dead leaves (Revera 2016) while *Hymenopus* is remarkably camouflaged (O'Hanlon 2013).

II. MATERIALS AND METHODS

Study of mantids was carried out in Mangaon from June 2021 to Sept 2021. They were photographed with the help of mobile camera. A few were caught for time being to see their morphometric and were released afterwards. Live specimens from the field were photographed, so that natural colouration and specific behavioural postures can be documented. The specimens of mantids were then processed for identification. The initial identification, of the praying mantids was done with the help of the keys of state fauna services of Zoological Survey of India and various research papers. Measurement of their fore wing, hind wing and abdomen with the help of vernier calliper.

Species: *Gongylus gongylodes* (Linnaeus, 1758)

III. REVIEW OF LITERATURE

Thus, the mantids are the only known insect group that can turn its head and look over its shoulder. *Mantids* lie in wait for their food and when close enough, snap it up with a lightning movement of their strong raptorial forelegs (Rossel at.el. 1996). Some *mantids* have a visual range of up to 20 m (Lelito at.el.2008). Praying mantids vary in size, from less than 10 mm (*Gonypetyllis semuncialis* Wood-Mason, 1891 and *Oligonicella brunneri* (Saussure, 1871)] up to 10 cm (*Macromantis ovalifolia* (Stoll, 1813) (Fatimah at.el.2016). They also vary in colour which is useful for their defence or capture strategies. The variation in size, shape and colour of mantids provide remarkable camouflage. *Pseudopogonogaster* Beier, 1942 have abdominal lobes that make them invisible in the substrates where they live (Revera at.el.2016). The member of *Acanthopidae* resemble dead leaves (Revera at.el. 2016). While *Hymenopus* is remarkably camouflaged (O'Hanlon at.el. 2013). some earlier works carried out on the Mantid fauna of the region. Mukherjee et al., (1995) who reported 14 genera and 17 species of Mantid from Maharashtra. There is also a list of 11 Mantid species from Sanjay Gandhi National Park, Mumbai (Chaturvedi et al., 2000). Jadhav et al., (2006) recorded 19 species from Pench National park, Maharashtra. Ghate and Ranade, (2002) reported 29 species of Mantid from Pune (Western Ghats) and other regions of Maharashtra. Sureshan et al., (2007) reported 33 species of Mantid with some new records from the Orissa. Vyjayandi (2007) studied on the mantid fauna of Kerala and reported 66 species.

Morphological Description

This species known as the wandering violin mantis, ornate mantis or Indian Rose Mantis Colour: brown, yellow or yellowish green; Head: small, vertex with protuberance; Antenna: filiform in the case of female and pectinate in male; Fore legs and Hindlegs: slender, coxa with external lobes; femur with distal, triangular lobe dorsally and semicircular lobe ventrally; Wings: well developed; in males wings longer and in female shorter than metasoma (Patel at.el.2018).

Plesiotype: Female, Body Length 98 mm.

Colour: Yellow (Like daed leaf)

Head: Conical, compressed, with anteriorly prolonged foliaceous lobes; eyes oval ~ frontal sclerite spiniform, as high as wide, with rhomboidal carinated disc; antenna filiform, short and non ciliated.

Pronotum : Slender, longer than fore coxa, anteriorly with rhomboidal dialation extending from anterior tip to upper one third of metazona. Fore legs: coxa simple, middorsally carinated, apical lobes conical, backwardly directed, trochanter slender; femur foliaceous, deeply .grooved ventrally, with 5 external, 4 discoidal, 8-9 long internal, 20 short internal spines, one longer internal spine alternates with 3-4 shorter spines; femur longer than coxa. Middle and hind legs: coxa short, femur with distal dorsal triangular lobe and with ventral semicircular lobes.

Abdomen: Broad, laterally laminated, longer than wings, carinated. supra anal plate short.cerci short.

Male: A little shorter than female; fore wings extened beyond the abdomen, but it is reduced in female. body length 82 mm.

Order: *Mantodea*

Family: *Mantidae*

Family: *Empusidae*

Medium to large and slender mantids. Vertex with a process. Antennae combed in male.

Fore femora with 5 external and 4-5 discoidal spines, internal spines arranged in groups of 3-4 smaller and then 1 larger spine.

Abdominal segments usually with lobular expansions.

Subfamily: *Empusinae*

Pronotum slender, fore coxa with a spiniform projection at distal end.

Two genera are known from Orissa.

Key to the genera

1. Superior lobe of fore femora highly dilated; middle and hind femora with dorsal lobes

Gongylus Thunberg

Genus *Gongylus* Thunberg

Diagnostic characters: Body bizarre shaped, color brown. Antennae filiform in female and pectinate in male. Vertex with protuberance. Pronotum slender, anterior part expanded and foliaceous. Fore legs with coxae slender, superior distal angle prolonged in to a spiniform projection. Femora with 4 discoidal and 5 external spines. In middle and hind legs femur with distal triangular lobe dorsally and semicircular lobe ventrally. Forewing well developed. Abdominal segments laterally expanded.

Key to the species

1. Dilation of pronotum rhomboidal, width about one-third the length of pronotum, lateral angles sharp

G. gongylodes (Linnaeus)

***Gongylus gongylodes* (Linnaeus)**

Diagnostic Characters: Body greenish brown. Forewing extending beyond abdomen, wide; costal area abruptly widened at base and brownish opaque; discoidal area hyaline. Hind wing as long as fore wing, hyaline and brownish near apex. Vertex ex tenued. Pronotum long, with rhomboidal expansion. In fore legs, coxae externally with brown bands, internally black, spinules are present externally; spine present near the trochanter. Femora with brown bands, dilated, 5 external spines and 4 discoidal spines, all spines black at tip only. In mid and hind legs femora has lobes at the distal end, ventral one rounded and dorsal lobe triangular and two in number. Mid abdominal segments laterally foliaceous with ventrally transverse black marks.

IV. RESULT AND DISCUSSION

All of 5 species of *Gongylus gongylodes* (Linnaeus) belonging to genus *Gongylus* Thunberg are reported from Mangan. All were compared with morphological characters and few measurements. All the characters were almost same except male and females. 2 males and 3 females were found. Present species differs in following manners:

Measurements

Gongylus gongylodes (Linnaeus): (M:BL: (Excluding protuberance of vertex) 72-76; FW: 46-48; PN: 33-35 (Koli et al 2011) but differs in measurements: BL-78 mm, PL-42 mm, FC-22 mm and FF-15 mm. In present species protuberance of vertex smaller than *G. gongylodes*.

In

Gongylus trachelophyllus Burmeister Foliaceous pronotum wider than long, extending more than one third length of pronotum, lateral angles rounded. In fore legs tibiae with 2 brownish bands externally, internally black at distal end, femora externally with 2-3 faint brownish bands. Protuberance of vertex longer than *G gongylodes* (Sureshan.2009).

Empussa guttula (Thunberg): Measurements: BL-55 mm, PL-25 mm, FC-13 mm and FF-15 mm (Koli at.el 2011).

V. CONCLUSION

As Mangaon is situated in Konkan region, it has rich diversity of Plants and animals. But few areas are covered with fields harbouring many insects. The present species is reported first time from this area but only a handful because this area has undergone road construction, so many areas were deforested.



Fig:1 *Gongylus gongylodes* (Linnaeus)



Fig.2 *Gongylus gongylodes* (Linnaeus)

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Liquid-Liquid Extraction and Spectrophotometric Determination of Some Metal Ions with Imine (Schiff Base) Derivative as an Analytical Reagent

Jayashree S. Patil

Department of Chemistry

J. S. M. College, Alibag, Raigad, Maharashtra, India

jayupatil25@gmail.com

Abstract: The spectrophotometric method is coupled with solvent extraction technique and used for the determination of Cu(II) using N,N'-bis(O-hydroxy acetophenone) ethylene diimine (HAPED) as an analytical reagent. This reagent is synthesized in the laboratory and characterized by NMR, IR, Mass and elemental analysis for its purity. The reagent forms a light pink coloured stable complex with copper metal, which can be quantitatively extracted into chloroform at pH 3.6. This Cu(II)-HAPED complex in chloroform exhibits intense absorption peak at 405nm. The study of change of colour intensity of Cu(II)-HAPED complex with varying concentration of reagent showed that 2cm³ of 0.1% of reagent is sufficient for full colour development of 100ppm copper solution. The stoichiometric ratio of complex studied by Job's continuous variation method, mole ratio and slope ratio method. The molar absorptivity and Sandell's sensitivity are also calculated. The molar absorptivity is 4012.73 L/mol/cm and Sandell sensitivity is 0.0158 µg/cm². The newly developed method is then applied to various commercial samples successfully and observed to be comparable with earlier known methods. Beer's law is obeyed in the range of 1 to 10 ppm of copper solution giving linear and reproducible graph.

Keywords: Sandell's Sensitivity; Spectrophotometric determination, Imine reagent, Copper(II).

I. INTRODUCTION

The electrical properties of copper are exploited in copper wires and devices such as electromagnets. Extractive methods are highly sensitive but generally lack in simplicity. Spectrophotometry is essentially a trace analytical technique and is one of the most powerful tools in chemical analysis. A wide variety of reagents have been proposed for the spectrophotometric determination of Cu(II). The extractive spectrophotometric analysis enables to separate desired metal ion, which is to be estimated in presence of other metal from samples. In the present work a novel analytical reagent N,N'-bis(O-hydroxy acetophenone) ethylene diimine (HAPED), was used for the extractive spectrophotometric determination of Cu(II). Developed method can be employed for efficient determination of Copper at microgram level. The results of analysis obtained were compared with those obtained by known methods.

II. EXPERIMENTAL WORK

2.1 Instruments

A Shimadzu 2100 UV-Visible spectrophotometer with 1.0 cm quartz cell was used for absorbance studies. An Elico LI-120 digital pH-meter was used for pH adjustment.

2.2 Synthesis of Reagent

The reagent was synthesized by O-hydroxy acetophenone and ethylene diamine in methanol in 2:1 molar proportions are mixed in Round Bottom Flask. Shake the flask for 10 to 15 minutes. Immediately dark yellow colour solid is obtained which is poured in ice cold water. The solid obtained is separated by filtration and washed with cold water and the product is recrystallised from ethanol. The yield was about 90%. It is then characterized and used for extractive spectrophotometric determination of Cu(II). A stock solution of HAPED

reagent with concentration 0.1% was prepared in methanol. The scheme of reaction is as shown in Figure 1.

2.3 Preparation of Stock Solution

A weighed quantity of Copper Chloride was dissolved in double distilled water containing dilute Hydrochloric acid and then diluted to desired volume by double distilled water. The solution was then standardized by EDTA Method.

2.4 Recommended Procedure

Mix 1 cm³ aqueous solution containing 1-100mg of Copper and 2 cm³ of 0.1% Methanolic solution of HAPED reagent in 25 cm³ beaker. Adjust the pH of the solution to required value with buffer solution make the final volume 10 cm³. Transfer the solution into 125 cm³ separating funnel and equilibrate for 1min with 10 cm³ Chloroform. Allow the two phases to separate and measure the absorbance of organic phase containing the complex at 405 nm against reagent blank.

2.5 Preparation of Calibration Plot

The calibration curve was prepared by taking known amount of Copper which is described in the procedure. A graph of absorbance against concentration was prepared Figure 2. The concentration of the unknown Copper solutions is determined from the calibration plot.

2.6 Composition of the Extracted Species

The composition of the extracted species was determined by using the Job's continuous variation method and verified by Mole ratio method and Slope ratio method. These methods show that the composition of Cu(II): HAPED reagent is 1: 2 which is represented in Figure 3.

2.7 Effect of Foreign Ions

The effect of diverse ions on the Copper (II) determination was studied, in presence of a definite amount of a foreign ion. Various cations, anions were investigated in order to find the tolerance limit of these foreign ions in the extraction of Copper (II) presented in Table 2. The tolerance limit of the foreign ion was taken as the amount required causing an error of not more than 2% in recovery of Copper(II). The ions which interfere in the spectrophotometric determination of Copper were masked by using appropriate masking agents presented in Table 3.

2.8 Comparison between Reagents

Various reagents were investigated by the earlier researchers for removal of Copper(II). The proposed reagent N,N'-bis(O-hydroxy acetophenone) ethylene diimine (HAPED) is found more superior as that of reported reagents and are presented in Table 5.

III. APPLICATIONS

The present method was applied for determination of amount of Copper(II) in various samples of alloys, commercial mixtures, injection vial, tablets. The results obtained were in well agreement with standard methods shown in Table 4. Every result is average of independent determinations.

IV. RESULT AND DISCUSSION

In this section experimental results of solvent extraction for removal of Cu(II) by using as N,N'-bis(O-hydroxy acetophenone) ethylene diimine (HAPED) organic reagent are presented. Effect of various parameters like pH, absorbance wavelength and validity of Beer's Lambert's law. The stability of Copper complex is 36hrs. represented in figure 4. It is observed from this figure that a linear calibration curve was obtained in the range of 1-10 ppm Copper. The best results of solvent extraction were obtained in aqueous phase at pH 3.6 and whereas organic phase containing Chloroform as solvent. The absorption is observed maximum at wavelength 405 nm. The equilibrium is attained within one minute.

4.1 Effect of pH and Absorbance

Various solvents are tried for extraction. Chloroform is found to be the most suitable solvent which is carried maximum extraction which is shown in figure 5. 1 cm³ aqueous solution contain 100 ppm Cu(II) at different pH shaking with 2 cm³ of 0.1% HAPED in Chloroform, after separated a two layers measure the absorbance of organic phase at wavelength of 405nm and pH of 3.6 respectively which is represented in figure 6.

4.2 Shaking Time Effect

1 cm³ aqueous solution contain 100 ppm Cu(II) at pH 3.6 after added 2 cm³ of 0.1% HAPED in Chloroform, shaking for different times (0-60) minutes after separated the layers, measuring the absorbance of organic phase at wavelength of 405nm.

4.3 Mole Ratio Method

Solution of 0.01M HAPED in Chloroform used to extract 0.01M Cu(II) from aqueous solution at optimum conditions, also determine absorbance of organic phase at wavelength of 405nm against Chloroform, figure 3 indicates that the ratio of Cu(II) to complex was 1:2[Cu+2(HAPED)].

V. CONCLUSION

The proposed method is more highly sensitive and selective than the reported methods for the extractive spectrophotometric determination of microgram amounts of copper. It offers advantages like reliability and reproducibility in addition to its simplicity, instant colour development and suffers from less interference. It has been successfully applied to the determination of copper at trace level in synthetic mixtures and alloys.

Sr. No.	Different parameters Studied	Observation
1	Solvent	Chloroform
2	pH	3.6
3	Equilibrium time	1 min.
4	Stoichiometry M:L	1:2
5	95% confidence limit	±0.1532
6	Reagent Conc.	0.1%
7	Volume of Rgt.	2cm ³
8	Average of 7 determination	9.96
9	Stability of the complex	36 hrs.

Table 1

Sr. No.	Interfering ions	Tolerance limit
1	SO ₄ ²⁻ , I ⁻ , Cl ⁻ , BrO ₃ ⁻ , ClO ₃ ⁻ , Br ⁻ , NO ₃ ⁻ , IO ₃ ⁻ , NO ₂ ⁻ , SO ₃ ²⁻ , CN ⁻	15
2	Tartarate, Oxalate	11
3	phosphate, Acetate	06
4	Mg(II), Mo(VI), Ce(IV), Ca(II), As(III), W(VI), Cd(II)	13
5	Co(II), Fe(II), Mn(II), Ni(II)	Interfere strongly

Table 2 Effect of foreign ions

Sr. No.	Interfering Ions	Masking Agents
1	Cd(II)	Thiourea
2	Fe(III)	Sodium Fluoride
3	Co(II)	Sodium Fluoride
4	Ni(II)	DMG
5	EDTA	Boiled with conc.HNO ₃
6	CN ⁻	Boiled with conc.HNO ₃ And formaldehyde

Table-3: Effect of masking agent

Sr. No.	Sample	Standard method	Present method
1	Devardas alloy	72.40µg	72.35µg
2	Cupra-Nickel alloy	81.25µg	82.20µg
3	Cu(100) + Cd(100)	100ppm	99.70ppm
4	Cu(50) + Fe(50) + W(50)	50ppm	50.12ppm

Table 4 Applications

Sr./ Ref. No.	Reagent	Remark
1	2-Hydroxy-1-acetophenone oxime	Extracted in isobutyl methyl ketone
2	2,4 -dihydroxy acetophenone thiosemicarbazone	Beer's Range 0.8-5.5 ppm W ⁶⁺ , Zn ²⁺ interfere
3	2-bromo-2-hydroxy-5-methylacetophenone hydrazone	Beer's Range 0.13-2.75 ppm Ni ⁺² , Co ⁺² interfere
4	3-(O-acetophenyl)-1-methyl triazine-N- oxide	Beer's Range 0.25-4.7 ppm

Table 5 Comparison between reagents

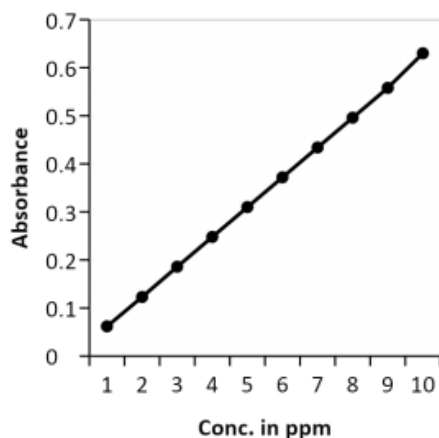


Fig.2 Calibration Plot For Extractive Spectrophotometric Determination of Cu(II) with Chloroform

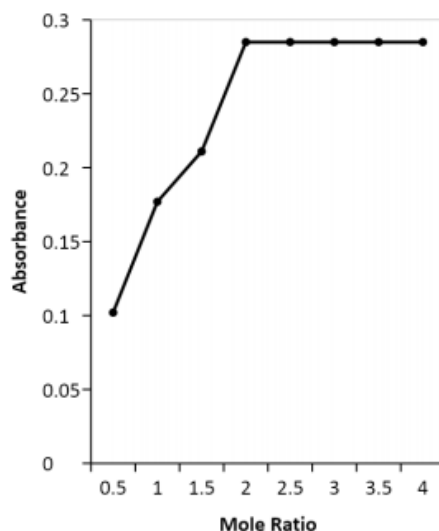


Fig.3 Composition Of The Extracted Cu(II) : HAPED Species By Mole Ratio Method

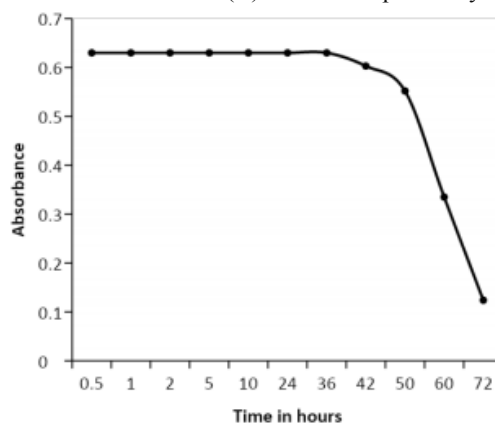


Fig.4 Effect Of The Stability On Absorbance Of Cu(II) : HAPED complex

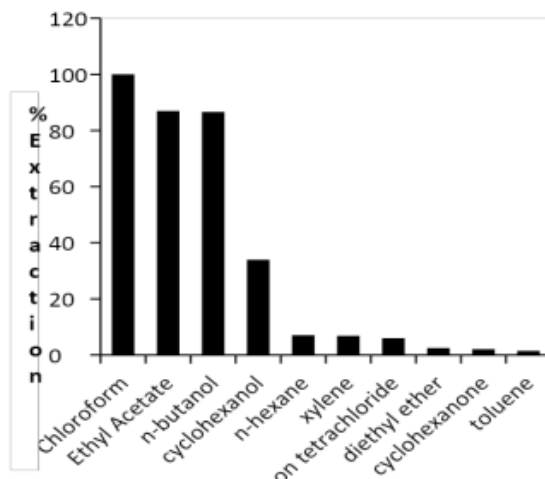


Fig. 5 Effect of Various Solvents on Cu(II) : HAPED complex

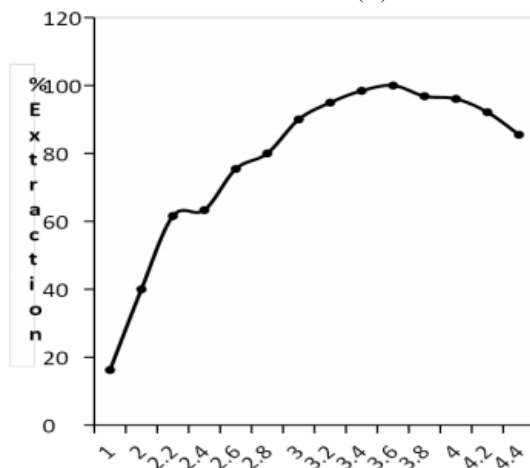


Fig.6 Effect of pH on the Extraction of Cu(II) : HAPED complex.

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Application of Computer and Information Communication Technology in Libraries

Mr. Anjum Naeem Dakhwe¹ (Librarian)

Miss. Husain Azma Jabeen Anwar² (F. Y. B.Sc, G.S)

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Computer technology and ICT has converted library services in a better way. The library can perform its all operations with more accuracy and speed. Current world is known for electronic information. Bulk of the information is in electronic format, to handle this type of information Computer technology and ICT suit very important. With the use of Computer technology and ICT libraries can perform its functions more effectively, and it can provide more accurate and up-to-date information as per user's need. The article states that what is Computer technology and ICT Components of information technology, application of Computer technology and ICT in libraries, what is information and communication technology? What is library? And application of Computer technology and ICT in libraries.*

Keywords: Computer Technology, Information Communication Technology and its Application in Libraries

I. INTRODUCTION

1.1 Computer Technology

Nowadays, computers are associate degree integral a part of our lives. They're used for the reservation of tickets for airplanes and railways, payment of telephone and electricity bills, deposit and withdrawal of cash from banks, process of business knowledge, prediction of climate, identification of diseases, sorting out info on the net, etc. Computers also are used extensively in faculties, universities, organizations, music trade, film industry, research, law firms, fashion business, etc. The term computer comes from the word compute. The word compute means that to calculate. A computer is associate degree electronic machine that accepts knowledge from the user, processes the info by playacting calculations and operations on that, and generates the specified output results. Computer performs each easy and complicated operation, with speed and accuracy.

II. DIGITAL AND ANALOG COMPUTERS

A computing device uses distinct values to represent the info internally. All info is portrayed victimization the digits 0s and 1s. The computers that we have a tendency to use at our homes and offices are digital computers. Analog computer is a type of different computing device data electronic information processing system is another reasonably a computer that represents knowledge as variable across a continual vary of values. The earliest computers were analog computers. Analog computers are used for activity of parameters that change ceaselessly in real time, like temperature, pressure and voltage. Analog computers is also additional versatile however typically less precise than digital computers. Analog computer is associate degree example of associate degree computing device. This book deals solely with the digital computing machine processing system and uses the term computer for them.

2.1 Characteristics of Computers

Speed, accuracy, diligence, storage capability and flexibility are a number of the key characteristics of a laptop. Transient overviews of those characteristics are

- **Speed** the pc will method knowledge in no time, at the speed of several directions per second. Some calculations that may have taken hours and days to complete otherwise, are often completed in a very few seconds victimization the pc. as an example, calculation and generation of remuneration slips of thousands of workers of a corporation, forecasting that needs analysis of an outsized quantity of knowledge associated with temperature, pressure and wetness of assorted places, etc.

- **Accuracy** Computer provides a high degree of accuracy. As an example, the pc will accurately offer the results of division of any 2 numbers up to ten decimal places.
- **Diligence** once used for a extended amount of your time, the pc doesn't get tired or worn out. It will perform long and complicated calculations with an equivalent speed and accuracy from the beginning until the tip.
- **Storage Capability** giant volumes of knowledge and knowledge are often keep within the laptop and additionally retrieved whenever needed. A restricted quantity of knowledge is often kept, briefly, within the primary memory. External storage devices like diskette and compact disc will store an outsized quantity of knowledge for good.
- **Versatility** computer is flexible in nature. It will perform differing types of tasks with an equivalent ease. At one moment you'll use the pc to organize a letter document and within the next moment you'll play music or print a document. Computers have many limitations too. Laptop will solely perform tasks that it's been programmed to try and do. laptop cannot do any work while not directions from the user. It executes directions as such by the user and doesn't take its own selections.

2.2 History of Computer

Until the event of the primary generation computers supported vacuum tubes, there had been many developments within the computing technology associated with the mechanical computing devices. The key developments that occurred until the primary laptop was developed are as follows

- **Calculating Machines** ABACUS was the primary mechanical hard device for count of enormous numbers. The word ABACUS means that hard board. It consists of bars in horizontal positions on that set of beads are inserted. The horizontal bars have ten beads every, representing units, tens, hundreds, etc.
- **Napier's bones** was a automaton engineered for the aim of multiplication in 1617 ad. by associate degree English man of science Napier.
- **Slide Rule** was developed by associate degree English man of science Edmund Gunter within the sixteenth century. victimization the analog computer, one may perform operations like addition, subtraction, multiplication and division. it absolutely was used extensively until late Seventies.
- **Pascal's Adding and Subtraction Machine** was developed by Blaise Pascal. It may add and work out. The machine consisted of wheels, gears and cylinders.
- **Leibniz's Multiplication and Dividing Machine** was an automaton that might each multiply and divide. The German thinker and man of science Gottfried Leibniz engineered it around 1673.
- **Punch Card System** was developed by Jacquard to regulate the ability loom in 1801. He fancied the card reader that might acknowledge the presence of hole within the card as binary one and also the absence of the opening as binary zero. The 0s and 1s are the idea of the fashionable computing device.
- **Punched card Babbage's associate degree analytical Engine** an English man Charles Babbage engineered a mechanical machine to try and do complicated mathematical calculations, within the year 1823. The machine was known as distinction engine. Later, Charles Babbage and woman enzyme Richard Lovelace developed a general machine, the analytical engine. Charles Babbage is additionally known as the father of computers.
- **Hollerith's card Tabulating Machine** was fancied by discoverer. The machine may browse the knowledge from a card and method it electronically. The developments mentioned higher than and several other others not mentioned here, resulted within the development of the primary laptop within the Nineteen Forties.

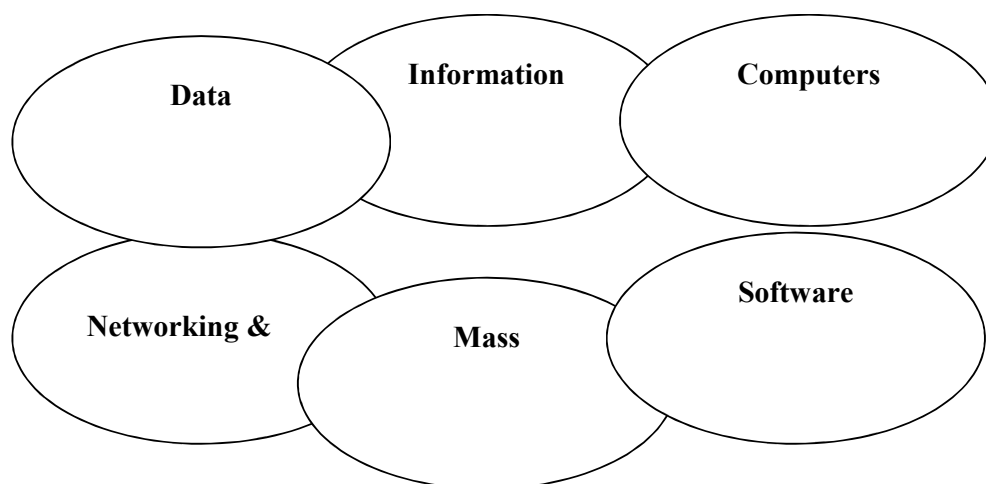
2.3 Information Communication Technology

"Information and Communication Technologies" ICT refers to technologies that give access to info through telecommunications. it's almost like info Technology (IT), however focuses totally on communication technologies. This includes the web, wireless networks, cell phones, and alternative communication mediums. In the past few decades, info and communication technologies have provided society with a massive array of recent communication capabilities. as an example, folks will communicate in period with others in several countries victimization technologies like instant electronic communication, phonation information processing (VoIP), and video-conferencing. Social networking websites like Facebook permit users from everywhere the globe to stay in-tuned and communicate on a daily basis. Library need to

perform several duties and services. With the assistance of ICT libraries will perform their duties and services terribly effectively.

III. COMPONENTS OF INFORMATION TECHNOLOGY

Technological change is becoming a driving force in our society. Information technology is a generic term used for a group of technologies. Following are the major components of information technologies as most relevant in modern library and information system.



3.1 Application of Information Technology in Libraries

The library is that the main information centre which may build use of the fat development IT for the advantages of humans as an entire. The librarian's preference of IT ought to embody all those technologies that area unit expected to be utilized in the library activities/ operations and alternative library services for assortment, processing, storage, retrieval and dissemination of recorded info, the quick developing info technologies have showered virtually each areas of application together with libraries. Just in case of libraries, these area unit sensible use within the following environments.

1. **Library Management:** Library management includes the subsequent activities which are able to actually be equipped by the employment of those quick IT developments: Classification, Cataloguing, Indexing, information creation, information classification.
2. **Library Automation:** Library automation is that the construct of reducing the human intervention all told the library services so any user will receive the specified info with the most comfort and at the bottom price. Major areas of the automation may be classified into 2 organization o f all library databases and every one housework operations of library.
3. **Library Networking:** Library networking suggests that a bunch of Libraries (information, knowledge and data) Centers area unit interconnected for a few common pattern or style for information exchange and communication with a read to enhance potency.
4. **Audio-Video Technology:** It includes photography, microfilms, microfiches, audio and tapes, printing, memory device etc.
5. **Technical Communication:** Technical Communication consisting of technical writing, editing, publishing, DTP systems etc.

3.2 What is Information and Communication Technology (ICT)?

Information and technology or info and communication technology (ICT), is usually used as AN extended word for info technology (IT), however may be a additional specific term that stresses the role of unified communications and also the integration of telecommunications (telephone lines and wireless signals), computers still as necessary package middleware, storage, and audio-visual systems, that alter users to access, store, transmit, and manipulate information.

3.3 What is Library?

A library may be a service establishment. It's a store house of knowledge that is pictured within the type of books, periodicals, newspapers, manuscripts, films, maps, prints, documents, microform, CDs, cassettes, videotapes, DVDs, Blue-ray Discs, e-books, audio books, databases, and alternative formats. These assortment of sources of knowledge and similar resources, created accessible to an outlined community or parent body for reference or borrowing. It provides access to material that is out there in physical or digital type. It's the first duty of library to prepare its resources that is useful to those that use. It implies that the arrangement of library resources ought to be in simple and convenient.

There is a unit several services offered by the library such as: Books disposition service, Document Delivery Service, Inter-Library Loan so on.

3.4 Application of Computer and Information Communication Technology in Libraries

Information Communication Technology is incredibly helpful for libraries in making databases of their own and meeting them on the market to users through networks. It additionally permits libraries to produce effective and economical services. Most of the library operations like book acquisition, circulation, workplace management, info services, etc.

A. Computer Technology

Computers area unit currently extensively utilized in the library operations and has nice impact within the management of libraries and knowledge centers. Engineering may be utilized in varied fields of library activities. A number of the areas wherever pc application takes place are:

1. Information Resource Building

Acquisition of books, monographs, audio-visual, electronic materials like read-only storage, maps and then on. There square measure some specific functions of a procurement method. (Suggestion, recommendations and choice of library assortment.)

- Library holding checking.
- An vender selection.
- Preparation of order/cancellation of order lists with terms and conditions of the supply.
- Verifying of overdue orders.
- Track of items on order.
- Record of arrived and non-arrived items and receipt to the vender.
- Items verification with order file and invoice.
- Inspection of items by the concerned department.
- Prepare for payment after accessioning.
- Preparation budget and maintain accounts and statistics subject wise etc.
- Final report. (Items/subjects wise/chronologically/booksellers reported etc.)

2. Data Entry

- Database is required for each:
- Books.
- Clients/Members.
- Serials.
- Audio-visuals.
- CD-ROMS, Floppies.
- Gifted items.
- Maps, Reports etc.

3. Classification and Cataloguing

- Catalogue card production.

- On-line cataloguing.
- Duplication checking of catalogue cards.
- Production of duplicate catalogue cards.
- Preparation of authority file subject heading list.
- Shorting, checking and filing of catalogue cards.
- Automatic generation of added entries (author, title, series etc).
- Generation of monthly accession list.
- Developing centralized and on-line cataloguing.

4. Circulation Control

- Registration/cancellation and make time for membership.
- Issue, return, renew, reservation of documents and produce the slip for proof.
- Charges for late, lost book, binding and production of penalty slip.
- Maintenance of circulation statistics.
- Inter library loan.
- Use of bar code system.
- Report/statistics of circulation.

5. Serial Control

- Input essential serials data.
- Order list of new serials.
- Mode of payment, prepare for payment
- Receipt and updating the records.
- Receipt to vendors or publishers.
- Preparing the list of present holdings, additions, missing, cancelled serials chronologically, subject-wise, etc.
- Renewal and cancellation of present subscriptions.
- Sending reminders and follow-up of missing issues.
- Binding control.
- Accession register of bound serials.
- Prepare budget and maintain accounts/statistics - subject wise, binding etc.

6. Documentation and Allied Services

- Indexing and abstracting of micro and macro documents.
- Thesaurus construction.
- Compilation of union catalogue.
- Bibliographical control.
- Current Awareness Services.(CAS)
- Literature search.
- Selective Dissemination of Information.(SDI)
- Newspaper clippings.

7. Information Retrieval

- Database creation and maintenance, interactive searching, saving of in house as well as external databases.
- Search and print outs of queries against specified requirement.
- Information about the books (issued, reserved, lost, overdue, weed out), member-ship, inter library loan, penalty charges, periodicals, newspaper clippings, reports etc.

- According alphabetically, chronologically, subject-wise, members wise, keywords with each particular such as accession no-wise, title, author, call number, edition etc.

B. Communication Technology

Communication is that the method of reworking info from associate info supply to a destination. Communication, the exchange of data and also the transmission is incredibly essence in an exceedingly social organisation or in a company. Wordbook suggests that means of communication is news or the act of creating oneself perceive the means of causation info between one places to a different. In fashionable days, numerous means that of act the data came into existence. There's a necessity to speak info effectively, with efficiency and timely by applying fashionable technologies like communication technology. The key areas of communication technology are:

1. Audio-visual technology
2. Fax
3. Telex
4. E-mail
5. Video text
6. Tele text
7. Online search
8. Tele conference
9. Voice Mail Box
10. Satellite Technology
11. Cellular telephones
12. Internet
13. Intranet
14. Extranet
15. CD-ROM
16. DVD

IV. CONCLUSION

Computer technology and ICT has converted library services in a better way. The library can perform its all operations with more accuracy and speed. Current world is known for electronic information. Bulk of the information is in electronic format, to handle this type of information Computer technology and ICT suit very important. With the use of Computer technology and ICT libraries can perform its functions more effectively, and it can provide more accurate and up-to-date information as per user's need. The article states that what is Computer technology and ICT Components of information technology, application of Computer technology and ICT in libraries, what is information and communication technology? What is library? And application of Computer technology and ICT in libraries.

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Cyber Security Challenges and its Emerging Trends on Latest Technologies

Shruti C Karbhari¹ and Sonali Singh²

Asst. Professor and HOD, Department of Computer Science¹

Student TYBSC, Department of Computer Science²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Cyber Security plays a very important role within the field of data technology. Securing the data became one amongst the most important challenges within the gift day. Whenever we predict concerning the cyber security the primary factor that involves our mind is 'cyber crimes' that square measure increasing vastly day by day. Numerous Governments and corporations square measure taking several measures so as to forestall these cybercrimes. Besides numerous measures cyber security remains a awfully huge concern to several. This paper principally focuses on challenges moon-faced by cyber security on the newest technologies .It additionally focuses on latest concerning the cyber security techniques, ethics and therefore the trends dynamic the face of cyber security.*

Keywords: Cyber Security, Cybercrime, Cyber Ethics, Social Media, Cloud Computing, Automaton Apps

I. INTRODUCTION

Nowadays man is ready to send associated receive as sociatey type of information is also an e-mail or an audio or video simply by the clicking of a however ton but did he ever assume however firmly his information id being transmitted or sent to the opposite person safely with none escape of information?? The solution lies in cyber security. Nowadays net is that the quickest growing infrastructure in on a daily basis life. In today's technical setting several latest technologies square measure dynamic the face of the person kind. however thanks to these rising technologies we tend to square measure unable to safeguard our personal info in an exceedingly} very effective method and therefore of late cybercrimes square measure increasing day by day. Nowadays quite sixty % of total business transactions square measure done on-line, thus this field needed a top quality of security for clear and best transactions. Therefore cyber security has become a contemporary issue. The scope of cyber security isn't simply restricted to securing the data in IT business however additionally to varied alternative fields like cyber house etc. Even the newest technologies like cloud computing, mobile computing, E-commerce, internet banking etc additionally desires high level of security. Since these technologies hold some vital info concerning someone their security has become a requirement factor. Enhancing cyber security and protective essential info infrastructures square measure essential to every nation's security and economic successfulness. Creating the web safer (and protective net users) has become integral to the event of recent services still as governmental policy. The fight against cybercrime desires a comprehensive and a safer approach. Provided that technical measures alone cannot stop any crime, it's essential that enforcement agencies square measure allowed to research and prosecute cybercrime effectively. Nowadays several nations and governments square measure imposing strict laws on cyber securities so as to forestall the loss of some vital info. Each individual should even be trained on this cyber security and save themselves from these increasing cyber crimes

II. CYBER CRIME

Cyber crime may be a term for any criminal activity that uses a laptop as its primary suggests that of commission and stealing. The U.S. Department of Justice expands the definition of cyber crime to incorporate any criminal activity that uses a laptop for the storage of proof. The growing list of cyber crimes includes crimes that are created attainable by computers, like network intrusions and therefore the dissemination of laptop viruses, still as computer-based variations of existing crimes, such as fraud, stalking, bullying and terrorism which became as major downside to folks and nations. Sometimes in common man's language cyber crime is also outlined as crime committed employing a laptop and therefore the net to steel

a person's identity or sell contraband or stalk victims or disrupt operations with malevolent programs. As day by day technology is taking part in a major role in an exceedingly person's life the cyber crimes additionally can increase alongside the technological advances

III. CYBER SECURITY

Privacy and security of the information can continuously be prime security measures that any organization takes care. We tend to square measure presently living in an exceedingly world wherever all the data is maintained in an exceedingly digital or a cyber type. Social networking sites offer an area wherever users feel safe as they move with friends and family. Within the case of home users, cyber-criminals would still target social media sites to steal personal information. Not solely social networking however additionally throughout bank transactions someone should take all the desired security measures. technology and health care executives nationwide, {silicon valley Silicon Valley geographical square measure geographic area geographical region geographic region} Bank found that corporations believe cyber attacks are a significant threat to each their information and their business continuity.

- 98% of corporations square measure maintaining or increasing their cyber security resources and of these, [*fr1] square measure increasing resources dedicated to on-line attacks this year
- The majority of corporations square measure making ready for once, not if, cyber attacks occur
- Only third square measure utterly assured within the security of their info and even less assured concerning the safety measures of their business partners.

There will be new attacks on automaton OS primarily based devices, however it'll not air large scale. The actual fact tablets share an equivalent OS as good phones suggests that they'll be presently targeted by an equivalent malware as those platforms. the amount of malware specimens for Macs would still grow, although abundant but within the case of PCs. Windows eight can enable users to develop applications for just about any device (PCs, tablets and good phones) running Windows eight, thus it'll be attainable to develop malicious applications like those for automaton, therefore these square measure a number of the expected trends in cyber security.

3.1 Cloud Computing and its Services

These days all little, medium and huge corporations square measure slowly adopting cloud services. In alternative words the globe is slowly moving towards the clouds. This latest trend presents an enormous challenge for cyber security, as traffic will go around ancient points of review to boot, because the range of applications obtainable within the cloud grows, policy controls for internet applications and cloud services also will ought to evolve so as to forestall the loss of valuable info. although cloud services square measure developing their own models still a great deal of problems square measure being said concerning their security. Cloud could offer vast opportunities however it should be noted that because the cloud evolves thus as its security considerations increase.

3.2 APT's and Targeted Attacks

APT (Advanced Persistent Threat) may be a whole new level of cyber crime ware. For years network security capabilities like internet filtering or IPS have compete a key half in distinguishing such targeted attacks (mostly once the initial compromise). As attackers grow bolder and use additional imprecise techniques, network security should integrate with alternative security services so as to discover attacks. Therefore one should improve our security techniques so as to forestall additional threats coming back within the future.

3.3 Mobile Networks

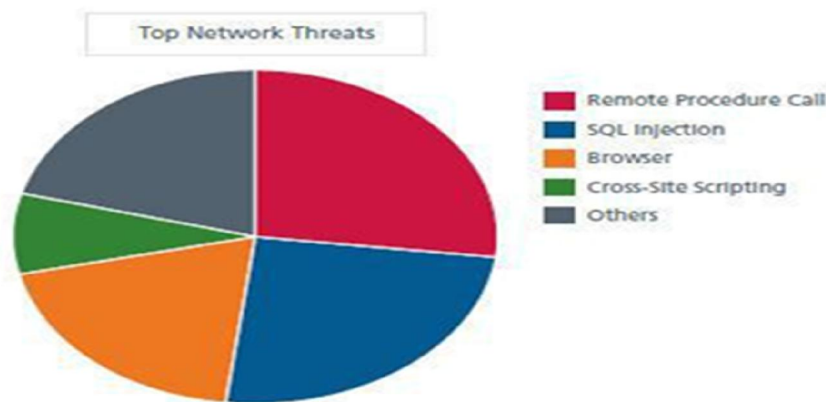
Today we tend to square measure able to hook up with anyone in any a part of the globe. Except for these mobile networks security may be a terribly huge concern of late firewalls and alternative security measures are getting porous as folks square measure exploitation devices like tablets, phones, PC's etc all of that once more need additional securities except those gift within the applications used. We tend to should always admit the safety problems with these mobile networks. Additional mobile networks square measure extremely liable to these cyber crimes a great deal of care should be taken just in case of their security problems.

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3.5 coding of the code

Encryption is that the method of encryption messages (or information) in such some way that eavesdroppers or hackers cannot scan it. In associate coding theme, the message or info is encrypted exploitation associate coding rule, turning it into associate unclear cipher text. This is often sometimes through with the employment of associate coding key, that specifies however the message is to be encoded. Coding at a awfully starting level protects information privacy and its integrity. However additional use of coding brings additional challenges in cyber security. coding is additionally accustomed defend information in transit, as an example information being transferred via networks (e.g. the web, e-commerce), mobile telephones, wireless microphones, wireless intercoms etc. therefore by encrypting the code one will recognize if there's any escape of data. Hence the higher than square measure a number of the trends dynamic the face of cyber security within the world.



The top network threats square measure mentioned in below Fig -1.

IV. ROLE OF SOCIAL MEDIA IN CYBER SECURITY

As we become more social in an increasingly connected world, companies must find new ways to protect personal information. Social media plays a huge role in cyber security and will contribute a lot to personal cyber threats. Social media adoption among personnel is skyrocketing and so is the threat of attack. Since social media or social networking sites are almost used by most of them every day it has become a huge platform for the cyber criminals for hacking private information and stealing valuable data.

In a world where we're quick to give up our personal information, companies have to ensure they're just as quick in identifying threats, responding in real time, and avoiding a breach of any kind. Since people are easily attracted by these social media the hackers use them as a bait to get the information and the data they require. Hence people must take appropriate measures especially in dealing with social media in order to prevent the loss of their information.

The ability of individuals to share information with an audience of millions is at the heart of the particular challenge that social media presents to businesses. In addition to giving anyone the power to disseminate commercially sensitive information, social media also gives the same power to spread false information, which can be just as damaging. The rapid spread of false information through social media is among the emerging risks identified in *Global Risks 2013* report.

Though social media can be used for cyber crimes these companies cannot afford to stop using social media as it plays an important role in publicity of a company. Instead, they must have solutions that will notify them of the threat in order to fix it before any real damage is done. However companies should understand this and recognise the importance of analysing the information especially in social conversations and provide appropriate security solutions in order to stay away from risks. One must handle social media by using certain policies and right technologies.

V. CYBER SECURITY TECHNIQUES

5.1 Access Control and Password Security

The concept of user name and password has been fundamental way of protecting our information. This may be one of the first measures regarding cyber security.

5.2 Authentication of Data

The documents that we receive must always be authenticated before downloading that is it should be checked if it has originated from a trusted and a reliable source and that they are not altered. Authenticating of these documents is usually done by the anti virus software present in the devices. Thus a good anti virus software is also essential to protect the devices from viruses.

5.3 Malware Scanners

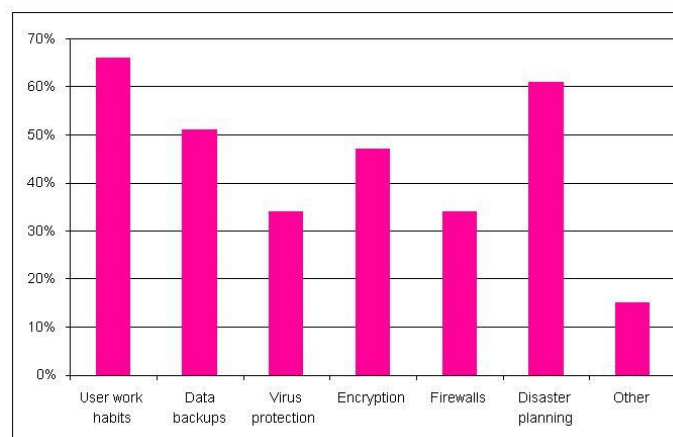
This is software that usually scans all the files and documents present in the system for malicious code or harmful viruses. Viruses, worms, and Trojan horses are examples of malicious software that are often grouped together and referred to as malware.

5.4 Firewalls

A firewall is a software program or piece of hardware that helps screen out hackers, viruses, and worms that try to reach your computer over the Internet. All messages entering or leaving the internet pass through the firewall present, which examines each message and blocks those that do not meet the specified security criteria. Hence firewalls play an important role in detecting the malware.

5.5 Anti-virus software

Antivirus software is a computer program that detects, prevents, and takes action to disarm or remove malicious software programs, such as viruses and worms. Most antivirus programs include an auto-update feature that enables the program to download profiles of new viruses so that it can check for the new viruses as soon as they are discovered. An anti virus software is a must and basic necessity for every system.



VI. CYBER ETHICS

Cyber ethics are nothing but the code of the internet. When we practice these cyber ethics there are good chances of us using the internet in a proper and safer way. The below are a few of them:

- DO use the Internet to communicate and interact with other people. Email and instant messaging make it easy to stay in touch with friends and family members, communicate with work colleagues, and share ideas and information with people across town or halfway around the world
- Don't be a bully on the Internet. Do not call people names, lie about them, send embarrassing pictures of them, or do anything else to try to hurt them.
- Internet is considered as world's largest library with information on any topic in any subject area, so using this information in a correct and legal way is always essential.
- Do not operate others accounts using their passwords.
- Never try to send any kind of malware to other's systems and make them corrupt.
- Never share your personal information to anyone as there is a good chance of others misusing it and finally you would end up in a trouble.
- When you're online never pretend to be the other person, and never try to create fake accounts on someone else as it would land you as well as the other person into trouble.
- Always adhere to copyrighted information and download games or videos only if they are permissible.

The above are a few cyber ethics one must follow while using the internet. We are always thought proper rules from out very early stages the same here we apply in cyber space.

VII. CONCLUSION

Computer security is a vast topic that is becoming more important because the world is becoming highly interconnected, with networks being used to carry out critical transactions. Cyber crime continues to diverge down different paths with each New Year that passes and so does the security of the information. The latest and disruptive technologies, along with the new cyber tools and threats that come to light each day, are challenging organizations with not only how they secure their infrastructure, but how they require new platforms and intelligence to do so. There is no perfect solution for cyber crimes but we should try our level best to minimize them in order to have a safe and secure future in cyber space.

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Ethics in Ethical Hacking

Shruti C Karbhari¹ and Rifa Ukaye²

Asst. Professor and HOD, Department of Computer Science¹

Student FYBSC, Department of Computer Science²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *This paper explores the ethics behind moral hacking and also the issues that pair this rising field of network security. Since moral hacking has been a polemic subject over the past few years, the question remains of verity intentions of moral hackers. The paper additionally appearance at ways in which during which future analysis can be looked into to assist to keep moral hacking, ethical.*

Keywords: Moral Hacking, Hacking, Hackers, Education and Coaching, Risk Management, Automatic Security

I. INTRODUCTION

Ethical hacking technology is spreading to diversified fields of the life and particularly to any or all walks of pc industry; the necessity to shield the necessary information of constant ought to be self-addressed with right technology. Moral Hacking emerged because the latest and artistic movement technology of the computers, thanks to the smartness of hackers. Each tiny or huge company is adopting this because the front layer of security for shielding their information. Understanding verity intentions of the overall public is kind of a tough task in lately, and it's even tougher IJSER therefore, to understand the intentions of each single moral hacker going in vulnerable systems or networks. Technology is ever growing and folks are encountering tools that are useful to them. If these tools falls into the incorrect hands they'll produce nice conflict, breaching our basic right to privacy, respect and voluntary. The constant problems highlighted by the media continuously news some form of cyber crime, a study showing that almost ninety three of attacks happened inside the organization raising issues of however simple it's to be operating within to be ready to infiltrate attacks . is moral hacking finally come back to the rescue for determination the issues or has it created new ones?

II. DISCUSSION

2.1 Education and Coaching

The problem of teaching students to hack remains a awfully serious issue that we have a tendency to face today; specialists feel that they're going to teach students the way to improve intrusion that sadly not happening therefore. Understanding verity intentions of the scholars is extremely exhausting to pinpoint the rationale why moral hacking ought to be used. Teaching students to hack and later discover that the data accustomed hack, will certainly have a control on society on why they're allowed to know the way to hack within the 1st place, however we have a tendency to cannot, simply, pinpoint our argument to mention that it's the fault of the instructors that allowed him to undertake the course. If that's the case, then we'd have major issues in alternative areas, like once automobiles ar made they're crash tested to completely perceive areas of improvement to provide users a reliable car, if corporations failed to take a look at the problems, wouldn't it be the fault of the manufacturer if the automobile was concerned in an exceedingly crash?. Teaching students to hack in impact provides them a worldwide data of the way to hack into pc systems with the assistance of subject material specialists. The threat they create is out of the question. With this state of mind students are in, it's simple to imagine what sorts of threats they create, some within the past have gone on gun sprees, killing innocent students, some beginning terrorist plots and currently the University helps in inflicting injury to networks, primarily giving students of "how to try to it" directly, showing tools that may be accustomed do such crimes, like giving a stealer a wrecking bar to interrupt into house. "A drawback with the below graduate students victimization this approach is that the trainer is effectively providing them with a loaded gun".

Once the scholars acquires new skills they'll use them permanently or for dangerous intentions, sure policies that don't seem to be being applied at university which require to handle problems for college kids conducting malicious acts. but these are often corrected by applying security checks on people that Universities do certainly courses like moral hacking. A criminal background check, the necessity of some style of skilled certification, and student interviews ar few measures that

might probably comb out many, if not all, students with potential malevolent intentions. With Associate in Nursing array of coaching courses that ar accessible round the world it might be a tough task to know the explanations behind their interest within the course. It can be the very fact that the individual has been curious about security for an extended time which his main objective is to good his CV for higher job prospects and a much better salary; the very fact cannot be unheeded that moral hackers ar extremely paid people. To a precise extent moral hacking is moral. If we have a tendency to failed to have such measures in situ we'dought to manually make sure that our systems ar safe, therefore moral hacking will guarantee safety of our systems if conducted ethically.

2.2 Trusting the Potential Enemy

No 2 people during this world are same in nature, behavior and perspective. Their appearance, shape, size and even mental states and also the actions they are doing might not be same for anyone individual, cannot be perceived joined would hope to. To remedy issues of 2 whole completely different people would wish to be employed to run tests for corporations in order that nobody individual will have total freedom with anyone system. The necessity for secure info is vital and perhaps a vital consider moral hacking involved people would wish to know sure things regarding themselves or society in general; this info will cause major issues of WHO will get that info and WHO ought to see it. Hacking is wrong for any gain whether or not that's money or personal or for the very fact moral. It are often argued that once performing on huge comes with one in all the countries, huge money corporations to search out security flaws to assist remedy issues, will facilitate to strengthen the data of a moral hacker and generally within the future out of curiosity or through spite breach his contract and sell his ideas to criminals. It had been argued that this will be achieved which this can be one in all the numerous issues moral hacking faces. It's believed that Christians and Muslims feel that committing criminal conversation is wrong and could be a major sin. Basically, there's a distinction between ethics and faith, however the urge of wanting you to not be intimate doesn't stop you and you'll move and be intimate anyway. "used to clarify however {different|totally completely different|completely different} folks have different perception of right or wrong, looking on their faith, culture or society.". Hackers have a bent of gaining access to systems and will well recognize that it's wrong except for that very same spiritual reason, create them wish to try to it for pleasure or alternative means that.

2.3 Risk Management

Ethical hackers are extremely paid professionals with a legitimate standing and a way of access. They'll minimize the chance of impact, clearly characteristic advantages and flaws serving to senior company administrators to know if such activities ought to be undertaken. Moral hackers might explore vulnerabilities earlier to attenuate the chance. The corporate might undertake penetration tests to search out if they're prone to attack. Finding vulnerabilities for corporations not solely help the corporate however additionally minimizes the risks of attacks. But moral hackers have 5 days generally to perform tests, what happens if vulnerabilities ar unnoted. If Associate in Nursing moral hacker fails to deliver results to the business and assumes the system is safe which it's no issues, WHO are going to be to blame for legal actions if a malicious hacker gets into the system? Astonishingly, a journal by IBM on moral hacking reports, "...the consumer would possibly raise "So, if I fix these items i will have good security, right?" "Unfortunately, this can be not the case. Folks operate the client's computers and networks, and that they do create mistakes. The longer it's been since the testing was performed, the less are often dependably aforementioned regarding the state of a client's security. Some of the ultimate report includes recommendations for steps the consumer ought to still follow so as to cut back the impact of those mistakes within the future."

There is a bit chance of moral hacking in work places if info isn't correct. If an organization has been hacked ethically, what's the color of the individual's hat is it black or white? Giving special privileges to users then to come back with non-accurate info as golfer describes {we can we will we are able to} raise ourselves what the variations are, as against victimization traditional security package to try to to the task for you. Deeper analysis showed that properly programmed systems at the start would facilitate to boost security. the most concern would be the price to each manage and administer to supply nice solutions. the concept of self-improving are often another issue, therefore to whom we will permit these enhancements, the corporate or {the moral the moral} hackers to extend their data and therefore obtaining enough info they'll come up of so launching attacks from completely different elements of the planet as a moral hacking regime that may build data by move as ethical hackers and obtaining info to use. differently to look at this can be, if legitimate moral hackers

WHO aims to remedy security problems, whether or not they ought to be allowed to access sure info and be entered into security barriers. So as to try to to the task we have a tendency to should have some leeway and be allowed to use sure tools to assist them with their job. For instance Randal Schwartz, WHO was sentenced for under doing his job, best describes the necessity to use tools with none question, to spot security vulnerabilities. Moral hackers will determine issues, however to what extent, even they might not realise a standard virus wearing away at information, they'll miss it or let it go since they solely have a restricted time to perform take a look at. it's the hacker's intention to bypass and deceive the network, the moral hacker could also be open-eyed of this and compromise the network deed it until issues arise, thus raising the problem of "the insider".

2.4 Serving to the Enemy

Almost nothing is secure in our technological world. There's freedom of knowledge and is out there for anyone hungry enough to need it. CAPTCHA (Completely automatic Public mathematician take a look at to inform Computers and Humans Apart) that is coined by Luis von Ahn, Manuel Blum, Nicolas J.Hopper and John Longford of Carnegie Andrew Mellon University, may be a mathematician take a look at application that makes correct distinctions between humans from computers, which may facilitate US perceive attacks a lot of clearly and stop them from happening. creating the excellence between humans and computers facilitate US to rectify issues and to more administer them, square measure to mention catch the human criminals and let the computers do their job. There square measure several tools obtainable for moral hacker's facilitate to try and do their job effectively. It may be understood that there square measure completely different styles of identical tool, one or two of tools may be utilized by the moral hacker to hack systems is NMap to search out open ports however this can be promptly obtainable for anyone to transfer and use. Acunetix, IJSER is on the market to use unethically by a hacker victimization sure cracks which may be found on the net. These tools may be utilized by a traditional hacker moreover as associate moral hacker, the hackers uses them for criminal intentions and therefore the moral hacker uses them for the advantage of the organization to assist determine weaknesses and flaws within the security. Google may be a nice program that presents valuable and generally unwanted data to be obtained. Google causes privacy issues, for the folks to know the way to get such data by victimization clever commands. Is it moral for Google to carry such data concerning sure people or companies? Definitely, the solution here would be no, it permits US to get sensitive data concerning our targets, sensible for the hacker, however dangerous for the target. Tho' it's still obtainable, corporations should make sure that all staff don't send any sensitive data across the net. Google will play a significant role for giving valuable and generally sensitive data. This causes nice concern for the people that purchase or have net servers with valuable data. With more investigation Google permits retrieving valuable data. Allow us to view example, shipping a valuable package which it's determined to be sent victimisation the web system to avoid wasting time of getting to travel to the post workplace, UPS (United Parcel Service) makes this doable.

If someone makes a booking to send a parcel, UPS would collect the package and send it to the required location. A would be hacker might intercept the booking and impersonate because the company and intercept the package. victimization clever searches on Google, personal video cameras aren't thus personal, searches show that we will access data directly through Google permitting the would be criminals to execute an ideal crime while not even doing field analysis (for example Google Maps and Google Earth). If a moral hacker was ready to track the daily activities of a particular filling station, he or she, as a malefactor might simply calculate the days of business and a lot of significantly the quantity of your time he/she can desire commit the proper crime, giving them a selected and correct time window. The foremost necessary and wide gettable data is that of passwords, an exploration "Index of /" +password.txt", will permit a spread of various passwords searched from databases, permitting hackers normally to big selection of knowledge to commit unsettling crimes. Google normally could also be a really powerful tool that assists hacker in an exceedingly major manner, to assist minimize the matter may be troublesome as we'd would like separate servers to store data which may be pricey and time intense. Permitting people to try and do such activities helps increase data of the enemy on understand whether or not they square measure terrorists or criminals by serving to them to commit crimes. This raises issues that Google could also be blame for permitting hackers for such data.

2.5 Applying Moral Hacking in Apply

One memorized record that's indirectly coupled to the penetration tester at the time may be obtained and exploited, that the trust of knowledge is once more infringed upon. Moral hackers operating in banks would produce another tilt, having access to valuable information starting from student accounts to high senior executives, the need to steal or memorise one account detail would be enough to assist. With several on-line frauds being committed it'd produce nice issues in pursuit down moral hackers and promise the blame, for having access to accounts can in result blame the moral hacker although they failed to commit the crime. In sure environments wherever fraud is probably going to require place will so raise problems. This argument is incredibly necessary to handle since if employment was given to associate moral hacker to visualize vulnerabilities in banking systems, and per week later many accounts were hacked then United Nations agency would be accountable is that the banker or the moral hacker?. Currently allow us to imagine the situation of a residential home and permitting access to systems for administration for safety measures. Members of any community, whether or not they reside privately homes, massive public buildings or residential homes square measure entitled to a particular level of privacy. Most weaknesses occur a lot of promptly through humans instead of computers. However it may be argued that laptop failure rates may be between 10-15% thus permitting a hacker to explore the system inside a given period of time at the time of failure might not be moral. One will assume that during this program every resident would receive variety and their daily routines and whereabouts might simply be accessed via the network, whether or not the patient is enjoying cards or taking a shower. Definitely nobody would be comfy knowing a network administrator United Nations agency might simply decipher once they were showering, victimisation the lavatory or preparing for bed. This brings US to a different potential moral issue.

2.6 The Matter Inside!

Estimating and understanding the corporate executive attacks may be a massive drawback. Finding the explanations behind the attacks that surface square measure rather clear, is for sheer greed of monetary gain. Most cases cope with discontent staff United Nations agency enkindle raises and so commit fraud. Most frauds lure staff to steal very important data from their company and begin their own company, with full data of the potential profits. Moral hackers may be given with a good deal of knowledge that might facilitate, it's conjointly recommended that folks inside the organization tend to not suspect insiders and focus the matter on outsider attacks.

III. COUNTERING THE ISSUES

To counter issues, researchers square measure wanting towards new ways in which of rising moral hacking and hacking normally from within the corporate.

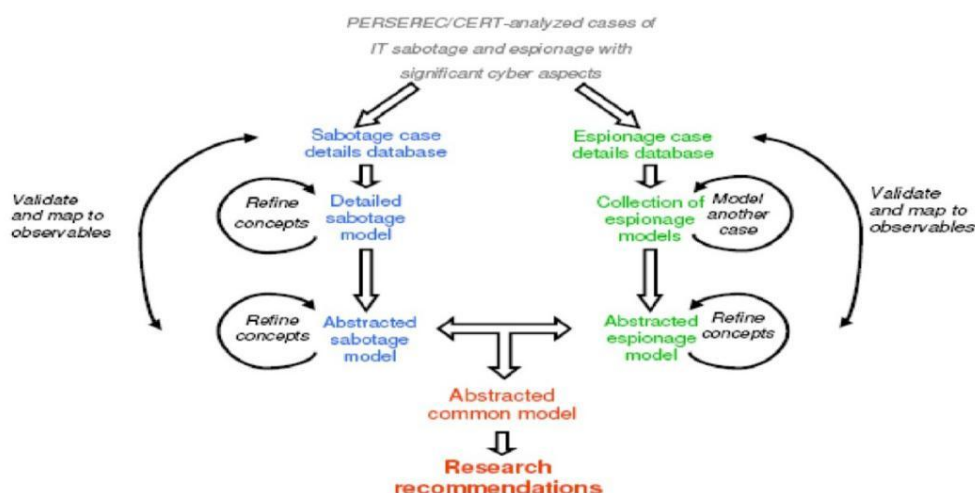


Figure 1: Insider attack analysis

One approach is to use models to watch staff closely to scale back the chance of impact. One resolution is to use a model approach which will seriously facilitate in moral hacking. Not solely will this model helps, however conjointly tries cut back to scale back to cut back} the impact by characteristic implications early enough to assist reduce the impact of confrontation. The model portrayed below provides US associate insight in to the matter and the way it may be helped to attenuate risks and to more monitor the behavior of moral hackers and to undertake to eliminate the issues as and once they occur.

Not only these models be used in the workplace but they can also be adopted in other fields of work such as education. Another solution could be to automate ethical hacking which causes great concerns in allowing machines take over jobs of humans, the biggest problem that lies here is that machines are prone to making mistakes and can sometimes even crash [10].

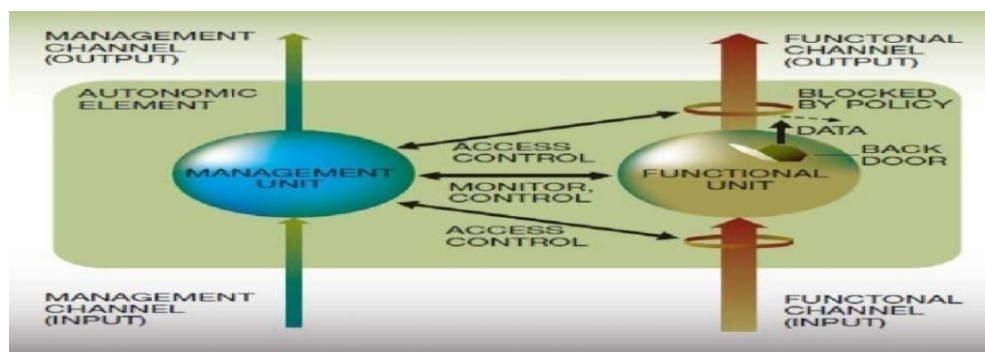


Figure 2: Blockage of backdoor leak by autonomic system

IV. CONCLUSION

Technology has continued to grow at a high rate over the years and continues to do so; scholars are putting themselves in vulnerable positions by helping individuals to hack. The mind is a very powerful tool that has no control, the control will continue to grow proportionally with the desire to get knowledge of something that is impossible to achieve in its entity, but not forgotten in its entirety. Hackers will always find ways of getting into systems, whether they are doing it for good or bad.

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Machine Learning in Artificial Intelligence

Miss. Dakhni Rushda Naushad¹ and Mr. Mandlekar Mohammad Ashraf²

Teacher¹ and Student, TYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *AI has received increased attention from the information systems (IS) research community in recent years. There is, however, a growing concern that research on AI could experience a lack of cumulative building of knowledge, which has overshadowed IS research previously. This study addresses this concern, by conducting a systematic literature review of AI research in IS between 2005 and 2020. The search strategy resulted in 1877 studies, of which 98 were identified as primary studies and a synthesise of key themes that are pertinent to this study is presented. In doing so, this study makes important contributions, namely (i) an identification of the current reported business value and contributions of AI, (ii) research and practical implications on the use of AI and (iii) opportunities for future AI research in the form of a research agenda.*

Keywords: Artificial intelligence, AI Machine learning, Systematic literature review, Research agenda

I. INTRODUCTION

AI has been claimed to offer transformational potential across sectors and industries, ranging from supply chain management. Studies have reported that AI provides opportunities to reinvent business models, change the future of work performance improvements, and even enhance human capabilities.

The aim of this research is to understand the various characteristics of AI studied within the context of IS. A systematic literature review is important as it can be used to provide a valuable baseline to aid in further research. The aims of this systematic review are to:

1. Identify the reported business value and contributions of AI
2. Examine the practical implications on the use of AI
3. Identify the opportunities for future AI research in IS.

The structure of the paper is as follows. First, an introduction to related work on AI in the IS field is presented. Then the methodology of the systematic literature review is explained, and limitations of the study are acknowledged. The paper ends with a conclusion and directions for future research.

Intelligence usually means “the ability to solve hard problems”. “AI is concerned with methods of achieving goals in situations in which the information available has a certain complex character. The methods that have to be used are related to the problem presented by the situation and are similar whether

II. METHODOLOGY

This section outlines the systematic review process adopted for this study. A Systematic Literature Review is defined as “means of identifying, evaluating and interpreting all available research relevant to a particular research question, or topic area, or phenomenon of interest”. This systematic approach was chosen for its ability to offer reviews of high quality and transparent and replicable review. Additionally, it is useful for studies with a clearly formulated research question and summarising large quantities of research studies. Thus, the SLR was chosen for the following reasons: (i) the study will generate large amounts of literature; (ii) this study aims to answer a specific research question; (iii) we intend to systematically extract relevant AI references from the studies transparently; and (iv) therigour and replicability it offers leads to an unbiased scientific study. The foundation of our guide was taken from the guideline developed by Okoli (2015).

III. LITERATURE REVIEW

Okoli (2015) propose a systematic review process that consists of 8 steps, namely planning (2 steps), selection (2 steps), extraction (2 steps) and execution (2 steps) that are completed across 4 phases (see Fig. 1.). Each of these four phases and eight steps are discussed in detail in the remainder of the section.

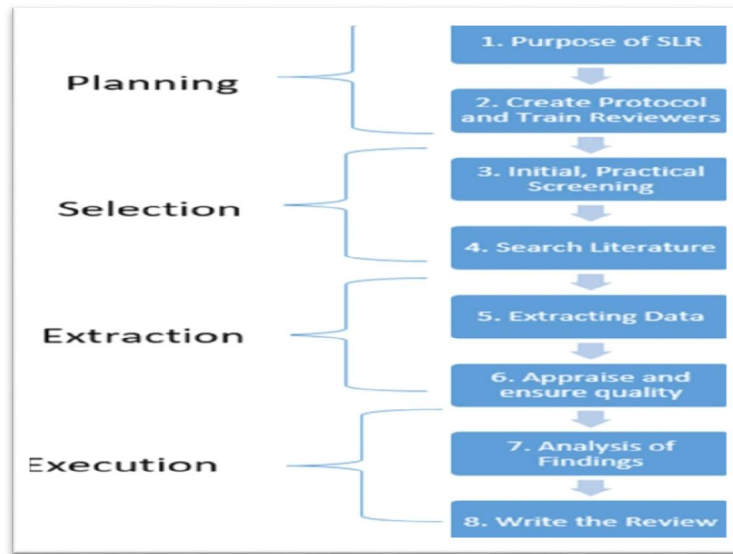


Figure 1: A systematic guide to literature review development (Okoli, 2015).

Figure 2 shows the study selection process. After the initial step of identifying a search string was complete, pilot steps were carried out on the databases used. This entailed refining the search string for each database. However, the terms used to search the databases were used the same throughout. The lead author analysed the 1877 studies retrieved in the initial search.

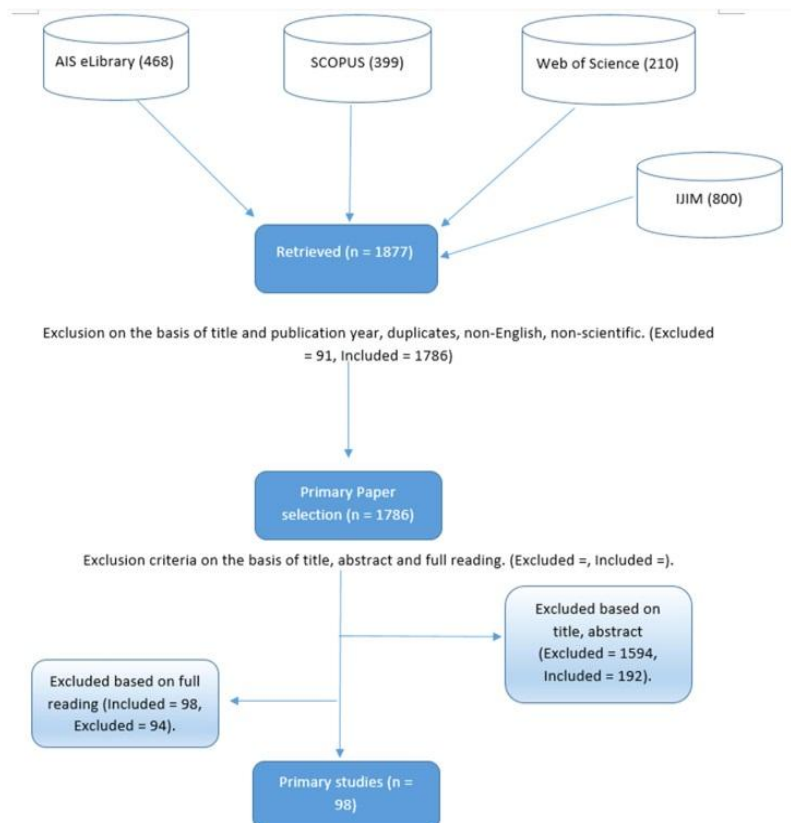


Figure 2: Study selection process.

A second reviewer was invited to analyse these studies as well, to pre-emptively combat potential bias. The two reviewers had to agree for a study to stay a primary study. Based on the removal of duplicates, non-scientific and non-English studies, 91 were removed, leaving 1786. These 1786 studies were then analysed based on title. The title gave a clear indication on whether they were outside the focus of the study, and thus excluded. If a title did not clearly reveal application domain of the study it was included for review in the subsequent steps, where title, keywords and abstract were examined. Based on title, abstract and keyword, the 1786 studies were further narrowed down to 187. There were still cases where the abstract was unclear, so these studies carried onto the next stage, where the contents of the full study were examined. An in-depth examination of the 187 remaining studies was undertaken by the reviewers, which resulted in a further 90 studies being excluded. This resulted in a total of 98 primary studies used as the basis of this SLR.

3.1 How is AI being defined in the field of IS?

The aim of this research question is to identify and analyse the different definitions of AI used in the field of IS. It was noted in Section 2.1 the difficulties the field of AI had with definitions, and this research questions aims to look at how IS has handled those difficulties. However, despite AI and Machine Learning being a large part of the primary studies, many did not provide a definition, or used definitions that were not cited (see Fig. 3).

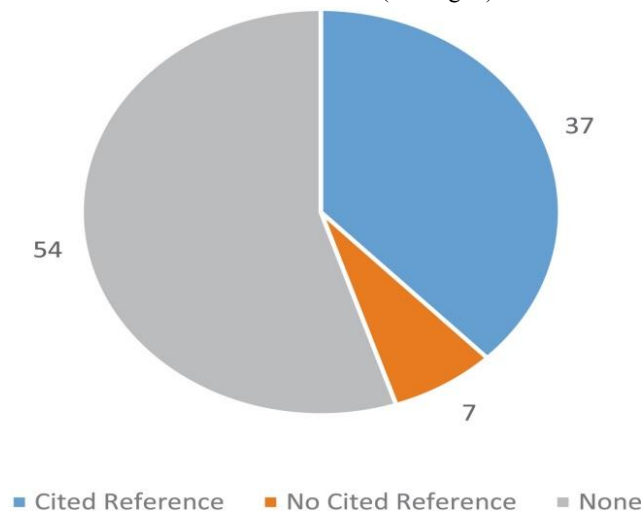


Figure 3: AI definition cited.

Of the 98 primary studies, 54 of them gave no clear definition of the AI relevant to the study. And of the 44 studies that did give a definition, 7 of them cited no reference for the definition given. The definitions of AI used in the primary studies varied in both term of definition and source cited. Disregarding the seven studies that defined AI without citing a source, Russel & Norvig's book Artificial Intelligence: A Modern Approach was the most frequently cited source for defining AI, though the actual edition of the book varied, with each studies using the latest edition at the time

3.2 What number of IS academic studies on AI has been published between 2005 and 2020?

The aim of this research question is to identify the number of academic studies involving Artificial Intelligence and Machine Learning in the field of Information Systems, specifically those between the years 2005 and 2020 (see Fig. 4.). Fig. 4. reveals that studies on AI remained relatively low for most of this period, with a total of 11 studies between the years 2005 and 2015. 2019 and 2020 show an immense surge in AI related studies in IS, signifying a much greater interest in the field. Due to the inclusion and exclusion criteria of this study, there were no studies on AI in Information Systems in the years 2007, 2008, 2010, and 2012.

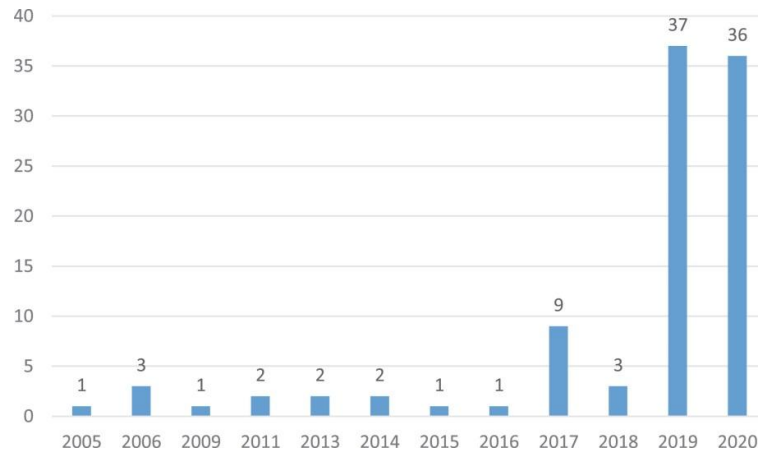


Figure 4: Number of studies by year.

What types of AI technologies are used by IS researchers?

The aim of this research question is to categorise studies on AI based on the type of AI used in the primary study. It is possible to combine a variety of these types together into a single AI system. For example, IBM's Watson combines NLP, ML and machine vision techniques (Jarrahi, 2018, Jarrahi, 2018). However, for the purpose of this SLR, the study will be categorised solely based on the primary AI type of the study (see Fig. 5.).

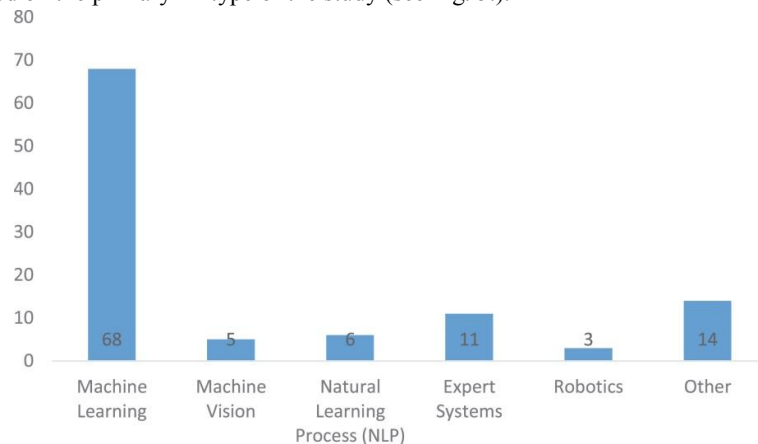


Figure 5: Types of AI.

Fig. 5 shows that ML is the most popular form of AI used in the primary studies, with 69 studies categorised under it. There was less range between the other types, expert systems having 11, machine vision with five and NLP at 6. Robotics was the least common with 3 studies having it as the primary focus.

IV. RESULT AND DISCUSSION

This section summarises the findings of the SLR and highlights some areas that research to date has focused and the key findings from these studies. It is then followed by a discussion on the theoretical contributions and implications for practice. The overall goal is to uncover themes that are relevant for research and practice and identify areas which warrant further research. This section will discuss relevant insights we found from the literature, starting with the lack of cohesion around the definition of AI, the resurgence of AI interest and research in recent years, the specific contribution types of AI literature, and the disproportionate focus on machine learning and process automation.

In this study we conducted a SLR that provides a comprehensive overview on AI in IS related studies. By using a systematic literature review, we identified, classified, and analysed 1877 studies on AI and ML in IS that were published between 2005 and 2020. Of these, 98 were identified as primary studies, after a rigorous filtering process. To understand the fundamentals of AI in IS we examined and studied the articles based on studies by year, publication channel, research

methods used, and their contribution to IS contributions research. Prior to commencing this task however, we had to consider the problem that the definitions of artificial intelligence were largely varied and ambiguous.

Our findings show that while there was a lack of studies in the first decade of the relevant time, there has been a resurgence in recent years. Over half of the primary studies were published in 2019 and 2020. As previously shown in Fig. 4, there was a resurgence in interest in AI in 2017, before it seemed to really expand in 2019 and 2020.

V. CONCLUSION

This systematic literature review study provides a structured understanding of the state-of-the-art of AI research in IS. This was achieved by identifying 98 primary studies out of 1877 related AI articles over a fifteen-year period (2005 – 2020) and analysed them with respect to (i) definitions of AI, (ii) frequency of publication by year, and (iii) type of AI.

ACKNOWLEDGEMENT

I hereby declare that all the information provided in the respected paper is authenticated, authorized and hence reliable. I would like to thank all the viewers and readers of this paper for their precious time.

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Ethical Hacking and Its phases

Miss. Dakhni Rushda Naushad¹, Ms. Ulde Ayman Ajaz²

Teacher¹ and Student, TYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: The state of security on the internet is very poor. Hacking is an activity in which, a person exploits the weakness in a system for self-profit or gratification. As public and private organizations migrate more of their critical functions or applications such as electronic commerce, marketing and database access to the Internet, then criminals have more opportunity and incentive to gain access to sensitive information through the Web application. Thus the need of protecting the systems from the hacking generated by the hackers is to promote the persons who will punch back the illegal attacks on our computer systems. Ethical hacking is an identical activity which aims to find and rectify the weakness and vulnerabilities in a system. Ethical hacking describes the process of hacking a network in an ethical way, therefore with good intentions. This paper describes what is ethical hacking, what are the types of ethical hacking, impact of Hacking on Businesses and Governments. This paper studied the different types of hacking with its phases.

Keywords: Artificial in Vulnerabilities, Hacker, Cracker, Port and Intrusion

I. INTRODUCTION

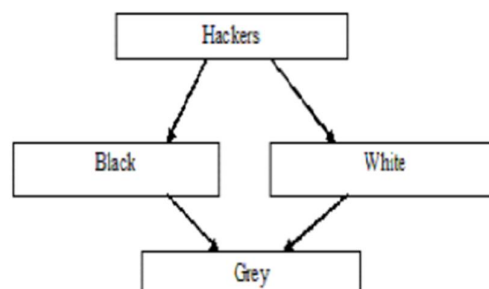
1.1 What is Hacking?

Hacking is the technique in which the persons, what's in a name? Call them hackers, crackers, intruders, or attackers, they are all interlopers who are trying to break into your networks and systems. Some do it for fun, some do it for profit or some simply do it to disrupt your operations and perhaps gain some recognition. Though they all have one thing in common; they are trying to uncover a weakness in your system in order to exploit it.

1.2 What is Ethical Hacking?

Ethical hacking is also known as "Penetration Hacking" or "Intrusion Testing" or "Red Teaming".[3] Ethical hacking is defined as the practice of hacking without malicious intent. The Ethical Hackers and Malicious Hackers are different from each other and playing their important roles in security. According to Palmer (2004, as quoted by Pashel, 2006): "Ethical hackers employ the same tools and techniques as the intruders, but they neither damage the target systems nor steal information. Instead, they evaluate the target systems' security and report back to owners with the vulnerabilities they found and instructions for how to remedy them". [10] The vast growth of Internet has brought many good things like electronic commerce, email, easy access to vast stores of reference material etc. As, with most technological advances, there is also other side: criminal hackers who will secretly steal the organization's information and transmit it to the open internet. These types of hackers are called black hat hackers. So, to overcome from these major issues, another category of hackers came into existence and these hackers are termed as ethical hackers or white hat hackers.

II. TYPES OF HACKING/HACKERS



The hacking can be classified in three different categories, according to the shades or colours of the “Hat”. The word Hat has its origin from old western movies where the colour of Hero’s cap was “White” and the villains’ cap was “Black”. It may also be said that the lighter the colour, the less is the intension to harm.

2.1 White Hat Hackers

White Hat Hackers are authorized and paid person by the companies, with good intends and moral standing. They are also known as “IT Technicians”. Their job is to safeguard Internet, businesses, computer networks and systems from crackers. Some companies pay IT professionals to attempt to hack their own servers and computers to test their security. They do hacking for the benefit of the company. They break security to test their own security system. The white Hat Hacker is also called as an Ethical Hacker. In contrast to White Hat Hackers.

2.2 Black Hat Hackers

The intension of Black Hat Hackers is to harm the computer systems and network. They break the security and intrude into the network to harm and destroy data in order to make the network unusable. They deface the websites, steal the data, and breach the security. They crack the programs and passwords to gain entry in the unauthorized network or system. They do such things for their own personal interest like money. They are also known as “Crackers” or Malicious Hackers Other than white hats and black hats.

2.3 Grey Hat Hackers

Another form of hacking is a Grey Hat. As like in inheritance, some or all properties of the base class/classes are inherited by the derived class, similarly a grey hat hacker inherits the properties of both Black Hat and White Hat. They are the ones who have ethics. A Grey Hat Hacker gathers information and enters into a computer system to breach the security, for the purpose of notifying the administrator that there are loopholes in the security and the system can be hacked. Then they themselves may offer the remedy. They are well aware of what is right and what is wrong but sometimes act in a negative direction. A Gray Hat may breach the organizations’ computer security, and may exploit and deface it. But usually they make changes in the existing programs that can be repaired. After sometime, it is themselves who inform the administrator about the company’s security loopholes. They hack or gain unauthorized entry in the network just for fun and not with an intension to harm the Organizations’ network. While hacking a system, irrespective of ethical hacking (white hat hacking) or malicious hacking (black hat hacking), the hacker has to follow some steps to enter into a computer system, which can be discussed as follows.

III. METHODOLOGY

3.1 Hacking Phases

Hacking can be done by following these five phases:

Phase 1: Reconnaissance: can be active or passive: in passive reconnaissance the information is gathered regarding the target without knowledge of targeted company (or individual). It could be done simply by searching information of the target on internet or bribing an employee of targeted company who would reveal and provide useful information to the hacker.

This process is also called as “information gathering”. In this approach, hacker does not attack the system or network of the company to gather information. Whereas in active reconnaissance, the hacker enters into the network to discover individual hosts, ip addresses and network services. This process is also called as “rattling the doorknobs”. In this method, there is a high risk of being caught as compared to passive reconnaissance.

Phase 2: Scanning: In Scanning Phase, The Information Gathered In Phase 1 Is Used To Examine The Network. Tools Like Dialers’, Port Scanners Etc. are being used by the Hacker to Examine the Network So As To Gain Entry in the Company’s System and Network.

Phase 3: Owning the System: This Is the Real and Actual Hacking Phase. The Hacker Uses The Information Discovered In Earlier Two Phases To Attack And Enter Into The Local Area Network (LAN, Either Wired Or Wireless), Local Pc Access, Internet Or Offline. This Phase Is Also Called As “Owning The System”.

Phase 4: Zombie System: Once the hacker has gained the access in the system or network, he maintains that access for future attacks (or additional attacks), by making changes in the system in such a way that other hackers or security personals cannot then enter and access the attacked system. In such a situation, the owned system (mentioned in Phase 3) is then referred to as “Zombie System”.

Phase 5: Evidence Removal: In this phase, the hacker removes and destroys all the evidences and traces of hacking, such as log files or Intrusion Detection System Alarms, so that he could not be caught and traced. This also saves him from entering into any trial or legality. Now, once the system is hacked by hacker, there are several testing methods available called penetration testing to discover the hackers and crackers

IV. LITERATURE REVIEW

The vast growth of Internet has brought many good things like electronic commerce, email, easy access to vast stores of reference material etc. More and more computers get connected to the Internet, wireless devices and networks are booming. As, with most industrial advances, there is also other face: illegal hackers who will secretly steal the organization's information and transmit it to the open internet. These types of hackers are called black hat hackers. There is also a dark side of web and web technological advancements in form of “Criminal Hackers” that are posing a threat to websites and web related services as well as corporate activities. The number of these hackers are increasing while the resources available to law-enforcement agencies are also increasing, but at a much slower rate. So, the hackers are clearly winning the battle with law-enforcement agencies, which are must content themselves with investigating and prosecuting the most spectacular cases. So, to overcome from these major issues, another category of hackers came into existence and these hackers are termed as ethical hackers or white hat hackers. So, this paper describes ethical hackers, their skills and how they go about helping their customers and plug up security holes. Ethical hackers perform the hacks as security tests for their systems. This type of hacking is always legal and trustworthy.

4.1 Advantages of Ethical Hacking

Following are the advantages of Ethical Hacking as follows.

- This helps to fight against cyber terrorism and to fight against national security breaches.
- This helps to take preventive action against hackers.
- This helps to build a system that prevents any kinds of penetration by hackers.
- This offers security to banking and financial establishments.
- This helps to identify and close the open holes in a computer system or network.

4.2 Disadvantages of Ethical Hacking

Following are the disadvantages of Ethical Hacking as follows.

- This may corrupt the files or data of an organization.
- They might use information gained for malicious use. Subsequently, trustful programmers are expected to have achievement in this framework.
- By hiring such professionals will increase costs to the company.
- This technique can harm someone's privacy.
- This system is illegal.

V. RESULT AND DISCUSSION

Some of the most expensive and prolific victims of hacking have been businesses. Businesses are many times targeted for their customers' personal and financial data and often are targeted by their own employees, whether disgruntled or just opportunistic. Businesses lose billions of dollars yearly as a result of hacking and other computer breaches. Many times, the true cost cannot be evaluated because the effects of a security breach can linger for years after the actual attack. Companies can lose consumer confidence and in many cases are held legally responsible for any loss to their customers. The cost of recovering from an attack can spread quickly: legal fees, investigative fees, stock performance, reputation management, customer support, etc. Companies, and more recently, consumers, are investing more and more money into preventing an

attack before it actually happens. Businesses that hold stores of consumer's personal and financial data are especially taking extra steps to insure the data's safety.

VI. CONCLUSION

Hacking has both its benefits and risks. Hackers are very diverse. They may bankrupt a company or may protect the data, increasing the revenues for the company. The battle between the ethical or white hat hackers and the malicious or black hat hackers is a long war, which has no end. While ethical hackers help to understand the companies' security needs, the malicious hackers intrude illegally and harm the network for their personal benefits. Which may allow a malicious hacker to breach their security system. Ethical Hackers help organizations to understand the present hidden problems in their servers and corporate network. Ethical Hacking is a tool, which if properly utilized, can prove useful for understanding the weaknesses of a network and how they might be exploited. This also concludes that hacking is an important aspect of computer world. It deals with both sides of being good and bad. Ethical hacking plays a vital role in maintaining and saving a lot of secret information, whereas malicious hacking can destroy everything. What all depends is the intention of the hacker. It is almost impossible to fill a gap between ethical and malicious hacking as human mind cannot be conquered, but security measures can be tightened.

ACKNOWLEDGEMENT

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Ethical Hacking

Shaikh Tuba Mohd Asim¹ and Bismah Ulde²

Assistant Professor¹ and Student²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *The Internet's explosive growth has conducted several virtuous things: ecommerce, e-mail, cooperative computing & new fields for promotional material and data distribution. Moral hacking has become a main anxiety for businesses & governments, conjointly called the intrusion testing or penetration testing. Organizations square measure involved regarding the likelihood of being "hacked" & potential purchasers square measure involved regarding keeping personal info in restraint. Hackers square measure classified per their work and data. The white hat hackers square measure the moral hackers. Moral hackers use hacking approaches to confirm safety. Moral hacking is required to shield the system from the hacker's harm. This paper provides a short plan of the moral hacking & each facet. As these days all the knowledge is on the market on-line, an oversized variety of users square measure accessing it, a number of them use this info for gaining data and a few use it to understand a way to use this info to destroy or steal the information of internet sites or databases while not the data of the owner. the aim of this paper is to inform what's hacking, UN agency is hackers, what's moral hacking, what's the code of conduct of moral hackers and also the would like of them*

Keywords: Cybercrimes, Clearing Tracks, Laptop Security, Moral Hacking, Scanning and Enumeration

I. INTRODUCTION

As the technology advances, it's its darker facet also; HACKERS. In nowadays world the scale of the net is growing at a awfully quick rate, an oversized quantity of information is moving on-line, therefore, information security is that the major issue. the net has junction rectifier to the rise within the conversion of varied processes like banking, on-line dealing, on-line cash transfer, on-line causing and receiving of varied sorts of information, so increasing the danger of the information security today an oversized variety of firms, organizations, banks, and websites area untargeted by the varied varieties of hacking attacks by the hackers.

Generally, when hearing the term hacker we tend to all consider the dangerous guys WHO area unit computers specialists with dangerous intensions, WHO tries to steal, leak or destroy someone's confidential or valuable information while not their data. They area unit the persons with terribly high laptop skills WHO tries to break into somebody else security for gaining access to their personal data, however all the days it's not like that. to beat the danger of being hacked by the hackers we've got moral Hackers within the trade, WHO are laptop specialists similar to the hackers however with smart intensions or finite by some set of rule and laws by the varied organizations.

These area unit the persons WHO attempt to shield the web moving information by the varied attacks of the hackers and keeping it safe with the owner. Further, this paper tells you a lot of concerning hackers, moral hackers and Linux software package (kali Linux) and aware you concerning some attacks performed by the hackers on the net.

II. HACKERS

The term HACKER in popular media is used to describe someone who breaks in to someone else's security using bugs and exploits or use his expert knowledge to act productively or maliciously. Hackers are the computer experts in both hardware as well as software. A hacker is a computer enthusiast and master in a programming language, security, and networks. He is kind of person who loves to learn various technologies, details of the computer system and enhances his capability and skills. According to the way of working or based on their intensions HACKERS can be classified into three groups

1. White Hat Hackers
2. Black Hat Hackers
3. Grey Hat Hackers

2.1 White Hat Hackers

A white hat hacker may be a pc security specialist that breaks into and notice loopholes within the protected networks or the pc systems of some organization or company and corrects them to boost the security. White Hat Hackers use their skills and information to guard the organization before malicious or unhealthy hackers notice it and create any damage to the company or the organization. White Hat Hackers are unit the licensed persons within the trade, though the strategies utilized by them are unit the same as those of unhealthy hackers however they need permission from the organization or the corporate United Nations agency hires them to try and do thus.

2.2 Black Hat Hackers

A Black Hat Hacker also known as a "Cracker" is a computer hardware and software expert who breaks into A Black Hat Hacker additionally called a "Cracker" may be hardware and package knowledgeable United Nations agency breaks into the protection of somebody with malicious intent or unhealthy intentions of stealing or damaging their necessary or secret data, compromising the protection of huge organizations, motion down or neutering functions of internet sites and networks. They violate the pc security for his or her personal gain. These are unit persons United Nations agency usually needs proves their intensive information within the computers and commits numerous cybercrimes like identity stealing, mastercard fraud etc.

2.3 Grey Hat Hackers

A gray Hat Hacker may be a pc hacker or security knowledgeable United Nations agency typically violates the laws however doesn't have any malicious intentions just like the black hat hackers. The term gray Hat springs from the Black Hat and therefore the White Hat because the white hat hackers finds the vulnerabilities within the system or the networks and doesn't tell anybody till it's being fastened, whereas on the opposite hand the black hat hackers lawlessly exploits the pc system or network to seek out vulnerabilities and tells others the way to do thus whereas the gray hat hacker neither lawlessly exploits it nor tells anybody the way to do thus. gray Hat Hackers represents between the white hat hackers United Nations agency operate to maintain system security and therefore the black hat hackers United Nations agency operate maliciously to exploits pc systems.

The Code of Conduct of Associate in Nursing moral Hacker:

- Distinctive and crucial the confidentiality and privacy of the info of any organisation before hacking and will not violate any rule and laws.
- Before and once the hacking maintaining the transparency with the consumer or owner of the organisation.
- The intentions of Associate in Nursing moral hacker should be terribly clear, that to not damage the consumer or organisation.
- Operating inside the bounds set by the consumer or the organisation, don't transcend them.
- Once the hacking don't disclose the non-public or confidential findings throughout the hacking with others.

Would like of moral Hackers within the Industry:

As each organisation has its own info|tip|lead|steer|wind|hint|guidance|counsel|counseling|counselling|direction} which might be hacked by the malicious hackers or will be broken by them so so as to safeguard that information the organisations their moral hackers and permit them to hack their own systems ethically any notice flaws or loopholes in their systems and proper them before any hacker hacks it. Currently beginning with some hacking attacks performed by the hackers over the net. Before that there's would like of knowing operational system} operating systems and what square measure their use in activity hacking attacks.

UNIX Operative Systems

As the name tells it's Associate in Nursing software system similar to the windows and waterproof. Associate in Nursing software system is Associate in Nursing interface between the user and the pc hardware, it manages all the hardware resources accessible with the pc. In the laptop system Associate in Nursing OS is needed for operating of varied applications. In contrast to Microsoft Windows and waterproof operative systems the operational system} square measure the open supply operating systems because it is distributed underneath open supply license. it's safer than the windows and has terribly less

variety of viruses famed which can damage UNIX system OS. a number of the operational system} operating systems square measure Ubuntu, Kali Linux, Fedora, UNIX system Mint etc.

III. METHODOLOGY

3.1 Reconnaissance

The method of aggregation data concerning the target system is named intelligence. The method includes finding vulnerabilities within the system, which suggests finding the ways in {which} which area unit left vulnerable. The more method of hacking is carried by the hacker if the hacker finds any thanks to access the system. At the tip of the intelligence part the hacker features a bunch of data exploitation that he will construct a promising attack on the target system.

3.2 Scanning

Before the attack hacker needs to grasp what system is up, what applications square measure used, what square measure versions of the applications. In scanning, looking out of all open, yet as closed ports, is completed means that finding the way to enter the system. It includes getting target's scientific discipline address, user accounts etc. during this part the knowledge gathered within the intelligence operation part is employed to look at the network and tools like Dialers, Port scanners etc. are used. Nmap is that the well-liked, powerful and freely accessible tools employed in scanning.

- **Gaining Control:** this can be the important a part of the hacking procedure wherever the knowledge gathered within the previous 2 phases is employed to enter and take hold of the target system through the network or physically. This section is additionally referred to as "Owning the System".
- **Maintaining Access:** when gaining entry within the system within the previous step the hacker maintains the access to system for the longer term attacks and build changes within the system in such the simplest way that the other security personal or the other hacker doesn't get the entry into the system into that is hacked. this can be matters during which the attacked system is understood because the "Zombie System".
- **Log Clearing:** it's the technique of removing any leftover log files or the other varieties of evidences on the hacked system from that the hacker will be caught. There are numerous tools in the moral hacking techniques from that a hacker will be caught like penetration testing. once reading regarding hacking and the shades of hackers there ought to be some method or some technique of protective the pc system or the pc networks type the malicious hackers, so the terms "Ethical Hacking" and "Ethical Hackers" came into the business.
- **Moral Hacking:** Ethical hacking could be a branch of knowledge security. it's additionally known as "Penetration Testing" or "White Hat Hacking". it's a sort of hacking performed by AN individual or an organization, that helps to find threats and loopholes in the laptop system or network's security of the organisation. The techniques or the ways employed in the moral hacking ar terribly just like those of malicious hacking however the distinction is that they ar legal here they're employed in a productive manner. the data gained from moral hacking is employed in maintaining system security and to forestall the system from any longer potential attacks.

IV. LITERATURE REVIEW

The thesis initial placed moral hacking among data security management literature. The ideas of risk management and risk assessment in data security were explained as a result of they represent the broader literature and structure context of moral hacking practices. Then, moral hacking theory and analysis were mentioned. The structure data security considerations were mentioned. Then, moral hacking as a risk management strategy, that is, as a risk assessment method, was mentioned. Finally, the role of policy in data security management was mentioned. A discussion of moral hacking theory and analysis began with a quick account of the historical image of hackers within the Nineteen Eighties and early Nineteen Nineties among pc security professionals. 2 main variations between moral hacking and hacking were explained, namely, variations in strategic goal (prevention versus exploitation), and within the realism of moral hacking (the nature of hacking simulation). Attention then turned to however moral hacking was studied, so however the thesis studied it. when situating moral hacking among data security risk management literature, the second space of focus for the chapter was mentioned.

V. RESULT AND DISCUSSION

Ethical hacking is the way to find out the weaknesses and vulnerabilities in the system or computer network. It is a way to describe the procedure of hacking in an ethical way for any network. The ethical hacker has the good purpose to do it. Actually it has become the general perception in our mind for hacker that he will be bad, fanatic, criminal and unethical. Basically some of the hacker has even done very badly with some organisations like they have stolen very important information of their customers. In some of the government organisations they have damaged very confidential information like social security numbers and other sensitive information. That is the reason hackers are not having very good reputation. To avoid such conditions many organisation have hired many ethical hackers to keep a track on their system and computer network. Ethical hackers are supposing to test and check vulnerabilities and weaknesses in the present system. There is one another face of the coin which tells that without hackers the vulnerabilities and holes of software would remain undiscovered. A study shows that almost 90% attacks happen on the inside which shows that easy it is to invade into the system or network for insiders. I have tried to explore the ethics behind the ethical hacking and the problems lie with this particular field of information technology where security is concerned. Though ethical hacking has become a very upcoming technological subject from the last few years, now the doubt remains the true intentions of the hacker. Hackers in this context have had a very measurable impact on society. There are several fields in computing where hackers made measurable impact on society. In this paper I have tried to look into different ways how we can make ethical hacking safe and ethical.

VI. CONCLUSION

In conclusion, moral hacking isn't a criminal activity and will not be thought of in and of itself. Whereas it's true that malicious hacking could be a laptop crime and criminal activity, moral hacking isn't against the law. Ethical hacking is in line with trade regulation and structure IT policies. Malicious hacking ought to be prevented whereas moral hacking that promotes analysis, innovation, and technological breakthroughs ought to be inspired and allowed.

Hacking has each its advantages and risks. Hackers are terribly numerous. could they'll|they will} bankrupt an organization or may protect the info, increasing the revenues for the corporate. The battle between the moral or white hat hackers and therefore the malicious or black hat hackers could be a long war, that has no end. whereas moral hackers facilitate to know the companies' their security desires, the malicious hackers intrudes illicitly and hurt the network for his or her personal advantages. Which can permit a malicious hacker to breach their security system.

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Artificial Intelligence

Miss. Shaikh Tuba Mohd Asim¹ and Miss. Saniya Sandilkar²

Department of Computer Science^{1,2}

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Use of computer science (AI) has hyperbolic within the aid in several sectors. Organizations from health care of various sizes, sorts and totally different specialties square measure currently a days additional curious about however computer science has evolved and is serving to patient wants and their care, additionally reducing prices, and increasing potency. This study explores the implications of AI on aid management, and challenges involved mistreatment AI in aid in conjunction with the review of many analysis papers that used AI models in numerous sectors of aid like medical specialty, Radiology, Drug style etc. AI refers to machine tools that square measure able to substitute for human intelligence within the performance of bound tasks. This technology is presently advancing at a unsafe pace, very like the exponential growth practiced by information technology within the late twentieth century. Databases have mature to become the core infrastructure that drives enterprise-level code. Similarly, most of the new price more from code over the approaching decades is predicted to be driven, a minimum of partially, by AI.*

Keywords: Artificial Intelligence; Healthcare; Pharmacy; Patient Care; Deep Learning, Machine Learning

I. INTRODUCTION

The recent improvements in the Artificial intelligence technologies across healthcare, made us wonder if AI tools will replace the human physicians in the future. Practically AI tools may not replace the human physicians but can assist physicians to achieve better results and accuracy in medical field.

One important support for this AI tools evolving in the medicinal field is availability of healthcare data. Artificial intelligence is not just a technology, it is a the recent improvements in the Artificial intelligence technologies across healthcare, made us wonder if AI tools will replace the human physicians in the future. The recent enhancements in the computing technologies across health care, created North American nation surprise if AI tools can replace the human physicians in the future. Much AI tools might not replace the human physicians however will assist physicians to accomplish higher results and accuracy in medical field.

Vital support for this AI tools evolving within the healthful field is availableness of health care information. computing is not simply a technology, it is Manne and Kantheti; CJUST, 40(6): 78-89, 2021; Article no.CJUST.67947 seventy nine assortment of technologies. Some among these technologies square measure wide used in health care, for instance, machine learning. Machine learning may be a technique wherever you train models victimization pre-existing information, in order that once somebody feed the information that you square measure victimization for testing, supported pre learning, it can establish the check input.

Machine learning is one of the normally used forms of computing. In health care the most common place wherever machine learning is used is exactness medication. Exactness medication is predicting what treatment protocols can success on a given patient, and this is often determined supported past information of patients. This sort of determinant from previous learning can need coaching the model victimization datasets, and this approach is referred to as supervised learning. re trained victimization massive amounts of information, and therein method, algorithmic rule creates sure set of rules that connects its observations to the all over diagnoses.

Next time once the information of latest patient is given to AI, it will judge patient victimization its expertise from previous information and predicts the likeness of a condition or sickness. From the past decade, information within the health care like data of patient, analysis findings, and designation data is being generated in huge volumes every day. With the facilitate of analytical tools organizations were in a position to collaborate and accomplish insights required to treat patients expeditiously and effectively.

Use of AI in planning treatment plans for patients has been growing in the health care. AI by analysing information from the previous patients, will give superior methods for treating patients and observation treatment plans. With the assistance

of medical pictures like CT scans, MRI, X-rays, Ultrasound, AI has the power to acknowledge signs of a malady a lot of accurately and apace. It helps patients, with quick identification of malady accurately and a lot of precise treatment decisions. IBM's Watson recently got sensible attention in the media for its ability to focus on exactness medication, particularly cancer diagnosing and treatment. completely different completely different} sorts of AI techniques ar getting used for identification different diseases like neural networks, support vector machines, and call trees etc., ANN (Artificial neural network) showed a lot of accuracy in classifying polygenic disease and CVD.

Electronic health records area unit crucial in care, as they facilitate analyze the information from the terribly past to gift and that in flip helps improve totally different sorts of treatments, and drug usage to a illness. AI will be used to interpret the records and give data to the physicians.

Algorithms will build use of EHR to predict the chance of a illness based mostly on the past data are trained victimisation giant amounts of information, and in this method, formula creates bound set of rules that connects its observations to the terminated diagnoses. Next time once the info of recent patient is given to AI, it will judge patient victimisation its expertise from previous information and predicts the likeness of a condition or illness. From the past decade, information within the care like data of patient, analysis findings, identification data is being generated in huge volumes every day. With the facilitate of analytical tools organizations were ready to collaborate and deliver the goods insights required to treat patients with efficiency and effectively.

II. APPLICATIONS OF AI IN ROBOTS

Robots square measure advanced automation technologies usually used for production and non-production activities so as to create life easier and to boost productivity at the work place within the producing systems, several makers have turned artificial intelligence and automation for a lot of reliable producing system solutions.

Application examples of robots square measure found within the housing industry, car parks, nuclear installations, airports, mines, hospitals, fastening shipyards, house stations, and automotive applications.

In particular, robots square measure found in uncommon places wherever the environmental and working conditions presents hazards and/or wherever dangerous tasks square measure performed. Studies on robots are viewed from 3 dimensions - its navigation, automaton localisation and robot's participation in agent groups.

The study that deals with automaton navigation is attributable to Shatkay and Kaelbling (2002). The authors describe a proper framework for incorporating pronto obtainable odometric data and geometrical constraints into each the model and also the rule that learns them. In another work. (1999) gift a version of Andre Markoff localisation that provides correct position estimates and that is ready-made towards dynamic environments.

The key plan to Andre Markoff localisation is to keep up a likelihood density over the house of all locations of a automaton in its atmosphere. The work here presents a wholly a wholly from what obtains within the literature. Thus, it's a singular contribution to information.

III. METHODOLOGY

Expert Systems in drugsExpert systems (ES) correspond to the foremost common variety of AI system in routine clinical use. They're outlined as systems with the flexibility to capture knowledgeable data, facts and reasoning techniques to assist care suppliers in routine work. Metal conceive to mimic clinician's experience by applying illation strategies to assist in call support or drawback resolution. Metal have the flexibility to manage knowledge to come back up with reasoned conclusions. Uses of metal embody image interpretation, designation support and alarms generation, among different utilities.

3.1 Key options of AN metal are:

- A data acquisition system: The system accustomed gather the data and also the rules utilized by the metal to unravel the planned issues. This method will be created either through direct input by the knowledgeable or the data engineer or supported a info of past case studies and their results.
- A data base: It stores the data and rules concerning the precise drawback to be solved by the metal. An illation engine: The system that implements the data and rules command at intervals the content to the information, playacting the reasoning method.

- Rule-based reasoning (RBR), case-based reasoning (CBR), and fuzzy systems are the foremost common metal utilized in the polygenic disorder domain. ANN are supported the human brain perform, that means, interconnected neurons. Every nerve cell, the straightforward unit, receives many inputs and generates only 1 output. Every association has allotted a weight connected with the importance of the output. The neural network “learns” by coaching with far-famed inputs, comparison actual output with the far-famed one and mistreatment the error to regulate weights. Thus, the links that turn out right answers are reinforced and people that generate wrong answers, weakened.

When employing a library of existing neural networks, the foremost common is that within the coaching method we tend to get data concerning however the formula works within the variety of a mean sq. error (MSE). for every example, the ANN evaluates the error all told its output neurons, raises every of these numbers square, and eventually the common is calculated. Using MSE, errors ar continuously positive and also the errors of some neurons don't nullify those of others.

III. LITERATURE REVIEW

Research on computing within the last twenty years has greatly improved performance of each producing and repair systems. Currently, there's a dire want for a piece that presents a holistic literature survey of worldwide, theoretical frameworks and sensible experiences within the field of computing.

This paper reports the progressive on computing in associate degree integrated, concise, and elegantly distilled manner to indicate the experiences within the field above all, this paper provides a broad review of recent developments at intervals the sector of computing (AI) and its applications. The work is targeted at new entrants to the factitious intelligence field.

IV. RESULT AND DISCUSSION

The fusion construct was treated in Baade et al. (2002). The authors extend the decidability transfer results from traditional modal logics to an outsized category of description logics. They introduce abstract description systems, to hide to hide logics in a regular method which may be seen as a typical generalisation of description and modal logics, and show the transfer end in this general setting. On the construct of logic in reasoning, Halpern and Pucallpa (2002) presents a prepositional logic to reason regarding the uncertainty of events, wherever the uncertainty is modelled by a collection of chance measures assignment associate interval of chance to every event.

They give a sound and complete axiomatisation for the logic, and show that the satiability problem is NP-complete, no tougher than satisfiability for function word logic. An important analysis space in reasoning is on consistency. Wray and property owner (2003) show however the mix of a hierarchy and protracted assertions information |of data |of information} will lead to difficulty in maintaining logical consistency in declared knowledge. They explore the problematic consequence of persistent assumptions within the reasoning method and introduce novel potential solutions This section presents the results from the analysis of the ninety eight primary studies, supported the analysis queries listed antecedent. The results represent the state of AI analysis in IS and is predicated on the subsequent (i) however AI is being outlined, (ii) study by year, (iii) publication channel, (iv) analysis strategies adopted, (v) variety of contribution, (vi) forms of AI and (vii) the rumoured business price of AI.

V. CONCLUSION

The promise of AI in health care business is proved in this literature. AI is on its method to become a lot of helpful at several levels, that ends up in higher and quicker patient outcomes computing, machine learning, deep learning will facilitate United States of America with correct care in helping surgeries, designation diseases like cancer at early stages etc. Some factors that want to be thought-about whereas doing analysis on AI is additionally mentioned during this paper. With the recent advancements in AI analysis, and with the facilitate of support and resources from governments, it is extremely seemingly that use of computing in care can grow extensively and there is Brobdingnagian potential for price savings and improvement in the quality of service in care.

Diabetology must suffer AN adaptation method to include new tools for polygenic disease management. Technology and notably sensors and laptop applications became a key instrument in polygenic disease management for health care suppliers and patients. Though trendy polygenic disease care units ought to embody a polygenic disease technologist¹⁷ for handling technology, doctors and nurses cannot ignore the fundamentals to higher realize solutions to every patient circumstances.

data on internal secretion pumps and a lot of recently on aldohexose sensors has been increasing progressively; but, comprehension concerning AI and sensible applications performance remains mostly inadequate. This text provides a general summary of the elementary ideas, definitions, and language often employed in AI-related applications further as an inventory of relevant publications of AI applied to polygenic disease.

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Smart Computing

Mr. Kadu Sarah Imtiyaz¹, Mr. Hamdule Shaukat Moazzam²

Teacher¹ and Student, TYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Following the well-known concepts of computerization and infomatization, a rising technology of cyberization, which is considered as a reformation of the existing bodily, social and intellectual worlds, has become a hotly mentioned fashion within the new cyber global. Cyberization refers to using conversation and pc technology to interconnect computers and various electronic terminal devices allotted in extraordinary locations. It permits customers to share software, hardware and statistics resources consistent with positive network protocols. Cyberization has substantially advanced the sensible application of computers and has been broadly applied in transportation, finance, commercial enterprise management, schooling, telecommunications, commerce, and so on in our day by day life.*

Keywords: Introduction, Methodology, Review, Privacy, Security, Behavior and influence analytics in social computing, Results & Discussion, Conclusion, Acknowledgement and References.

I. INTRODUCTION

Throughout the cyberization manner, a massive quantity of actual matters will conjugatively map to various sorts and stages of cyber lifestyles in cyber global. It is stated that cyberization has already taken region in a selection of fields together with the development of numerous emerging computing paradigms and records verbal exchange technology, along with ubiquitous/ pervasive computing, social computing and networking, and wearable technologies, and so forth. In particular, with the rapid growth of internet of factors and cognitive cyber-physical systems, increasingly more virtual matters or cyber entities, are engaged or generated inside the included cyber global. Rising technology in clever environments, which include clever computing and smart items, become very large, promising, and enabling troubles in cyberization, to decorate.

The efficiency of sensing, processing, and conversation within the conjugations of physical, social and intellectual worlds. As a consequence, the cyber generation is playing an crucial position in growing powerful techniques of useful resource management, information acquisition, and pattern recognition across cyber-associated structures and packages. All these offer us opportunities to explore clever computing methodologies and computational intelligence algorithms, to be able to facilitate the cyberization system in cyber international.

This unique trouble pursuits to document exquisite research on latest progress in the diverse regions related to smart Computing and Cyber era for Cyberization. Our aim is to shed mild within the more than one factors concerned in the cyberization, encompassing algorithms, techniques, packages, enabling technology and platforms, except security troubles. A total of 36 papers had been submitted from all around the world. After a careful evaluate manner completed by reviewers selected through the visitor Editors, 18 papers had been normal addressing topics that have been categorised within the following classes: (i) infrastructure and systems for intelligent structures, (ii) clever sensors and ad-hoc wireless networks, (iii) behavior and impact analytics in social computing, (iv) gadget gaining knowledge of and clever packages, and (v) privacy and security in clever computing. The precise contributions of every paper are summarized in the next phase.

Infrastructure and platforms for intelligent systems

An crucial thing within the cyberization technique is the computational intelligence techniques and techniques which might be on the middle of cyber global permitting tactics. Recently there has been a extraordinary strengthen inside the fields of system learning (ML) and artificial intelligence (AI). However, a lot of this strengthen has centered on algorithms and their programs. Plenty less emphasis has been given to the underlying infrastructure of those wise systems. Presently, the mainstream in ML/AI consists in paintings being done in my opinion by means of specialists inside the subject, following ad-hoc methods that make collaboration hard, and with little aid from abstractions and tooling to facilitate the deployment of clever systems at scale. Ultimately, that is especially because of a postpone in infrastructure evolution, which has so far been some distance outweighed by way of innovation in system learning techniques. You will say that the systems and

equipment that helped usher in the gift technology of fingers-on system gaining knowledge of are not appropriate to feed destiny generations of the intelligent applications they've generated. Therefore, it is vital to strengthen no longer handiest the algorithms, but also the infrastructure and computing systems that permit the effective and efficient execution of such algorithms.

Inside the context of ubiquitous/pervasive intelligent systems, in addition to inside the cyber-bodily systems (CPSs), cloud computing has been the most prevailing version and platform for information processing and garage. Because of the richness of sources traditional of cloud structures, cloud- based totally CPSs and cloud-assisted IoT make bigger and augment the computing potential of CPSs to behavior resource-hungry packages. The Cloud computing model is eager to use centralized shared sources and addresses the raising recognition of clever apps with the aid of integrating one of a kind resources and the statistics acquired from them.

On the way to provision the bodily resources dynamically, virtualized generation is extensively used for resource management within the cloud structures, which gives an effective manner to improve the aid efficiency of the cloud-based CPSs. Jogging packages on the virtual machines (VMs) makes it viable for high aid utilization and occasional energy Intake. Despite the fact that virtualization strategies have been drastically studied inside the cloud computing subject, there are still numerous open troubles concerned in the allocation and migration of VMs to meet the best of carrier (QoS) demands of cloud-based CPSs. A key challenge entails considering the advantages of migrating VMs to provide better QoS to the consumer while contemplating migration prices, as an example in phrases of transmission delays. In addition, electricity consumption in cloud-based totally structures is likewise an more and more relevant challenge to bear in mind. To satisfy the growing demand for brand new situations which includes CPSs and IoT, abilities of cloud facts centers have grown steadily. Such growth effects inside the increasing power intake of these facts facilities. In instances of strength crisis and with the developing demand for greener and extra sustainable era solutions, decreasing energy intake in facts centers has emerge as a key purpose. The authors inside the paper "A QoS-aware digital device Scheduling technique for strength Conservation in Cloud-based totally Cyber-bodily Systems" purpose to address the aforementioned challenges. Their goal is to discover an choicest VM scheduling method in cloud-primarily based CPSs with QoS enhancement. For such, they endorse a QoS-aware VM scheduling technique for energy conservation, named QVMS. By using offloading several programs to different physical machines (PMs), the workloads on a few under-load physical servers are migrated out, and those servers might be set to idle mode for strength saving. Inside the paper, they first outline some primary principles and present the system model. Then, they formalize the goal feature and gift the limitations assumed to model the solution. Non-dominated Sorting Genetic set of rules (NSGA-III) is adopted to locate the most reliable VM scheduling strategies and acquire the aim of QoS enhancement together with energy consumption, downtime and useful resource usage. Besides, saw (simple Additive Weighting) and MCDM (more than one criteria decision Making) are adopted to pick out the most effective scheduling method. They achieved sizeable experimental evaluations to confirm the effectiveness in their proposed VM scheduling method.

But, notwithstanding the popularity of cloud computing as a backend of clever ubiquitous structures and CPSs, newly rising applications and facts technology are very disturbing in relation to the latency and bandwidth. Their requirements for the optimized shipping community and processing of information done as close to the give up gadgets as viable is likewise rapidly growing. Some of the drawbacks of cloud systems such as latency and jitter outcomes, distance to the server, records protection and privacy, and assist of mobility cannot be solved with the aid of adoption of the hyper-scale cloud computing technology. To conquer a number of such boundaries, the brink Computing paradigm has lately emerged as an answer for handing over statistics and real-time facts processing in the direction of the information source. The aggregate of side Computing with ML/AI gave upward thrust to a brand new paradigm known as aspect intelligence (EI). EI comprises aspect computing this is supported with machine studying algorithms and superior networking abilities. The implication is that a number of records era and operational era industries are gravitating to the edge of the network. The end result is that problems together with cybersecurity, self-gaining knowledge of, real-time networks and tailor-made connectivity can all be appropriately treated. In their previous work, the authors of the paper "A light-weight and value effective part Intelligence architecture primarily based on Containerization era" proposed the concept to build and integrate Docker packing containers within the facet and pinpoint the edge Intelligence's capacity in the vertical-particular eventualities of use. Their modern-day take a look at, protected in this special difficulty, extends this concept similarly and specializes in the utilization of Docker generation into the popularity of human interest. They count on their offered structure to offer significantly shorter

delays in communicate and decision-making in addition to lower the costs associated with these tactics way to adoption of light-weight and not pricey platform.

Since the proposed structure is the usage of ML algorithms and removing any useless communicate with cloud, it may provide extra effective and short selection-making. Undesirable delays are decreased thanks to avoiding of unreasonable roundtrips. As some other contribution of their thought, decreased use of public extensive place networks at the side of the adoption of local algorithms and caching bring about much less highly-priced verbal exchange. In addition they sell an awesome stability of utility's, community's and person's requests a few of the facet and core infrastructure. Eventually, the proposed computing version can make use of decisions associated with the pre-processed records and adopt alarms traded among numerous edge gadgets.

Also leveraging the computational resources at the threshold of the community, the paper "LW- CoEdge: A light-weight virtualization model and collaboration manner for edge Computing" proposes a novel dispensed and light-weight virtualization model focused on the edge tier. Besides a novel virtualization version tailor-made to the threshold tier and assembly the particular necessities of IoT packages, their suggestion encompasses a fixed of heuristic algorithms in conjunction with a P2P collaboration process to perform upon the virtualization model. The algorithms carry out (i) a allotted aid control procedure, and (ii) statistics sharing among neighboring digital nodes (VNs, deployed at facet nodes). The disbursed resource management technique affords every side node with selection-making functionality, enticing neighboring area nodes to allocate or provision on-demand VNs. Thus, the disbursed useful resource control improves device overall performance, serving extra requests and coping with part node geographical distribution. In the meantime, information sharing reduces the statistics transmissions between cease gadgets and facet nodes, saving energy and lowering facts traffic for IoT- area infrastructures.

Many of the present CPSs, manufacturing and employer applications are one of the essential drivers of superior and shrewd networked structures following the trend of enterprise. Massive records are generated in a allotted style and cross-area statistics want to be shared and analyzed in an efficient manner to comprehend an effective supply chain control. Consequently, grasp information control (MDM) that manages how information are saved in a distributed system performs a vital function for corporation facts warehousing and analyses. The paper "master statistics management for production massive records: a way of evaluation for facts network" proposes a multi-layer grasp statistics control architecture and investigates the usage of Set Pair analysis (SAP) to model the disbursed information community. The proposed technique is validated the usage of an aviation company facts and has established the capacity to assist well timed update, reaction, distribution of facts at every degree of the supply chain.

II. METHODOLOGIES

2.1 Smart Sensors and Ad-Hoc Wireless Networks

CPSs depend on a sturdy synergy among computational and physical additives. A CPS is the combination of abstract computations and bodily methods wherein sensors, actuators, and embedded gadgets are networked to experience, screen, and control the physical global. Consequently, clever sensors and wireless sensor networks are essential additives of CPSs. Wi-fi sensor networks (WSNs) are composed of tiny devices geared up with sensing, processing, storage, and wireless conversation capabilities. Each node of the community can commonly have numerous sensing units, capable of perform measurements of physical variables, inclusive of temperature, luminosity, humidity, and vibration, consequently being the main components to create a perception of the bodily world. WSN nodes operate collaboratively, extracting environmental information, appearing same (regularly) simple processing, after which transmitting them to outside systems, via sink nodes, to be analyzed and similarly processed.

Sensor nodes are critically confined regarding reminiscence, energy, and processing capabilities. Therefore, several approaches had been proposed to reduce the energy intake of those nodes with a purpose to make bigger the overall life of the device. When you consider that radio verbal exchange is the dominant aspect of strength consumption in maximum WSN (except for the hungry devices of multimedia sensor networks), an effective method is the discount of facts transmission among the sink and the sensing nodes. One of the most typically used method to reduce radio verbal exchange is the dual prediction mechanism and numerous proposals are pronounced inside the literature. However, even as all existing methods have been proven to be very effective in decreasing the amount of data said to the sink, their efficiency is countered by using a boom in complexity. Moreover, they may be very touchy to facts loss which renders the dual prediction

mechanism out of date. In the paper “Fault Tolerant records Transmission Reduction technique in wireless Sensor Networks”, the authors gift an alternative approach that has as a main gain to be simple but robust, and greater effective in phrases of prediction accuracy and records reduction. Their approach exploits the truth that sensor information adjustments easily over time, therefore they leverage the prediction model proposed in to forecast future readings. They coupled this technique with a facts reconstruction algorithm that exploits each temporal smoothness and spatial correlation among specific sensed capabilities that allows you to estimate lacking values.

Vehicular ad hoc networks (VANETs) are a subclass of mobile advert hoc networks (MANETs), and a promising technique for future shrewd transportation structures (ITS). A VANET commonly helps conversation models, namely automobile to car (V2V) and vehicle to Infrastructure (V2I). Currently, most VANET programs depend upon V2V communications seeing that they do not require luxurious infrastructure. But, as VANET is a totally dynamic community, information need to be exchanged between cellular cars in an efficient way through warding off as a ways as feasible the printed hurricane hassle, that occur on every occasion a big variety of automobiles broadcast messages at the equal time as a consequence main to a community saturation, packet delay and collision problems. In this context, information aggregation is an appealing method allowing to integrate numerous records about comparable activities to generate a summary (aka mixture) and accordingly potentially reducing the community traffic. There are several proposals for information aggregation in VANETs already suggested in the literature. But, the noticeably complicated city and motorway networks produce an awesome traffic facts information that calls for green choice standards and smart filtering before the aggregation procedure. The design of an green statistics aggregation method that mixes correlated visitors statistics or Floating car data (FCD) remains a difficult trouble. The authors of the paper “in the direction of a smarter Directional information Aggregation in VANETs” introduce a brand new records aggregation protocol, referred to as clever Directional facts Aggregation (SDDA), with the goal of choosing the maximum suitable FCD messages that should be aggregated.

Based totally at the aforementioned research works, it is clear that the future CPSs and intelligent packages heavily depend on the presence and vast of bodily sensors and WSNs. To make certain the functionality of an application, which include intruder detection, it is of vital significance to assure the insurance and availability of wi-fi sensors at some stage in deployment. As such, barrier coverage is a essential problem for wireless sensor deployment for lots business and army applications, wherein each wi-fi sensor can sense inside its variety and a set of wi-fi sensors may be deployed to cowl the whole range of a barrier. Over the past decade, one of a kind barrier insurance algorithms were set up for one of a kind varieties of sensors which include seismic and acoustic sensors, even as in recent years, more studies efforts are committed to radar sensor systems. In “gold standard Placement of Barrier coverage in

Heterogeneous Bistatic Radar Sensor Networks”, authors check out the barrier insurance trouble for bistatic radar sensor systems. Specific to the traditional passive sensing version, the Cassini oval sensing model is investigated and an optimal placement approach for heterogeneous transmitters and receivers has been proposed to reap maximum barrier period insurance. The proposed set of rules has been verified through theoretical simulations to demonstrate the most suitable coverage.

Cyber-social networks have considerably progressed social relationships amongst cell users across device-to-tool communications. Within the paper “a detailed review of D2D Cache in Helper choice”, the authors gift a survey work which makes a speciality of D2D helper choice techniques in accordance to 3 simple categories, which include the community frame, computing approach, and social-aware characteristic. Differing from different surveys which in particular do not forget the electricity consumption and latency minimization in D2D networks, they speak the choice of D2D helper based totally on different network architectures, which include content distribution networks, peer-to-peer networks, named statistics networks, mobile networks, and vehicular ad-hoc internet- works. Particularly, a selection of computing paradigms are taken into account to classify D2D helper choice techniques, along with mobile cloud computing, fog computing, and cell aspect computing.

III. REVIEW

Behavior and influence analytics in social computing

In recent years, the advice device has been nicely evolved and is playing an vital role throughout social media. Inside the paper “ICFR: An effective Incremental Collaborative Filtering based totally recommendation architecture for personalized web sites”, the consumer- primarily based collaborative filtering algorithm is carried out in an incremental advice

implementation approach, wherein three essential factors: consumer, item, and rating, are redefined, and relationships among user choices and recommended content material are applied to enhance the person-based collaborative filtering set of rules. Furthermore, customers' surfing behaviors are extracted primarily based at the evaluation of net logs from customized web sites, which could facilitate the update of customers' historic choice within the design of an incremental algorithm. Experiments demonstrate the excessive overall performance of the proposed approach evaluating with traditional updating strategies.

Following the fast improvement of cellular social networks, the paper "From Crowdsourcing to Crowd mining: the use of Implicit Human Intelligence for better know-how of Crowd sourced information" discusses the concept of crowd mining and affords a everyday version for the improvement of crowd mining systems. The simple concept is to find out and higher make use of the implicit human intelligence hidden in man or woman behavior patterns and crowd-item interaction patterns underneath a certain network context. The authors introduce a simple body- work to recognize the crowd sourced statistics with a formal description and discuss its usage in several trendy obligations in phrases of statistics mining such as type, filtering and grouping. Based on those, they describe case research, particularly the crowd event and crowd trip, which make use of the strength of implicit human intelligence to facilitate the event sharing and experience planning respectively. Particular scenario applications are presented, and the test evaluation display the effectiveness of the proposed method in occasion localization and detection, and journey course generation the use of on line/offline crowd sourced facts.

Behavioral analysis has drawn an increasing number of attentions for mobile computing software in massive records environments. To cope with the special problem of have an effect on maximization in social networks, the paper "three-hop speed Attenuation Propagation model for affect Maximization in Social Networks" proposes a 3-hop speed attenuation propagation model, primarily based on which the authors layout an algorithm for the most of impact considering the grasping set of rules with heuristic set of rules. Within the constructed community version, the sum of changed ranges of the active nodes is hired to degree the effect of a node. In one of these manner, the have an effect on of a single node can be effectively modeled and represented, and the shortage of diffused have an impact on resulting from the 3-hop simulation may be further made up. Two different datasets gathered from DBLP and fb are used to conduct the propagation simulations, and the experiment outcomes display the high performance of the proposed approach comparing the conventional greedy algorithms. Results:

Machine Learning and Intelligent Applications

Sensors and WSNs play an essential position inside the CPSs and sensible applications via offering essential infrastructure and information resources. But, how to method facts to guide decision making and provide "intelligence" in systems and programs remains a large mission. In recent years, ML has proven first-rate ability to many applications in client electronics, commercial, and protection and surveillance applications. On this special difficulty, several particular studies works are supplied on numerous novel ML techniques and sensible applications.

As networked systems are becoming more and more complicated, computerized operations and protection have become enormously critical to ensure efficient and dependable device operations. As the technologies evolved, the focus of advanced technologies also shifted to offer more intelligent and extra "personalized" offerings to cease users. This trend may be found from patron electronics to even production organizations to have customized products and services. Consequently, advanced technology for figuring out the person have become a very crucial topic to ensure the transport of secure and comfortable non-public offerings. Whilst there are numerous uni-model private identification strategies consisting of password, facial, voice, and fingerprint, each modality exists its very own weaknesses which may make the overall gadget vulnerable. Inside the paper "An correct Multi-Modal Biometric identity system for man or woman identity through Fusion of Face and Finger Print", a multi-modal man or woman identity

Approach is proposed with the aid of fusing facial and fingerprint statistics. The proposed approach has been tested with four distinct datasets and has finished a promising popularity accuracy of ninety nine.59%.

Special to conventional synthetic intelligence (or gadget intelligence), research efforts are also dedicated to mimicking unique human traits, behaviors, and personalities. In addition to offer intelligence, researchers are in search of approaches to seize and represent the distinctiveness of people in reaching human-like (or even man or woman-like) artifacts which includes digital avatars and humanoid robots. But, there's yet a complete model to systematically describe human trends and personalities. The paper "From have an effect on, Behavior, and Cognition to character: An included personal individual

model for character- like intelligent Artifacts” offers a huge overview on the present non-public man or woman fashions (PCMs) from one of a kind research arenas and views which include psychology and computational intelligence. A singular PCM is proposed to seize comprehensively personal influences, behaviors, cognition, and the intra- and inter-relationships between those personal traits. The feasibility of the proposed PCM model has been verified with the aid of extracting representative personal characteristics via various private facts which include wearable gadgets and cognitive assessments.

IV. DISCUSSION

4.1 Privacy and Security in Smart Computing

Certainly one of the largest issues in the cyber world is safety. Via delegating manage of physical strategies to virtual entities, often accessed via wireless networks, a number of vulnerabilities arise. Without solving protection issues, it isn't feasible to leverage the paradigms linked to the cyber physical structures. As cyber-attacks grow to be greater frequent, the studies community has offered several techniques (e.g. Heuristic techniques) to locate and examine malicious programs (also referred to as malware). However, designing effective and green malware detection processes poses numerous demanding situations and nonetheless has open troubles, for instance due to counter-malware detection efforts via malware authors and cyber criminals. There are three main approaches for reading malware: static, dynamic and hybrid, each of them with their own execs and cons. Looking to mitigate a number of the drawbacks of cutting-edge static, dynamic and hybrid malware detection tactics, multi-view mastering is a promising solution. Multi-view data are very commonplace in actual global applications, in which statistics are often gathered from unique sources, using distinctive measuring strategies. Specific information assets shape one of a kind characteristic units, and every set is known as a view. Any particular unmarried-view records can't comprehensively describe the phenomenon under commentary. Influenced by using this, multi-view getting to know is an emerging direction in machine gaining knowledge of which considers mastering with more than one perspectives to enhance the generalization overall performance. To conform multi-view mastering for malware hazard looking, the authors of the paper “A Multiview learning approach for Malware danger hunting: home windows, IoT and Android as Case research” leverage the ability of the usage of executable files for both malware or good ware (i.e. Non-malware) as the source for multi-view records extraction. The venture they tackle on this context is to determine what algorithm may be used to successfully extract functions from executable documents. Current procedures normally use unmarried view facts for malware detection or a combination of some views within the form of a single view [35, 36, 39]. Of their paper, the authors recommend an efficient ensemble multi-view getting to know approach, which automatically assigns optimized weights to specific perspectives. The proposed method is a huge margin classifier that improves generalization the use of a worldwide most desirable hypothesis. To demonstrate adaptability of the proposed Approach in detecting malware on one of a kind platforms, they examine their device with datasets comprising internet of factors (IoT), windows and Android malware.

Further to the demanding situations of coping with cyber-attacks, which arise in a variety of situations and application domain names, cyberization poses numerous security and privateness demanding situations in the specific situation of IoT structures. Given its relatively dynamic and heterogeneous scenario, besides the opportunistic and ad-hoc nature of interactions, in an IoT gadget it's far hard to carry out identification control, guarantee the trustworthiness of records, detect abnormal behaviors and manipulate the access to numerous data. Information provenance has the capability to resolve some of the aforementioned troubles in IoT via recording statistics approximately statistics origins, data operations and processing records from its supply to modern kingdom. As a result, it turns into possible to song the resources or origins of several varieties of troubles associated with abnormal behavior, trustworthiness and statistics get admission to in IoT. Despite the fact that long followed in data structures and information mining techniques, for the cause of identifying the owner of an item/data or its origin, creator and the way the data became communicated or processed, investigations of statistics provenance within the context of IoT have handiest currently begun. The authors in designed a conceptual model as a common structure of data provenance in IoT. Since this first paintings, increasingly researchers started to pay attention to facts provenance in IoT and some provenance control schemes were proposed and applied in various sensible IoT services. However, the literature nevertheless lacked a comprehensive survey on records provenance in IoT. To be able to fulfil this gap, the paper “A Survey on statistics Provenance in IoT” [1] reports the findings of a complete survey on present works associated with this discipline. As main contributions, the authors (i) advocate uniform standards on information provenance in IoT by way of analyzing IoT allotted structure and reviewing facts provenance techniques and packages, (ii) review

existing works on facts provenance in IoT and analyze their professionals and cons consistent with our proposed criteria and protection requirements, and (iii) point out a number of open issues based totally at the thorough survey and try to offer guidance for destiny research inside the subject of statistics provenance in IoT with the aid of evaluating its recent enhance.

V. CONCLUSION

This unique problem aims to promote the development of cyber-associated information and communication technologies in clever computing. Particularly, a spread of essential subjects are addressed on this unique trouble, such as: information Modeling and management for Cyberization, statistics Sharing and Dissemination in clever Computing, clever manage and tracking for Cyberization, Cognitive bodily-Social Networks, content analysis and Mining in Cyber-Social Networks, Behavioral Analytics throughout smart Networks, Deep studying in Cyberization, aid management in heterogeneous Networks, intelligent Transportation structures the usage of smart Networks, smart internet of things, Cyber-bodily-Social statistics Processing and Intelligence Mining, smart data Streaming and actual-Time Processing, smart Sensors and advert-Hoc wireless Networks, facts garage and Integration in our on-line world, Semantic web Mining in clever Computing, Infrastructure and Platform for smart community structures, Wearable technology in smart Environments, mobile Computing with clever Sensors, smart electricity control and Sustainability, privacy and safety in smart Computing, and so forth.

The prevalent papers have attracted researchers (corresponding authors) across trans - disciplinary research fields from 11 distinctive countries, inclusive of Australia, Brazil, China, Finland, France, Japan, Saudi Arabia, Singapore, united kingdom, US, and Tunisia. Consequently, this unique difficulty may have a remarkable significance and impact on: i) studying cyber and cyber-conjugated matters for the cyber-enabled new worlds; ii) organizing the body of expertise in cyber-related researches and programs with complete frameworks in inter-, trans- and multi-field fields; iii) improving cyber technologies no longer best in fundamental research works, but also in application gadget development.

ACKNOWLEDGEMENT

The paper consist of the information related to smart computing. It focuses on the following elements and values such as introduction, methodologies, privacy, security, behavior and influence analytics in social computing, results and discussion followed by conclusion and references. I hereby declare that all the information provided in the respected paper is authenticated, authorized and hence reliable. I would like to thanks all the viewers and readers of this paper for their precious time.

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Cyber Security

Miss. Kadu Sarah Imtiyaz¹ and Miss. Shrivardhankar Reem Ashfaque²

Teacher¹ and Student, SYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *In the current world that is controlled by innovation and organization associations, it is vital to know what network protection is what's more, to have the option to utilize it really. Frameworks, significant documents, information, and other significant virtual things are in danger on the off chance that there is no security to safeguard it. Whether it is an IT firm not, each organization must be safeguarded similarly. With the improvement of the new innovation in digital protection, the aggressors also don't implode behind. They are consuming better and improved hacking methods and point the flimsy parts of numerous organizations out there. Digital protection is fundamental since military, government, monetary, clinical and corporate associations gather, practice, and stock remarkable amounts of information on PCs and other gadgets. A significant standard of that information can be delicate data, whether that be monetary information, licensed innovation, individual data, or other different sorts of information for which illicit access or colleague could guarantee negative worries.*

Keywords: Introduction, Methodology, Review, Benefits, Hindrances, Results & Discussion, Conclusion, Acknowledgement and References.

I. INTRODUCTION

A successful online protection strategy has various layers of safeguard spread across the networks, PCs, projects, or information that one means to keep non-harmful. In a general public, the processes, individuals and apparatuses should all backup one choice to create a genuine safeguard on or after digital assaults. A bound together danger the executives framework can motorize increases across select Cisco Security merchandise and accelerate key security processes capacities: revelation, assessment, and remediation.

1.1 People

Shoppers should appreciate and comply with fundamental data security morals like choosing solid passwords, fact careful about adornments in email, and back up information. Learn extra around fundamental network safety values.

1.2 Processes

Legislatures should have a diagram for how they contract with together endeavored and well-known digital assaults. Some very much regarded diagram can accompany you. It explains how you can perceive sessions, safeguard associations, notice and answer to dangers, and improve from fruitful events.

1.3 Technology

Innovation is essential to giving people and associations the framework security devices needed to safeguard themselves as of digital assaults. Three boss objects fundamental be compromised: endpoint methodologies like PCs, handheld gadgets, and switches; frameworks; and the cloud. Shared innovation cast-off to safeguard these objects contain cutting edge firewalls, DNS pass through a channel, malware safeguard, antivirus instruments, and email wellbeing results.

Digital may be particular as fairly associated with the assortment of workstations or the network. Simultaneously, security implies the system of safeguarding anything. That is why the terms Cyber and security took coordinated characterize the method of cautious client data on or after the angry assaults that could piece of information to the security break.

The time has been pushed off for a period back a short time later the web happening creating like no big deal either way. By resource of Cybersecurity, any general public or any client can safeguarded their basic information from programmers. Although it is fearful with hacking at around point, it as a matter of fact utilized moral hacking to invention Cybersecurity in any construction.

1.4 Definition

It very well may be characterized as the methodology to ease the security fears to safeguard notoriety harm, business misfortune or monetary loss of all gathering. The term Cybersecurity clearly expected that it's a delicate of safety that we proposition to the association that successive clients can contact utilizing the web or over an organization. There are various handles and procedures that are castoff to send it. The best critical truth around protecting data is that it's anything but a one span technique yet, a relentless cycle. The association owner needs to keep stuffs modernized in order to keep the peril low.

1.5 How does the Cyber Security make working so easy?

No wavering that the apparatus of Cybersecurity makes our work extremely simple by guaranteeing the attainable quality of the capitals restricted in any organization. A business or society could look a colossal harm if they are not legit about the security of their on the web event. In the present connected world, everybody helps from moderate digital guard plans. At a separate level, a network protection flare-up can result in total from independence burglary, to extort endeavors, to the harm of essential information comparative family photos. Everyone depends on risky structure like impact plants, hospitals, and money related assistance organizations. Getting these and different social orders is fundamental for trust our human progress usable. Everyone likewise compensations from the work of cyberthreat specialists, comparable the group of 250 gamble specialists at Talos, whoever investigate new what's more, creating fears and digital session strategies. They reveal new susceptibilities, show the local area on the place of online protection, and harden open source gears. Their work denotes the Internet innocuous for oneself what not.

II. METHODOLOGIES

2.1 Types of Cyber Security

A. Phishing

Phishing is the practice of dispersion counterfeit interchanges that resemble messages from trustworthy sources. The objective is to deal insightful information practically identical to Visa subtleties and login information. It's the best sort of digital assault. You can assist with protecting physically over learning or a mastery arrangement that strainers malevolent electronic mail.

B. Ransomware

It is a sort of malignant programming. It is considered to remove money by hindering contact to records or the PC framework until the arrangement is paid. Paying the payment doesn't affirmation that the records will be recovered or the framework returned.

C. Malware

It is a kind of programming expected to acquire unlawful right to utilize or to make impedance a framework.

D. Social Engineering

It is a strategy that adversaries use to imagine you into enlightening sensitive data. They can implore a monetarist installment or improvement admittance to your saved information. Social designing can be aggregate with a portion of the pressures enrolled above to style you extra plausible to associate on joins, move malware, or conviction a pernicious reason.

III. DISCUSSION AND RESULTS

3.1 Goals of Cyber Security?

The authoritative target of network safety is to protect the information from fact taken or co-worked. To accomplish these we angle at 3 significant objectives of network safety.

1. Guarded the Privacy of Information
2. Moderating the Integrity of Information
3. Controlling the Obtainability of data as it were to supported clients

These targets practice the privacy, respectability, accessibility (CIA) ternion, the foundation of totally security plans. This CIA ternion model is a security model that is planned to direct systems for information security inside the spots of a general

public or company. This model is comparably referenced to instead of the AIC (Availability, Integrity, and Confidentiality) ternion to evade the error with the Central Intelligence Agency. The fundamentals of the ternion are mirrored the three biggest fundamental systems of security. The CIA norms are one that most noteworthy of the social orders and organizations practice whenever they have associated another solicitation, makes a record or while guaranteeing admittance to around data. For information to be absolutely protected, all of these protected keeping regions should start into result. These are protected keeping techniques that all work together, and thus it tends to be mistaken to direct one arrangement. CIA set of three is the best aggregate norm to measure, decision and machine the legitimate wellbeing boards to consolidate risk.

1) Confidentiality

Making ensured that your complex insights is reachable to licensed clients and protecting no information is uncovered to accidental ones. In the event that, your key is private and will not be shared who power experience it which eventually hampers Confidentiality.

Techniques to defend Confidentiality:

- Information encryption
- Two or Multifactor check
- Affirming Biometrics

2) Integrity

Ensure every one of your information is exact; reliable what's more, it should not be change in the show from one truth to another. Trustworthiness guarantee strategies:

- No illicit will have access to erase the records, what breaks protection too. Thus, there will be
- Administrator Contact Controls.
- Suitable reinforcements should be reachable to get back generally.
- Adaptation administrative should be close by to check the log who has changed.

3) Availability

Each time the administrator has requested an asset for a part of insights there will not be session sees like as Denial of Service (DoS). Completely the proof must be reachable. For model, a site is in the possession of assailant's resultant in the DoS so there hampers the attainable quality. The following are not many strides to keep up with these objectives: Arranging the belongings in view of their position and priority. The most significant ones are held back protected at all periods.

1. Holding down potential dangers.
2. Deciding the strategy for safety officers for every danger
3. Checking any penetrating exercises and overseeing information very still and information moving.
4. Iterative support and answering any issues included.
5. Refreshing strategies to deal with risk, in light of the past evaluations.

IV. REVIEW

4.1 Benefits

- It comprises of various in addition to focuses. As the according to term itself, it offers security to the organization or framework, and we as a whole realize that getting anything has a part of benefits. A few advantages are proclaimed beneath. Getting society – Cybersecurity is about defending an associations network from outside assaults. It checks sure that the general public ought to accomplish good and should detect protected around its significant information.
- Security of complicated information - The profoundly private information like understudy information, patient information and exchanges information must be protected from unlawful access with the goal that it couldn't be changed. It's what we can achieve by Cybersecurity.

- Hamper illicit access helps us protect the framework in the wake of being recovered by someone who is not authorized to get in touch with it. The information is saved profoundly safeguarded and could be made with legitimate clients.

Network safety conveys security close to burglary of information, safeguards workstation from burglary, lessening PC freezing, conveys protection for administrators, I recommendations severe order, and it's tricky to exertion with non-specialized individuals. It is the main salaries of assurance PCs, safeguards them contrasted with worms, infections and extra undesired programming. It manages securities against scornful assaults on a framework, erases as well as keeps scornful essentials in a prior network, stops illicit network access, dispenses with programming on or later different bases that may be co-worked, as well as gets complicated information. Network protection offers upgraded Internet security, propels digital adaptability, speeds up framework information, and data guard for enterprises. It monitors individual private information, it safeguards nets and capitals and difficulties PC programmers and burglary of character. It prepares for information burglary since vindictive administrators cannot disturbance the organization development by applying a high-security methodology. Secure the hacking procedure. Convey security of information and association. This can be achieved by applying security rules and framework conventions well.

4.2 Hindrances

The firewalls can be trying to design accurately, deficient arranged firewalls may preclude administrators from execution any presentation on the Internet prior the Firewall is accurately associated, and you will carry on to progress the most recent programming to recall protection current, Cyber Security can be expensive for ordinary clients. In expansion, network safety needed cost a significant number of administrators. Firewall rules are difficult to accurately design. Makes conspire security for the week or incidentally excessively high. The typical is exorbitant. The administrator can't right to utilize different organization offices through ill-advised firewall rules.

4.3 More Pandemic-Related Phishing

Cybercriminals will keep on utilizing the Coronavirus pandemic as a subject for their phishing efforts. Assaults frequently correspond with significant occasions, like a flood in new cases or the declaration of another medication or immunization. Their fair-minded is to get unsuspecting fatalities to tick on a malevolent connection or embellishment or surrender complex information.

New wrinkles on the "Nigerian Prince" fiddle

In the exemplary Nigerian Prince trick, a staff playing to be far off regal's true capacities to extend you parcels assuming you convey your financial balance information. Presently phishing programmers are claiming to be with a government office conveying financial upgrade installments. In any case the trick works something similar.

4.4 Speeding up Ransomware Assaults

Network protection Speculations has eaten past cybercrime information and gauges that a business will fall setback to a ransomware session like clockwork in 2021. That is discouraged from every 14 seconds in 2019. The general expense of ransomware will go past \$20 billion around the world.

4.5 Developing Quantities of Cloud Breaks

While cloud framework is very secure, clients are answerable for carrying out network protection includes and designing them accurately. Cloud misconfigurations are normal wellsprings of information breaks, and the number is normal to increment as more organizations embrace cloud administrations to help telecommuters.

4.6 Expanding Dangers Focusing on Client's Gadgets

Staffs at telecommute are consuming frameworks that aren't fix up, achieved and safeguarded by the business IT office. It expands the organization's assault surface, and gives programmer interior into the framework that sidestep line wellbeing. Basic business information is presence to kept on these frameworks, further group the risk of an information break.

4.7 Assaults occurring in the Internet of Things (IoT) frameworks

An increasing number of associations are carrying out IoT gadgets and applications to catch information, remotely control and make due foundation, upgrade client care, and that's just the beginning. Numerous IoT gadgets need vigorous security, creation them vulnerable to assault. Programmers can increment system of methodologies for training in botnets, and impact IoT faintness to get close enough to the organization.

V. CONCLUSION

The impending of network safety will in one knowledge resemble the current: difficult to depict and possibly boundless as advanced abilities connect with humanoid across basically all elements of arrangements, society, the family, and outside. We built this project on the suggestion that together the "digital" and the "security" instruments of the thought "network safety" assurance be in quick sign all through the back portion of the 2010s. That motion is more likely to revive than to slow, however its way shifts widely among our circumstances. That is no article of our examination system; it is the fundamental place of the work. We envision that, at around point in the not-really far off prospect (on the off chance that it is not beforehand verifiable at contemporary), network safety resolve be perceived widely as the "ace issue" of the web period. That places it at the most elevated of any rundown of troubles that human advancements face, extra similar to an almost existential preliminary like climate change than to a working misgiving that innovation organizations need to succeed. That appreciation likewise will convey major varieties to how humanoid and computerized apparatuses act together. The purpose of these five situations is to opinion to some of the ups and downs that might result. In this effort, we have left influences about straight-up armed to military "cyberwar" to the cross. It is our certainty that these circumstances brief broad reasoning and discussion that they make a greater number of questions than responds to, additional strong examination thoughts and unique arrangement proposition than secure determined declarations about what need or need not be finished. With that in consideration, we offer under some exceptionally significant level prompt focuses and aggravations that emerged from this work. The most arrangement is expanded, obviously, at what time explicit entertainers and legislatures use circumstances like these to develop more itemized and pointed ideas appropriate to their own advantages, capacity, risk acknowledgment and situating. Thus we assume that users will ask themselves this: tested with a view of forthcoming possibilities that highlight the subjects these situations high point, what will online protection inferred to mean after my perspective and what might I, or the association(s) that I am essential for, do a while later? Same way fundamentally, what will fundamental after essential examination and technique in request to achieve the best network protection results I can literally predict?

ACKNOWLEDGEMENT

The paper consist of the information related to cyber security. It focuses on the following elements and values such as introduction, methodologies, benefits, hindrances, results and discussion followed by conclusion and references. I hereby declare that all the information provided in the respected paper is authenticated, authorized and hence reliable. I would like to thanks all the viewers and readers of this paper for their precious time.

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Sensors

Miss. Ifra Hidayat Datey¹ and Miss. Mariya Ghalte²

Teacher¹ and Student, TYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *The availability and wide range of application of low cost sensors have encouraged a demand for improved sensor performance. Integrated sensors are being developed to meet the designer's need for simpler systems. Smart sensors are becoming integral parts of systems performing functions that previously could not be performed or were not economically viable.*

Keywords: Introduction, Methodology, Review, Privacy, Security, Behavior and influence analytics in social computing, Results & Discussion, Conclusion, Acknowledgement and References.

I. INTRODUCTION

We can find sensors everywhere, and the whole world is full of sensors and their applications. There are many types of sensors available around us, in our offices, gardens, shopping malls, homes, cars, toys etc. These sensors make our lives so easy and comfortable, starting from applications such as switching on the lights, fans, television (TV), automatic adjustment of the room temperature by air conditioning (AC), fire alarm, detecting obstacles when the car is reversing, making a thumb impression etc. A sensor is a device which receives signals as well as responding to a signal or stimulus. The stimulus signals can be defined by the measure, property, or state which is sensed. We also can say that a sensor is a translator that converts a nonelectrical value to an electrical value [1–3]. The output signal of a sensor may be in the form of voltage, current, or charge. A sensor has many forms of input properties and electrical output properties. If there is small change in the sensed quantity, it will cause a small change in the electrical output and the changes can be detected with their measuring capabilities. All the sensors are categorized on the basis of their uses, applications, material used and some production technologies. Some sensors are classified also by their characteristics such as cost, accuracy or range of sensor. There are two main types of sensors: passive sensor and active sensor. A passive sensor does not require any extra energy source and electric signal is produced directly in reply to stimulus of external sources. This means that the sensor converts input energy to output signal energy [1, 4, 5]. Examples of passive sensors include photographic, thermal, electric field sensing, chemical, infrared and seismic. The active sensors need external sources of energy for their response, known as excitation signal. To produce the output signals, sensors adopt necessary changes to these input signals. The active sensors are also known as parametric sensors due to their own properties which can be modified in response to an exterior effect and these properties can be afterward changed into electric signals. Active sensors have a variety of applications related to meteorology and observation of the Earth's surface and atmosphere.

1.1 Infrastructure and Platforms for Intelligent Systems

Upon receiving the input stimuli, the sensor produces output which is obtained from several conversion steps before it produces an electric signal [1, 6–10]. The performance of sensors is described in terms of relationship between input and output signals. Sensors are characterized depending on the values of some of the important parameters. The characteristics of sensors are described here in this section.

1.2 Types of Sensors

There are many sensors commonly used in various applications [1, 11–21]. All these sensors are categorized as per their physical properties like temperature, resistance, pressure, heat flow etc. The following is a brief discussion on different types of sensors.

A. Temperature Sensors

A temperature sensor is used to measure the amount of energy in the form of heat and cold produced by an object and system. It allows one to sense or detect any physical change to that energy and gives the output as analog or digital.

Temperature sensors are used in various applications such as notification of environmental temperature, medical instruments, automobiles etc. According to application and its characteristics, many different types of temperature sensors are available. There are basically two types of temperature sensors, contact temperature sensor and non-contact temperature sensor. In contact temperature sensor, there is physical contact with the object being sensed and to monitor the change in temperature, conduction is used. It is used to sense solids, liquids or gases over a wide range of temperatures. In a non-contact temperature sensor, we use convection and radiation properties to measure the changes in temperature. It uses radiant energy in the form of heat and cold.

- **Thermostat:** The thermostat is a kind of contact temperature sensor employing an electro-mechanical component and using two thermally different kinds of metals, nickel, copper, tungsten or aluminium etc, which are stuck together to form a Bi-metallic strip. When it is cold, one of the strips is contracted and its contacts are closed and current passes through the thermostat. When it is hot, one metal strip is expanded and opens the contacts to stop the flow of current.
- **Thermistor:** The thermistor is another type of temperature sensitive device or resistance whose electrical resistance changes as the object temperature changes. This is made up of semiconductor materials. When temperature of the object or surroundings increases or decreases, resistance will also increase or decrease. How much the resistance will increase or decrease depends on the properties of the semiconductor material. The thermistor is of two types: positive temperature coefficient, (PTC) and negative temperature coefficient, (NTC). In PTC, resistance value increases with an increase in the temperature and in NTC, its resistance value goes down with an increase in the temperature. Thermistors are used for precise temperature measurement, control and compensation. Thermistors are highly sensitive and exhibit non-linear characteristics of resistance versus temperature. Generally, these are made up of manganese, nickel, cobalt, copper and iron.
- **Resistive temperature detector:** The resistive temperature detector (RTD) is also known as resistance thermometer, and used for measurement of temperature. It is based on the temperature coefficient of sensors and generally composed of high-purity conducting metals like platinum, copper or nickel. These materials are looped into a coil whose changes of electrical resistance depend on a temperature function. The working principle of an RTD is very similar to that of the thermistor.
- **Thermocouple:** The thermocouple is a device which is used for the measurement of the temperature variation in a measurement of sensors. The thermocouples are coupled with two metals joined together forming a junction. Thus, there are two junctions in the metals, one is called hot junction and other is called cold junction, also referred as measuring junction and reference junction, respectively. These junctions are kept at different temperatures due to the change of EMF (electromotive force) induced in a thermocouple and output voltage obtained with the help of the relationship between the voltage and temperature. When the two junctions are at different temperatures, a voltage is developed across the junction which is used to measure the temperature sensor. The thermocouple is based on three main effects: Thomson effect, Seebeck and Peltier effect. It has broadest range of temperatures of all the temperature sensors, covering from -200°C to 2000°C .

B. Position Sensors

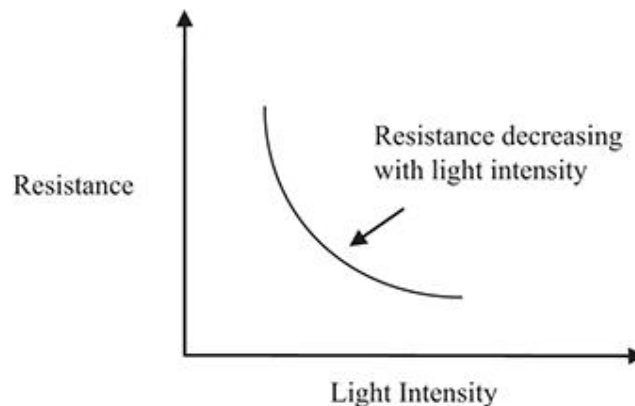
The position sensor detects the position of an object either linearly or in rotation with respect to some fixed point or position. Position can be determined by the distance between two points moving away from some fixed points. We can measure the displacement of position in a straight line by linear sensor and angular displacement using rotational sensors. Position sensors are also known as potentiometers and used to measure the displacement of the object. A potentiometer can be an electrical or resistive type of sensor, because its working principle is based on change in resistance of wire with its length. This converts rotary or linear displacement to electrical voltage. The resistance of wire is directly proportional to length of wire. If the length of wire changes then the resistance of wire also changes. Potentiometers are available as rotary and linear potentiometers in the market, and can be used to measure the angular position and linear position, respectively; through voltage division the changes in resistance can be used to create an output voltage that is directly proportional to the input displacement.

The sensors have three terminals, where the one in the middle is known as the wiper, and the other two are known as the ends. The wiper is a movable contact where resistance is measured with respect to it and either one of the end terminals.

The displacement of the moving object is measured with the help of the sliding element of the potentiometer. When position of the moving body changes then its resistance between two fixed points also changes. The result is obtained in the form of differential output voltage which varies linearly with the movement of core position. The resulting output signal has both the amplitude and polarity. Amplitude is calculated as linear function of the displacement and polarity gives the direction of movement. Major advantages of the potentiometer include user friendly operation, low cost, high amplitude output and the sensors are used for measuring even large displacement, but its operating cycles are limited.

C. Light Sensors

A light sensor is a photoelectric passive sensor which changes the light energy into an electrical signal output. It measures the ambient light which is surrounding light, room light and reflected light. The major component of a light sensor is the light dependent resistor (LDR) or photoresistor. It is a resistor that depends on the light which changes its resistance depending on the amount of light incident on it. The sensors are made up of semiconductor materials and therefore when light is incident on semiconductor material it becomes low conductive and therefore has less resistance. When we increase the light intensity, its resistance decreases and vice versa which is shown in figure 1.2. Intensity of light falling on an LDR is measured in lux.



There are different kinds of light sensors such as photoresistors, photodiodes, photovoltaic cells, phototubes, photomultiplier tubes, phototransistors, charge coupled devices (CCDs) etc.

D. Sound Sensor

A sound sensor is also known as auditory and used to detect the intensity of sound. It converts the acoustic wave into an electrical signal output. These sensors can also detect sound pressure waves which are not within the audible range, making them suitable for a wide range of tasks. Sound sensors are mostly used for security purposes.

E. Proximity Sensor

A proximity sensor can be used for detecting the presence of a nearby object without any physical contact. It emits an electromagnetic field for a beam of electromagnetic radiation as infrared instances and changes in the field returning a signal. The object being sensed is often referred to as the proximity sensor's target. Depending on different types of proximity sensors, different targets are used. For example, an inductive proximity sensor needs a metal object, whereas a capacitive photoelectric sensor is suitable for a plastic target. A proximity sensor has high reliability due to the absence of mechanical parts and lack of physical contact between the sensor and target. It has very short range when used as a touch switch. It is commonly used in industrial applications, manufacturing of food production, mobile phones etc.

F. Accelerometer

This sensor is used to detect the acceleration of an object, and operates by sensing the acceleration of gravity, and the direction of the object is calculated. This sensor is a kind of micro electromechanical system (MEMS), which uses a silicon integrated circuit. These sensors convert the mechanical motion caused in an accelerometer into an electrical signal by using the piezoelectric, piezo-resistive and capacitive components.

G. Infrared Sensor

An infrared (IR) sensor consists of two packs, one is Rx (receiver) and the other is Tx (transmitter). Transmitters are used in transmitting the rays in the infrared spectrum and the receiver receives the IR spectrum range. In the IR spectrum, the voltage is given between its terminals and then it emits rays. The main principle of working of an IR sensor is reflectivity by an object. When an object is placed in front of the transmitter it tends to reflect the rays that are coming from the IR sensor back to the IR sensor. Whenever a ray that is reflected by an object is received by the receiver it generates a voltage level across the terminal. This voltage level depends upon the intensity of light that is reflected by the object. Transmitter and receiver are placed side by side, and the IR transmitter transmits a signal within a limited range and going to a certain distance. When IR rays hit the surface, some rays are reflected depending upon the colour of the surface. The brighter the colour the more IR rays are reflected; similarly, the darker the surface the more IR rays are absorbed by the surface and fewer IR rays are reflected back.

H. Pressure Sensor

Pressure is an external force exerted on a surface in unidirectional areas. We commonly measure the pressure of liquid, air and other gases. A pressure sensor monitors this pressure and is sometimes called a pressure transmitter as it converts pressure into an electrical signal. The most common type of pressure sensor is the strain gauge-based pressure sensor. Conversion of pressure into electrical signal is achieved through the physical deformation of strain gauge which is bound into the diaphragm of the pressure sensor. The strain will produce a change in electrical resistance which is proportional to the pressure. Change in voltage is the result of ambient pressure. A pressure sensor can also be used to measure other variables such as fluid or gas flow, speed, water level, and altitude.

I. Ultrasonic Sensors

An ultrasonic sensor uses ultrasonic waves for the purpose of sensing and measuring the distance of a particular object. Ultrasonic waves are very high frequency waves. The sensors have two main transducers, namely transmitter and receiver. A transmitter uses 40 KHz of frequency wave transmitted in the air and when it is blocked by an object then it gets reflected and bounced back to the sensor. These reflected waves are absorbed by the receiver of the sensor. So, the total time taken by the ultrasonic waves to travel from the transmitter to the object and again from the object to the receiver of the sensor is given by the output of the sensor. Ultrasonic sensors are used in many applications such as robotics, driverless cars, for measuring distance, and also in radar systems etc.

J. Touch Sensor

Touch sensors are sensitive to touch, pressure and force. The sensors operate as switches and when the surface of the sensor is touched the current starts to flow in the circuit just like current flowing in a closed circuit. When there is no contact, it performs like an open circuit and no flow of current is reported. There are two types of touch sensors, capacitive and resistive. The touch sensors are used popularly in modern gadgets such as smartphones, and other handy devices.

- **Capacitive sensor:** The capacitive sensor has an important element as a capacitor. Parallel capacitors are generally placed like top and bottom plates at some certain distance and between these parallel capacitor plates there is a dielectric medium. The main principle of change in capacitance is used such that it may be caused by change in overlapping area, change in distance between two plates and change in dielectric constant. Changes of these parameters can be made by the physical variables like displacement, force, pressure and flow of liquid. Capacitance and output impedance are measured with a bridge circuit. An extremely small force is needed to operate them and hence they are very useful for a small system. The sensors are highly sensitive with good frequency response and high output. As force requirement is small, thus the power requirement is also less to operate the sensors. The metallic parts of the sensor must be insulated from each other in order to reduce the effect of stray capacitance.
- **Resistive sensor:** The resistive sensor is based on the change in resistance of the material and is used to measure temperature, displacement, moisture etc. A slider is free to move between two points and at a certain point we get the zero output and at some other point we get the maximum output. The output voltage is obtained between these two points and it is directly proportional to displacement. So, the change in length of the wire causes the change in the value of the resistance. This property is utilized to measure the changes in displacement using resistivity and

resistance. When the fixed voltage is applied across end terminals of the sensor, a proportional voltage is generated across the slider and this voltage can be calculated using voltage divider rule. As distance increases, the output voltage will also increase. The resistive technique used in this sensor can be used to sense or measure linear displacement.

K. Humidity Sensor

Humidity is the amount of water present in the surrounding air and a hygrometer is the device which measures humidity directly. Humidity is a non-electrical quantity that is converted into electrical quantity by using resistance, capacitance and impedance properties. There are various parameters that change due to humidity. There are five basic types of humidity sensor: resistive hygrometer, capacitive hygrometer, microwave refractometer, aluminium oxide hygrometer and crystal hygrometer.

- **Resistive hygrometer:** In a resistive hygrometer, the main element is a material whose resistance changes with the change in humidity or relative humidity. A wire or electrode coated with hygroscopic salt (lithium chloride) can be used for measurement of the humidity. Resistance of salt changes with humidity because hygroscopic salt absorbs moisture and its resistance decreases.
- **Capacitive hygrometer:** In a capacitive hygrometer, the changes in humidity are caused by the changes in the capacitance. Dielectric medium is used in the capacitor and the capacitor consists of two electrodes or plates and a dielectric medium is there between the plates. There is also some hygroscopic material which exhibits the change in dielectric constant with the change in the humidity. Therefore, such hygroscopic material or salt can also be used for construction of a capacitive hygrometer. If the change is very small, then the capacitor includes a frequency determining element in the oscillator and another frequency is produced by the beat frequency oscillator. This frequency is heterodyned and the difference in frequency is a measure of relative humidity.
- **Microwave refractometer:** A microwave refractometer consists of two cavities, each coupled with Klystron. Klystron is a material which produces microwaves in which one cavity is filled with dry air and another cavity is filled with a mixture whose humidity is measured. In the mixture, water vapour will be present and due to the presence of water vapour, there will be a change in dielectric constant, and frequency of one of the oscillators changes consequently. If there is no change in dielectric constant, its frequency is going to be constant, whereas in the mixture water vapours are present, and there is change in dielectric constant which results in change in its frequency. Frequency changes are measured as the measure of humidity.
- **Aluminium oxide hygrometer:** In an aluminium oxide hygrometer, aluminium oxide is coated on anodized aluminium and this aluminium oxide exhibits a change in the dielectric constant with respect to changes in humidity. There are two electrodes in which one is the inner electrode and the other is the outer electrode made from a very thin layer of material like gold. Some pores are presents in the inner layer. Due to the change in humidity, dielectric constant changes and this change can be measured to measure the humidity by bridge or electric method. The errors are much reduced and the response time is small and therefore the response is very fast.
- **Crystal Hygrometer:** In a crystal hygrometer, crystals are coated with hygroscopic materials (hygroscopic polymers). These crystals are used as frequency determination elements in the oscillator, and therefore just like with the capacitive hygrometer, if there is change in humidity then frequency also changes. Frequency changes due to the humidity as the mass of the crystal changes with amount of water absorbed by the coating. This change in frequency is measured. Humidity sensors are used in industry, agriculture, the medical field, environment monitoring etc.

L. Colour Sensor

A colour sensor is used to detect and identify various colour patterns and convert them into desired frequency as output. It consists of four photodiodes of red, green, blue and clear (no colour). All these photodiodes are connected in parallel and work as filters. For example, if we have to detect red colour, we use red colour filter for this purpose. Colour light signals are sensed by the photodiodes and we get the square wave signals with the frequency directly proportional to light intensity and that is transferred to the microcontroller and we get the result of colour.

M. Chemical Sensor

A chemical sensor is a device which transmits chemical information from a chemical reaction. The chemical information may be of composition, concentration and chemical activity which originates from a chemical reaction or from physical activities. It has different applications such as for home appliances and the chemical industries. The chemical sensor usually contains two basic components, which are a chemical resonance system known as the receptor and a physical chemical transducer. The receptor interacts with analytic molecules and the transducer sends the electric signal. A test sample is given to the receptor which checks composition connected with the transducer. The transducer collects the information from the receptor and sends it to the signal amplifier. This amplifies the signal from the transducer and sends it as output signals. There are two types of chemical sensors used to detect the composition: optical sensor and electro chemical sensor.

- Optical sensor: In the optical sensor, there are an emitter and a detector as the main elements. The emitter senses the light to the optical sensor and the light rays fall on the analyte and these rays may be reflected or refracted. These reflected or refracted lights are passed through the detector. Now the detector receives these lights and according to their intensity, the chemical compound present is analysed. Operation of an optical sensor is very simple and it uses absorption coefficient characteristics of the medium and path length travelled by the rays.
- Electrochemical sensor: The electrochemical sensor operates by acting on gas molecules of interest and produces an electric signal proportional to the compound present in the gas. It consists of sensing modules and electrodes, separated by a thin layer of electrolyte. There are two plates and the centre is filled by electrolytes. One plate is the cathode and the other plate is the anode. An external membrane is introduced in solution and it is absorbed by certain ions from the solution. Therefore, chemical properties of the solution change and the electromagnetic field will also change; and consequently change in the electromagnetic field ensures that the chemical composition is present in the gas.

N. Seismic Sensor

A seismic sensor measures small movements of the ground and also amplifies and records these small movements. It is also known as a seismometer, and is mostly used in measuring the details of earthquakes, volcanic eruptions and other vibrations. There are two types of seismic sensor, inertial seismometer and strain meter or extensometer seismic sensor.

- Inertial Seismometer: The inertial seismometer consists of a weight suspended from a frame by a spring. The frame moves due to the vibration being measured but the mass is held stationary due to the spring. It is used to measure a large-scale vibration such as an earthquake. Now the movement of mass is converted for output as a digital electric signal. Since both types of seismic sensors most commonly output an electric signal, calibration is necessary to derive a relationship between the input and output.
- Strain meter or extensometer seismic sensor: In a strain meter seismic sensor, a strain gauge is used to measure the motion relative to the various points. It generally is used for smaller scale measurement and movement of mass is converted for output as a digital electric signal.

O. Magnetic Sensor

Magnetics sensors respond to the presence or interruption of a magnetic field like flux, strength and direction by producing a proportional output. It converts magnetic information into an electrical signal for processing by the electronic circuit. A magnetic sensor is used in different types of application such as sensing position, velocity and movement of an object. There are different kinds of technology used to design a magnetic sensor. Fluxgate, Hall effect, resistive, inductive, proton processing etc, have a dissimilar approach of using magnetic sensors. A resistive magnetic sensor keeps the electrical resistance of the magnetic field and an inductive magnetic sensor uses coils surrounding its magnetic material, which have the ability to detect changes within the Earth's magnetic field. A fluxgate magnetic sensor uses the approach of changing flux parameters. Each type of technology focuses on a specific area for identifying measurements to be detected. Sensitivity of the magnet is increased by combining layers of magnetic alloys and the magnetic field is surrounded by an electric current, and variation within the field is detected. The output of a magnetic sensor increases with a strong magnetic field and decreases with a weak magnetic field.

II. COMPARISON OF DIFFERENT SENSORS

This section presents a tabular comparison of different types of sensors [1, 10, 18–30] in terms of advantages and disadvantages, as shown in table 1.3.

Table 1.3. Comparison of different sensors.

Sensors	Advantages	Disadvantages
Temperature sensors	- Reference temperature not required - Large response time - Easy display - Durable	- Self-heating error from applied power - Difficult to calibrate
Position sensor	- Accurate, reliable, and predictable measurement - Higher switching rate - High susceptibility to noise	Sensing range depends on the type of metal of the target object
Sound sensor	- Used in speech recognition software - Easy to manipulate sound in real time - Does not require cabling compare to wired mic	- Sound files require more memory size - Interference cancelation is required - Limited coverage area
Light sensor	- Requires very small power and voltage - Available in different shapes and sizes - Easy to integrate with a lighting system - Quick response time and low cost	- Nonlinear characteristics - If applied voltage exceeded, it will cause irreversible damage to the photo resistor - Temperature sensitive - Vulnerable to surges and spikes
Accelerometer	- Good response at higher frequencies - Withstands high temperature - Small size	- Sensitive to high frequency - Requires external power
Infrared sensor	- Operates with low power - Capable of detecting presence or absence of light - Does not require contact with object - Not affected by corrosion or oxidation - Strong noise immunity	- Requires line-of-sight deployment - Gets blocked by common objects - Limited range - Affected by environmental conditions - Transmission data rate is slow
Pressure sensor	- High output signal level - Low cost - Technological robustness	- High hysteresis - Sensitive to vibrations - Movable contacts
Ultrasonic sensor	- Sensing capability to all the materials - Not affected by dust, rain, snow etc - Works in any adverse conditions - Higher sensing distance - Not affected by colour or transparency of objects - Can be used in dark environments	- Sensitive to variation in the temperature - Difficulties in reading reflections from soft, curved, thin and small objects - Cannot work in a vacuum - Sensing accuracy is affected by soft materials

Sensors	Advantages	Disadvantages
Smoke and gas sensor	- Simple and low-cost technology - Measures flammability of gases - Linear output and low power requirements - Wide measurement range - Higher sensitivity, resolution and reliability	- Requires air or oxygen to work - Narrow or limited temperature range
Humidity sensor	- Does not require much maintenance - Flexibility to use - No ageing effects	- Sensitive to dewing and substances - Limited accuracy and measurement range
Color sensor	- Easy to change or modify setups without even re-programming the sensor device - Easy to implement - Common color space, used in a wide range of devices	- Lens subject to contamination - Sensing range affected by colour - And reflectivity of target
Chemical sensor	- Linear output, low power requirements and good resolution - Excellent repeatability and accuracy	- Narrow or limited temperature range - Short or limited life - Cross-sensitivity for other gases
Seismic sensor	- Detects lateral and vertical variations in velocity - Produces detailed images of the subsurface - Used to map stratigraphic units.	- Data processing is time consuming - Equipment is expensive

III. MODERN SENSORS

The sensor technologies have changed a lot in the last decade in terms of compactness, smartness and sensitivity. The traditional sensors such as photosensors, optical sensors, capacitive sensors and almost all sensors have been replaced by their integrated circuit forms such as MEMS (microelectromechanical system). The sensors are embedded in all modern computing and navigation devices in compact forms and this is why an ordinary smartphone carries around 22 sensors for various purposes. The technologies of sensors have further advanced and become intelligent as smart sensors and available in wearable forms. This may be seen in smart watches, smart gadgets or a large application such as self-driving cars where hundreds of smart sensors are involved for seamless and smooth driving without assistance of a driver. The same can also be seen in robotics, medical diagnosis, brain-computer interface (BCI) and many more, where AI (artificial intelligence) has empowered the sensors with intelligence and smartness for emerging and modern applications such as industry, healthcare and sophisticated automation.

IV. METHODOLOGIES

4.1 Smart Sensors and Ad-Hoc Wireless Networks

CPSs rely on a strong synergy between computational and physical components. A CPS is the integration of abstract computations and physical processes [9] where sensors, actuators, and embedded devices are networked to sense, monitor, and control the physical world. Therefore, smart sensors and wireless sensor networks are major components of CPSs. Wireless sensor networks (WSNs) are composed of tiny devices equipped with sensing, processing, storage, and wireless communication capabilities. Each node of the network can typically have several sensing units, able to perform measurements of physical variables, such as temperature, luminosity, humidity, and vibration, thus being the main components to create a perception of the physical world. WSN nodes operate collaboratively, extracting environmental data,

performing same (often) simple processing, and then transmitting them to external systems, via sink nodes, to be analyzed and further processed.

Sensor nodes are severely constrained regarding memory, energy, and processing capabilities. Therefore, several approaches have been proposed to reduce the energy consumption of these nodes in order to extend the overall lifetime of the system. Since radio communication is the dominant factor of energy consumption in most WSN (except for the hungry devices of multimedia sensor networks), an effective approach is the reduction of data transmission between the sink and the sensing nodes. One of the most commonly used technique to reduce radio communication is the dual prediction mechanism and several proposals are reported in the literature [10,11,12]. However, while all existing approaches have been proven to be very effective in reducing the amount of data reported to the sink, their efficiency is countered by an increase in complexity. Moreover, they are very sensitive to data loss which renders the dual prediction mechanism obsolete [13]. In the paper “Fault Tolerant Data Transmission Reduction Technique in Wireless Sensor Networks” [13], the authors present an alternative technique that has as a major benefit to be simple yet robust, and more effective in terms of prediction accuracy and data reduction. Their approach exploits the fact that sensor data changes smoothly over time, therefore they leverage the prediction model proposed in [14] to forecast future readings. They coupled this technique with a data reconstruction algorithm [15] that exploits both temporal smoothness and spatial correlation among different sensed features in order to estimate missing values.

Vehicular ad hoc networks (VANETs) are a subclass of mobile ad hoc networks (MANETs), and a promising approach for future intelligent transportation systems (ITS). A VANET typically supports two communication models, namely Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I). Currently, most VANET applications rely on V2V communications since they do not require costly infrastructure. However, as VANET is a very dynamic network, information must be exchanged between mobile vehicles in an efficient way by avoiding as far as possible the broadcast storm problem, that occur whenever a huge number of vehicles broadcast messages at the same time thus leading to a network saturation, packet delay and collision issues. In this context, data aggregation is an appealing approach allowing to integrate several data about similar events to generate a summary (aka aggregate) and as a consequence potentially reducing the network traffic. There are several proposals for data aggregation in VANETs already reported in the literature. However, the highly complex urban and highway networks produce an overwhelming traffic information data that requires efficient selection criteria and smart filtering before the aggregation process. The design of an efficient data aggregation approach that combines correlated traffic information or Floating Car Data (FCD) is still a challenging issue. The authors of the paper “Towards a Smarter Directional Data Aggregation in VANETs” [16] introduce a new data aggregation protocol, called Smart Directional Data Aggregation (SDDA), with the goal of selecting the most appropriate FCD messages that have to be aggregated.

Based on the aforementioned research works, it is clear that the future CPSs and intelligent applications heavily rely on the presence and widespread of physical sensors and WSNs. To ensure the functionality of an application, such as intruder detection, it is of critical importance to guarantee the coverage and availability of wireless sensors during deployment. As such, barrier coverage is a critical issue for wireless sensor deployment for many industrial and military applications, where each wireless sensor can sense within its range and a collection of wireless sensors can be deployed to cover the entire range of a barrier. Over the last decade, different barrier coverage algorithms had been established for different types of sensors such as seismic [17] and acoustic [18] sensors, while in recent years, more research efforts are dedicated to radar sensor systems [19, 20]. In “Optimal Placement of Barrier Coverage in Heterogeneous Bistatic Radar Sensor Networks” [21], authors investigate the barrier coverage problem for bistatic radar sensor systems. Different to the traditional passive sensing model, the Cassini oval sensing model is investigated and an optimal placement strategy for heterogeneous transmitters and receivers has been proposed to achieve maximum barrier length coverage. The proposed algorithm has been validated through theoretical simulations to demonstrate the optimal coverage.

Cyber-social networks have significantly improved social relationships among mobile users across device-to-device communications. In the paper “A Detailed Review of D2D Cache in Helper Selection” [22], the authors present a survey work which focuses on D2D helper selection techniques according to three basic categories, including the network frame, computing method, and social-aware attribute. Differing from other surveys which mainly consider the energy consumption and latency minimization in D2D networks, they discuss the selection of D2D helper based on different network architectures, such as content distribution networks, peer-to-peer networks, named data networks, cellular networks, and

vehicular ad-hoc networks. In particular, a variety of computing paradigms are taken into account to classify D2D helper selection techniques, such as mobile cloud computing, fog computing, and mobile edge computing.

V. CONCLUSION

This chapter presented an overview of sensors with basics, characteristics and different types of sensors. A sensor is a device that receives a signal and converts it into an electrical signal. These sensors are classified on the basis of their applications, cost, accuracy and range. Sensors are classified also into different categories like thermal, electrical, magnetic optical, mechanical and chemical sensors. The sensor technologies have become advanced now and cognitive and smart sensors are being used in all modern applications.

ACKNOWLEDGEMENT

The paper consist of the information related to smart computing. It focuses on the following elements and values such as introduction, methodologies, privacy, security, behavior and influence analytics in social computing, results and discussion followed by conclusion and references. I hereby declare that all the information provided in the respected paper is authenticated, authorized and hence reliable. I would like to thanks all the viewers and readers of this paper for their precious time.

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Smart Computers

Miss. Ifra Hidayat Datey¹, Miss. Kadu Shifa²

Teacher¹ and Student, TYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Current user interfaces are not very "smart" in that computers dumbly do what the user explicitly commands it to do via buttons or menus. As the computers become more capable and applications become complicated, more "smart" user interfaces are desired. We are exploring possible "smart" user interfaces in the domain of pen-based computing and interactive 3D graphics. The idea is to allow the user to intuitively express his/her intention by combining sketching and direct manipulation, and have the computer take appropriate actions without explicit commands. This talk consists of many live demonstrations to illustrate the idea of interactive "smart" interfaces. I plan to show 2D geometric drawing program, electronic whiteboard system, sketch-based 3D modeling, automatic zooming, clothing manipulation interfaces, and other interesting systems.*

Keywords: Introduction, Methodology, Review, Privacy, Security, Behavior and influence analytics in social computing, Results & Discussion, Conclusion, Acknowledgement and References.

I. INTRODUCTION

Following the well-known concepts of computerization and informatization, an emerging era of cyberization, which is considered as a reformation of the present physical, social and mental worlds, has become a hotly discussed trend in the new cyber world. Cyberization refers to using communication and computer technologies to interconnect computers and various electronic terminal devices distributed in different locations. It allows users to share software, hardware and data resources according to certain network protocols. Cyberization has greatly improved the practical utility of computers and has been widely applied in transportation, finance, business management, education, telecommunications, commerce, and so on in our daily life [1].

During the cyberization process, a large number of real things will conjugatively map to various kinds and levels of cyber existence in cyber world. It is said that cyberization has already taken place in a variety of fields along with the development of several emerging computing paradigms and information communication technologies, such as ubiquitous/pervasive computing, social computing and networking, and wearable technologies, etc. Specifically, with the rapid growth of Internet of Things and cognitive cyber-physical systems, more and more digital things or cyber entities, are engaged or generated in the integrated cyber world. Emerging technologies in smart environments, such as smart computing and smart objects, become very significant, promising, and enabling issues in cyberization, to enhance the efficiency of sensing, processing, and communication in the conjugations of physical, social and mental worlds. Accordingly, the cyber technology is playing an important role in developing effective methods of resource management, data acquisition, and pattern recognition across cyber-related systems and applications. All these provide us opportunities to explore smart computing methodologies and computational intelligence algorithms, in order to facilitate the cyberization process in cyber world.

This special issue aims to report high-quality research on recent progress in the various areas related to Smart Computing and Cyber Technology for Cyberization. Our goal is to shed light in the multiple aspects involved in the cyberization, encompassing algorithms, techniques, applications, enabling technologies and platforms, besides security issues. A total of 36 papers were submitted from all over the world. After a careful review process performed by reviewers selected by the Guest Editors, 18 papers were accepted addressing subjects that were classified in the following categories: (i) infrastructure and platforms for intelligent systems, (ii) smart sensors and ad-hoc wireless networks, (iii) behavior and influence analytics in social computing, (iv) machine learning and intelligent applications, and (v) privacy and security in smart computing. The detailed contributions of each paper are summarized in the next section.

1.1 Infrastructure and Platforms for Intelligent Systems

An important component in the cyberization process is the computational intelligence techniques and methods that are at the core of cyber world enabling processes. Recently there has been a tremendous advance in the fields of machine learning (ML) and artificial intelligence (AI). However, much of this advance has focused on algorithms and their applications. Much less emphasis has been given to the underlying infrastructure of these intelligent systems. Currently, the mainstream in ML/AI consists in work being done individually by experts in the field, following ad-hoc processes that make collaboration difficult, and with little support from abstractions and tooling to facilitate the deployment of intelligent systems at scale. Ultimately, this is mainly due to a delay in infrastructure evolution, which has so far been far outweighed by innovation in machine learning techniques. One can say that the systems and tools that helped usher in the present era of hands-on machine learning are not suitable to feed future generations of the intelligent applications they have generated. Therefore, it is important to advance not only the algorithms, but also the infrastructure and computing platforms that allow the effective and efficient execution of such algorithms.

In the context of ubiquitous/pervasive intelligent systems, as well as in the cyber-physical systems (CPSs), cloud computing has been the most prevailing model and platform for data processing and storage. Because of the richness of resources typical of cloud platforms, cloud-based CPSs and cloud-assisted IoT extend and augment the computing capacity of CPSs to conduct resource-hungry applications. The Cloud computing model is keen to use centralized shared resources and addresses the raising popularity of smart apps by integrating exclusive resources and the data obtained from them [2].

In order to provision the physical resources dynamically, virtualized technology is extensively used for resource management in the cloud platforms, which provides an effective way to improve the resource efficiency of the cloud-based CPSs. Running applications on the virtual machines (VMs) makes it possible for high resource utilization and low energy consumption [3]. Although virtualization techniques have been extensively studied in the cloud computing field, there are still several open issues involved in the allocation and migration of VMs to meet the quality of service (QoS) demands of cloud-based CPSs. A key challenge involves considering the benefits of migrating VMs to provide better QoS to the user while taking into account migration costs, for example in terms of transmission delays. In addition, energy consumption in cloud-based systems is also an increasingly relevant challenge to consider. To meet the growing demand for new scenarios such as CPSs and IoT, capabilities of cloud data centers have grown steadily. Such growth results in the increasing power consumption of these data centers. In times of energy crisis and with the growing demand for greener and more sustainable technology solutions, reducing energy consumption in data centers has become a key goal. The authors in the paper “A QoS-Aware Virtual Machine Scheduling Method for Energy Conservation in Cloud-based Cyber-Physical Systems” [3] aim to tackle the aforementioned challenges. Their goal is to find an optimal VM scheduling strategy in cloud-based CPSs with QoS enhancement. For such, they propose a QoS-aware VM scheduling method for energy conservation, named QVMS. By offloading several applications to other physical machines (PMs), the workloads on some under-load physical servers are migrated out, and these servers could be set to idle mode for energy saving. In the paper, they first define some basic concepts and present the system model. Then, they formalize the objective function and present the constraints assumed to model the solution. Non-dominated Sorting Genetic Algorithm (NSGA-III) is adopted to find the optimal VM scheduling strategies and achieve the goal of QoS enhancement including energy consumption, downtime and resource utilization. Besides, SAW (Simple Additive Weighting) and MCDM (Multiple Criteria Decision Making) are adopted to select the most optimal scheduling strategy. They performed extensive experimental evaluations to verify the effectiveness of their proposed VM scheduling method.

However, despite the popularity of cloud computing as a backend of intelligent ubiquitous systems and CPSs, newly emerging applications and information technologies are very demanding when it comes to the latency and bandwidth. Their requirements for the optimized transport network and processing of data performed as close to the end devices as possible is also rapidly increasing [4]. Some of the drawbacks of cloud platforms such as latency and jitter effects, distance to the server, data security and privacy, and support of mobility cannot be solved by adoption of the hyper-scale cloud computing technology. To overcome some of such limitations, the Edge Computing paradigm has recently emerged as a solution for delivering data and real-time data processing closer to the data source [5]. The combination of Edge Computing with ML/AI gave rise to a new paradigm known as Edge intelligence (EI). EI comprises edge computing that is supported with machine learning algorithms and advanced networking abilities. The implication is that a number of information technology and operational technology industries are gravitating to the edge of the network. The result is that issues such as cybersecurity,

self-learning, real-time networks and tailored connectivity can all be adequately dealt with [2]. In their previous work [6], the authors of the paper “A Lightweight and Cost Effective Edge Intelligence Architecture based on Containerization Technology” [2] proposed the idea to build and integrate Docker containers within the edge and pinpoint the Edge Intelligence’s potential in the vertical-specific scenarios of use. Their current study, included in this Special Issue, extends this idea further and focuses on the utilization of Docker technology into the recognition of human activity. They expect their presented architecture to provide significantly shorter delays in communication and decision-making as well as decrease the costs related to these processes thanks to adoption of lightweight and economical platform. Since the proposed architecture is using ML algorithms and eliminating any unnecessary communication with cloud, it is able to provide more effective and quick decision-making. Unwanted delays are decreased thanks to avoiding of unreasonable roundtrips. As another contribution of their proposal, decreased use of public wide area networks along with the adoption of local algorithms and caching result in less costly communication. They also promote a good balance of application’s, network’s and user’s requests among the edge and core infrastructure. Finally, the proposed computing model can utilize decisions related to the pre-processed data and adopt alarms traded between several edge devices.

Also leveraging the computational resources at the edge of the network, the paper “LW-CoEdge: A lightweight virtualization model and collaboration process for Edge Computing” [7] proposes a novel distributed and lightweight virtualization model targeting the edge tier. Besides a novel virtualization model tailored to the edge tier and meeting the specific requirements of IoT applications, their proposal encompasses a set of heuristic algorithms along with a P2P collaboration process to operate upon the virtualization model. The algorithms perform (i) a distributed resource management process, and (ii) data sharing among neighboring virtual nodes (VNs, deployed at edge nodes). The distributed resource management process provides each edge node with decision-making capability, engaging neighboring edge nodes to allocate or provision on-demand VNs. Thus, the distributed resource management improves system performance, serving more requests and handling edge node geographical distribution. Meanwhile, data sharing reduces the data transmissions between end devices and edge nodes, saving energy and reducing data traffic for IoT-edge infrastructures.

Among the existing CPSs, manufacturing and enterprise applications are one of the major drivers of advanced and intelligent networked systems following the trend of Industry 4.0. Massive data are generated in a distributed fashion and cross-domain data need to be shared and analyzed in an efficient manner to realize an effective supply chain management. Therefore, master data management (MDM) that manages how data are stored in a distributed system plays a critical role for enterprise data warehousing and analyses. The paper “Master Data Management for Manufacturing Big Data: A Method of Evaluation for Data Network” [8] proposes a multi-layer master data management architecture and investigates the use of Set Pair Analysis (SPA) to model the distributed data network. The proposed methodology is validated using an aviation enterprise data and has demonstrated the ability to support timely update, response, distribution of data at each stage of the supply chain.

II. METHODOLOGIES

2.1 Smart Sensors and Ad-Hoc Wireless Networks

CPSs rely on a strong synergy between computational and physical components. A CPS is the integration of abstract computations and physical processes [9] where sensors, actuators, and embedded devices are networked to sense, monitor, and control the physical world. Therefore, smart sensors and wireless sensor networks are major components of CPSs. Wireless sensor networks (WSNs) are composed of tiny devices equipped with sensing, processing, storage, and wireless communication capabilities. Each node of the network can typically have several sensing units, able to perform measurements of physical variables, such as temperature, luminosity, humidity, and vibration, thus being the main components to create a perception of the physical world. WSN nodes operate collaboratively, extracting environmental data, performing same (often) simple processing, and then transmitting them to external systems, via sink nodes, to be analyzed and further processed.

Sensor nodes are severely constrained regarding memory, energy, and processing capabilities. Therefore, several approaches have been proposed to reduce the energy consumption of these nodes in order to extend the overall lifetime of the system. Since radio communication is the dominant factor of energy consumption in most WSN (except for the hungry devices of multimedia sensor networks), an effective approach is the reduction of data transmission between the sink and the sensing nodes. One of the most commonly used technique to reduce radio communication is the dual prediction

mechanism and several proposals are reported in the literature [10,11,12]. However, while all existing approaches have been proven to be very effective in reducing the amount of data reported to the sink, their efficiency is countered by an increase in complexity. Moreover, they are very sensitive to data loss which renders the dual prediction mechanism obsolete [13]. In the paper “Fault Tolerant Data Transmission Reduction Technique in Wireless Sensor Networks” [13], the authors present an alternative technique that has as a major benefit to be simple yet robust, and more effective in terms of prediction accuracy and data reduction. Their approach exploits the fact that sensor data changes smoothly over time, therefore they leverage the prediction model proposed in [14] to forecast future readings. They coupled this technique with a data reconstruction algorithm [15] that exploits both temporal smoothness and spatial correlation among different sensed features in order to estimate missing values.

Vehicular ad hoc networks (VANETs) are a subclass of mobile ad hoc networks (MANETs), and a promising approach for future intelligent transportation systems (ITS). A VANET typically supports two communication models, namely Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I). Currently, most VANET applications rely on V2V communications since they do not require costly infrastructure. However, as VANET is a very dynamic network, information must be exchanged between mobile vehicles in an efficient way by avoiding as far as possible the broadcast storm problem, that occur whenever a huge number of vehicles broadcast messages at the same time thus leading to a network saturation, packet delay and collision issues. In this context, data aggregation is an appealing approach allowing to integrate several data about similar events to generate a summary (aka aggregate) and as a consequence potentially reducing the network traffic. There are several proposals for data aggregation in VANETs already reported in the literature. However, the highly complex urban and highway networks produce an overwhelming traffic information data that requires efficient selection criteria and smart filtering before the aggregation process. The design of an efficient data aggregation approach that combines correlated traffic information or Floating Car Data (FCD) is still a challenging issue. The authors of the paper “Towards a Smarter Directional Data Aggregation in VANETs” [16] introduce a new data aggregation protocol, called Smart Directional Data Aggregation (SDDA), with the goal of selecting the most appropriate FCD messages that have to be aggregated.

Based on the aforementioned research works, it is clear that the future CPSs and intelligent applications heavily rely on the presence and widespread of physical sensors and WSNs. To ensure the functionality of an application, such as intruder detection, it is of critical importance to guarantee the coverage and availability of wireless sensors during deployment. As such, barrier coverage is a critical issue for wireless sensor deployment for many industrial and military applications, where each wireless sensor can sense within its range and a collection of wireless sensors can be deployed to cover the entire range of a barrier. Over the last decade, different barrier coverage algorithms had been established for different types of sensors such as seismic [17] and acoustic [18] sensors, while in recent years, more research efforts are dedicated to radar sensor systems [19, 20]. In “Optimal Placement of Barrier Coverage in Heterogeneous Bistatic Radar Sensor Networks” [21], authors investigate the barrier coverage problem for bistatic radar sensor systems. Different to the traditional passive sensing model, the Cassini oval sensing model is investigated and an optimal placement strategy for heterogeneous transmitters and receivers has been proposed to achieve maximum barrier length coverage. The proposed algorithm has been validated through theoretical simulations to demonstrate the optimal coverage.

Cyber-social networks have significantly improved social relationships among mobile users across device-to-device communications. In the paper “A Detailed Review of D2D Cache in Helper Selection” [22], the authors present a survey work which focuses on D2D helper selection techniques according to three basic categories, including the network frame, computing method, and social-aware attribute. Differing from other surveys which mainly consider the energy consumption and latency minimization in D2D networks, they discuss the selection of D2D helper based on different network architectures, such as content distribution networks, peer-to-peer networks, named data networks, cellular networks, and vehicular ad-hoc networks. In particular, a variety of computing paradigms are taken into account to classify D2D helper selection techniques, such as mobile cloud computing, fog computing, and mobile edge computing.

III. REVIEW:

In recent years, the recommendation system has been well developed and is playing an important role across social media. In the paper “ICFR: An Effective Incremental Collaborative Filtering based Recommendation Architecture for Personalized Websites” [23], the user-based collaborative filtering algorithm is applied in an incremental recommendation

implementation method, in which three important elements: user, item, and rating, are redefined, and relationships between user preferences and recommended content are utilized to improve the user-based collaborative filtering algorithm. Moreover, users' browsing behaviors are extracted based on the analysis of Web logs from personalized websites, which can facilitate the update of users' historical preference in the design of an incremental algorithm. Experiments demonstrate the high performance of the proposed method comparing with traditional updating methods.

Following the rapid development of mobile social networks, the paper "From Crowdsourcing to Crowdmining: Using Implicit Human Intelligence for Better Understanding of Crowdsourced Data" [24] discusses the concept of crowdmining and presents a generic model for the development of crowdmining systems. The basic idea is to discover and better utilize the implicit human intelligence hidden in individual behavior patterns and crowd-object interaction patterns under a certain community context. The authors introduce a basic framework to understand the crowdsourced data with a formal description and discuss its usage in several general tasks in terms of data mining including classification, filtering and grouping. Based on these, they describe two case studies, namely the crowdevent and crowdtrip, which utilize the power of implicit human intelligence to facilitate the event sharing and trip planning respectively. Detailed scenario applications are presented, and the experiment evaluation demonstrate the effectiveness of the proposed method in event localization and detection, and travel route generation using online/offline crowdsourced data.

Behavioral analysis has drawn more and more attentions for mobile computing application in big data environments. In the paper "TBI2Flow: Travel Behavioral Inertia Based Long-Term Taxi Passenger Flow Prediction" [25], the authors focus on the analysis of travel patterns of taxis in cities using GPS data. Specifically, the travel behavioral inertia, which mainly includes two basic components: driver inertia and passenger inertia, is newly defined and introduced as a new metric for the long-term taxi passenger flow prediction. A traffic flow prediction framework, called TBI2Flow, is designed to forecast the distribution of taxi passengers in each small region of a district over different time intervals. The multi-layered neural network is utilized to extract and represent the new features from the taxi trajectory data based on the travel behavior analysis. The results of simulation-based experiments demonstrate the significance and efficiency of the proposed model for traffic management in the design of a smart city.

To deal with the special problem of influence maximization in social networks, the paper "Three-hop Velocity Attenuation Propagation Model for Influence Maximization in Social Networks" [26] proposes a three-hop speed attenuation propagation model, based on which the authors design an algorithm for the maximum of influence considering the greedy algorithm with heuristic algorithm. In the constructed network model, the sum of modified degrees of the active nodes is employed to measure the impact of a node. In such a way, the influence of a single node can be effectively modeled and represented, and the lack of subtle influence caused by the three-hop simulation can be further made up. Two different datasets collected from DBLP and Facebook are used to conduct the propagation simulations, and the experiment results demonstrate the high efficiency of the proposed method comparing the traditional greedy algorithms.

Results:

IV. MACHINE LEARNING AND INTELLIGENT APPLICATIONS

Sensors and WSNs play an important role in the CPSs and intelligent applications by offering fundamental infrastructure and data sources. However, how to process data to support decision making and provide "intelligence" in systems and applications remains a big challenge. In recent years, ML has demonstrated great potential to many applications in consumer electronics, industrial, and security and surveillance applications. In this special issue, several unique research works are presented on various novel ML techniques and intelligent applications.

As networked systems are becoming more and more complex, automated operations and maintenance are becoming highly important to ensure efficient and reliable system operations. The paper "Intelligent Maintenance Frameworks of Large-scale Grid using Genetic Algorithm and K-Medoids Clustering Methods" [27] investigates the automation and scheduling problem of maintenance of a large-scale smart grid system, where a smart grid management system (GMS) is proposed with genetic algorithm and K-medoids clustering. This research identifies and addresses different severity levels according to the faulty devices. The two proposed algorithms are validated with five real-world datasets collected in five different cities in China.

As the technologies evolved, the focus of advanced technologies also shifted to offer more intelligent and more "personalized" services to end users. This trend can be observed from consumer electronics to even manufacturing

enterprises to have customized products and services. Therefore, advanced technologies for identifying the user are becoming a very important topic to ensure the delivery of safe and secure personal services. While there are various unimodal personal identification techniques such as password, facial, voice, and fingerprint, each modality exists its own weaknesses which may make the overall system vulnerable. In the paper “An Accurate Multi-Modal Biometric Identification System for Person Identification via Fusion of Face and Finger Print” [28], a multi-modal person identification approach is proposed by fusing facial and fingerprint information. The proposed method has been verified with four different datasets and has achieved a promising recognition accuracy of 99.59%.

Different to traditional artificial intelligence (or machine intelligence), research efforts are also dedicated to mimicking unique human traits, behaviors, and personalities. In addition to offer intelligence, researchers are seeking ways to capture and represent the uniqueness of human beings in achieving human-like (or even individual-like) artifacts such as digital avatars and humanoid robots. However, there is yet a comprehensive model to systematically describe human traits and personalities. The paper “From Affect, Behavior, and Cognition to Personality: An Integrated Personal Character Model for Individual-like Intelligent Artifacts” [29] offers a broad overview on the existing Personal Character Models (PCMs) from different research arenas and perspectives such as psychology and computational intelligence. A novel PCM is proposed to capture comprehensively personal affects, behaviors, cognition, and the intra- and inter-relationships between these personal characteristics. The feasibility of the proposed PCM model has been demonstrated by extracting representative personal characteristics through various personal data such as wearable devices and cognitive tests.

IV. DISCUSSION

4.1 Privacy and Security in Smart Computing

One of the biggest concerns in the cyber world is security. By delegating control of physical processes to virtual entities, often accessed via wireless networks, a number of vulnerabilities arise. Without solving security issues, it is not possible to leverage the paradigms linked to the cyber physical systems. As cyber-attacks become more frequent, the research community has presented several approaches (e.g. heuristic methods) to detect and analyze malicious programs (also referred to as malware). However, designing effective and efficient malware detection approaches poses several challenges and still has open issues [30], for example due to counter-malware detection efforts by malware authors and cyber criminals. There are three major approaches for analyzing malware: static, dynamic and hybrid [31, 32], each of them with their own pros and cons. Trying to mitigate some of the drawbacks of current static, dynamic and hybrid malware detection approaches, multi-view learning is a promising solution. Multi-view data are very common in real world applications, where data are often collected from different sources, using different measuring methods. Different data sources form different feature sets, and each set is referred to as a view. Any particular single-view data cannot comprehensively describe the phenomenon under observation. Motivated by this, multi-view learning is an emerging direction in machine learning which considers learning with multiple views to improve the generalization performance [33]. To adapt multi-view learning for malware threat hunting, the authors of the paper “A Multiview Learning Method for Malware Threat Hunting: Windows, IoT and Android as Case Studies” [34] leverage the potential of using executable files for either malware or goodware (i.e. non-malware) as the source for multi-view data extraction. The challenge they tackle in this context is to determine what algorithm can be used to effectively extract features from executable files. Existing approaches generally use single view information for malware detection or a combination of some views in the form of a single view [35, 36, 39]. In their paper, the authors propose an efficient ensemble multi-view learning method, which automatically assigns optimized weights to different views. The proposed method is a large margin classifier that improves generalization using a global optimum hypothesis. To demonstrate adaptability of the proposed approach in detecting malware on different platforms, they evaluate their system with datasets comprising Internet of Things (IoT), Windows and Android malware.

In addition to the challenges of dealing with cyber-attacks, which occur in a variety of scenarios and application domains, cyberization poses several security and privacy challenges in the specific scenario of IoT systems. Given its highly dynamic and heterogeneous scenario, besides the opportunistic and ad-hoc nature of interactions, in an IoT system it is difficult to perform identity management, guarantee the trustworthiness of data, detect abnormal behaviors and control the access to various data. Data provenance has the potential to solve some of the aforementioned issues in IoT by recording information about data origins, data operations and processing history from its source to current state. Thus, it becomes possible to track the sources or origins of several types of issues related to abnormal behavior, trustworthiness and data access in IoT.

Although long adopted in archives systems and data mining techniques, for the purpose of identifying the owner of an object/data or its origin, creator and how the data was communicated or processed, investigations of data provenance in the context of IoT have only recently begun [37]. The authors in [37] designed a conceptual model as a common architecture of data provenance in IoT. Since this first work, more and more researchers started to pay attention to data provenance in IoT and some provenance management schemes were proposed and applied in various intelligent IoT services. However, the literature still lacked a comprehensive survey on data provenance in IoT. In order to fulfil this gap, the paper “A Survey on Data Provenance in IoT” [1] reports the findings of a comprehensive survey on existing works related to this field. As main contributions, the authors (i) propose uniform criteria on data provenance in IoT by analyzing IoT distributed architecture and reviewing data provenance techniques and applications, (ii) review existing works on data provenance in IoT and analyze their pros and cons according to our proposed criteria and security requirements, and (iii) point out a number of open issues based on the thorough survey and attempt to provide guidance for future research in the field of data provenance in IoT by evaluating its recent advance.

The paper “Secure Limitation Analysis of Public-key Cryptography for Smart Card Settings” [38] focuses on a special case of smart card used in intelligent application systems with high security requirements. The authors first summarize the features of three main types of attacks in smart card security, including invasive attacks, semi-invasive attacks, and non-invasive attacks, and review the public key cryptography algorithms regarding security issues. Based on these, they convert secure problems of public-key cryptography into the capacity of attack channels of adversaries. The insecure limitation is then defined and introduced based on a communication framework with Shannon information theory. Several metrics are given to analyze security restrictions according to the average mutual and conditional mutual information. The authors discuss a series of attack models with the security limitation of encryption, such as ciphertext-only attack channel model, chosen plaintext attack channel Model, chosen ciphertext attack channel Model, adaptive chosen ciphertext attack channel Model, direct forgery attack channel Model, and tampering attack channel model.

V. CONCLUSION

This special issue aims to promote the development of cyber-related information and communication technologies in smart computing. In Particular, a variety of important topics are addressed in this special issue, including: Knowledge Modeling and Management for Cyberization, Information Sharing and Dissemination in Smart Computing, Smart Control and Monitoring for Cyberization, Cognitive Physical-Social Networks, Content Analysis and Mining in Cyber-Social Networks, Behavioral Analytics across Smart Networks, Deep Learning in Cyberization, Resource Management in heterogeneous Networks, Intelligent Transportation Systems Using Smart Networks, Smart Internet of Things, Cyber-Physical-Social Data Processing and Intelligence Mining, Smart Data Streaming and Real-Time Processing, Smart Sensors and Ad-Hoc Wireless Networks, Data Storage and Integration in Cyberspace, Semantic Web Mining in Smart Computing, Infrastructure and Platform for Intelligent Network Systems, Wearable Technologies in Smart Environments, Mobile Computing with Smart Sensors, Smart Energy Management and Sustainability, Privacy and Security in Smart Computing, and etc.

The accepted papers have attracted researchers (corresponding authors) across transdisciplinary research fields from 11 different countries, including Australia, Brazil, China, Finland, France, Japan, Saudi Arabia, Singapore, UK, US, and Tunisia. Consequently, this special issue may have a great significance and impact on: i) studying cyber and cyber-conjugated things for the cyber-enabled new worlds; ii) organizing the body of knowledge in cyber-related researches and applications with comprehensive frameworks in inter-, trans- and multi-discipline fields; iii) enhancing cyber technologies not only in fundamental research works, but also in application system development.

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The paper consist of the information related to smart computing. It focuses on the following elements and values such as introduction, methodologies, privacy, security, behavior and influence analytics in social computing, results and discussion followed by conclusion and references. I hereby declare that all the information provided in the respected paper is authenticated , authorized and hence reliable. I would like to thanks all the viewers and readers of this paper for their precious time.

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Green Chemistry for Chemical Synthesis

Ms. Tasnim Jalil Malbari¹ and Ms. Rammen Wasim Shabandar²

Teacher¹ and Student, TYBSc²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Green chemistry has been a major part of sustainable development and also had an important trend in recent years. In order to extrapolate the state of the work in this field, a systematic laboratory work has been performed, also it's is used to identify possible developments for future research. Now specially, the main aim of this research is to investigate how Green Chemistry, Sustainability and Circular Economy concepts are related to each other and how researchers are addressing and analyzing this relation. Since the main purpose of this chemistry is to produce intermediate substances that are generally used by other industries, this focus is mainly placed on industrial sector. Or we can say, chemistry involves most of production systems. Green chemistry for chemical synthesis define our future challenges and scopes in working with chemical procedures and products by inventing new reactions that can give maximum desired products and less or no by-products, designing new synthetic procedures and apparatus that can simplify operating in chemical productions, and to seek greener solvents that are environmentally and ecologically benign. Following basic principles of green chemistry should be followed:*

- 1)Prevention of waste or by-products.
- 2)Maximum incorporation of reactants in final products.
- 3)Minimization of hazardous products
- 4)To design safer chemical
- 5)To select most appropriate solvents
- 6)Use of catalyst should prefer.
- 7)Biodegradable products.
- 8)Such manufacturing plants should be designed to eliminate the possibility of accidents.

Keywords: Green Chemistry, Green Synthesis, Development of Green Chemistry, Principles of Green Chemistry, Application of Green Chemistry.

I. INTRODUCTION

Over the past two centuries, fundamental theories and reactivities in chemistry have been productively established. Such theories and reactivities have been providing the one of the main foundations for the chemicals that generates critical basic living needs such as food for the world's population, it achieves various medical areas that save n number of lives and improve people's health, and produces such materials which are helpful to the present and future needs of human.

Less than two centuries ago, organic compounds were believed to be only approachable through biological processes under "vital forces". Today, many complex molecules of great complexity can be synthesized.

The total syntheses of natural products with mostly high complexity such as vitamin B12 and palytoxin in the laboratory are references of achievements as compare to the construction of the great achievements at the molecular scale. The capacity or ability to generate selective molecules for medicines, pharmaceuticals, petro-chemicals and materials much of science and the research themes within the chemistry laboratories.

II. METHODOLOGY

Some consideration was given to the use of different reagents in acquired quantities, which were not involved into the target molecule and would result in significant by-products. But, in a balanced chemical reaction, a simple addition or cyclo addition incorporates all atoms of the starting materials into the final product. Some of these methods belong to less-common techniques, as, for example, magnetic field-assisted synthesis etc.

Microwave irradiation: So what is microwave irradiation? This is a green source of heating both in organic and inorganic synthesis, and it is based on the conduction and dipolar polarization type. A number of organic molecules have been reported

as because of this economic, efficient, fast and clean way, now recognized as a conventional synthetic chemistry tool, which has made a great contribution to organic synthesis. The electromagnetic energy, is being transformed into heat and other kind of energy, due to this is able to drives interactions between compounds. Microwave irradiation and the components are in a direct interaction with each other, due to that a minimum of energy is needed for its heating, and also without expanding the process to the furnace material in that.

The Microwave heating is almost rapid, very fast, due to the fast transfer 'Microwave energy—heat', and can be stopped immediately by a simple turning-off of the Microwave equipment.

Hydro(solvo)thermal synthesis: A solution reaction-based approach is applied to synthesize compounds, crystallize and grow single crystals and poly-crystals at high pressures (normally up to 10 bar) and elevated temperatures (generally up to 300°C) in water or organic solvent media.

The main advantage of the this method is the possibility of the formation of the crystalline components, which are unstable at the melting point of the desired compound; the main disadvantage is the necessity to have expensive equipment. Morphological control and crystallinity for the formed compounds can be made available by changing pressure and temperature, solvent and reaction time or precursors' method's ratio. Hydrothermal reactions in the water are normally considered as more stable and suitable for green chemistry purposes, because it's being environmental friendly, and are widely used and applied to textile a variety of materials. This method required as minimum loss of reactants and mainly higher yields of products, are especially useful to obtain classic and unique nano-structures with desired shape and size control: these are in the form of powders, or films and especially these are from one- to three-dimensional nano-crystals.

Solvents and catalysis in green processes: For the organic synthesis, where hazardous solvents are mostly used, the 12 rules of green chemistry can be successfully applied maximal atom economy (avoiding formed by-products and the wastes, in particular using solventless techniques, i.e. dry media), safe and non-hazardous chemical routes without harmful chemicals, use of renewable precursors (i.e. plants are used instead of fossil fuels), catalysts in small amounts (These are non-harmful and preferably solids catalyst are used in order to be renewable), safer chemicals and solvents, biodegradable substances, as well as prefer to avoid energy waste, to prevent pollution and To minimize possibility of hazardous accidents. Solvents represent a major source (80–90%) of pollution in organic (and not only) chemical processes. Conventionally organic solvents, which are derived from oil, are , hazardous and possess bad health, on environment and safety impacts. So, the are to be used as green medium for Organic synthesis need processing biodegradability, low toxicity, boiling should be high, it should be easily recyclable and immiscible with water. Due to this, non-toxic and biodegradable glycerol, which is the main side product in the formation of biodiesel, is mainly suitable for green synthetic organic synthesis and also called 'organic water'. It has various advantages which are as great availability, can be biodegrade, not so expensive, vapour pressure is low, high boiling point; also, glycerol is immiscible that is it can be mixed with aliphatic hydrocarbons, because of high polarity it is capable to form hydrogen bonds and solubilizes both inorganic and organic compounds.

II. LITERATURE REVIEW

According to the main systematic literature review methodology, different types of questions were formulated, in order so that it can be schematic and to get a broad view about the evolution of green chemistry research.

The selected articles were analyzed through different criteria, including the Triple Bottom Line (TBL) framework, and were divided into different clusters, according to purposes, impacts and scope of each research.

The analysis of papers shows that chemical industry is able to contribute to a fair transition towards a greater economic, environmental and social sustainability. Even if the main focus of GC is the environment, GC is getting closer to TBL pillars, representing the main tool for chemical industry to implement Sustainable Chemistry (SC) system and to realize the transition towards sustainability and CE. Finally, main results were summarized in a framework that shows the connections among systems and tools, highlighting main synergies.

The processes and syntheses that have as main focus the green chemistry that have been found in the literature has great advantages over traditional methods, among which are the reduction of toxic emissions to the environment, reactions that do not generate by-products and processes more optimal, which in turn reduce production costs, such as costs derived from the treatment or storage of waste and the adverse health effects on personnel working in the process.

III. RESULT AND DISCUSSION

- Cleaner air: Less release of hazardous chemicals to air leading to less damage to lungs
- Cleaner water: less release of hazardous chemical wastes to water leading to cleaner drinking and recreational water
- Increased safety for workers in the chemical industry; less use of toxic materials; less personal protective equipment required; less potential for accidents (e.g., fires or explosions)
- Less exposure to such toxic chemicals as endocrine disruptors
- Many chemicals end up in the environment by intentional release during use (e.g., pesticides), by unintended releases (including emissions during manufacturing), or by disposal. Green chemicals either degrade to innocuous products or are recovered for further use
- Plants and animals suffer less harm from toxic chemicals in the environment
- Lower potential for global warming, ozone depletion, and smog formation
- Less chemical disruption of ecosystem
- Higher yields for chemical reactions, consuming smaller amounts of feedstock to obtain the same amount of product
- Fewer synthetic steps, often allowing faster manufacturing of products, increasing plant capacity, and saving energy and water
- Reduced waste, eliminating costly remediation, hazardous waste disposal, and end-of-the-pipe treatments
- Allow replacement of a purchased feedstock by a waste product
- Better performance so that less product is needed to achieve the same function
- Reduced use of petroleum products, slowing their depletion and avoiding their hazards and price fluctuations
- Reduced manufacturing plant size or footprint through increased throughput
- Less use of landfills, especially hazardous waste landfills

IV. CONCLUSION

Green chemistry is a considerable contribution to this field. The 12 key principles of green chemistry, on whose basis the present review has been written, mean, in particular, the use of alternative raw materials (such as plants, agricultural wastes), renewable sources and effective catalysts, non-hazardous manufacture when possible without the use of toxic chemicals and ideal case when CO₂ and water as by-products, prevention of unnecessary wastes, lower-hazard chemical reactions, minimization of energy consume, leading to degradable reaction products, non-persisting in the environment. Energy-efficient processes such as biotransformations, photochemistry, ultrasound or microwaves and use of bioactive molecules in chemical processes yielding high-value molecules—all these are green processes.

The green chemistry methods include several non-contaminating physical methods as microwave heating, ultrasound-assisted and hydrothermal processes or ball milling, frequently in combination with the use of natural precursors, which are of major importance in the greener synthesis, as well as solvent-less and biosynthesis techniques. Biological methods (the use of bacteria, viruses, yeasts, plant extracts, fungi and algae) perfectly fit to the green chemistry, in particular to nanochemistry, resulting in biologically produced nanoparticles, which are non-toxic, stable, environmentally friendly and cost effective. Plant extracts contain polyphenols, terpenoids, proteins, enzymes, peptides, sugars, phenolic acids and bioactive alkaloids as a driving force for nanoparticle formation.

It is important to highlight that green chemistry and the awareness that this has given to the scientists has allowed us to make exhaustive revisions of the traditional methods to optimize them and to implement them based on the standards of the present time and, in some cases, the traditional methods have been substituted, bringing as a consequence more optimized processes both at the laboratory level and at the industrial level, as it has been seen in the reports mentioned in this review.

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Organic Farming of Some Valuable Medicinal Plants

Dr. Swati S. Kharade and Ishrat Mozar, Muskan Hamdule

Assistant Professor Department of Botany and TY Botany Student
Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *The excess use of chemical fertilizers and biopesticides creates various side effects on human body. To overcome this condition people moving towards organic food. In pandemic all over the world high demand on organic medicinal plants has increased. Organic farming increases soil organic carbon, phosphorus content and microbial population of soil. In present study, different organic amendment can supply the nutrient requirement to selected medicinal plants. Organic farming shows great influence on medicinal plant. Therefore, it helps to farmers who adopted the organic management practice have a way to improve soil quality and capacity for next generation. From this research paper, technical aspects of cultivation of medicinal plants shows safer way for sustainability. By these ways, it helps to improve economic aspects in the agricultural.*

Keywords: Organic farming, medicinal plants.

I. INTRODUCTION

Chemical farming created much serious problems for soil, environment and human health. There is a path of organic farming which create integrated, humane, environmentally and economically sustainable agricultural production systems, which increase reliance on farm-derived renewable resources and the management of ecological and biological processes and interactions, are provided acceptable level of crop, livestock and human nutrition, protection from pests and diseases and an appropriate return to the human and other resources. (Lampkin, 1990;Neuerburg and Padel, 1992)

In India, after green revolution modern agriculture move towards uses of fertilizer, insecticide, pesticide and farm operation with heavy machinery. The excess use of fertilizer started creating environmental problems such as enrichment of nitrate in underground water (Aishwath, 2005), pesticides contamination in underground water and soil erosion etc. In pandemic people also perceived that organically grown food is good as that of produced with fertilizers. These problems and issues create the attention to the scientific community of various fields for produced organic agricultural products. During last few years, the global market for organic food was increased about US \$ 26 billion in 2003 and estimated to reach up to 102 billion by the 2020. India's share in this market for organic food was 0.76%(Anonymous, 2004).

According to World Health Organization (WHO) more than one billion people used herbal medicines. The WHO has reported 21,000 plants that have reported medicinal uses around the world. India is a rich country in terms of medicinal plants flora. while some species are used commercially on a fairly large scale. India and Brazil are the largest exporters of medicinal plants in world market. In India, medicinal plants are estimated to be worth Rs. 550 crores. Organic cultivation of medicinal and aromatic plants has an excellent global market and India can exploit this market and takes its advantage (Rajeswara Rao and Rajput,2005). Results on application of organic manures on medicinal plants revealed that enhancement of yield and markets.

II. METHODOLOGY

Whole plant or individual plant part such as root, stem, leaves, bark, flower, fruits, seeds etc. or the chemicals derived from these parts are used in different system of medicines (Allopathy, Ayurveda, Homeopathy, Siddha, Unani, Herbomineral, Folklore etc.) to cure the disease. In present study, some medicinal plants like *Aloe babadensis*, *Bacopa monnieri*, *Catharanthus roseus* and *Lawsoniainermis* are cultivated under normal soil and soil with organic manure. The experiment set in three plots and mean values put in results. The present work carried out in campus of AIJ degree college of science Murud-Janjira.

III. LITERATURE REVIEW

Medicinal plants are a valuable source of biomolecules with therapeutic potential and as a lead to develop new drugs. India is a gold mine of medicinal plants and a rich repository of traditional medicinal knowledge. Organic cultivation is an attitude or behavior of the farmer in implementing farming system by Concerning the ecological balance, by utilizing natural and organic ingredients and without using chemical fertilizer. Trisilawatiet *al.* (2019) studied on organic cultivation of medicinal crops in the efforts to support the sustainable availability of Jamu raw material. They concluded that organic medicinal plant cultivation can play a role in supporting the sustainable supply and efficacious of Jamu raw materials, improving public health and the environmental safety. Blum *et al* studied improvement of seed quality of medicinal plants and herbs in organic farming. They noticed the physical and biological methods of seed treatment for medicinal plants cultivation. Victoria and Mariaselvam (2004) discussed the importance of growing medicinal plants in organic farming systems, The domestic and commercial uses, the water, soil and weather requirements for growth and the methods of propagation of different medicinal plant are provided.

IV. RESULT AND DISCUSSION

Organically grown medicinal products are not only readily acceptable in global market but also fetch premium prices than those grown with conventional farming. Hence the future global market is bright for organically grown products. Therefore, it is essential that India has to initiate pace to move from chemical or conventional farming to organic farming in the medicinal and aromatic plant sector. Based on the ecological significance of medicinal plants, these are very specific for soil, water and climatic requirement. In present study four medicinal plant selected for this experiment.

Table 1: Some important medicinal plants with their useful part and medicinal uses

Scientific name	Common name	Useful parts	Uses
<i>Aloe babadensis</i>	Aloe vera	Leaves	cosmetics, purgative, vermifuge
<i>Bacopa monnieri</i>	Bacopa	whole plant	improves memory
<i>Catharanthus roseus</i>	periwinkle	leaves, roots	anti-cancer, hypotensive
<i>Lawsoniainermis</i>	Mehendi	leaves	Antidermatophytic properties, anticancer, wound healing

The effect of organic manure on growth of medicinal plant mention in table 2. The parameter such as plant height and number of plant branches are counted. Selected medicinal plant shows remarkably difference in growth.

Table 2: Effect of organic manure on growth of medicinal plant.

Scientific name	Plant height		No. of branches	
	Normal soil (cm)	Soil with organic manure	Normal soil	Soil with organic manure
<i>Aloe babadensis</i>	27	34	6	8
<i>Bacopa monnieri</i>	15	17	8	12
<i>Catharanthus roseus</i>	36	40	3	6
<i>Lawsoniainermis</i>	50	55	4	7

Organic farming has grown the best possible relationship between the earth and human being. Soil organic matter content is the direct measure of soil fertility. Organic farming system includes the use of organic matters for maintaining soil health, growth and multiplication of beneficial microbes. It helps minimizing health hazards associated with food. Medicinal crops have great demand in modern civilization to extract various natural products for human welfare. It's gained global significance and are sought after by pharmaceutical companies and flavour and fragrance industries all over the world. The physical and chemical properties (quality) of the compound extracted from the organically grown medicinal plants are superior as compared to traditional system. But designing an organic farming system to tie together principles of sustainability and productivity is complex in these crops. Organic farmers will maintain both productivity and profitability. This practice helps to ensure economic profitability for the farming system. Organic agriculture builds on the idea of the efficient use of locally available resources as well as the usage of adapted technologies. It is best promising option for sustainable agricultural intensification in the tropics, as it may offer several potential benefits (Watson et al., 2008). It helps to strengthened self-confidence and autonomy of farmers.

V. CONCLUSION

Medicinal plants perform better in terms of yield and quality under organic farming system. At present the imbalanced application of the chemical fertilizer caused decreases in quality of the products not only inferior but also in residual effect leads to enter the food chain and threat to human health and other creatures. But the organic manures along with improvement in the yield and also controls weeds and provide the organic matter and nutrients to the soil, ultimately improve the soil health. However, switching over from modern farming to organic farming in Indian perspective is not so feasible at present.

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Emerging Wild Plants to Build up Immunity

Miss. Samiksha Raghunath Mali¹ and Miss. Azmajabeen Anwarkhan Husain²

Assistant Professor, Department of Botany¹

Student, F.Y.B.Sc Botany²

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *The aim of this document is to study role of wild plants in boosting immunity, fighting diseases and other viruses. It also reveals that the diversity, distribution, parts used and season of availability of wild food plants that can be useful in boosting immunity to fight seasonal infection. Wild vegetables have been an important part of human diets from ancient times. They contain important micronutrients, like vitamins and minerals which maintain health and promote immunity against infections. Wild plants can grow easily, they do not required much care as compared to other traditional cultivated species and are rich source of micronutrients. Hence, they could make an important contribution to fight against micronutrient malnutrition also providing food security. Unfortunately, wild vegetables are currently used less and have been neglected by researchers.*

Keywords: Wild Plant, Boosting Immunity, Micronutrients, Diseases.

I. INTRODUCTION

The immune system is built on beneficial live bacteria that lives in the gut which protect the human body from various diseases. When the immune system response is low, weak, or damaged, it becomes an open invitation for infections such as coronavirus or other diseases like diabetes, heart disease, or cancer.

Biodiversity is important for the planet as well as it's important for human health too. Eating a variety of fresh fruits, vegetables and while grains can help to immune systems by providing the full range of nutrients, different vitamins from vitamin C to vitamin D to zinc and iron. Recently COVID-19 is revelling the urgency of improving immunity and the power of food to protect us.

There is a variety of vitamins, flavonols, minerals that have been looked at that we know to improve immune system. Wild foods mainly wild plants, wild vegetables, wild fruits, wild mushrooms, flowers and wine berries now emerging to improve the immunity.

II. RESEARCH DESIGN AND METHOD/RESEARCH METHODOLOGY

The present study will be mainly based on primary sources of data. Primary data will be field based study and survey method where data will be collected through structured questionnaire. The study was conducted by survey and interviewing the knowledgeable peoples through questionnaires for plants which are traditionally used as medicine and tonic to cure cough, cold and fever. Plants are rich in antioxidant, vitamin A, vitamin C, and Zn were documented for their ability to boost immunity.

2.1 Preliminary Work/Survey

There was discussion with the knowledgeable peoples about wild plants which are traditionally used as tonic and boost up immunity. Their answers inspired to choose this topic for research work.

III. LITERATURE REVIEW

Approximately, twenty-five thousand plant based formulations and extracts have been used in folk medication in the south Asian subcontinents (Pundarikakshudu and Kanaki, 2019). In the past three decades the use of these traditional medicinal plants in Romania has been scarce (Pieroni et al., 2015; Papp et al., 2011, 2014; Gilca et al., 2018). Wild edible plants like *Angelica glauca*, *Berberis lycium*, *Terminalia chebula*, and *Ziziphus mauritiana* are used in the preparation of alcoholic drinks for local personal uses (Thakur, 2020). Wild plants are important ingredients of many traditional and

modern medicine, which are used to cure a variety of ailments from time immortal. Almost comparable findings were reported by other workers. (Dutt, 2013; Sharma, et al., 2017; Patil & Kakde, 2020) and Babich, et al., 2020).

IV. RESULT AND DISCUSSION

List of wild food plants useful in boosting immunity is as below:

Sr. No.	Botanical Name and Common Name	Uses
1	<i>Achyranthesaspera</i> / Agada	The whole plant is useful in the treatment of dropsy, piles, boils, toothache and skin problems. Root&stem are useful in toothache & used as a toothbrush.
2	<i>Centellaasiatica</i> / Bramhi	Used as memory booster, tonic and to manage diabetes and nervous disorder.
3	<i>Cyclospermumleptophyllum</i>	Powered seed are used to cure cough while fresh are used to cure cough.
4	<i>Foeniculumvulgare</i> /	Local people use fruits decoction to cure indigestion, cough and cold.
5	<i>Mangiferaindica</i> /Mango	Root, leaf&bark are astringent, acrid, refrigerant & useful in vitiated conditions of pitta,
6	<i>Asparagus adscendens</i>	Powdered Rt is used as tonic.
7	<i>Terminalia bellirica</i> /Behada	The bark is mildly diuretic and useful in anaemia and leucoderma.
8	<i>Ficusracemosa</i>	Fruit used for its antidiuretic effect.
9	<i>Syzygiumcumini</i>	Local people use seed, tender leaf are used in diabetes, diarrhea.
10	<i>Murrayakoenigii</i> /Curry Leaf	The leaf, bark & root are used as a tonic & Stomachic.

Due to changes in our life style and food habits we are less resident towards the disease as compare to our ancestors. By using medicinal wild food plants we can conserve our traditional health care and it will helpful in boosting immunity. Therefore, there is a need to assimilate the wild plants which are havingnutritional valuein our daily diet. .Addition of wild food plants as food and food supplements with some modern twist to our food plate. Plants which will available in future will support the human health is dependent on the conservation and sustainable use of their source species in the long term. Maintaining biodiversity will help to promote the tourism. Medicinal plants and herbs are better alternatives to treat several diseases.

V. CONCLUSION

Lack of attention to ensuring the sustainability of herbal ingredients, in particular those sourced from the wild. The wild plants key to ensuring the long-term survival of medicinal and aromatic plant species, which could form the basis of the medicinal formulations. Addition of wild food plants as food and food supplements with some modern twist to our food plate. Modern twist such as maggi, poha, sandwich, momos which are very popular in young generation. By including these wild plants in our food habit we can make our present and future generations healthy, happy and strong. Lack of knowledge among the people regarding benefits of wild plants.

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Post Harvest Management of Agricultural Produce

Miss Namira Irfan Gazgeand and Miss. Iqra Mubin Daroge

Research Scholar, Department of Botany, University of Mumbai, Mumbai, India

Assistant Professor of Botany Department

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *The minimization of wastage of agricultural produce is the ultimate goal of post-harvest management. The post-harvest management has increasing population and shrinking agricultural land and other resources. Present situation is the main global challenge to ensure food security in a sustainable manner safe to mankind and environment. The production of agricultural crops have increased during the recent years, but the development and adoption of post harvest technology is lacking and resulting in huge post harvest losses. The factors which affect on post harvest during harvesting, storing, transporting, and marketing is microbial activity. The highly perishable crop like horticultural produce need much more attention and to ensure promotion of processing and value addition. The value chain for processing has become a important to improve the food safety and strengthen national food security. The value chain in post-harvest management of horticultural crops mainly comprise of pre-harvest factors, harvesting, market preparation (common storage, sorting, grading, packaging and on-farm storage), transportation, storage by-product waste management.*

Keywords: Harvest, Quality, Post-Harvest Techniques in Vegetables. Post-Harvest Management, Processing of Vegetables

I. INTRODUCTION

Today, one of the main global challenges is how to ensure food security for a world growing population whilst ensuring long-term sustainable development so it's a core part of the concept of sustainable development. Agro-ecosystem functions solving the persistent hunger problem is not simply a matter of developing new agricultural technologies and practices. Most poor producers cannot afford expensive technologies. They will have to find new types of solutions based on locally-available and cheap technologies combined with making the best of natural and human resources. the use of the best available technologies and inputs such as best genotypes, best agronomic management practices and best postharvest technologies to maximize yields, while at the same time minimizing or eliminating harm to the environment.

Postharvest losses are caused by external such as mechanical injury (bruising, cutting, breaking, impact wounding), Parasitic Diseases (fungi, bacteria, other organisms) and internal factors such as physiological deterioration, mineral deficiency, low or high temperature injury, or undesirable environmental conditions. Postharvest losses which average between 24 and 40% in developing countries, and between 2 and 20% in developed countries are major source of waste. High levels of waste result in higher prices for fresh produce, and the farmer increasingly facing poverty. Therefore, this review will be focused on the postharvest physiology and management including harvesting, handling, packing, storage, transportation and hygiene of fruits and vegetables to enhance using of new postharvest biotechnology. India is the second largest producer of fruits

II. METHODOLOGY

Minimization of Post-Harvest Losses

By various technological adoptions there are two approaches for reducing postharvest losses of vegetables. The first approach for loss reduction is to follow scientific postharvest management of vegetables. Another approach for loss reduction in processing into value added products. Postharvest technology of vegetable crops envisages development of appropriate techniques to reduce postharvest losses to prevent spoilage and help to utilize maximum crops in a nutritious and safe manner.

Post-harvest management practices Post-harvest losses can be reduced by adopting breeding technologies for longer shelf life, improvement of pre-harvest factors and harvesting techniques, proper methods of handling, marketing, packaging, transportation and storage, development of appropriate processing technology

1. Selection of varieties
2. Harvesting
3. Sorting/Grading
4. Washing
5. Trimming
6. Curing
7. Waxing
8. Precooling
9. Post- Harvest Disease Control
10. Sprout inhibition
11. Packaging
12. Transport
13. Waxing
14. Marketing System
15. Storage

III. REVIEW OF LITERATURE

Post-harvest technologies constitute an inter-disciplinary science and technique applied to agricultural commodities after harvest for the purpose of prevention, conservation, quality, packing, storage, distribution, marketing and utilization to meet the food and nutritional requirements of consumer in relation to their need

IV. RESULT AND DISCUSSION

Post-harvest losses in vegetable in (Murud 2021-2022):

Name of vegetable	Post-harvest losses as percentage of production
Bean and pea	7-12
Brinjal	10-13
cabbage	7-15
Cauliflower	10-15
Garlic	1-3
Onion	15-13
Potato	15-20
Tomato	10-20

Post-harvest management practices Post-harvest losses can be reduced by adopting breeding technologies for longer shelf life, improvement of pre-harvest factors and harvesting techniques, proper methods of handling, marketing, packaging, transportation and storage, development of appropriate processing technology

1. Selection of varieties: Varieties with better keeping and processing quality and lesser handling susceptibility should be bred and selected for different vegetables. A few examples of varieties with long shelf life are Arka Vishal, Pusa Gaurav (Tomato).
2. Harvesting: Harvesting should be done at proper stage where there is minimum damage and loss, as rapidly as possible and at minimum cost. Harvesting should be done at early morning or late evening hours. A temperature of above 27 °C during harvesting should be avoided. The products that are to be send to distant markets are harvested in the evening and transported in the cool hours of night where as commodities for local markets are harvested early morning. Harvesting should not be done immediately after rain or irrigation. Harvesting at optimum stage of maturity ensures maximum quality and yield. Care must be taken to avoid mechanical injury to product.

3. **Sorting/Grading:** Sorting of harvested vegetable produce is done to remove diseased, damaged, misshapen, over mature, insect attacked and rotten vegetable.
4. **Washing:** The Produce is cleaned/washed to remove adhering dirt, dust, insects, mould and spray residues and to improve appearance. Onion, garlic, okra and mushrooms are not washed after harvest
5. **Trimming:** Trimming is done in crops like cabbage and lettuce etc. To remove unwanted, discolored, rotten and damaged parts.
6. **Curing:** Curing is a process of strengthening and wound periderm (skin) of root and tuber crops for a specified period under well-defined conditions of temperature and relative humidity which enhances shelf life of these crops by forming corky layer which protects against water loss and infections by decaying organisms.
7. **Waxing:** Waxing is done mainly to minimize water loss and reduce shrivelling and wilting to enhance therefore storage life. Wax seals off the stem near the petiole and the pores on the surface of fruits which are the main routes of transpiration. Waxing on the surface of fruit or vegetable product which are the main routes of transpiration.
8. **Precooling:** Pre-cooling is the process of removing field heat from the harvested commodity, particularly when harvested during hot weather. Pre-cooling helps in decreasing rate of transpiration and respiration delayed ripening and easing the load on the cooling system of transport or storage chambers.
 - a. Room cooling
 - b. Hydro-cooling
 - c. Contact icing
 - d. Vacuum cooling
9. **Post- Harvest Disease Control:** Vegetables suffer significantly due to invasion of fungi and bacteria causing disease and resulting in huge postharvest losses.
10. **Sprout inhibition:** Tuber and bulb crops (onion & potato) enter a dormant stage at maturity, sprouting starts at the end of dormancy or rest period. Sprouting is a growth resumption process.
11. **Packaging:** Packaging is a fundamental and necessary for management of highly perishable products. The main role of packaging is to assemble the produce into convenient units for handling and safeguard the produce during distribution, storage and marketing. Packaging materials are selected according to plant characteristics. It improves storage life of produce.
12. **Transport:** Transport is an important linkage in postharvest handling, storage and distribution. Transport of horticultural produce from field to the distribution markets is done by rail, truck, airplane and ship. Serious losses take place due to improper handling, careless loading and unloading and use of improper containers.
13. **Waxing:** Vegetables such as tomato, brinjal, sweet pepper, cucumber, muskmelon, carrot etc. are often waxed with a water emulsion by dipping or spraying to retard the moisture loss from the product
14. **Marketing System:** Vegetable market is often suffering from several constraints due to their high perishable nature, season market and bulky nature. Assembling and subsequent marketing of the produce is further blocked due to lack of proper storage facilities and quick transport systems.
15. **Storage:** Storage of vegetable produce an important for improving shelf life avoiding market glut and to ensure supply through the year and increase profit to the producers.

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VI. CONCLUSION

A study was conducted on the effects of postharvest handling and storage temperature on the quality and shelf of produce during 2021-2022. Which revealed that rough handling of produce can result in the destruction of the fruit cell wall leading to softening and reduced marketability of the produce. Also, high storage temperature can result in increased respiration (3.8 mlCO₂/kg-h) and ethylene production (7.85 µl/kg/h) significantly as well as accelerate ripening (16.80)

and weight loss (97.08 %). Therefore these conditions (rough handling and high temperature) accelerate the metabolic rate of produce and thereby reduce the shelf life of the produce. This research is based on the study on shelf life and quality of produce by using post-harvest technique like produce packed in perforated (0.25%) polyethylene bag and kept at ambient temperature (20-25 °C) & relative humidity 70-90%) condition resulted in substantial reduction in decay and weight losses.

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Hypertension-The Restrained Terminator: A Mini Review

Mr. Shoyeab M. Khan and Ms. Padge Sakshi Sunil

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: Hypertension, the “silent killer” is a modern day’s epidemic and is an increasingly important medical and global public health issue its role in causation of coronary heart disease, stroke, and other vascular complications. Hypertension is one of the major risk factors for cardiovascular disease and this leads cause of death worldwide. High blood pressure is another home of hypertension High blood pressure, often has no symptoms most of the studies on hypertension provided the data on older of high blood pressure so. the study on prevalence pressure among younger age group and their socio- demographic variables provides the guide for requirements of any intervention. The present study indicates the Current prevalence of hypertension and its correlates in the state of Maharashtra. I’ve searched PubMed, Embase, Cochrane library, Google Scholar and includes cross sectional studies reporting data on hypertension prevalence among young adults. For more state I’ve visited national library of medicine and analyzed National family Health survey Date (NHFS). The data collected is present using Microsoft Excel. Overall prevalence of hypertension was 35-40% and that of pre-hypertension was 40 45%. among the study population human ecology factors like age, mode of travel, physical activity, hypertension, male gender, family history of hypertension, mode of travel, physical activity, overweight, years of service, intake of coffee and smoking had shown significant association with hypertension.

Keywords: Hypertension, Prevalence, Young adults, NFHS

I. INTRODUCTION

Hypertension is defined as systolic blood pressure measuring more than or equal to 90 mm ed in an individual according to JNC, 72 The of mercury record. global prevalence of raised blood pressure in adults aged 15 years and over was, in 2019-2015 Approximately 9.4 million deaths. around 20% and 7% of disease burden as measured in DALYS (disability adjusted life years. caused are by roused blood pressure in 2010.[2] Higher the blood pressure, higher the risk of both stroke and coronary events overall prevalence for hypertension in India was found to be 29.8% about 33 /. urban and 25 % rural Indians have hypertension.[4]

Many modifiable factors contribute to the Current high prevalence rates of blood rates They include overweight obesity harmful we Pressure. They include overweight and obesity, harmful use of alcohol, physical inactivity, psychological stress, eating food containing too much salt, inadequate intake of fruits and vegetables, socioeconomic determinants, etc [3].

II. METHODOLOGY

Present study may be a cross sectional study administered geographic area throughout 2019 to 2020 by National Family Health Survey (NFHS-5).[5] Multistage sampling technique was utilised within the study. this may be a across the nation sampling survey and therefore the information is collected completely for every state. NFHS-5 munition for geographic area was conducted from nineteen June 2019 to thirty Dec 2019 by Indian Institute of Health Management analysis (IIHMR) and TRIOs Development Support (P) Ltd. Knowledge was gathered from 31,643 households, 33,755 women, and 5,497 men. The scope of clinical, measuring, and organic chemistry testing (CAB) has conjointly been enlarged to incorporate mensuration of waist and hip circumferences, and therefore the age vary for the mensuration of vital sign and blood sugar has been enlarged.[1] The NFHS-5 sample has been designed to produce national, state/union territory (UT), and district level estimates of assorted indicators lined inside the survey. [6] The Biomarker Schedule of this survey lined measurements of height, weight, and Hb levels for children; measurements of height, weight, waist, and hip circumference,

and Hb levels for ladies aged fifteen-49 years and men aged 15-54 years; and vital sign and random blood sugar levels for ladies and men aged 15 years and over. [17,18]

III. LITERATURE REVIEW

There is a scarcity of targeted analysis for programs or study protocols with prehypertension because the study focus. this can be seemingly as a result of prehypertension isn't a malady class however a identification of risk(National High pressure level Education Program, 2004), that solely in recent years has been at argeted space of focus.[12] For reasons that seemingly appear associated with funding for this subject primarily being given to communities and health departments that have terribly restricted business capability compared to educational and laboratory settings, most studies reportage prehypertension, hypertension, or overall heart condition risk reduction as outcomes concentrate on risk issue reduction through life-style modification programs (e.g. those centered on physical activity and nutrition). Such programs or study protocols centered in the main on fatbar and rising physical activity and/or nutrition.[25] just one article, Associate in Nursing analysis of exercise coaching on resting pressure level in young adults, had prehypertension because the topic of focus. this text evaluated Associate in Nursing eight-week exercise coaching protocol.[25] Researchers found a clinically and statistically vital seven to 12 mmHg reduction in pressure level when program completion.

IV. RESULTS

Prevalence of high blood pressure in geographic area in geographic area, the prevalence of high blood pressure is found 25.1%. Besides, an enormous variation within the prevalence of high blood pressure is ascertained across the districts. At the district level, the prevalence rate of high blood pressure is varied between V-J Day in Hingoli and three hundred and 65 days in Bombay. Satara, Dhule, Gadchiroli and Bombay are the districts with over half-hour prevalence of high BP, whereas Hingoli, Nagpur, Osmanabad, Wardha and Akola have a prevalence rate of but one-fifth. There are districts like Nandurbar, Jalgaon, Buldana, Gondiya, Chandrapur, Yavatmal, Bombay residential district, Pune, Ahmednagar, Bid and Solapur that show the next prevalence of high blood pressure than the state average. [26, 5]

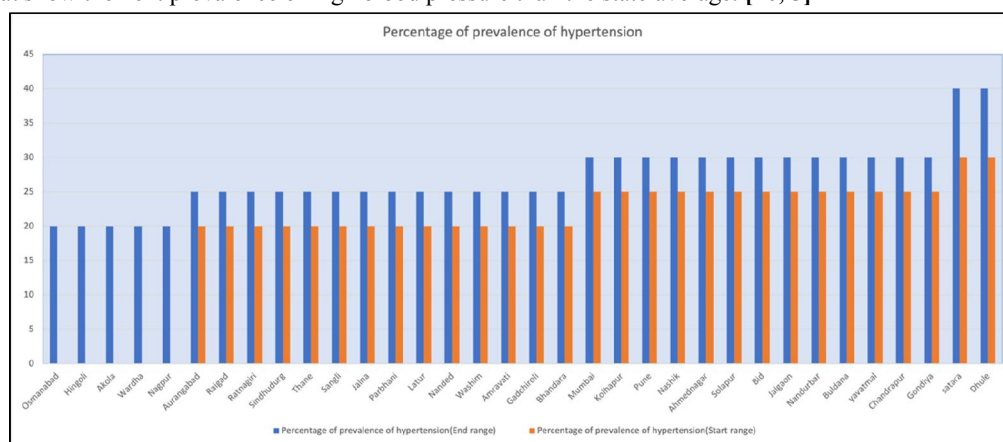


Figure 2: Percentage of prevalence of hypertension in states of Maharashtra.

4.1 Prevalence of High Blood Pressure Related to Totally Different Socioeconomic Factors

Table 1 shows the prevalence of high blood pressure in geographic area in step with the socioeconomic characteristics of the respondents. Concerning twenty-five percent (25%) of the respondent's square measure at the chance of high blood pressure. The study shows that the prevalence of high blood pressure is absolutely related to the age of the respondents and therefore the results square measure found statistically vital ($\chi^2 = p < 0.001$). [22, 24]

Table 1: Prevalence of hypertension associated with different socioeconomic factors.

Sr. No.	Variables	Categories of the variables	Percentage
1	Age(Years)	18-29	29-30
		30-39	21-22
		40-49	17-18
		50-59	13-14
		60+	18-19
2	Sex	Male	45
		Female	55
3	Marital Status	Single	14
		Married	77
		Widow/Separated/Divorced	9
4	Place of residence	Rural	57
		Urban	43
5	Education Status	Illiterate	3
		Primary	14
		Secondary	29
		Higher	54
6	Religion	Hindu	80
		Muslim	10
		Buddhist	7
		Christian	1
		Others	2
7	Caste	SC	19
		ST	14
		OBC	43
		Others	24
8	Wealth index	Poorest	20
		Poorer	19
		Middle	18
		Richer	22
		Richest	21

Figure 2 shows that the prevalence of hypertension in males (28%) is significantly higher as compared to the prevalence in females (23%). But, in the age group of sixty years and above, the prevalence of hypertension is found higher among females (42%) than among males (39%). [26]

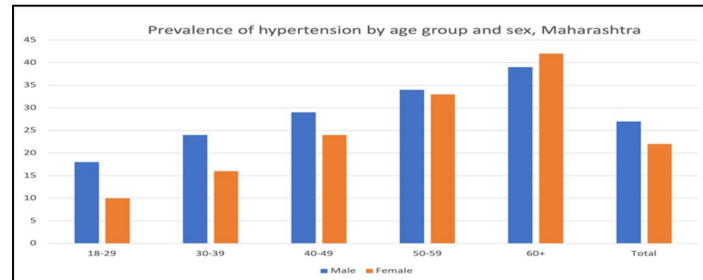


Figure 2: Prevalence of hypertension by age group and sex, Maharashtra

We have observed a higher prevalence of hypertension among widow, divorced and separated (37%, 95% CI: 35.9–38.1), compared to single and married. In contrast, when it is compared to the former, a higher prevalence of hypertension is found among the single and married at the younger age (i.e., age between 18 and 39 years). The prevalence increases after the age of forty years among widowed, divorced and separated (Fig 3). [26]

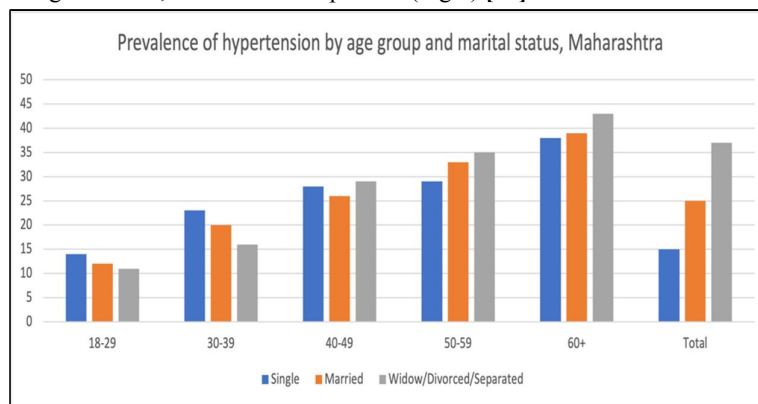


Figure 3: Prevalence of hypertension by age group and marital status, Maharashtra

We have additionally found an urban-rural difference in the prevalence of hypertension, which is 27% (95% CI: 25.5–27.7) in the urban areas and 24% (95% CI: 23.1–24.7) in the rural areas. No clear pattern of prevalence of hypertension by education is seen, through respondents who are illiterate and are with primary education have a higher risk of hypertension as compared to those who have higher educational activities. The prevalence of hypertension is found higher in Christian and Muslim religion. Again, respondents belong to Scheduled Tribe (ST) are found to experience a higher level of BP (i.e., 26%, 95% CI: 24.6–27.8) than the respondents from alternative castes. We have observed a higher prevalence of hypertension (i.e., 28%, 95% CI: 27.2–29.7) among the respondents belonging to the richest wealth quintile as compared to the other respondents. Further, across the seven administrative divisions, variation in the prevalence of hypertension is also observed. Nashik (28.5%, 95% CI: 26.8–30.3) and Pune (27.5%, 95% CI: 26.0–29.0) regions have shown a higher prevalence of hypertension. [5, 26]

V. DISCUSSION

Maharashtra ranks among the highest 5 hierarchical states in Asian country on the Human Development Index (HDI). the current study focuses the situation of cardiovascular disease in geographic area and its districts. The study has found a large variation within the rate of prevalence of cardiovascular disease within the districts of geographic area. The prevalence of cardiovascular disease is found the bottom (15%) in Hingoli (the district with low HDI rank), and therefore the highest (36%) in Bombay (very high HDI hierarchical district). [24, 23] Besides, regional variation is observed, and cardiovascular disease is found additional current in Pune and Nashik (regions sharing a better proportion of internet State Domestic Product). Among the individual level non-modifiable factors, age, sex, and legal status area unit found to be considerably related to cardiovascular disease. kind of like the previous studies, older participants, males, widowed, unmarried and separated, Christians and Muslims, regular tribes, low educated and wealthier respondents' area unit additional probably to be hypertensive [7–9].

Further, the prevalence rate of cardiovascular disease is found higher in urban areas than in rural areas [10, 11]. during this study, we've conjointly found that a better level of BMI (25 and above) and level of glucose (>140 mg/dl) are also the significant predictors of cardiovascular disease and are absolutely related to the prevalence of cardiovascular disease [10, 12]. alternative mode factors that area unit modifiable, like consumption of tobacco and alcohol and habit of smoking conjointly play a crucial role in increasing the chance of cardiovascular disease [8, 13, 14]. Despite awareness of the chance factors of cardiovascular disease, even among the participants with a better level of education and economic standing, prevalence of cardiovascular disease could also be high thanks to their fatness, physical inactivity and therefore the place of residence i.e., urban areas. Higher news of the matter of high force per unit area level among wealthier and educated respondents is additionally thought of as a crucial issue for the upper level of prevalence of cardiovascular disease during this cluster [10, 15]. Within the present study, the aim of utilizing structure model is to assess the number of variabilities within the prevalence of cardiovascular disease due to the effects of the of the various combination of things and due to the effect of every level [16, 17]. Hence, the smaller worth of VPC (1%) indicates that variation within the rate of prevalence of cardiovascular disease at the district level is low that will ensue to the influence of alternative factors (i.e., socio-economic characteristics, health, and mode practices). On the contrary, at the community level a better worth of VPC (13% to 14%) shows a better rate of variation within the prevalence of cardiovascular disease and may be attributed to the results of background factors [7]. Hypertension is that the third most vital risk issue for burden of diseases in South Asia [8].

Overall, the present prevalence of cardiovascular disease in geographic area is twenty fifth that is below the planet average. the speed is in line with several Asian countries like Bangladesh (24%), China (24%) and Vietnam (25%), however is inconsistent with the western countries like u. s. (20.3%) and Canada (21.4%) [18,19,20]. in step with a study, 20.6% of Indian men and twenty.9% of Indian ladies were full of cardiovascular disease in 2005 [19]. The reportable prevalence of cardiovascular disease was thirty seventh among 30–64 cohort in 1998 and fifty fifth among 40–60 cohort in 2000 in Asian country, although the speed varies from rural to urban and across the states [21, 22]. Action on the development of mode and its management to scale back the chance of cardiovascular disease is proscribed in Asian country. Further, inappropriate food habits and mode practices also are chargeable for the upper prevalence of cardiovascular disease [15, 8, 14]. correct force per unit area management live is required to avoid the chance of cardiovascular disease [23]. Hence, the management of the known risk factors (such because the use of tobacco and

consumption of alcohol) across the economic standing will improve the cardiovascular disease level of the population within the state of geographic area.

VI. CONCLUSION

Hypertension is additional common in urban areas than in rural areas in Republic of India. The structure analysis has shown that the variation within the rate of prevalence of high blood pressure is higher at the community (PSU) level as compared to the variation within the prevalence rate at the district level in Maharashtra. The study conjointly explores the high prevalence rate of high blood pressure in Pune, Nashik, and Amravati regions. The study emphasizes the requirement of a further focus and strategy to regulate high blood pressure among the deprived population (like uneducated and low educated, widowed, unmarried and separated, scheduled caste and scheduled tribe, and therefore the non-secular minority communities like Christians and Muslims) among whom high blood pressure is additional rife. The results intensify the present potential for preventive ways, focusing the community and direct for each medical and lifestyle-related factors like medical message, acceptable dietary practices, and social group attitudes toward healthy lifestyles. this can facilitate to realize associate degree optimum BMI level and an occasional glucose level. Moreover, correct pointers and promotion of healthy practices to stick a healthy way are needed. Further, changes in unhealthy behavior and practices at the individual level are desired. At the community and district level, there's associate degree imperative would like for acceptable intervention ways for the interference and management of high blood pressure by providing info, early designation, and treatment.

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Review Article: Impacts of Pesticides on Human Health and Environment: Need for a New Concept in Agriculture

Mr. Nitin S. Pawar, Taskeen Azim Mahadkar

Anjuman Islam Janjira, Degree College of Science, Murud-Janjira, Raigad, Maharashtra, India

Abstract: *Increasing demand of food has increased the chemical burden on natural ecosystem. A pesticide is a chemical product used in agriculture to protect crops from pests, weeds and to enhance crop yields. However, these pesticides causes large number of negative health and environmental effects. Now a days their side effects have become an important environmental risk factor. The sustainability of agriculture cropping system is a basic question on which the future of humanity is relying. Several indicators tend to suggest that the current system of agriculture production is reaching its limit and become unsustainable. The urgent need for more sustainable agriculture practice has produced many innovative ideas. This review paper emphasised on how the agricultural reforms and food production implementing sustainable practices will evolve to food sovereignty.*

Keywords: Ecosystem, Pesticides, Agriculture, Sustainable Agriculture

I. INTRODUCTION

A pesticide is a chemical product used in agriculture, to protect crops from pests, weeds and enhance crop yields. Insecticides, fungicides, herbicides, rodenticides, and plant growth regulators are some examples of such chemical products. These products are used in agriculture for preventing, destroying and controlling pests, weeds and diseases. They protect humans from vector borne diseases. Apart from agricultural uses they are also employed for the maintenance of non-agricultural areas like public gardens and sport fields. [1] These chemicals have long been used in agriculture for controlling pests and improving crop yield. About 4,500 years ago Sumerians had employed sulphur compounds to control insects. [4] For more than 2000 Pyrethrum has been applied as an insecticide. For controlling weeds salts or sea water has been used. Until 1940 many inorganic substances and organic compounds were employed in pest control. [3]

In the recent past, increasing demand of food grains and decreasing farmland have increased the pressure on farm yield improvement. [2] Because of this the use of pesticides in agriculture have tremendously increased. But many pesticides have adverse effects on human health and environment. [1] Use of some certain pesticides in agriculture has been banned due to their hazardous effects. Some pesticides can cause harmful impact even when come in contact with skin. [6] The possible health outcome depends on factors like the type of pesticide, the duration and route of exposure, and the individual health status. [9] When the pesticides are ingested or inhaled by a human or animal body, they may be metabolized, stored, or excreted. In some cases they are bioaccumulated in body fat. [10] The pesticides have many negative health effects, some of them are dermatological, neurological, respiratory, gastrointestinal, carcinogenic, reproductive and endocrine effects. In many cases continuous or accidental exposure to these chemical pesticides can cause hospitalization and sometime it even results in death. [15]

Coming to the environmental impacts, many chemicals present in the pesticides are environmentally stable and hence they prone to bioaccumulation. Such toxic chemicals remain in the environment for hundreds of years. They can cause permanent farmland infertility. They also contaminate their surrounding environment like air and water resources. [5] Residues of pesticides have been founded in a great variety of routine foods and beverages. For instance, these harmful substances can be found in cooked meals, water, fruit juices, wine, animal feed and refreshments. [14]

This current review aims at focusing on the urgent need for a new concept in agriculture which involves an abundant reduction in the use of chemical pesticides. Given the fact that human health issues and environmental issues have been extensively discussed in the current literature, this review paper focuses on health and environmental effects that have

been associated with exposure to harmful chemical pesticides. More emphasis is given to the widely used herbicide “glyphosate” and on bio based plant protection product “Stifenia”. The underestimated negative health impacts of such products reveal the urgent need for their proper risk assessment.

II. METHODOLOGY

2.1 Search Criteria

To carry out this study required review of literature materials and documents available from online publications. These materials were obtained from the internet through Google, Google Scholar, ResearchGate, Frontiers and ScienceDirect. The following criteria were used to search for the studies that were used in this paper. Studies that were selected were those that have addressed toxicity of pesticides, effect of pesticides on human health and environment, the need of sustainable practices in agriculture. Also chosen were studies that have emphasized on the underestimated toxic effects of widely used herbicide "Glyphosate" and plant protection product "Stifenia".

A. Terms used in the Search

The terms used in the search were 'Pesticides', 'Pesticides toxicity', 'Impact of pesticides on human health', 'Impact of pesticides on environment', 'Glyphosate toxicity', 'negative impacts of herbicides', 'Inflammatory effect of Stifenia', 'Pesticide Pollution', 'Sustainability in agriculture', 'New concept in agriculture', 'Commercial pesticides', 'Pesticides Exposure', 'Pesticides effect on non-target organisms'.

2.2 Screened Publications

The total number of publications screened was seventeen. Among the studies identified four publications reported on the toxic effect of pesticides on human health and environment. Nine publications focused on how some pesticides adversely affect the human as well as environmental health. Two publications reported on water pollution effect of pesticides. Two publications reported on the need of sustainable practices in agriculture.

III. LITERATURES REVIEW

Robin Mesnage and Gilles-Eric in 2018 conducted a research on toxicity of pesticides on health and environment. The study was done from multi-disciplinary point of view. The study revealed that toxicity of pesticides is underestimated. For instance, pesticides are always commercialized as mixtures of different ingredients but only one declared of these ingredients is tested for human health effects. Ingredients such as surfactants are poorly tested although they can be the most toxic ingredients in a pesticide formulation. The research confirms that new ways to evaluate effects of pesticides on human health and environment are urgently needed.

In 2017, Leny Teyssier, Julie Colussi, Stephanie Delemasure, Johanna Chluba, David Wendehenne, Olivier Lamotte and Jean-Louis Connat conducted research on effects of the plant protection product Stifenia on vertebrates. Stifenia is a plant protection product composed of crushed fenugreek seeds. It is thought to be a safer alternative to classical plant protection products. But the study revealed unexpected effects of Stifenia on human and animal health. In case of humans it have very harmful effect on peripheral blood mononuclear cells. This leads to a conclusion that although bio-based pesticides are natural in origin but their impact on human health and environment need to be carefully studied.

Polyxeni Nicolopoulou-Stamati, Sotirios Maipas, Chrysanthi Kotampasi, Panagiotis Stamatis and Luc Hens in 2016 conducted a review on effects of pesticides on human health. The study emphasized on the need of new concept in agriculture. The study focuses on harmful effects of organochlorines, organophosphorus and carbamates pesticides on human health. The study revealed that Current agricultural practices include the wide production and extensive use of chemicals known for their ability to cause negative health effects in humans and wildlife and to degrade the natural environment. Therefore, an urgent strategic approach is needed for a reduction in the use of agrochemicals and for the implementation of sustainable practices. This leads to a conclusion that alternative procedures to the current model of food production should be implemented in new agricultural policies targeting sustainable development and protection of the consumers' health.

In 2010, Anju Agrawal, Ravi S. Pandey, Bechan Sharma conducted a review on the impacts of pesticides contamination in water bodies and drinking water. The study revealed that although use of pesticides have enhanced the crop yield and

reduced the vector borne diseases but their unregulated and indiscriminate application have raised serious concerns about the environment. Further, the study shows that even at low concentrations, the pesticides present in environment may exert several adverse effects. Pesticide contamination causes great harm to the environment and non target organisms like beneficial soil microorganisms, insects, plants, fish, and birds. The study leads to a conclusion that best way to avoid pesticide contamination is to use safer, non chemical pest control methods.

In 2015, Isra Mahmood, Sameen Ruqia Imadi, Kanwal Shazadi, Alvina Gul and Khalid Rehman Hakeem conducted a study on effects of pesticides on environment. Detailed study have done on pesticides, their types, usefulness and the environmental concerns related to them. This article has discussed about the methods for eradication of use of pesticides. Further, future outcomes after complete pesticides eradication have also discussed. The study emphasized on how excessive use of pesticides leads to destruction of biodiversity. The study revealed that in future chemical pesticides can be used in combination with natural treatments and remedies which result in more sustainable elimination of pests and insects. This combination will surely help to attain environmental sustainability. Also it has diverse applications in controlling urban pests and invasive species.

Lauren Brzozowski and Michael Mazourek in 2018 conducted a review on how agro ecological pest management will lead to sustainable agricultural future. The harmful impacts of using pesticides in pest management have discussed. The study focuses on ways to develop agro ecological management strategies. The main aspect of sustainable agricultural system consist of meeting food demands in a economical viable manner, while improving environmental health and individual and societal well being. Therefore, there is a need to invest in the agricultural systems that will give us sufficient yield to fulfil food grain demand while minimizing environmental impacts.

In 2016, Marek Cuhra, Thomas Bohn and Petr Cuhra conducted a review study on glyphosate. Glyphosate is a herbicide which is considered as less toxic in comparison to other products of the same class. But many new research evidences increases controversy about glyphosate toxicity. The study revealed that glyphosate is having more toxicological effects than assumed from previous assessment. One more finding of this review paper is that the biological and chemical degradation process of glyphosate are insufficiently documented. There is a need of more regulated risk assessment of glyphosate and glyphosate based herbicides (GBHs). The study leads to a conclusion that use of glyphosate and glyphosate based herbicides (GBHs) should be restricted on account of their recognized higher toxicity and stronger potential to cause harmful effect on human health and environment. But in reality in spite of so much of evidences regulatory authorities are allowing more sources of glyphosate in the food supply chain.

IV. RESULTS AND DISCUSSION

4.1 Effects on Human Health

Pesticides have many adverse effects on human health. The common classes of pesticides i.e., organochloride, organophosphate, pyrethroids, carbamates, triazine and neonicotinoids contain detrimental pesticides that have human endocrine disrupting potential. Many of them have carcinogenic actions. [18] The endocrine disrupting compounds have adverse effects on human reproductive system which causes breast, testicular and ovarian cancer. [14] They can also cause metabolic disruption leading to metabolic diseases such as obesity or diabetes. There are concerns about prenatal exposure and health effects in children due to pesticides as their residues have been detected in human breast milk samples. [21] Many bio-based pesticides are considered safe as they are of natural origin. But an important study investigated the inflammatory effects of one of the bio-based plant protection product Stifenia [FEN 560] on human peripheral blood mononuclear cells. Although this plant protection product is of natural origin [made from crushed fenugreek], direct toxicity of it to human health can be observed. Thus bio-based pesticides must be studied carefully to avoid their negative health effects on human health. [22]

Since 1970, glyphosate based herbicides are being used in agriculture. [2] Many scientists and researchers have revealed that glyphosate is responsible for increased rates of human infertility and birth defects. [13] This is because they are metal chelator and sperm motility is dependent on Mn. Recent researches have concluded that due the metal chelating properties of glyphosate they may be responsible for Alzheimer's disease, Parkinson's disease, anxiety disorder, osteoporosis, inflammatory bowel disease, renal lithiasis, osteomalacia, cholestasis, thyroid dysfunction, and infertility. [6]

4.2 Pesticide Effects on Environment

Pesticides have many hazardous effects on the environment. Some pesticides are used to kill fungi, unwanted herbs and insects from the farmland. This reduces the biodiversity of that landscape to only one edible crop. The lack of biodiversity directly affects the soil resilience. [3]

The bioactive pesticides interact with biomass and water systems. The widely used herbicide glyphosate residues have been detected in soil and ground water. [4] Many environmentally stable toxic pesticides get bioaccumulated into the environment and remain there for hundreds of years. These pesticides may be present in different organisms like birds, fish and insects and thus there are possibilities that they may reach the non target organisms. [1]

The large scale use of organophosphorous pesticides causes their accumulation in soil, from where they get into the ground water and rivers. A recent study has demonstrated the long range transfer of organothiophosphate insecticide chlorpyrifos as its residues have been detected in air and sea water of Arctic. [10]

A research done by David B. Donald and colleagues investigated the presence of residues of 45 Pesticides in the drinking water of reservoirs of northern Great Plains of North America. This increases concerns about the non-target effects of Pesticides. [23]

A huge amount of pesticides exists in environment. There are many chemicals which are present in low concentration and do not cause acute detectable effects in organisms, but they may cause other types of harms like genetic disorders and physiological alteration that, in long run, reduces the organisms life span. [4]

V. CONCLUSION

We need to invest in agricultural systems that will give us sufficient yields to nourish humanity while minimizing environmental impacts. The great yields from conventional agriculture today are inextricable from hidden cost to the environment through the detrimental effect of pesticides. While scaling organic agriculture to feed the world is still maturing, organic agroecological approaches hold the potential to provide for our world population sustainably by driving research and development of these pesticide alternatives. Our responsibility as agricultural scientists is not to maintain the status quo, but rather to continue path of innovations of previous generations for securing the productivity that currently supports our population. Indeed, agriculture is a human invention that has been in flux for millennia as new crops became available, growing techniques were developed, pest and environmental challenges emerged, new lands opened to cultivation, and markets expanded. Importantly, our knowledge of the effects of synthetic agricultural pesticide use has also shifted since their widespread introduction in the 20th century. How will we change our management techniques in response to improve the sustainability of our agricultural production? Can we move to more complex and multi-pronged strategies that are resilient and responsive to the living agroecosystems? By reframing the yield gap between conventional and organic agriculture as an investment gap, we can focus on the questions we need to answer toward the use of organic agroecological approaches in plant breeding and crop management for organic agricultural systems.

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Studies on Mixed Ligand Complexes of Zinc (II) With Paracetamol and Amino Acids

Dinesh V. Bhagat

Head, Department of Chemistry, KES Anandibai Pradhan Science College, Nagothane

Abstract: The Study was aimed at investigating the suitability of Paracetamol-amino acid novel metal (II) complexes. Synthesis of mixed ligand zinc (II) complexes of type $[M(par)(L)].2H_2O$ have been carried out by using Analgesic drugs Paracetamol (par) as a primary ligand and Amino acid (HL) such as L-Valine, L-Threonine and L-Serine as a secondary ligand. Synthesized metal (II) complexes have been characterized on the basis of elemental analysis, electrical conductance, room temperature magnetic susceptibility measurement and spectral analysis which include UV, IR and XRD techniques. An electrical conductance studies indicates non-electrolyte nature and magnetic susceptibility measurement revealed paramagnetic nature of the complexes. UV spectra shows intra-ligand, charge transfer and d-d transition and IR spectra confirm bonding of metal ion through O or N donor ligands which further indicates complexation. The agar cup method and tube dilution method have been used to study antibacterial activity of the complexes against pathogenic bacteria such as *Aureus*, *C. Diphtheriae*, *S.Typhi* and *E.coli*.

Keywords: Mixed Ligand Complexes, Paracetamol, Amino Acids, Metal ion

I. INTRODUCTION

The advancement of medicinal/bioinorganic chemistry has led to use of metal complexes and metal Nano-particles due to their imperative applications for the development of advance novel technologies which includes chemotherapeutics and diagnostics devices [1]. Amino Acids are well known for their tendency to form complexes with metals having biological significance and metabolic significance [2]. Mixed ligand complexes of copper and Zinc have also been reported to show Anti-tumor activities.[3-4].The antibacterial and anti- fungal property range of Zinc complexes have been evaluated against pathogenic bacteria and fungi [5] Paracetamol is found to be mild analgesic with weak anti-inflammatory activity.it is commonly used for relief of ache and pain.[6].However overdose of paracetamol may causes liver damage [7], therefore it decided to synthesize mixed ligand analgesic drug-metal complexes with amino Acids which are characterized by their chemotherapeutic properties [8]. The present paper reports synthesis, characterization of mixed ligand Zn (II) complexes with paracetamol (Par) as primary ligand and Amino acids (HL) such as L-Valine, L-Threonine and L-Serine as secondary ligand and potential of such metal complexes as broad spectrum antibacterial agents in-vitro. This is continuation of the research activities of our group on search for biologically active metal (II) complexes that could serve as lead compounds in drugs research for pain management and analgesic and as flavoring agents in food and perfume antibacterial studies

II. EXPERIMENTAL

2.1 Materials

Analytical Grade (A.R) $ZnCl_2 \cdot 2H_2O$ is used and amino acids such as L-valine, L-threonine, L-serine are used from S.D.Fine Chemical Mumbai, India. Solvents like ethanol, chloroform, DMSO (L.R grade) whenever used were distilled and purified according to standard procedure [9-11].All chemicals of high purity were used and purchased without any further purification

2.2 Preparation and Methods

Zn(II)Mixed ligand complexes ion is prepared by adding Zn(II) ion solution over mixture of Paracetamol, primary ligand and Amino Acid, secondary ligand solutions at specific experimental conditions. For that, an aqueous solution ($10cm^{-3}$) of Zinc(II) chloride dehydrate (172.3mg, 1mmol), ethanol solution ($10cm^{-3}$) of paracetamol (138mg, 1mmol) was added. The mixture was stirred and kept in boiling water bath for 10 min. To this hot solution, an aqueous solution ($10cm^{-3}$) amino

acids solution (1mmol) was added with constant stirring. The mixture was again heated in a water bath. The complexes were obtained by raising pH of the reaction mixture by adding dilute ammonia solution. The mixture was cooled & solid complexes obtained were filtered, washed with water followed by ethanol. The complexes thus prepared were dried under vacuum.

2.3 Instrumentation

The Melting point of complexes was determined to ascertain their purity. The Melting point was measured using melting point electro thermal IAg100 apparatus. The complexes were analyzed for C, H, N & S contents on thermos Finnigan elemental Analyzer, Model No. FLASH EA 1112 Series at Department Of Chemistry, I.I.T. Mumbai. Metal content was estimated complex metrically by standard procedure [12-13].

The Molar Conductance values were measured in DMSO (10^{-3}M) on an Equip-tronics auto ranging Conductivity Meter Model No. EQ -667 with a dip type conductivity cell fitted with platinum electrodes (cell constant = 1.0cm^{-1}). The room temperature magnetic susceptibility measurements of the complexes reported in the present study were made by the Guoy's method using $\text{Hg}[\text{Co}(\text{SCN})_4]$ as calibrant at Department of Chemistry, I.I.T., Mumbai. The electronic absorption spectra of all the complexes in DMSO solution (10^{-3}M) in the ultraviolet & visible region were recorded on Shimadzu UV/VIS-160 spectrometer at GNIRD, Mumbai. Infrared spectra of all the ligands & their metal complexes were recorded in KBr discs on a PerkinElmer FT-IR spectrophotometer model 1600 in the region $4000\text{--}400\text{ cm}^{-1}$ at Department of Chemistry, I.I.T. Mumbai. The pellets were prepared taking necessary precautions to avoid moisture. The instrument calibration with respect to wave number and percent transmission was confirmed by recording the spectrum of standard polystyrene film. From the spectra, the characteristic groups were assigned by using respective IR frequencies [14]. The Thermogravimetric (TG) & Differential Thermal Analysis (DTA) measurements were carried out in controlled nitrogen atmosphere on a Perkin-Elmer Diamond TG-DTA instrument at the Department of Chemistry, I. I.T. Mumbai by recording the change in weight of the complexes on increasing temperature up to 900°C at heating rate of 10°C per min.

2.4 Antibacterial Screening

A. Agar Cup Method

In the Agar cup method, a single compound can be tested against number of organisms or a given organism against different concentrations of the same compound. The method was found suitable for semisolid or liquid samples & was used in the present work. In the Agar cup method, a plate of sterile nutrient Agar with the desired test strain was poured to a height of about 8mm diameter was cut from the center of the plate with a sterile core borer. Thereafter, the cup was filled with the sample solution of known concentration & the plate was incubated at 37°C for 24hrs. The extent of inhibition of growth from the edge of the cup was considered as a measure of the activity of the given compound. By using several plates simultaneously, the activities of several samples were quantitatively studied.

B. Tube Dilution Method

The test compound (10mg) was dissolved in DMSO (10cm^3) so as to prepare a stock solution of concentration $1000\mu\text{g/mL}$. From this stock solution, aliquots of 50 to $1000\mu\text{g/mL}$ were obtained in test broth. The test compounds were subjected to in- vitro screening against *Staphylococcus Aureus*, *Corynebacterium Diphtheriae*, *Pseudomonas Aeruginosa* & *Escherichia coli* using Muller Hinton broth as the culture medium. Bacterial inoculums were prepared in sterilized Muller Hinton broth incubated for 24hrs at 37°C . They were dispersed (5cm^3) in each borosilicate test tube ($150\times 20\text{mm}$). The test sample solution was added in order to attain final concentration at 50 to $1000\mu\text{g/mL}$. The bacteria inoculums 0.1cm^3 of the desired bacterial strain (*S.aureus*, *C.diphtheriae*, *P.aeruginosa* & *E.coli*) containing 10^6 bacteria/ cm^3 were inoculated in the tubes. The tubes were incubated at 37°C for 24hr & then examine for the presence or absence of growth of the test organism. The lowest concentration which showed no visible growth was noted as minimum inhibitory concentration (MIC).

III. RESULTS AND DISCUSSION

3.1 Elemental Analysis and Conductivity Measurement

The physical properties and analytical data of the Zn (II) complexes are presented in table 1. Elemental analysis data of the prepared complexes were represented in table 2. It is concluded that complexes were formed in 1:1:1 proportion of M, L₁ & L₂. Their structures have been proposed on the basis of conductivity and magnetic moment measurements. The molar conductance of 1x10⁻³M solution of the complexes in DMSO were measured at 30°C. The molar conductance values which found less than one indicate that the complexes are non-electrolytic in nature [15-16].

3.2 Magnetic Studies

The observed value of effective magnetic moment (μ_{eff}) of Zn (II) complexes at room temperature are given in Table 2. Magnetic moment values in BM ranging between (1.73-1.97) which explains the extreme environment and paramagnetic behaviour of Zn (II) complexes. The square planar geometry has been proposed for zinc complexes on the basis of conductivity and magnetic moment behaviour.

3.3 Electronic Spectra

The electronic spectra of the metal complexes were recorded in 10⁻³DMSO at 30°C. (Table 4) The spectra show three transitions in the range 272-280 nm (36765-35714cm⁻¹), and 333-339 nm (30030-29762cm⁻¹) and 386-398nm (25907-25126cm⁻¹) ascribed $\pi \rightarrow \pi^*$, $n \rightarrow \pi^*$ and the charge transfer transitions (LMCT) from the ligands to the metal, respectively [17-19]. All those band shows bathochromic shift in complexes in comparing to ligands indicating the coordination process.

3.4 FTIR Studies

The FTIR spectra of the metal complexes were recorded in KBr discs over the range 4000-400 cm⁻¹. Some important frequencies are shown in table 4. Various absorption band were seen in spectra of ligands and metal complexes. Some of this band in these ligand disappeared from complex while some of the bands were shifted. This phenomenon indicates coordination of metal to ligands leads to form metal complexes.

The strong and medium band at 3467, 3452cm⁻¹ and 3412.08, 3527cm⁻¹ in paracetamol and valine were due to ν (OH). This band in paracetamol and valine found to be disappearing in metal complexes this clearly indicates complexations of metal ion through phenolic oxygen of paracetamol.

There is a sharp band in the range of 1622-1595cm⁻¹ in paracetamol which assign due to ν (CO) stretching vibration. This bands was found to shift to 1759-1553cm⁻¹ in metal complexes conforming complexation of metal ion through carbonyl oxygen of paracetamol. Furthermore, there are new absorption bands in the range of 596-504cm⁻¹ in metal complexes which were absent in ligand this band were assigned to ν (M-O) and not ν (M-N) as absorption band at 440-425cm⁻¹ were absent. The broad band at 3500 cm⁻¹ in the metal complexes were assign to ν (OH) of coordinated water

By comparing the spectra of free amino acids, it has been proved that there is decrease in the N-H stretching frequency on complex formation [20-21]. Character and strength of the M-N bond has been correlated to the shift of N-H stretching band. A [22-24] broad band observed in the region between 3300-3194cm⁻¹ due to asymmetric and symmetric O-H stretching modes and a weak band in the range 1578-1570 cm⁻¹ due to H-O-H bending vibrations indicating presence of water molecules further confirmed by thermal studies.

3.5 XRD

Like most of the metal organic complexes, these complexes also decompose to a fine powder of metal oxide i.e. ZnO. The constant weight plateau in TG after 610°C indicates completion of the reaction. The ZnO formed was confirmed by X-ray diffraction pattern of the decomposed product [25].

Table 1: Empirical formula, molecular weight, colour of the Zinc complexes studied

Sr. No	Complex	Empirical Formula	Molecular Weight	Colour	pH
1	[Zn(Par)(Val)].2H ₂ O	ZnC ₁₃ H ₂₃ O ₆ N ₂	368.748	Yellow	6.89
2	[Zn(Par)(Thr)].2H ₂ O	ZnC ₁₂ H ₂₁ O ₇ N ₂	370.721	Yellow	6.97
3	[Zn(Par)(Ser)].2H ₂ O	ZnC ₁₁ H ₁₉ O ₇ N ₂	356.574	Yellow	7.00

Par. represents the deprotonated primary ligand paracetamol, whereas Val, Thr & Ser. represent deprotonated secondary ligands: L-valine, L-threonine & L-Serine respectively.

Table 2: Elemental analysis data, molar conductance & magnetic moments of Zn(II) complexes

Sr. No.	Complex	Elemental Analysis Found(Calculated)					Molar conductance (Mhoscm ² mol ⁻¹)	μ_{eff} . (B.M.)
		%M	%C	%H	%N	%S		
1	[Zn(Par)(Val)].2H ₂ O	17.73 (17.75)	42.34 (42.30)	06.28 (06.30)	07.59 (07.60)	---	0.021	1.94
2	[Zn (Par)(Thr)].2H ₂ O	17.64 (17.65)	38.87 (38.90)	05.70 (05.75)	07.59 (07.63)	---	0.019	1.97
3	[Zn (Par)(Ser)].2H ₂ O	18.34 (18.32)	37.23 (37.24)	05.36 (05.40)	07.85 (07.87)	---	0.020	1.90

Abbreviations see Table 1.

Table 3: IR Spectral values of Zn (II) complexes

S. N.	Complex/Ligand	-C=C	-C-N	-O-H	-C=O	-N-H	C-O	M-N (AA)	-M-O (Par,AA)
1	Paracetamol	1444.68-566.20	1107.14-1257.89	3467,3452	1622,1595	3382 str. 1566 b	1012.63	-	-
2	Amino acid	-	11909.07-1255.66	3412.08-3527.80 str.	1687-1755.2	-	1026.13-1141.86	-	-
3	[Zn(Par)(Val)].2H ₂ O	1442.83-1562.27	1107.14-236.37	1371.39 (Phb)	1658.85	3330.21	1014.56	410	596,504 600
4	[Zn(Par)(Thr)].2H ₂ O	1430.3-1550.77	1109.07-321.24	1325.10	1666.5	3332.7	1011.63	419	596,503 610
5	[Zn (Par)(Ser)].2H ₂ O	1440.83-566.06	-	1321.24 (Phb)	1656.9	3327.21	1016.49	420	596,417 605

Table 4: Electronic Spectral Data of Zn (II) Complexes

Sr. No.	Complex	λ (nm)	ν (cm ⁻¹)	Proposed Assignments
1	[Zn(Par)(Val)].2H ₂ O	272	36765	$\pi \rightarrow \pi^*$
		336	29752	$n \rightarrow \pi^*$
		288	25773	Charge transfer
2	[Zn(Par)(Thr)].2H ₂ O	280	35714	$\pi \rightarrow \pi^*$
		333	30030	$n \rightarrow \pi^*$
		386	25907	Charge transfer
3	[Zn (Par)(Ser)].2H ₂ O	274	36496	$\pi \rightarrow \pi^*$
		334	29940	$n \rightarrow \pi^*$
		394	25381	Charge transfer

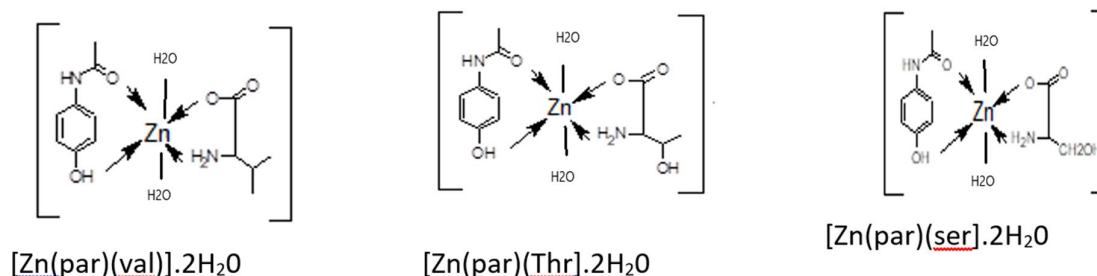
Table 5: Antibacterial activity (mm) of zinc complex by agar cup method

Sr. No.	Complex	Test			
		S.aureus	C.diptheriae	S.typhi	E.coli
1	[Zn(Par)(Val)].2H ₂ O	22	12	14	14
2	[Zn(Par)(Thr)].2H ₂ O	19	13	16	13
3	[Zn (Par)(Ser)].2H ₂ O	19	11	19	11

Table 6: MIC (mg/ml) data of zinc complexes

Sr. No.	Complex	S.aureus	C. diphtheriae	S. typhi	E.coli
1	[Zn(Par)(Val)].2H ₂ O	50	100	50	100
2	[Zn(Par)(Thr)].2H ₂ O	50	100	100	100
3	[Zn(Par)(Ser)].2H ₂ O	50	150	50	50

The proposed structures for the complexes are,



IV. BIOLOGICAL STUDIES

All the metal complexes were screened against *Staphylococcus aureus*, *Corynebacterium diphtheriae*, *Salmonella typhi* and *Escherichia coli*. The studies based on agar cup method revealed that the complexes are sensitive against *S. aureus* and *S. typhi* as compared to *C. diphtheriae* and *E. coli*. The minimum inhibitory concentration (MIC) of metal complexes ranges between 50-150 µg/cm³. The results show that, as compared to the activity of metal salts and free ligands the metal complexes show higher activity (Table 5 and 6). On the basis of the physico-chemical studies. All the complexes observed good antimicrobial activities. The tested mixed ligand complexes showed higher activities against selected strain microorganism so they are potential antimicrobial agents.

V. CONCLUSION

The method has been used to synthesis a mixed paracetamol-amino acid drug metal complexes where both the paracetamol and the amino acid found to act as a bidentate ligand. An electrical conductance studies shows non-electrolyte nature and magnetic studies indicate paramagnetic nature of the complexes. Electronic absorption spectra of the complexes show intra-ligand and charge transfer transitions. IR spectra show bonding of the metal ion through N-and O-donor atoms of the two ligands. The antibacterial study shows that complexes are found to be more active against *S. aureus* and *P. aeruginosa* as compared to *C. diphtheriae* and *E. coli* compared to standard antibacterial compound, tetracycline, and the complexes show satisfactory activity against selected strains of microorganisms, so they are potential anti-microbial agents.

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Use of Silver Nanoparticles for Detection of Arsenic Trioxide Contamination of Water

Saloni R. Mhavarkar¹, Nilesh C. Vadnere^{2*}

M.Sc. Student, Department of Microbiology¹

Assistant Professor and Head, Department of Microbiology²

Changu Kana Thakur Arts, Commerce and Science College, New Panvel (Autonomous),
Navi Mumbai, Raigad, India

Corresponding Author: Nilesh C. Vadnere

Abstract: Arsenic trioxide is a potent contaminant of groundwater. It is highly toxic, causing chronic poisoning, skin lesions, and skin cancer. Its permissible limit in drinking water in India is less than 0.05 ppm. Several methods have been proposed for the detection of arsenic. Present research investigates the use of silver nanoparticles for the detection of Arsenic trioxide contamination in water. Silver nanoparticles were synthesized using AgNO₃ solution and plant (*Epipremnum aureum*) extract. Standard Arsenic trioxide solution was prepared in 0.005M NaOH solution and its known aliquots were prepared in distilled water. Constant volume of Silver- Nanoparticles was allowed to react with different concentrations of Arsenic trioxide. Color change was observed showing absorption maxima at 353 nm with an increase in absorbance with Arsenic trioxide concentration from 1 ppm to 100 ppm. Use of silver nanoparticles is a rapid and cost-effective method for detection of Arsenic trioxide contamination of water.

Keywords: Arsenic Trioxide, Water Contamination, Silver nanoparticles, Green Synthesis

I. INTRODUCTION

Health concerns regarding Arsenic trioxide [As (III)] have been elevating globally and affecting millions. The major source of contamination are natural geological processes. It leaches into aquifers, and thus contaminate water. The other source of Arsenic contamination in water includes semiconductor manufacturing industries, pharmaceutical industries, paint industry, wood preservatives, and insecticides. Arsenic trioxide is known to exert its toxicity by inactivating several enzymes involved in energy yielding pathways and enzymes of DNA replication and repair. In acute cases it leads to nausea, vomiting, abdominal pain and chronically it causes encephalopathy, peripheral neuropathy, and skin cancer (1). It is a well-documented human carcinogen. The permissible limit of Arsenic in drinking water in India is less than 0.05 ppm. There are two forms of Arsenic based on its oxidation states; pentavalent form, arsenate (As₂O₅; As V) and trivalent form, arsenite (As₂O₃; As III). The trivalent form Arsenic trioxide has significantly higher toxicity than its pentavalent form. (2). The first objective of As contamination management is to detect the presence of Arsenic (As) in drinking water reservoirs and thereby reduce their ingestion. Methods involving spectroscopy, chromatography, microscopy, colorimetric and refractometry principles have been employed for detection of Arsenic (As) (16)

There are several reports, during the last decade, citing newly affected regions and leading to concern over global scenario of arsenic contamination. It was estimated that about 108 countries are affected by arsenic contamination of groundwater with concentration beyond maximum permissible limit (10 ppb) recommended by the World Health Organization (WHO) (8). Many developed and developing countries have problem of drinking water contamination with arsenic. The problem is of major concern in the USA—for example, the arsenic content of drinking water from public and private sources in Millard County ranges from 14 to 166 parts per billion (ppb). (4). The Environment Protection Agency (EPA) lowered the permissible level of arsenic in drinking water in the USA in 2001 from 50 ppb to 10 ppb. Bangladesh and West Bengal (India) are recognized as worst affected region by arsenite contamination in the world. In 51 districts of these two regions, more than 120 million people are exposed to groundwater arsenic concentrations that are above the WHO maximum permissible limit (5). In these areas, the source of arsenic was geological in origin, and it contaminated

aquifers which was providing water for over one million tube-wells (6). In West Bengal, the arsenic concentration in some tube-wells was as high as 3400 ppb. (3).

The present work focuses on the use of silver nanoparticles synthesized using plant extract for detection of Arsenic contamination. Due to their unique physical and chemical properties, silver nanoparticles have wide utility in the fields like medical, food, health, consumer, and industrial arena.

II. METHODOLOGY

A. Preparation of Leaf Extracts from *Epipremnum aureum* (Money Plant) Leaves

Fresh leaves of money plant were collected from local garden. Leaves were thoroughly washed in running water to remove the dust from the surface and chopped into fine pieces. 20 g of finely chopped leaves were added to 100 ml of double-distilled water and boiled for 10 min. The extract was cooled and filtered using Whatman filter paper no 1 and used for green synthesis of silver nanoparticles.

B. Synthesis of Silver Nanoparticles

In 250 ml conical flask, 9 ml of 1mM Silver nitrate solution was mixed with 1ml of extract of money plant leaves (15). The flask was incubated at room temperature till it showed significant change in colour from colourless to brown–yellow, which is an indication for the formation of silver nanoparticles.

C. Characterization of the Synthesized Silver Nanoparticles

The spectral analysis of silver nanoparticles was done in the wavelength range of 300nm to 700nm (10) in the UV spectrophotometer (Shimadzu UV-1800). The plant extract solution was used as blank.

D. Evaluation of silver nano particles' potential to detect different heavy metal ions and Arsenic trioxide in solutions

In 0.005M NaOH solution, 1000 ppm Arsenic trioxide stock solution was prepared. It was used to prepare different aliquots in distilled water (100 ppm, 10 ppm, 1 ppm) in triplicate and allowed to react with fixed concentration of silver nanoparticles. Intensity of colour developed was measure at 353 nm against plant extract blank using UV-visible spectrophotometer (11). To further evaluate the potential of silver nanoparticles to detect other heavy metal contaminants, 0.5g of lead acetate, lead nitrate and Mercury chloride was added to 5ml of prepared silver nanoparticle solution for test and in control distilled water was added instead of heavy metal.

III. RESULT AND DISCUSSION

For the preparation of silver nanoparticles, the method of Roy et al (2017) was employed. The leave extract solution changed color from colourless to brown – yellow after adding AgNO_3 solution (Fig.1). This colour change is an indication of formation of silver nanoparticles. Color changes are possible because aqueous silver ions are reduced by aqueous extract of plant parts to generate extremely stable silver nanoparticles in water (9). The UV-Visible spectrophotometry was used to monitor the formation of reduced silver nanoparticles in the solution.

The UV–vis spectra showed maximum absorbance at 353 nm, in which plant extract was used as blank, peaks were noticed at 353 nm which corresponds to the surface plasmon resonance of silver nanoparticles (13).

Qualitative detection of presence of heavy metal ions such as Pb^{2+} from lead acetate and lead nitrate, Hg^{2+} from mercury chloride and Arsenic trioxide was done using the prepared silver nanoparticles. The following heavy metals exhibited considerable colour change in silver nanoparticles solution as opposed to control. It was observed that silver nanoparticles have potential to detect these potential heavy metal contaminants (Fig.2).

As the focus of present study was detection of Arsenic trioxide (As III) in ground water. The minimum detectable concentration of Arsenic trioxide ions in aqueous solution determined by adding different concentrations of Arsenic ions into bio-synthesized silver nanoparticles showed visible observations (Fig. 3). The biosynthesized silver nanoparticles were able to detect the presence of Arsenic trioxide ions in the environmental sample as low as 1ppm with a mean absorbance of 0.071 with a standard error of 0.0024 (Fig 4).

As Arsenic trioxide As(III) is one well documented human carcinogen and According to the World Health Organization (WHO), arsenic in drinking water at a concentration of >10 ppb is highly unsafe to community health (7). Globally, intake of arsenic (III) and arsenic (V) ions via food and drinking water has dramatically increased, as per several recent reports (12). Approximately 200 million people worldwide are affected by arsenic toxicity (14). Colorimetric analysis of Arsenic trioxide in water is one of the simplest approaches amongst other developed strategies. A nanoparticle based colorimetric detection is useful for on-site arsenic detection. Aliquots of Arsenic trioxide were prepared which was reacted with constant concentration of prepared silver nanoparticles and intensity of colour developed was measured at 353 nm using UV-Visible spectrophotometer (Fig3 and Fig4). Green synthesized silver nanoparticles have potential to detect small concentration of Arsenic trioxide. It serves as eco-friendly system that has rarely been explored for their metal ion sensing abilities.

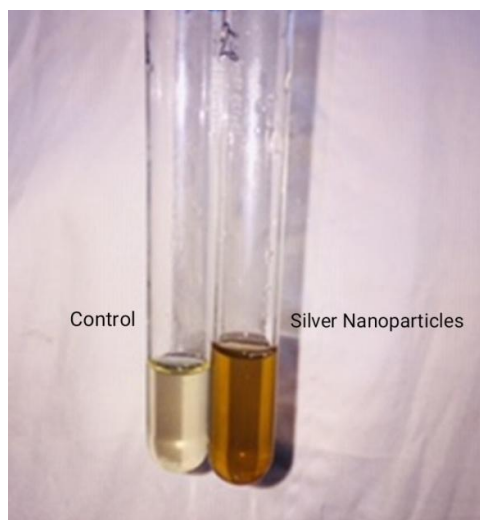


Figure 1: Colour change in the extract and silver nitrate solution after incubation (A) Control, (B) Silver nanoparticles.

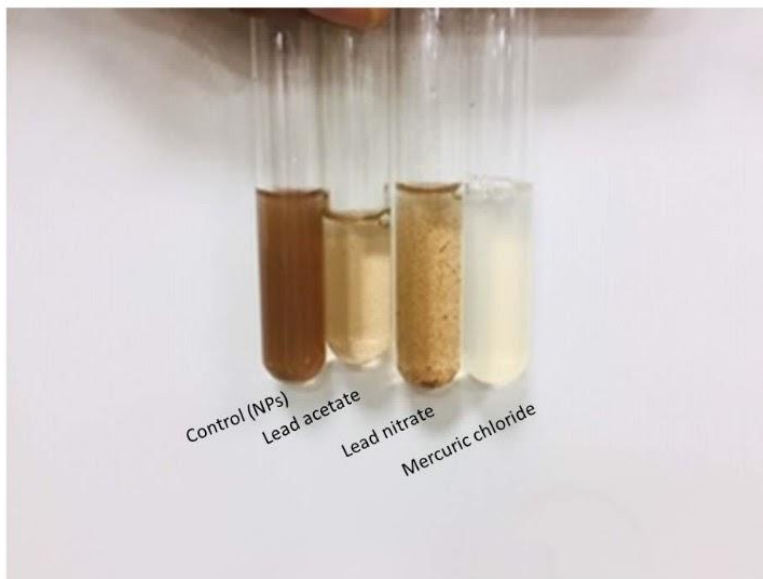


Figure 2: Silver nanoparticles binds to heavy metal ions such as Pb^{2+} , Hg^{2+} and showed colour change.

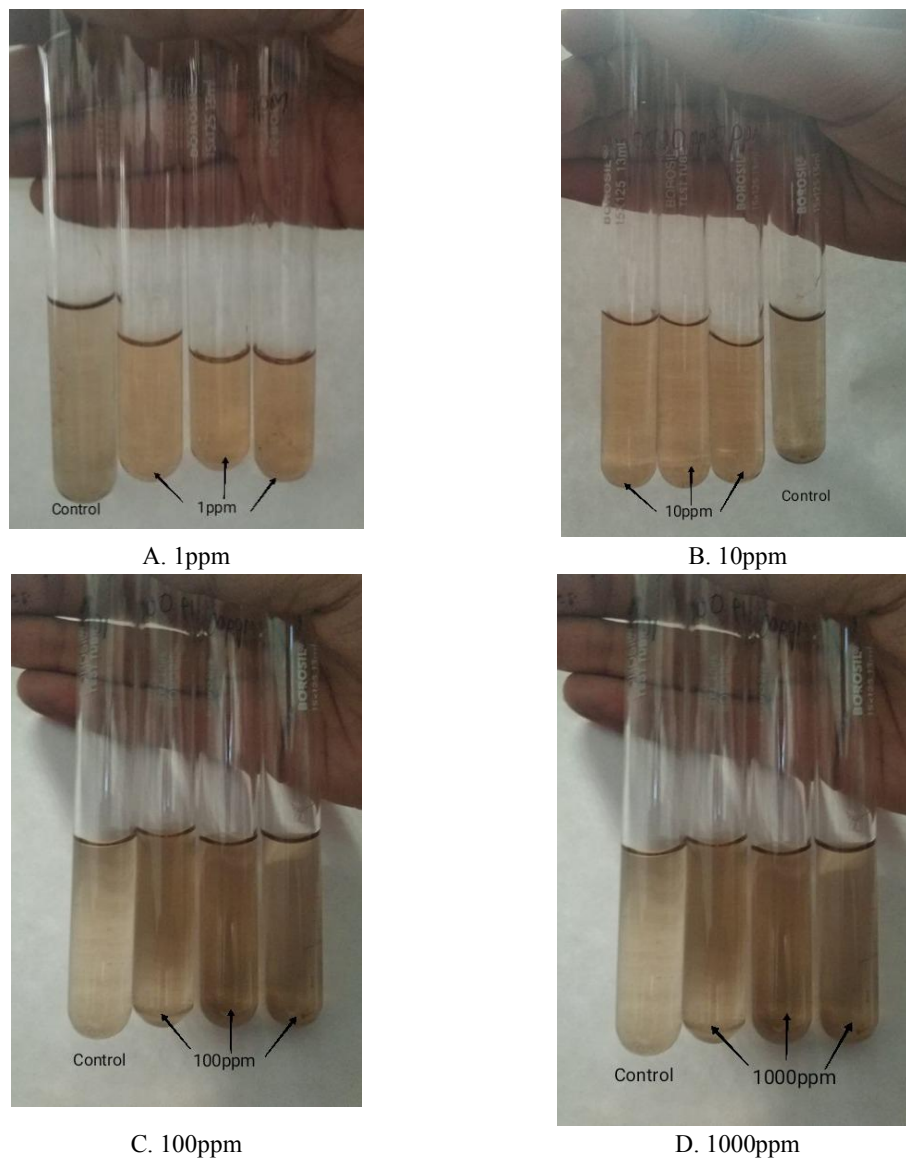


Figure 3: Visible colour change of silver nanoparticles solution by addition of Arsenic trioxide solutions of different concentrations. A. 1ppm, B. 10 ppm, C. 100 ppm, D. 1000 ppm.

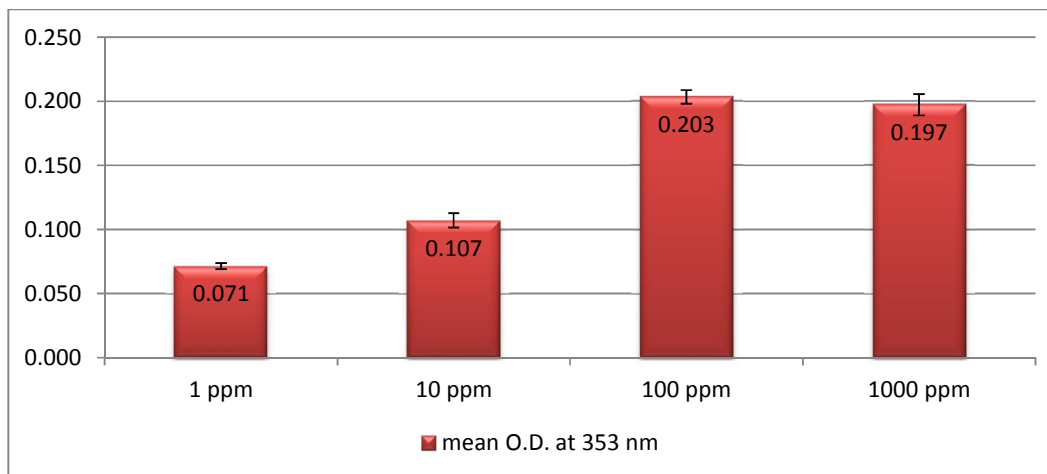


Figure 4: Effect of Arsenic trioxide concentration on colour intensity of silver nanoparticles. 1ppm concentration of Arsenic trioxide showed detectable change in colour intensity at 353 nm

IV. CONCLUSION

Biosynthesized Silver nanoparticles have been proven to be economically sustainable means for developing biosensor for detection of arsenic in environmental samples. *Epipremnum aureum* (money plant) leaves can serve as abiding source for production of silvernanoparticle instead of chemicals. The study shows detection limit of arsenic up to 1 ppm. These nanoparticles are proposed to be employed for development of biosensor for heavy metal detection as well.

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Recent Advances in Ayurveda in India with Reference to COVID-19 Pandemic

Dr. Sharad Phulari and Dr. Bharti P. Wadekar

Principal and Assistant Professor

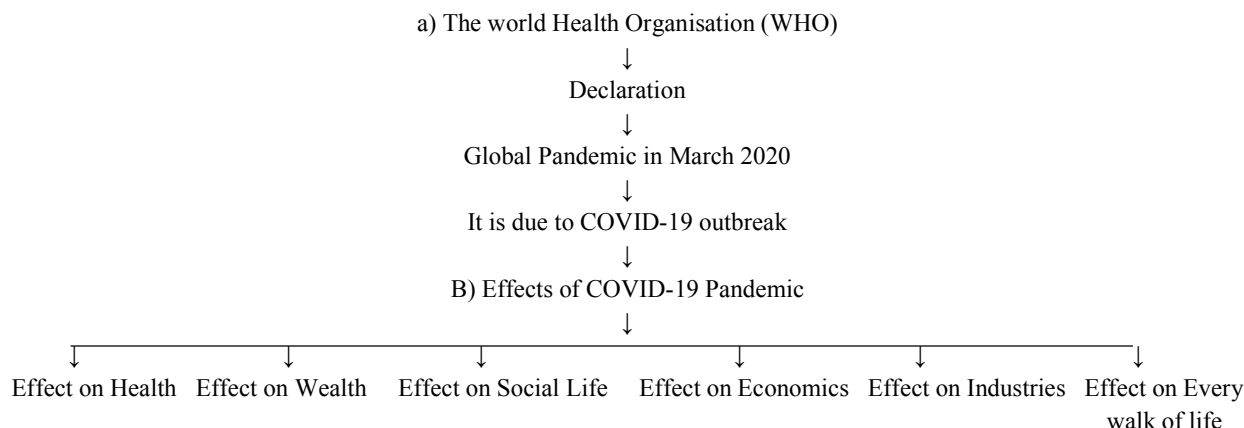
ZSCT's Thakur Shyamnarayan Degree College, Kandivali (E), Maharashtra, India

Abstract: In India, Kerala State Government stated 1206 AYUSH Raksha Clinics and associated task forces across the state in April 2020. It is to apply Ayurvedic Preventive, Therapeutic and Convalescent care strategies for the COVID-19 pandemic. Sayed Ahmad et. al. (2021) worked on medicinal plants and formulations and their potential against COVID-19 preclinical and clinical research. According to them, the AYUSH recommended formulations of medicinal plants routinely used by Indian population, which can be tested against COVID-19. AYUSH emphasised on Indian medicinal plants reported for antiviral, immune modulatory and anti-allergic/anti-inflammatory activities. AYUSH also categorised for prioritization in research on the basis of earlier reports. Sayeed Ahmad et. Al. (2021) further suggested that AYUSH has promising formulations with Indian medicinal plants to be investigated on a priority basis to solve the present pandemic situation. According to Unnikrishnan et. Al. (2020), approach of Ayurveda in pandemic situation like COVID-19 will reduce long time for clinical trials of allopathic drugs. Ayurveda and its derived drugs in COVID-19 resolved the long time for pandemic remedies. They also said that efforts should be taken to bring the whole systems approach into research methodologies to effectively generate evidence supporting Ayurveda interventions for COVID-19. Rakesh Kotecha (2021) state that use of immunity promoting interventions from the ancient traditional systems of medicine involving Ayurveda, Yoga and Naturopathy, Unani, Siddha, Sowa Rigpa, and Homeopathy (AYUSH) and several home remedies based on traditional knowledge played important role in lowering rates of mobility and mortality in India during COVID-19 pandemic Situation. Harish Singh (2022) provided a pragmatic plan for Ayurveda intervention in COVID-19 pandemic situation. He said that it should be implemented immediately it will be helpful to learn, to generate evidence of application of Ayurvedic in COVID-19 pandemics..

Keywords: COVID-19; SARS-Co.V-2; TCM, Ayurveda, Pandemic, AYUSH, MoA; WHO, ICMR, CSIR

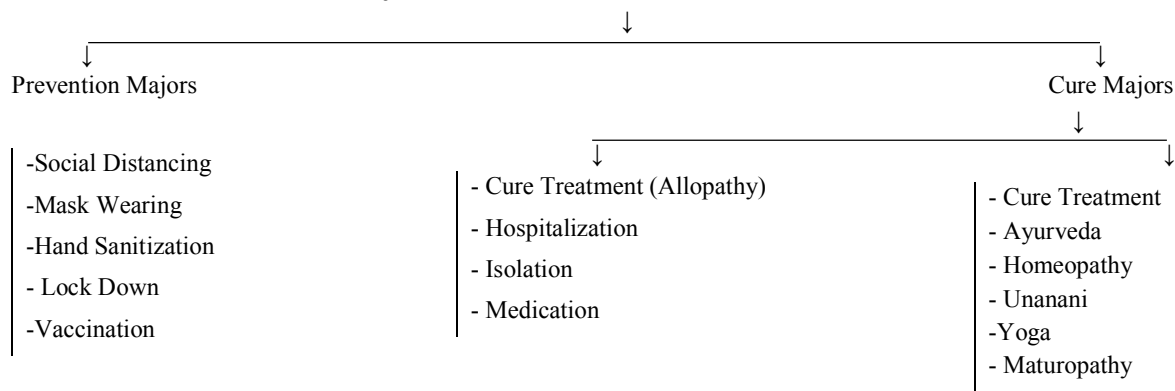
I. INTRODUCTION

1.1 About the COVID -19 Pandemic



1.2 Majors to Control the COVID-19 Pandemic in India

Majors to Control the COVID-19 Pandemic in India

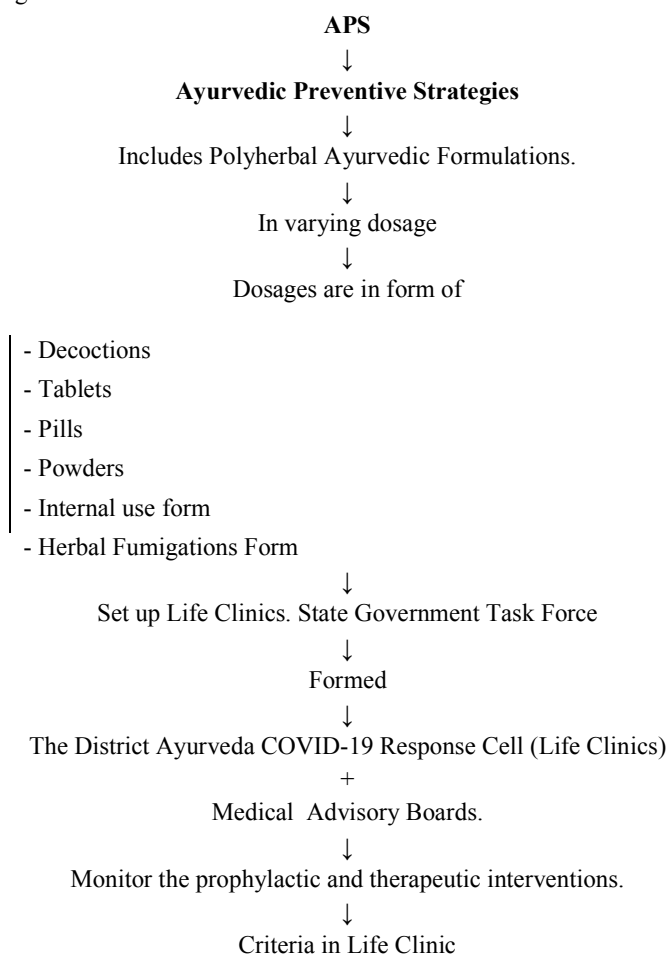


1.3 Recent Advances in Ayurveda in India with Reference to COVID-19 Pandemic

A. Recent Advances in Ayurveda in Kerala With reference to COVID-19 Pandemic

Kerala Implemented Ayurvedic Preventive Strategies for COVID-19. It is Named as Amritham.

Ayurvedic Preventive Strategies is abbreviated as APS.



- Provide Ayurvedic Medicines to Quarantine Patient	- To obtain informed consent for Ayurvedic Medicines
- APS Medicines to quarantine Patient	- To provide dietary advice
- No other Medicines to quarantine patient	- To provide tele follow-up

1.4 Results of Amritham in Kerala

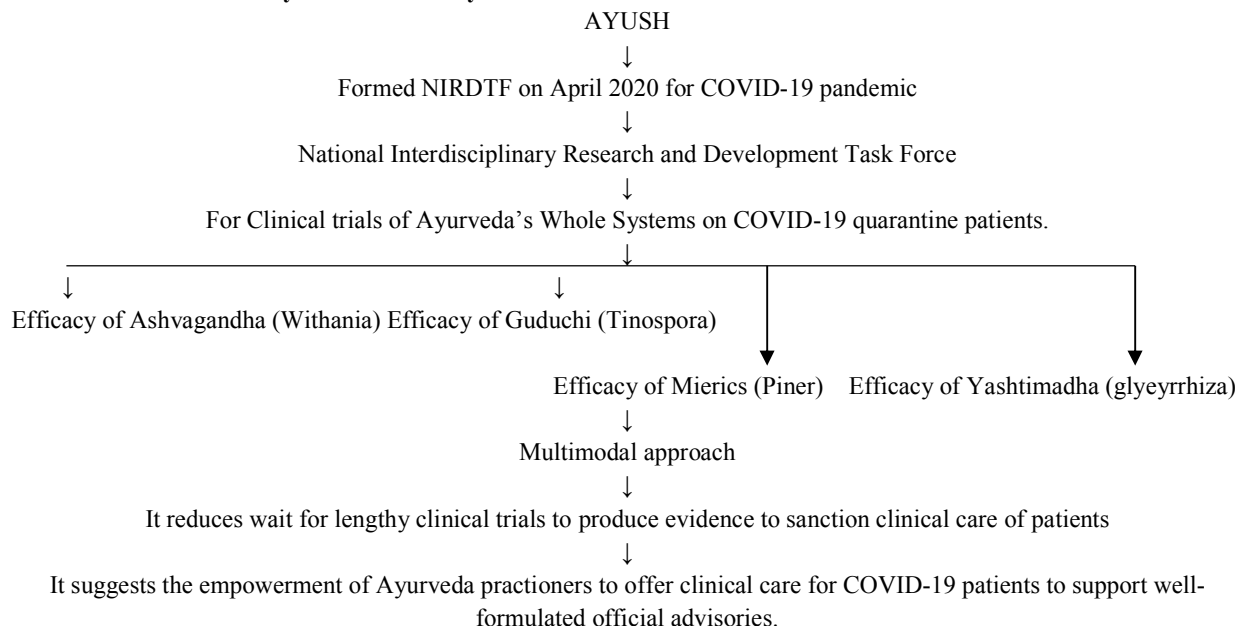
In Kerala, The AYUSH department established about 1,200 life clinics under Amritham. From 21 May 2020. TO 8TH July 2020, 101218 individuals quarantined under Amritham. Out of 101218, 347 individuals tested positive for COVID-19 infection at time of their quarantine. All those also recovered totally without any serious complications no one required intensive care or ventilator support. Authentic government sources concluded that 1.61% of the general quarantined population tested +ve for COVID-19 during pandemic situation.

Recent Advances in Ayurveda with reference to COVID-19 pandemic by Sayeed Ahmad et.al. In relation to Indian Medicinal plants and formulations against COVID-19 pandemics.

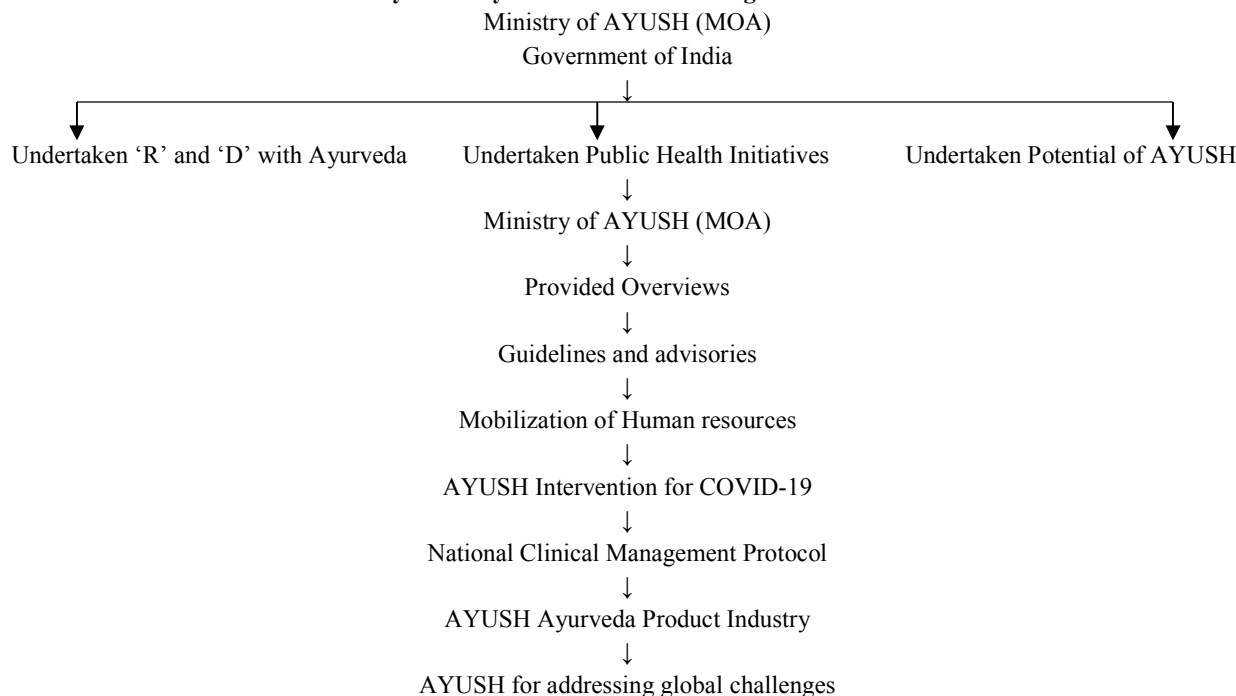
Ministry of AYUSH (Government of India) provided recommendations as per given table, it is on basis of practical knowledge and practical outcomes of data.

Name of the Formulation	Composition	Proof of activity related to COVID-19	References
Anuthalia	Leptaderia Reticulate (Retz) Wight and Am. Root/Stem bark	AC	Pravansha et. al.(2012), Mohanty et. al. (2015)
	CedrusDeodra (Roxb. Ex D. Don) G.Don (Stem)	B	Raghvendra et.al. (2016)
	Ocimum Sanctum L (Leaves)	A,B,C	Goel. et.al. (2010), Ghoke et. al.(2018), Soni K. et.al(2015)
	Asparagus racemogus wild (root)	A	Gautam et.al. (2009)
Agasthaya Hareetaki	PremnaMucronataRoxb (root/stem/bark)	AC	Danta and Janta (2017)
	Piper Chaba Hunter (Fruit)	C	Sheertawong et. al. (2012)
	HordeumVulgare L. (Seed)	C	Gul. et.al. (2014)
	Piper longum L. (Root)	A,B,C	Tripathi et. al.(1999), Jiang et.al. Kaushik, et. al. (2012)
AYUSH 64	AistoniaScholaris(L) R. Br.(Bark)	A,B,C	Lwo et. al(200), Antony et. al.(2014), Zahao et. al. (2017)
	CaesaipirieaCristia L (Seed Pulp)	C	Ramesh et.al. (2014)
AYUSH Kwath	Ocimum Sanctum L. (Leaves)	ABC	Goel. et.al. (2010), Ghoke et. al.(2018), Soni K. et.al(2015)
	Piper Nigrum L. (Fruit)	ABC	Majdaiewieh and carr (2010), Mair et. al.(2016), Taseem et.al. (2014)
	ZIngberoffcinataRascoe (rhizome)	ABC	Zhou et. al. (2006), Chang et. al. (2013), khan et. al. (2015)

1.5 Recent Advances in Ayurveda Whole Systems with Reference to COVID-19 Pandemics



1.6 Recent Advances in Initiatives by Ministry of AYUSH to Challenge the COVID-19 Pandemic Situation



1.7 Recent Advances in Ayurveda with Pragmatic Plan for Ayurveda Intervention in COVID-19 Pandemic.

Sr. No	Category of People	Proposed Intervention
1	Unexposed asymptomatic group	Common health keeping approaches of Ayurveda including healthy diet, healthy life-style, adequate sleep, physical activity, good conduct, care for retainable and non-retainable urges, and avoidance of disease causing factors (excessive cold and exposure to pollutants). In addition, <i>Chyavanprasha</i> , <i>Brahma Rasayana</i> , <i>AmritBhallataka</i> , <i>Sanjeevanivati</i> , <i>Swarnaprashan</i> .
2	Exposed asymptomatic (Quarantined)	<i>Sanjeevanivati</i> , <i>Chitrakatdivati</i> , <i>Chyavanprasha</i> , <i>Brahma Rasayana</i> , and decoction of a combination of herbs, <i>Tinosporacordifolia</i> , <i>Zingiberofficinale</i> , <i>Curcuma longa</i> , <i>Ocimumsanctum</i> , <i>Glycyrrhizaglabra</i> , <i>Adhatodavasica</i> , <i>Andrographispaniculata</i> , <i>Swertiachirata</i> , <i>Moringaoleifera</i> , <i>Triphala</i> and <i>Trikatu</i> .
3	With mild COVID-19 symptoms	<i>Pippalirasayan</i> , <i>Go JihvadiQuath</i> , <i>KantakariAvaleha</i> , <i>Chitrakadivati</i> , <i>Vyaghriharitaki</i> , <i>Dashamulkwath</i> , <i>Sitopaladi</i> , <i>Talishadi</i> , and <i>Yashtimadhu</i> etc.
4	With moderate to severe COVID-19 symptoms	<i>Pippalirasayan</i> , <i>Laghu Vasant Malati</i> , <i>Sanjeevanivati</i> , <i>TribhuvanKeerti rasa</i> , <i>BrihataVataChintamni rasa</i> , <i>Mrityunjaya rasa</i> , <i>Siddha Makardhvaja</i> etc.

II. CONCLUSION

In India, Kerala State Government stated 1206 AYUSH Raksha Clinics and associated task forces across the state in April 2020. It is to apply Ayurvedic Preventive, Therapeutic and Convalescent care strategies for the COVID-19 pandemic.

Sayed Ahmad et. al. (2021) worked on medicinal plants and formulations and their potential against COVID-19 preclinical and clinical research. According to them, the AYUSH recommended formulations of medicinal plants routinely used by Indian population, which can be tested against COVID-19.

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Vermicompost: A Sustainable Soil Amendment for Carbon Sequestration, Enhancing Microbial Growth and Physicochemical Properties of Non-Agriculture Soil

Tanaji S. Bhagat^{*1}, Rama S. Lokhande², Narendra H. Petha³

Basic Sciences School, Chemistry, Jaipur National University, Jaipur, Rajasthan^{1*,2}

Indofil Industries Limited, Thane, Mumbai^{3,4}

tanajibhagst@gmail.com, rama.lokhande@yahoo.com

npetha@indofil.com, jchandorkar@indofil.com

Abstract: *Vermicompost is proved to be one of the best natural/organic fertilizers for the soil amendment for restoring physicochemical and biological properties of the soil. The chemical composition of the vermicompost depends on the substrate and contains the micro and macro nutrients, various bio molecules like cytokinin, auxins, PGR's, enzymes required for seed germination, healthy microbial and plant growth. The use of organic amendment like vermicompost, organic manure is simple, user-friendly, eco-friendly and sustainable alternative for soil restructuring. It was observed that vermicompost has ability to maintain the carbon to nitrogen ratio for healthy microbial growth, slow down the use of chemical fertilizers, pesticides, increase disease resistance in crop and thereby yield per hector of the crop land by converting non agriculture land into fertile crop land. Organic amendments like vermicompost are proven to be essential for mitigating the climate change, healthy ecosystem and wellness and wellbeing of the globe.*

Keywords: Vermicompost, Organic fertilizer, Soil Amendment, Carbon to Nitrogen ratio, Seed germination, Physicochemical Properties

I. INTRODUCTION

Due to excessive use of Chemical fertilizers, Pesticides, chemically modified water-soluble Micro and Macro nutrients and lack organic amendments like crop residues, animal feces, compost, manures, vermicompost, monocropping system, the global soil is found to be deficient in carbon, nitrogen and other essential micro and macro nutrients required for healthy growth of plants. Due to Carbon and Nitrogen deficiency, poor water holding capacity, the microbial growth in soil started deteriorating globally. Soil chemistry is only one of many factors that are affecting microbial growth, biogeochemical cycle, plant and animal growth and the climate change. In order to change the soil chemistry, organic amendments are very essential.

Due to poor microbial growth in soil, the carbon sequestration potential of the soil has been decreased and that has affected the ideal carbon to nitrogen ratio required for healthy plant growth. Because of improper carbon sequestration and excessive use of chemical fertilizers, the gases like carbon dioxide and oxides of nitrogen getting released into environment and contributing to global warming and thereby climate change [1][2].

Carbon and nitrogen are one important aspect for maintaining the soil physical, chemical and biological properties. Carbon sequestration is only achieved by nitrogen fixation. Various farming techniques like, intercropping of cereals and legumes could be one of the best possible options for carbon sequestration and increasing the Soil Organic Carbon (SOC), over period of time. This intercropping system not only support to carbon sequestration but support to soil erosion up to 45 to 50 % also [3][4].

There is unbreakable natural correlation between plants and soil. The growth of plant in particular type of the soil depends on the physical, chemical and biological properties of the soil. Similarly, the growth of particular plant is also responsible for altering or modifying the physical, chemical and biological properties of the soil. The interface between

the plant roots and the soil is very complex to define, but the roots of the plants secrete various phytochemicals in the soil in their vicinity which boosts the soil health and also microbial growth[5].

The colour and the texture of the soil is one of the physical parameters to determine the physical and chemical properties of the soil. The sandy red soil is having remarkable concentration of iron than that of off white or creamy sandy loam soil but having very poor water holding and retention capacity and hence plant roots couldn't absorb water and nutrients and leads to poor plant growth as compared to that of sandy loam, loam and clay soils.

In order to change the soil texture and mitigate the climate change various techniques of soil amendments like, addition of plant residues with compost, industrial effluents, effluents from sewage treatment plants, kitchen wastes, municipal wastes having 30 to 40 % of moisture could be employed[6][7].

Vermicomposting was found to be one of the best techniques for amending the soil physicochemical and biological properties. The chemical composition of the vermicompost produced is mostly depends on the substrate used. It is also found that the vermicompost not only contain the micro and macro nutrients but various bio molecules like cytokinin, auxins, plant growth regulators and various useful enzymes required for the healthy growth of plants and microorganism present in the soil[8]-[10].

By considering all above aspects and potential of Vermicompost, author decided to study the Successive progress of vermicomposting process by studying the physicochemical properties, Total microbial count of vermicompost (vermicasts) and garden soil and then study the impact of the amendment of Vermicompost with garden soil to study changes the physicochemical properties of sandy garden soil after amendments.

Present study is based on addition of known quantity of vermicompost in garden soil, study various physicochemical parameters, total microbial count of the vermicompost and the soil before and after amendment, impact of vermicompost amendment on seed germination and healthy plant growth.

II. MATERIALS AND METHODS

About 1 kg Vermicompost and 1 kg garden soil was taken for the experiment. 300 g of vermicompost was mixed with 700 g of garden soil, after drying at $105 \pm 2^\circ\text{C}$ in thermostatically controlled oven. The various physico chemical parameters, total microbial count of vermicompost, garden soil and garden soil amended with vermicompost were studied. The impact of vermicompost amendment was also studied by seed germination and plant growth in garden soil and garden soil amended with vermicompost[11].

III. PHYSICAL AND CHEMICAL ANALYSIS

Various physico chemical parameters like pH and electrical conductivity (EC), Total Organic Carbon, Total Nitrogen, Phosphorous, Calcium, Manganese and Zinc content of the Vermicompost, garden soil and the Garden soil amended with vermicompost were determined[12][13].

A. pH and electrical conductivity (EC)

The pH and electrical conductivity of (1 %, w/w) of the test solution in deionised water was determined after calibrating the instruments using standard solutions.

B. Determination of Total Organic Carbon (TOC)

Total Organic Carbon (TOC) was determined by Walkley and Black method (Walkley and Black, 1934).

C. Determination of Total Nitrogen (N)

Nitrogen was determined by micro-Kjeldhal method (Bremner and Mulvaney 1982).

D. Determination of Phosphorous:

Phosphorous was determined by Ammonium Molybdophosphate method by UV- Visible Spectrophotometry.

E. Determination of Potassium (K) and calcium (Ca):

K and Ca were determined by flame photometry.

F. Determination of Manganese (Mn) and Zinc (Zn)

The Zinc and Manganese content was determined by complexometric titration using standard EDTA solution.

G. Determination Water Holding/Retention Capacity

20 gram Vermicompost/garden soil/garden soil amended with vermicompost sample was weighed accurately in 250 mL beaker, 50 mL deionised water was added and allowed to rest for 24 hours. After 24 hours, the material was filtered through Whatman paper No.42, the beaker is washed with deionised water till the material is completely transferred to the paper. The excess water is allowed to drain and then residue along with the paper is weighed for to determine the water holding/retention capacity of 0 hours. Similarly, the water holding 24, 48, 72, 96, 120, 144 was determined using following formula.

Water holding/retention capacity:

$$\% C = \frac{(A-B) \times 100}{W}$$

Where, A = Weight of filter paper along with residue

B = Weight of filter paper

W = Sample weight in g

H. Determination Particle Size of Aqueous Suspension

The particle size of the aqueous suspension of garden soil and the vermicompost was determined by the particle size analyser (Malvern). The particle size in micron at d(10), d(50) and d(90) was determined.

I. Determination of Total Microbial Count

The total microbial count of vermicompost, garden soil and vermicompost amended garden soil was determined by using nutrient agar medium.

J. Sterilization of Glass Wares

All the glass wares (Petri plate, test tubes, slides conical flask, inoculum needle, measuring cylinder, and beaker) were cleaned by cleaning solution. Then, they were washed by soap solution and tap water. Finally, they were washed with distilled water and dried and sterilized in hot air oven at 120°C for 15 minutes. All the solutions and media were sterilized in autoclave.

Preparation of Sample for Pour Plate

1 gm sample was dissolved in 100 mL deionised and used for plating.

Pour Plate Technique:

About 100 microliter of sample was poured into a sterile Petri plate and about 15 mL of nutrient agar medium was added, then gently rotated it to spread the sample by hand and the petri plates were kept in room temperature and observed for 24 -72 hrs for bacterial and fungal colonies developed.

Table 1: Physicochemical properties of Garden soil

Parameters	Garden soil	Vermicompost	Garden soil amended with Vermicompost
pH	6.79 ± 0.04	7.18 ± 0.07	6.89 ± 0.04
Electrical Conductivity (µs/cm)	8.17 ± 0.06	534 ± 0.04	275 ± 0.03
TOC (% w/w)	8.09 ± 0.15	48.25 ± 0.05	38.46 ± 0.07
N (% w/w)	0.11 ± 0.06	1.75 ± 0.07	1.09 ± 0.07
P (% w/w)	0.74 ± 0.03	2.48 ± 0.03	1.52 ± 0.06
K (% w/w)	0.77 ± 0.13	2.23 ± 0.08	1.43 ± 0.04
Ca (% w/w)	0.85 ± 0.09	1.66 ± 0.11	1.03 ± 0.09

Mn (% w/w)	0.65 ± 0.15	0.98 ± 0.12	0.64 ± 0.09
Zn (% w/w)	0.79 ± 0.07	0.85 ± 0.03	0.81 ± 0.07
C:N	73.55 ± 0.11	27.53 ± 0.08	35.28 ± 0.04
Bulk Density (g/mL)	1.0423 ± 0.13	0.6711 ± 0.11	0.8251 ± 0.12

Figure 1:

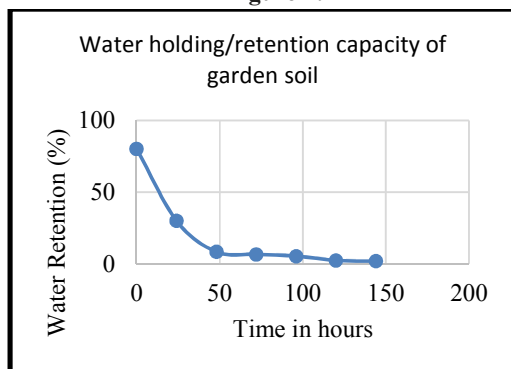


Figure 2:

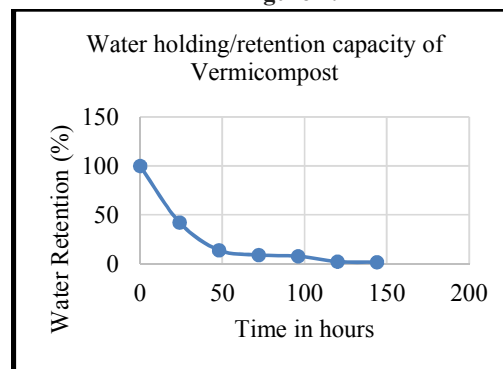


Figure 3:

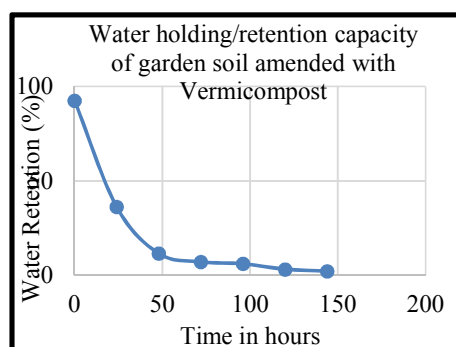


Figure 4:

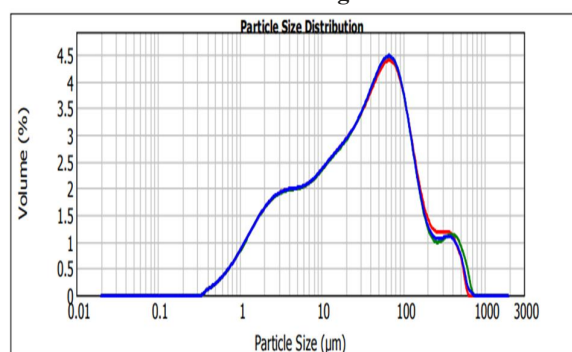


Figure 5:

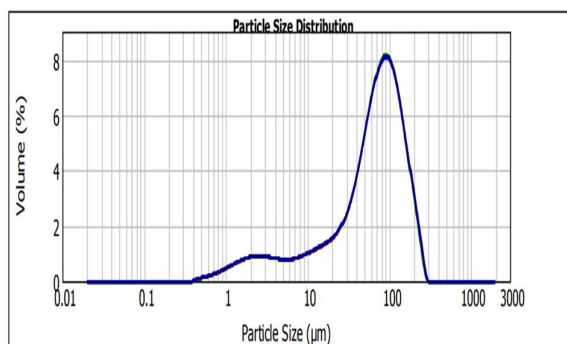


Figure 6

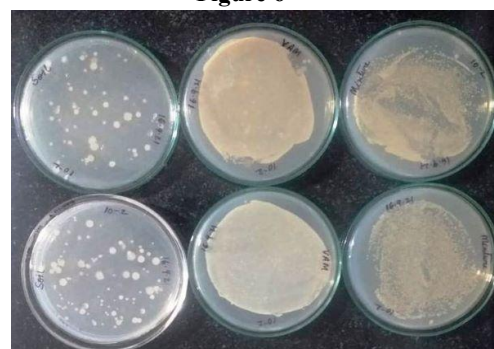


Figure:7

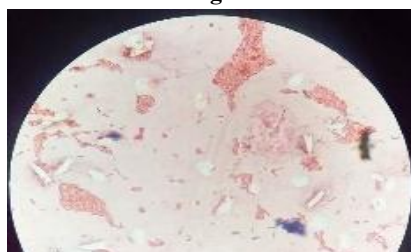


Figure: 8

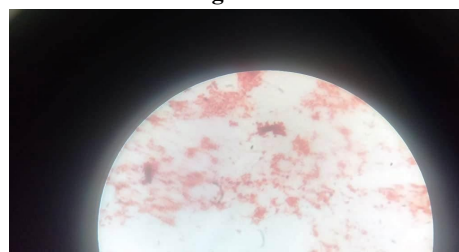


Figure 9

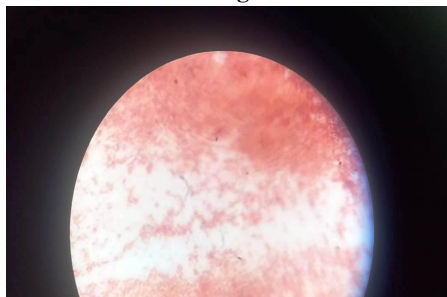


Figure 10



Figure 11



Figure 12



Figure 13



IV. RESULT AND DISCUSSION:

As shown in Table: 1, the pH of garden soil, Vermicompost and the Vermicompost amended with garden soil having almost similar pH, ranges from 6.8 to 7. The garden soil shows very less electrical conductivity $8.17 \pm 0.06 \mu\text{S/cm}$, whereas, vermicompost and garden soil amended with vermicompost shows comparatively higher electrical conductivity of $534 \pm 0.04 \mu\text{S/cm}$ and $275 \pm 0.03 \mu\text{S/cm}$, respectively. The total carbon content in garden soil was found to be very less $8.09 \pm 0.15 \%$ as compared to that of Vermicompost $48.25 \pm 0.05 \%$ and Vermicompost amended with garden soil. The total nitrogen content is also found to be very less, $0.11 \pm 0.06 \%$ in garden soil as compared to the Vermicompost, $1.75 \pm 0.07 \%$ and garden soil amended with Vermicompost, $1.09 \pm 0.07 \%$. The phosphorous, potassium, calcium, manganese and Zinc contents also found to be quite less, 0.74, 0.77, 0.85, 0.65, 0.79 % in garden soil as compared to the Vermicompost, 2.48, 2.23, 1.66, 0.98, 0.85 % and garden soil amended with vermicompost, 1.52, 1.43, 1.03, 0.64, 0.81, respectively [14].

The Bulk density (**Figure: 1,2,3**) was found to be quite higher, $1.0423 \pm 0.13 \text{ g/mL}$, as compared to that of Vermicompost, $0.6711 \pm 0.11 \text{ g/mL}$ and garden soil amended with vermicompost, $0.8251 \pm 0.12 \text{ g/mL}$ respectively. The water holding/retention capacity of garden soil is also observed comparatively poor, 80.27 %, as compared to the Vermicompost, 99.96 % and garden soil amended with Vermicompost, 92.51 %, at 0 hours, respectively. The water holding/retention was found to be dropped more in garden soil after 24 hours, 29.95 %, as compared to Vermicompost, 42.09 % and garden soil amended with vermicompost, 36.22 %, respectively. The water holding/ retention after 120 hours was found to be almost same, 2.22 to 2.06 in both garden soil and Vermicompost, whereas it is found to be quite higher, 3.18 % in garden soil amended with vermicompost.

From the above results, it was observed that the carbon content and the carbon to nitrogen ratio in garden soil is very less and very high respectively. Because of very high carbon to nitrogen ratio, the microbial growth in soil becomes inactive, which results in poor electrical conductivity, mineralization, increase in bulk density and there by poor water holding capacity as compared to the vermicompost. After the amendment, it was observed that the carbon content and carbon to nitrogen ratio has been modified and that has impacted on decreasing the bulk density, increasing the water holding capacity and mineralization[15].

To identify the basic difference in water holding/retention capacity in Vermicompost and the garden soil, the particle size (Figure: 4 and 5) of aqueous suspensions was determined by particle size analyser. From the particle size distribution of the suspension, it was observed that, the 10 % particles are having particle size 5.30 microns, 50 % particles having particle size 68.70 microns and 90 % particles having particle size 157.60 microns in garden soil, whereas in vermicompost, 10 % particles are having particle size, 2.34 microns, 50 % particles having particle size 30.71 micron and the 90 % particles having particle size of 153.21 microns, respectively.

From the particle size distribution of aqueous suspension, it was observed that, the 10 % and 50 % particles in garden soil having particle size almost double as that of in Vermicompost which has impacted on the poor water holding capacity of garden soil as compared to that of Vermicompost[15].

To study the microbial growth in garden soil, Vermicompost and garden soil amended with vermicompost, total microbial count was determined by using nutrient agar medium and pour plate method.

From the microbial test, (Figure:6) it was observed that, very few microbial colonies were present in garden soil, whereas in vermicompost, almost 95 % of the whole area of the culture medium was occupied by microbial colonies. The impact of vermicompost amendment was also seen in garden soil amended with vermicompost, where almost 80 % of the whole area of the culture medium was occupied by microbial colonies.

The colonies were also verified by Graham's test and found both Graham positive and negative species. (Figure: 7,8,9). From the microbial test it was observed that, the garden soil having very less population of microbial species, which has impacted on poor water holding capacity, high bulk density, very high carbon to nitrogen ratio, poor mineralization and particle size of the soil particles. From the Vermicompost amended garden soil, it was observed that, the microbial growth becomes active and multiply very quickly and contributing to change the physical, chemical and biological properties in sustainable manner[17].

The impact of vermicompost amendment in garden soil was also studied by seed germination, vegetative growth, flowering and fruiting. The capsicum seeds were isolated from the fruits of capsicum from local market, dried in sunlight. Two sets of vermicompost amended garden soil and garden soil were made in paper glass. About five seed of capsicum were sown in each glass and watered thoroughly. Both the sets were light watered every three days. After fifth day, the germination was observed in sets prepared with garden soil amended with vermicompost, whereas, no germination seen in set prepared from garden soil. After 10 days, the seedlings in sets prepared from garden soil amended with vermicompost acquired height of 3 to 5 centimetres and with 2 to 4 leaves, but no germination was seen in sets prepared from garden soil (Figure: 10 and 11), after transplanting, the seedlings acquired desired vegetative growth, flowering and fruiting (Figure: 12 and 13).

From the seed germination test it was observed that organic amendments are very essential for good soil microbial health, increasing the water holding capacity of the soil, seed germination and healthy plant growth and sustainable agricultural growth[18]-[20].

V. CONCLUSION

From the present study it is concluded that, the soils are getting deficient in carbon and nitrogen content and there by the carbon to nitrogen ratio does not remains proper for healthy microbial growth and mineralization. Due to poor microbial growth and improper mineralization, the physico chemical properties of the soil like, water holding capacity, bulk density getting deteriorated and impacted of seed germination, plant vegetative growth, flowering and fruiting and yield per hector. From the study it could be concluded that, the use of organic amendment like Vermicompost, Organic manure, Green manure is simple, user-friendly, eco-friendly, cost effective and sustainable alternative for soil restructuring. It is very essential to slow down the use of chemical fertilizers, pesticides and demanding the use of bio fertilizers and bio pesticides for mitigating the climate change, healthy ecosystem and wellness and wellbeing of the globe.

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To Study Histology of Ovary of the Fresh Water Bivalve, *Lamellidens marginalis* under the Stress of Tributyl tin oxide

Ghoble. S. S¹, Dongre. V. K.², Mirza. S. S.³

Asst. Professor, Department of Zoology

Arts Commerce and Science College, Lanja District. Ratnagiri, (MS), India¹

Sundarrao More Arts, Commerce and Science College, Poladpur District. Raigad, (MS), India²

G. M. Vedak College of Science, Tala District. Raigad, (MS), India³

dr.ghoble@gmail.com, drvkdongare@gmail.com, drmirzashsh@gmail.com

Abstract: The aim of the present study is to study the significant Histological changes seen due to Organotin Compound TBTO on ovary of fresh water bivalve species *L. marginalis*. Organotin compound is generally used on large scale as biocide in Aquatic ecosystems. The bivalves are bio-indicators to determine aquatic pollution on large scale in riverine Ecosystem. Histological study of these reflects the health of an entire aquatic ecosystem in the bio-monitoring process. Histological responses may also serve as Ecotoxicologically meaningful biomarkers since they form an important link between effects at the biochemical level and those measured in whole organism. The adverse effect of Tributyltin Oxide has been studied on ovary of freshwater bivalve. To study the acute lethal dose of Tributyltin Oxide the acute toxicity of TBTO is calculated under controlled laboratory conditions at 24 hrs, 48 hrs, 72 hrs and 96 hrs respectively. *L. marginalis* exposed to Tributyltin Oxide to 4.2 ppm, 3.6ppm, 2.8 ppm and 1.6 ppm for 24, 48, 72 and 96 hours respectively and studied its effect on the ovary. Results were compared with control group and illustrated histological changes in ovary. The results show gradual degenerative changes in its ovary. The severe damage was observed in the tissue of 72 & 96 hrs exposure to TBTO than compared to 24 & 48 hrs. Results showed damage to ovary tissue as exposure period increases and this was noted for all three observations.

Keywords: *Lamellidens marginalis*, Bis (tributyltin) oxide, ovary etc.

I. INTRODUCTION

India is a country in which great Biodiversity of fauna and flora are found. Due to increase in Industrialization, Urbanization and lack of use of Science and technology in Agriculture. Pollution became the threat for the mankind. Our students are protesting against the Deforestation and Use of heavy metals. Nowadays pollution is becoming a big issue, riverine ecosystem is badly affected by the use of heavy metals. For decades, mussels have been used as a sentinel species to monitor pollution in the aquatic environment (Foster and Bates, (1978) Farrington *et al.*, (1983) Colombo, *et al.*, (1995), Peven *et al.*, (1996) and Blackmore and wang, (2003). Study of toxic substances present in water and their adverse effects including mortality in aquatic organisms, increase with the growing awareness of the hazards of discriminate water pollution. The toxicological studies of pollutants are gaining more significance in recent time and worldwide attempts have been made to identify a "hazard" from toxic chemical present or released in aquatic environment. The toxicity study is essential to find out toxicants limit and safe concentration, so that there will be minimum harm to aquatic fauna in the near future. The considerable interest in and apprehension about the role, fate and toxic metals in aquatic environment are the result of several catastrophic events. The best way to ensure minimal recurrence of such events is to understand metal's physical, chemical, and biological behaviors in aquatic systems and to utilize this knowledge to propose mitigate measures when dealing with the problems of metal contamination.

Since many workers directed the studies towards the toxicity evaluation (Lowe *et al.*, 1971; Mane *et al.*, 1979; Rao, 1981; Bhavani and Dawood, 2003; Bhomre *et al.*, 1996; Arunee S, 1986; Gomot A, 1997). The reaction and survival of aquatic organism, under toxic conditions depend upon several factors, such as kind, toxicity and concentration of the toxicant and

the temperature, salinity, dissolved oxygen, pH and physiological factors such as reproductive cycle and seasons, in addition to the type and time of exposure to the toxicant (Holden, 1973; McKim *et al.*, 1973; Brungs *et al.*, 1977), it is necessary to carry out toxicity studies on varieties of aquatic species in different seasons. Freshwater bivalve molluscs are shown to be year around breeders (Gosh and Ghose, 1972) or the breeding is restricted to a year (Mudkhede, 1974) and it is shown to be influence by the changes in environmental factors.

In Present Study we have tried to evaluate the stress of heavy metal TBTO on ovary of fresh water bivalve at different Conc. Of TBTO.

II. MATERIALS AND METHODS

The freshwater bivalves, *Lamellidens marginalis* were collected from the Godavari River at Kaigaon. The site of the collection is 35 Km. away from Aurangabad city, of Maharashtra state. Bivalves were collected and were kept in a plastic troughs containing water and acclimatize to laboratory condition for 3 to 4 days. The water in the troughs was changed regularly after every 24 hours. 1 ppm stock solution of tributyltin oxide was prepared in acetone Laughlin *et al.*, (1983). After the acclimatization, healthy medium sized bivalves were selected for experiments. The histological analysis from different body parts were done from the bivalve, *L. marginalis* belonging to the control, and experimental.

For each experiment 10 animals of approximately similar size were exposed to 4.2ppm, 3.6ppm, 2.8ppm and 1.6 ppm LC50 values, for 24 h, 48 h, 72 h and 96 hours exposure period respectively. Bivalves in each experimental group were dissected and their tissues ovary were taken out from control and experimental group. Tissues were fixed in Bouins hollande. After fixation tissues were washed in running tap water, so as to remove the Bouins hollande from tissues. The washed tissues were dehydrated in different grades of alcohol (from 30% to absolute alcohol). The cleared tissues were embedded in paraffin wax (58 to 600c) and blocks were prepared. Blocks of the tissues were treamed and serial sections of 8μ thickness were cut with the help of Microtome. Sections were spread properly on the slides, and were stained with Mallory's triple stain. The stained sections were examined under light microscope for histological effect of tributyltin oxide.

III. RESULT

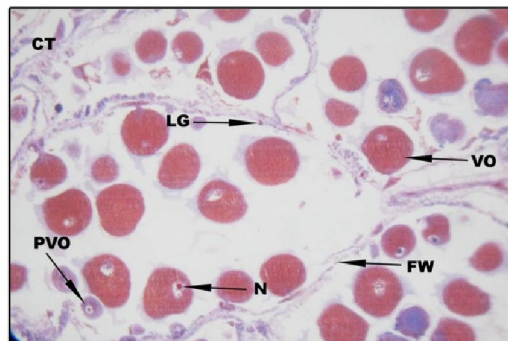
The histological section of the gonad from control group revealed compactly arranged follicles in connective tissue of mussels. Darkly stained inclusions were observed in the ooplasm of the follicles. Oogonial cells revealed the prominent nuclei with thin layer of cytoplasm. The developing oocytes showed few strands in nucleoplasm and granular cytoplasm. Free vitellogenic oocytes were large in size and with prominent nucleus and granular cytoplasm was observed, (Plate-1). *L. marginalis* exposed to tributyltin oxide to 4.2 ppm, 3.6 ppm, 2.8 ppm and 1.6 ppm for 24 h, 48 h, 72 h and 96 hours respectively. Results were compared with control group and illustrated histological changes in ovary.

In experimental, group showed Oogonia and developing previtellogenic and vitellogenic oocytes. Bivalves exposed to 4.2 ppm, 3.6 ppm, 2.8 ppm and 1.6 ppm for 24 h, 48, h, 72, h and 96 hours respectively almost all of them showed karyolysis and necrotic conditions. Fragmentation and resorbtion were observed almost in all treated experimental group more damage was observed in vitellogenic oocytes. Breakage of nuclear and oocyte membrane was found in 72 and 96 hr experimental group. Severity of damage was evident for 1.6 ppm at 96 hours exposure. Follicles distorted at many places and shrunk considerably when exposed 4.2 ppm, 3.6 ppm, 2.8 ppm of the vacuolization in cytoplasm oocytes was more pronounced in 96 hr exposure period. Lipid globules and nutritive cells reduced in size and also decrease in numbers amoebocytes were seen surrounded to the previtellogenic and vitellogenic oocytes, (Plate-1).

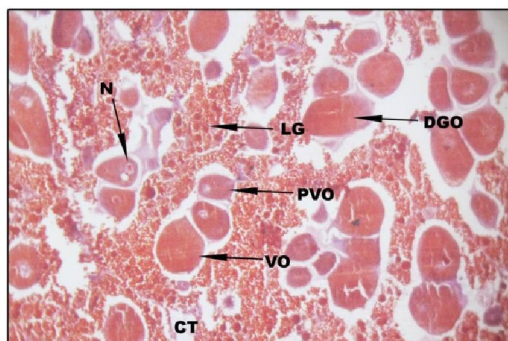
Histological changes in ovary of bivalve, *Lamellidens marginalis* due to tributyltin oxide (TBTO) stress.

V= Vacuole, CT = Connective tissue DVO= Developing Vitellogenic Oocytes OFC = DGN =Degenerating Nucleus , PVO = previtellogenic FW = Follicle wall, VO= Vitellogenic Oocytes , LG= Lipid globules, F=Follicle, N=Nucleus

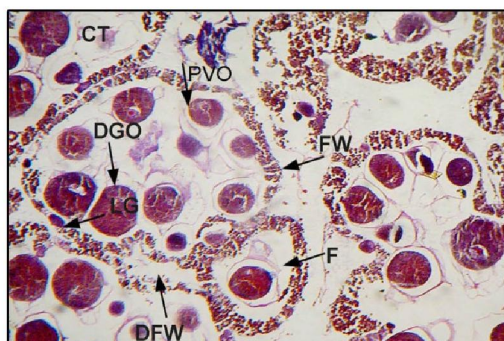
PLATE - 1



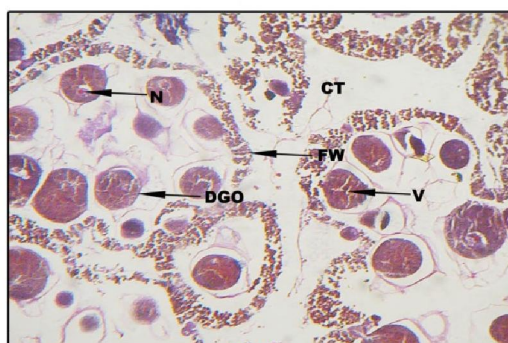
CONTROL



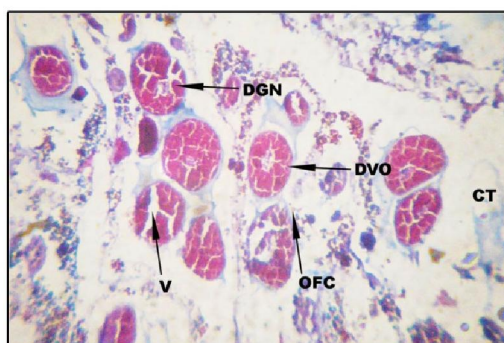
24 Hrs



48 Hrs



72 Hrs



96 Hrs

IV. DISCUSSION AND CONCLUSION

The histomorphology of the digestive gland of the bivalve *L. marginalis* subjected to the effect of tributyltin oxide was studied up to 96 hrs. Histological changes of the digestive tubules, channels, and connective tissue of the gland were recorded. The epithelium of the tubules and channels were characteristic with erosive disturbances and by heavy vacuolization of digestive cells; connective tissue of the gland was specified by cells with granulocytomes and by necrosis and lysis. It was concluded that histological changes in digestive gland of bivalve *L. marginalis* might be caused by acute toxicity of the tributyltin oxide.

Although the observed histological changes can not be linked with the relatively high mortalities observed during exposure and probably due to spawning, their severity appears to be both dose and time dependent. Furthermore, the data acquired suggest that poisoning results from different mechanisms. Although there are few studies devoted to histological effects of pollutants in molluscan species, digestive diverticula's modifications such as intensive fragmentation, vacuolization, epithelial thinning have been noted (Tripp *et al.*, 1984; Couch, 1984; Rasmussen, 1982; Rasmussen *et al.*, 1985). Such modifications could be considered as a general molluscan response to stress (Moore *et al.*, 1979; Lowe *et al.*, 1981) and have been interpreted as a physiological survival mechanism of bivalves subjected to stress.

In the present study, it is revealed that the initial impact of the organotin tributyltin compound TBTO exposed for 24 hours was less when compared with other exposure periods. The 48 hours exposure to TBTO shows that damage caused is at a higher rate to the tissue structure as it metabolizes into the tissues. After 72 hours exposure the damage is still there and not so high which might be due to the adaptation of the tissues to the pollutant and development of resistance to some extent. At 96 hours exposure the damage was increased which may be due to the lost of resistance of power of the tissues. This may be either due to the defense mechanism of cell becoming weak, or due to the high accumulation of the pollutant. The degree of toxic effect depends mainly on levels of pollutant and metabolites in the target tissues.

The mussels digestive glands cells are attractive models in ecotoxicological studies, since digestive glands are the second target and uptake site for many toxicants in the aquatic environment and thus gills cells are often affected by exposure to pollutants (Sunila, 1986, Bigas *et al.*, 2001) well established genotoxicity and cytotoxicity assays have been applied to isolated digestive glands cells of mollusks as measures of damage by environmental chemicals (Venier *et al.*, 1997. Auzoux-Bordenave 1995). The histological studies have shown that the TBTO have affected the digestive glands of *L. marginalis* when compared with the respective controls. The Ovary of the exposed bivalves showed disorganization of the tissue especially in the Ovary.

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Green-Synthesis of Silver and Gold Nanoparticles in Leaf and Bark of Plant *Vitex leucoxylon*

Udaybhan Yadav

Coordinator, Department of Microbiology (Interdisciplinary)

ZSCT's Thakur Shyamnarayan Degree College, Thakur Complex, Kandivali East Mumbai.

udaybhanyadav@tsdcmumbai.in

Abstract: Nanotechnology has emerged up as integration between biotechnology and nanotechnology for developing biosynthetic and eco-friendly technology for synthesis of nanomaterials. Nanoparticles are extensively used in biological and medical research due to their unique properties. Use of such nanoparticles in biological & medicinal field gives rise to the concept of biomedical nanotechnology, bio nanotechnology & nanomedicines. Green-synthesis of nanoparticles is emerging area in plant science research. Different plants are used for this purpose being it is most ecofriendly and convenient method of synthesizing nano scale particles of different salts. The plants are their potent sources of many valuable bioactive constituents and these constituents contribute reduction of salt in the system. In present work, leaf and plant bark of *Vitex leucoxylon* plant was taken as an experimental system for Green-synthesis of silver and gold nanoparticles from silver nitrates and gold chloride salt. *Vitex leucoxylon* is rich source in secondary metabolites especially polyphenols such as alkaloids, tannins, flavonoids and also steroids, triterpenes etc. which has lots of medicinal importance. The extract reaction mechanism of the nanoparticles synthesis by using biomaterials is yet to elucidate in detail; the work done proposes the involvement of redox enzymes in the reduction of silver and gold ions. Different biological sources can be used for synthesis of AgNPs and AuNPs such as bacteria, fungi, algae and plant material. Silver and Gold nanoparticles are gaining more attention due to their enormous applications, which includes biolabeling in optical receptors, catalyst in many chemical reactions and also possess different biological activities such as antibacterial, antifungal, antioxidant, antiviral activities.

Keywords: Nanoparticles, Green-synthesis, Vitex, Silver Nanoparticles, Gold Nanoparticles, NTA, TEM, UV-Vis.

I. INTRODUCTION

A nanometer is one-billionth of a meter. Norio Taniguchi coined the term "nano-technology" in 1974. Nobel Laureate Dr. Horst Stormer said that, "the nanoscale is more interesting than the atomic scale because the nanoscale is the first point where we can assemble something- it's not until we start putting atoms together that we can make anything useful". Biologists, chemist, physicists and engineers are all evolved in the study of substances at the nanoscale. Dr. Stormer hopes that the different disciplines develop a common language and communicate with one another without a solid background in multiple sciences one cannot understand the world of nanotechnology. Nano biotechnology is the merger of two distant fields of nanotechnology and biotechnology. Nanoparticles are extensively used in biological and medical research communities for various applications. Use of such nanoparticles in biological and medical field gives rise to the concept of biomedical nanotechnology, bionanotechnology and nanomedicine. The integration of nanomaterials with biology has led to the development of diagnostic devices, contrast agents, analytical tools, physical therapy applications, and drug delivery vehicles. The Biological systems especially algal materials, fungal forms and Angiospermic plants of medicinal importance are considered as a most ecofriendly and nontoxic systems with superiority of applications over physical and chemical methods of nanoparticle synthesis.

In present work, *Vitex leucoxylon* plant was taken as an experimental system for Green-synthesis of AgNP's and AuNP's. Bottom up and 'Top down Approach are considered as two important modes of nanoparticle synthesis. In the bottom up approach, materials and devices are built from molecular components which assemble themselves chemically by principles

of molecular recognition. While in the top down approach, nano sized particles are constructed from large entities without atomic level control (Maccuspie et.al. 2011). Nanostructures come in various size and shapes and are synthesized by using different metals and other chemicals.

Nanocages, Nanofibers, Nanotubes and Nanodots are the specific types of nanostructures. Nanocages are hollow porous gold nanoparticles ranging in size from 10nm-150nm. These are the product of reaction of silver nanoparticles with chloroauric acid (HAuCl_4) in boiling water. Nanocages show different properties than their building molecules. E.g. Gold Nanoparticles show absorbance in the visible spectrum of light while gold Nanocages absorb light in near infrared region. Nanofibers are the specially designed fibers with diameter less than 100 nanometers. They can be produced by interfacial polymerization and electro spinning. Carbon Nanofibers are graphitized fibers and are shaped by catalytic synthesis. Napkins with Nanofibers contain antibodies against numerous biohazards and chemical that signal by changing color. These napkins are chiefly used in identifying the bacteria in kitchens. Nanotubes are nanoscale tube like structures whose diameter ranges from 0.1 to 100 nm and length is much greater. Such nanotubes which exhibit extraordinary strength and unique electrical properties are efficient conductors of heat. Nanodots or Nanoparticles that consist of homogenous materials, especially those that are almost spherical or cubical in shape.

The size of nanomaterials is similar to that of most biological molecules and structures; therefore, nanomaterial's can be useful for both in vivo and in vitro biomedical research and applications. Thus far, the integration of nanomaterials with biology has led to the development of diagnostic devices, contrast agents, analytical tools, physical therapy applications, and drug delivery vehicle. Several proteins make nanomaterials suitable for bio tagging or labeling. In order to interact with biological target, a biological or molecular coating or layer acting as bioinorganic interface should be attached to the nanoparticles. These biological coatings include antibodies, biopolymers like collagen, or monolayers of small molecules making the nanoparticles biocompatible. This is the reason why the biological metal nanoparticle synthetic methods are favored over physical and chemical methods. As the biosynthetic methods utilize natural solvents for the production of metal nanoparticles they are biocompatible and can be utilized in the medicine. Also, nanoparticles have a further advantage over larger macromolecules as they are better suitable for intravenous delivery.

The shape of the nanoparticles is more often spherical but cylindrical, plate like and other shapes are possible. The size and size distribution might be important in some cases, for example if penetration through a pore structure of a cellular membrane is required. The size and size distribution are becoming extremely critical when quantum-sized effects are used to control material properties. A tight control of an average particle size and a narrow distribution of sizes allow creating very efficient fluorescent probes that emit narrow light in a very wide range of wavelengths. This helps with creating biomarkers with many and well distinguished colors. The core itself might have several layers and multifunctional. For example, combining magnetic and luminescent layers one can both detect and manipulate the particles.

Gold play an important role in pharmaceutical, cosmetic and food industries. Dentists use gold for crowns, and certain medicines, such as sodium aurichloride for rheumatoid arthritis which also contain gold. Small amount of gold sometimes brightens foods such as jelly or liquors, like Goldschlager gold can be catalyze, or speed up, certain chemical reactions more efficiently than other toxic catalysts. It plays an important role in reducing pollution. For example, scientists have recently discovered that gold particles energized by the sun can destroy volatile organic chemicals. Recently, gold nanoparticles were used to detect breast cancer. The procedure works by identifying the proteins found on the exteriors of the cancer cells. Different types of cancer have different proteins on their surfaces that serve as unique markers. Nanorods, gold nanoparticles shaped like rods, use specialized antibodies to latch onto the protein markers for breast cancer, or for another cancer type. After the nanorods bind to proteins in a blood sample, scientists examine how they scatter light. Each protein-nanorod combination scatters light in a unique way, allowing for precise diagnose.

In medicine, nanoparticles first found use in the diagnosis of tumors in the spleen and liver using magnetic resonance tomography. In cancer therapy a major difficulty is to destroy tumor cells without harming the normal tissues. Radiotherapy attempts to focus irradiation on the tumor but never the less damages healthy tissues which cannot always be protected in the desired way. Magnetic drug targeting employing nanoparticles as the carrier is a promising cancer treatment avoiding side effects of conventional chemotherapy (Akerman et.al.2006). There is also a very significant role in of hyperthermia in cancer drug delivery. There is increasing evidence that hyperthermia at 40-43⁰ Celsius enhances the uptake of therapeutic agents in to cancer cells and provides an opportunity for improved targeted drug delivery (Kocbek et.al.2001). Using nanoparticles for drug delivery of anticancer agents has significant advantages such as the ability to target specific locations

in the body, the reduction of the overall quantity of drug used, and the potential to reduce the concentration of the drug at non target sites resulting in fewer unpleasant side effects (Joenathan et.al.2006). The use of nanoparticles as drug delivery vehicles for anticancer therapeutics has great potential to revolutionize (Faroji and wipf et.al.2009) the future of cancer therapy. As tumor architecture causes nanoparticles to preferentially accumulate at the tumor site, their use as drug delivery vectors results in the localization of a greater amount of the drug load at the tumor site; thus improving cancer therapy and reducing the harmful nano specific side effects of chemotherapeutics.in addition, formulation of these nanoparticles with imaging contrast agents provides a very efficient system for cancer diagnostics.

Silver derives its broad-spectrum antimicrobial activity from the ability of silver ions to bind irreversibly to a nucleophilic group commonly available in cells of bacteria, viruses, yeast, fungi and protozoa. Binding to cellular components disrupts the normal reproduction and growth cycle resulting in death of the cell. Capitalizing on its potent activity, silver and its compounds have been incorporated over the past several decades in a variety of wound care products such as dressings, hydrogels, hydrocolloids, creams, gels, lotions, sutures, and bandages. The preferred form of silver in antimicrobial products has been its compounds or salts as the metallic form of the element itself lacks therapeutically effective oligodynamic action. The compounds or salts upon contact with an aqueous medium ionize to yield silver ions that become available for antimicrobial action. The majority of silver compounds is also photosensitive or heat sensitive making their utilization in stable commercial products challenging. It is well known that the proteins and enzymes present in the plant extract are responsible for the reduction of metal ions. However, the shape, size and the stability of metal nanoparticles is due to the Green--constituents present in the extract. It is also known that the composition of the enzymes and Green--constituents varies from plant to plants and thus has the impact on the ability to reduce metal ions as well as the shape, size and stability of the metal nanoparticles.

The most abundant polyphenols in Vitex juice are the hydrolysable tannins called ellagitannins formed when ellagic acid binds with a carbohydrate. Punicalagins are tannins with free-radical scavenging properties in laboratory experiments and with potential human effects. Punicalagins are absorbed into the human body and may have dietary value as antioxidants, but conclusive proof of efficacy in humans has not yet been shown. During intestinal metabolism by bacteria, ellagitannins and punicalagins are converted to urolithins which have unknown biological activity in vivo. Other Green-chemicals include polyphenolic catechins, gallocatechins, and anthocyanins, such as prodelphinidins, delphinidin, cyanidin, and pelargonidin. The ORAC (antioxidant capacity) of Vitex juice was measured at 2,860 units per 100 grams.

II. MATERIALS AND METHODS

2.1 Collections of Plant Materials

The bark and leaf of *Vitex leucoxylon* (Vitex) tree were collected from SGNP and the dust particles were removed. The plant materials are kept in oven for 24 hours at 40°C. After drying plant materials are converted in to a fine powder with the help of mortar and pestle.

2.2 Chemicals

1. Silver nitrate (AgNO_3)
2. Chloroauric acid (HAuCl_4)
3. Deionized water

2.3 Preparation of Bark and Fruit Leaf Extract

The 15 gm. of bark powder and 15gm. of leaf powder was mixed with sterile D/W in 500ml Erlenmeyer flask. This mixture was then boiled for 25min on heating plate. After boiling mixture were filtered with Whatman filter paper separately. The supernatant was used as a plant extract for the experiment.

2.4 Preparation of 1mM Aqueous AgNO_3 and HAuCl_4 Solution

76.441mg standard AgNO_3 powder and 177.223mg standard HAuCl_4 powder was separately diluted with 450ml de-ionized d/w. 1mM aqueous AgNO_3 solution and HAuCl_4 solution was used for the treatment of the plant extract.

2.5 Synthesis of Silver Nanoparticles in Vitex Bark and Leaf Extract

Accurately measured bark and leaf extract of 25ml and 50ml was separately added to the 75ml and 50ml in 1mM aqueous AgNO₃ solution respectively in a jar. The jar was agitated for few minutes and then incubated at room temperature.

2.6 Synthesis of Gold Nanoparticles in Vitex Bark and Leaf Extract

Accurately measured as prepared bark extract and leaf extract of 25ml and 50ml was separately added to the 75ml and 50ml in 1mM aqueous HAuCl₄ solution respectively in a jar. The jar was agitated for few minutes and then incubated at room temperature.

2.7 UV-Vis Spectra Analysis

The bioreduction of Au³⁺ to Au⁰ and Ag⁺⁺ to Ag⁰ in the aqueous solution was monitored by periodic sampling (0min, 15min, 30min...120min, 24hr) of aliquots of the suspension, if required then by diluting the samples with distilled water and subsequently measuring the UV-Vis Spectra (190nm to 1100nm) of the resulting diluents on the spectrophotometer (Model-Shimadzu UV 1800). Similarly, the spectra of the ions were recorded and compared. Deionized water was used for the base line correction.

2.8 Transmission Electron Microscopy (TEM)

TEM samples of the silver, gold nanoparticles synthesized by the leaf and bark extract of *Vitex leucoxylon* were prepared by first sonicating the samples in sonicator (Vibronics VS80) for 15mins. A drop of the nanoparticle's solution was put on carbon coated copper grids of 3mm diameter, blot to remove excess of solution and later was allowed to dry under Infrared light for 40mins. TEM measurements were then performed on instrument operated at an accelerating voltage at 200 Kv (PHILIPS MODEL CM 200).

III. OBSERVATIONS

The data obtain on analysis of characters of Green-synthesized nano scale particles in Leaf and Bark extract of *Vitex leucoxylon* is tabulated in this chapter.

Sr. No.	Salt Used	Plant Materials	NTA analysis		TEM analysis	UV Spectra (nm)
			Mean size (nm)	Particles per frame	Shape of the particles	
1	Silver Nitrate	Leaf extract	59	26.99	Oval, Spherical	463
2	Silver Nitrate	Bark extract	61	37.66	Circular	400

Table 1: Observation table for average particle size, shape and distribution frequency of Green-synthesized silver nanoparticles in *Vitex leucoxylon* bark & leaf extract.

Sr. No.	Salt Used	Plant materials	NTA analysis		TEM analysis	UV Spectra (nm)
			Mean size (nm)	Particles per frame	Shape of the particles	
1	Gold Chloride	Leaf extract	54	25.51	Spherical	548
2	Gold Chloride	Bark extract	58	10.91	Circular	520

Table 2: Observation table for average particle size, shape and distribution frequency of Green-synthesized gold nanoparticles in *Vitex leucoxylon* bark & leaf extract.

IV. RESULT AND DISCUSSION

The present work deals with the aspect of Green-synthesis of Silver nanoparticles (AgNPs) and Gold nanoparticles (AuNPs) in leaf and bark extract of *Vitex leucoxylon*. The finely grinded powder of Vitex leaves and bark (**Photoplate-1**) was used to prepare the extract. Au and Ag NPs have a wide range of application in areas such as catalysis, medical diagnostics, and biological imaging. Various physiochemical method of metal nanoparticles synthesis has been reported, all having their inherent limitations. Development of easy, reliable and ecofriendly biological methods helps in endorsing extra interest in the synthesis and application of nanoparticles which are good for mankind (Bhattacharya and Gupta, 2005). In

this context the utilization of biological systems for nanoparticles synthesis provide move towards this multifaceted approach. Biological systems have shown ability to interact with metal ions and reduce them to form metallic nanoparticles (Beveridge et.al.1997).

Green-synthesized Silver NP's in Leaf and Bark extract of *Vitex leucoxydon*: -

UV-Vis Studies

A UV-Vis measurement gives the precise report of the absorbance of the light on the basis of shape of the nanoparticles. Absorption spectra show the production of SNP's within an hour on the reduction of Ag^{++} ions. The UV-Vis spectra of reaction mixture of 1mM aqueous AgNO_3 solution and 25% leaf and 25% bark extract of plant *Vitex leucoxydon* is shown in the Fig.-1. The spectra clearly shows the absorption band at around 463nm in the leaf extract and at around 406nm in the bark extract of silver nanoparticles. There is a close relationship between the UV-Vis and light absorbance characteristics and size and shape of the absorbate (Ankavmar et.al, 2005). The absorption band is a characteristic feature of anisotropic nanoparticle and occurs in structures such as triangular, spherical and hexagonal particles (Ankavmar et.al, 2005).

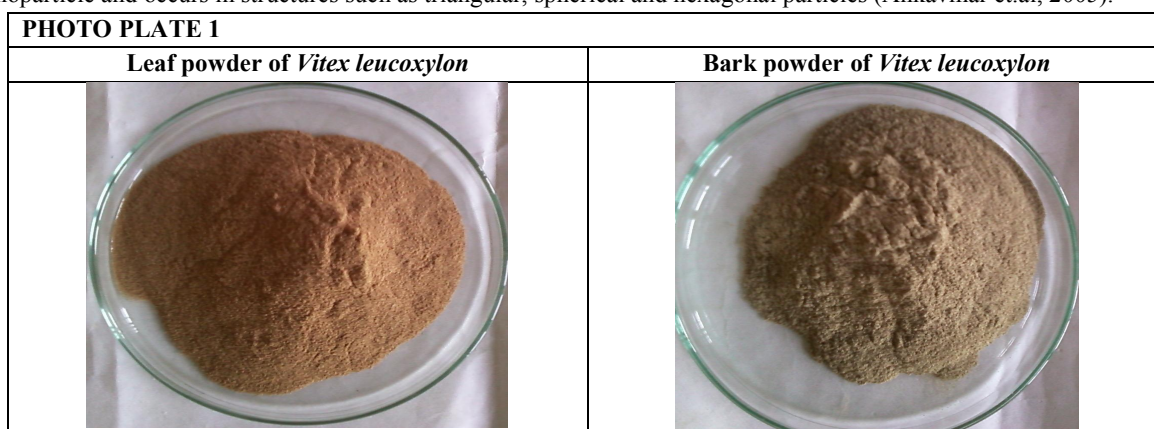


Figure 1: UV-Vis Spectra recorded as a function of time for the solutions prepared using silver nitrate (1mM), leaf and bark extract of *Vitex leucoxydon*.

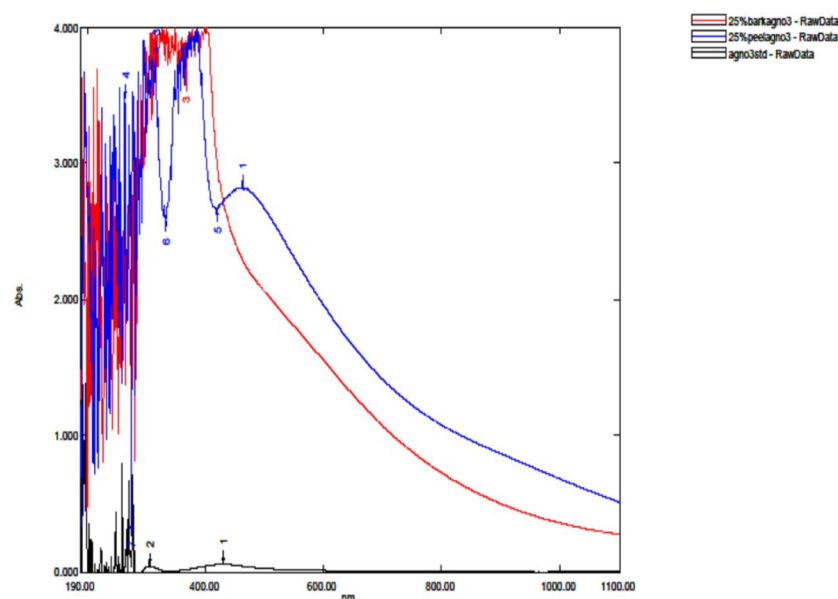


Fig. 2: UV-Vis spectra recorded as a function of time for the solutions prepared using gold chloride (1mM), leaf and bark extract of *Vitex leucoxydon*.

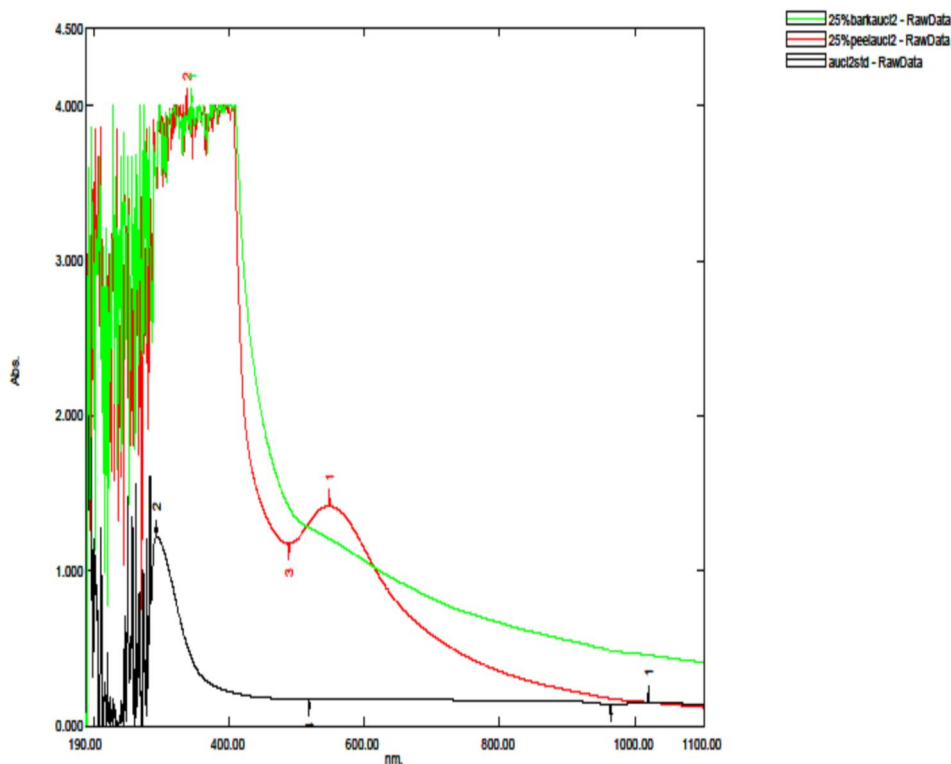


Figure 3: NTA analyses of 25% Leaf extract of Silver nanoparticles

4.1 Nanoparticle Tracking Analysis (NTA)

NTA analysis for silver nanoparticles was done using Nano sight Ver.2.1 Instrument in Institute of Science. NTA studies indicated the average size of SNP's synthesized in the leaf extract as 59 nm with the frequency of 26.99 particles per frame (**Fig.-3**). The nanoparticles synthesized using bark extract showed the average particle size of 61nm with the average frequency of 37.66 particles per frame (**Fig.-4**). These results indicated the high frequency of SNP' synthesis in bark extracts compare to leaf extract. It is to be noted that the average size of Green-synthesized SNP's was also more in bark extract (61nm) against leaf extract (59nm).

4.2 TEM Analysis for Silver Nanoparticles

The shape of the Green-synthesized nanoparticles can be conspicuously observed by TEM analysis. TEM samples of the aqueous suspension of silver nanoparticles after sonication for 15 minutes were produced by placing a drop of the suspension on Carbon coated copper grids and allowing water to evaporate in vacuum. TEM observations were performed on Philips Electron Microscope operated at an accelerating voltage of 200Kv with the resolution of 0.22. The shape of the AgNP's in Vitex leaf extract was spherical and Oval (**Photoplate-2**). This morphology of silver ions is obtained by reduction of Ag^{++} to Ag^0 . A large density of silver NP's was observed under low magnification. Thus, silver nanoparticles are quite polydispersed and ranged in size from 9-70nm. The SNP's in bark extract showed spherical shape (**Photoplate-3**). The Silver nanoparticles are quite polydispersed and ranged in the size from 9-22nm. These observations indicated the variations in the shape of nanoscale particles in leaf and bark extract.

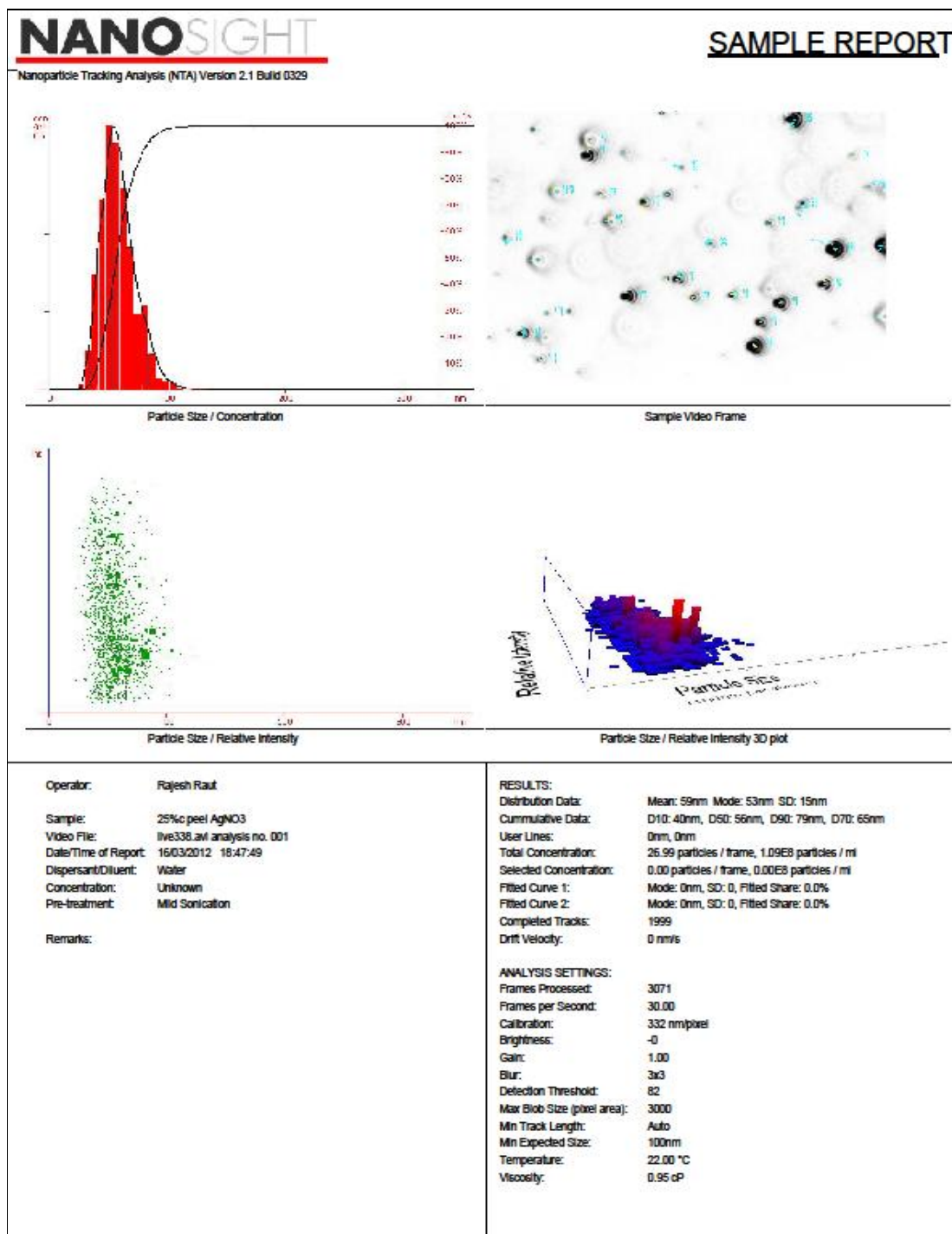
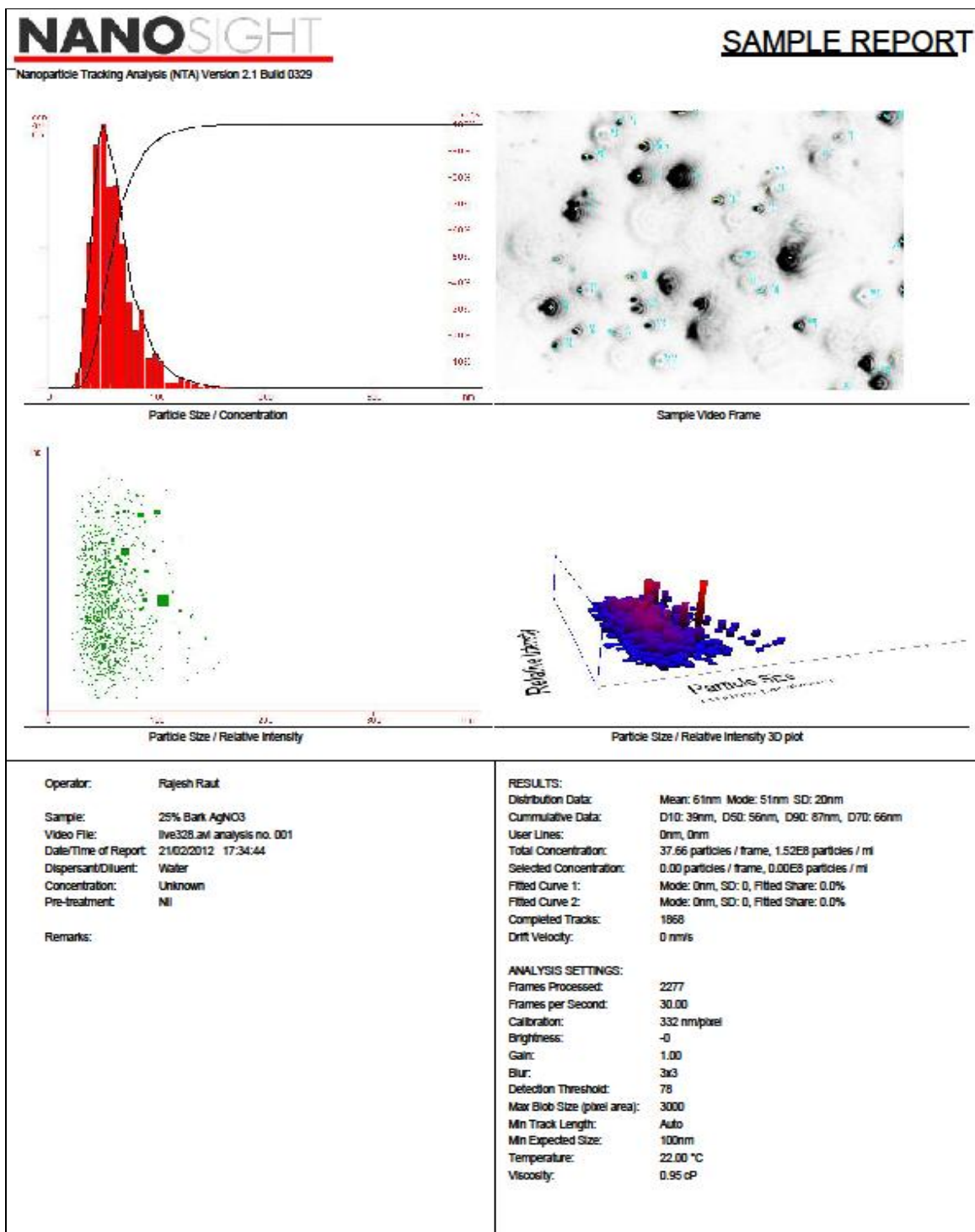


Figure 4: NTA analyses of 25% bark extract of silver nanoparticles



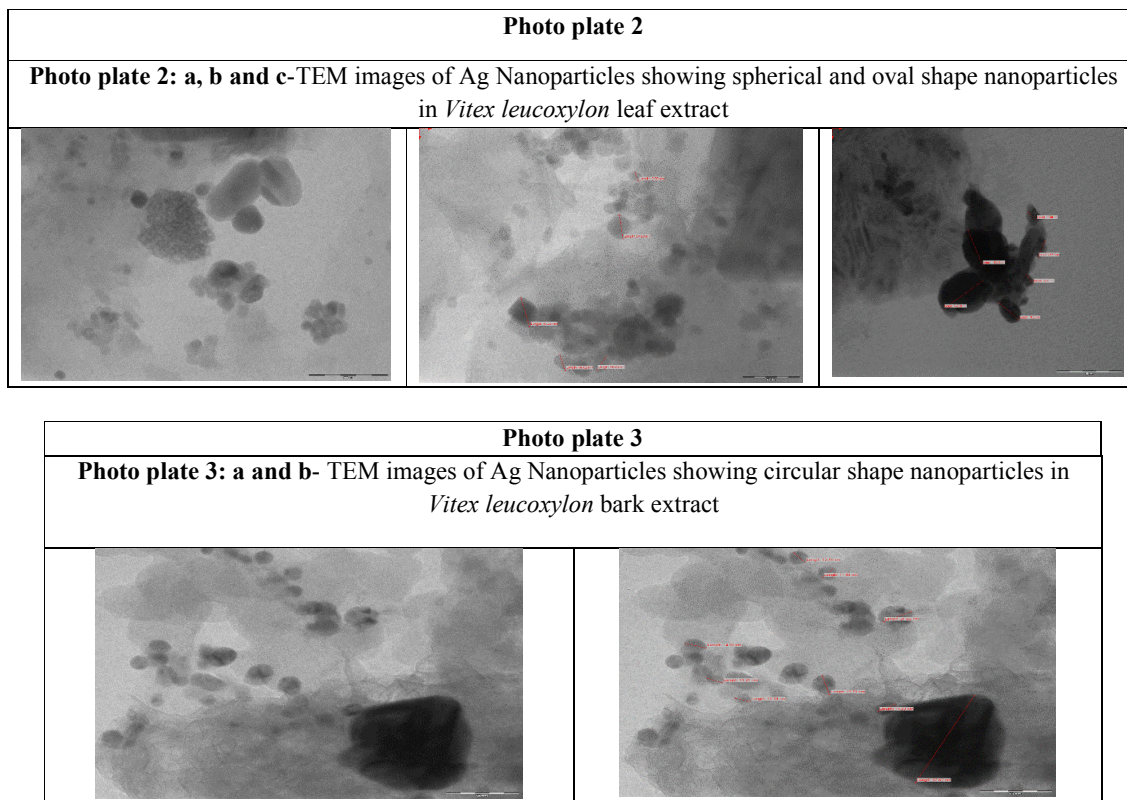


Figure 5: NTA analyses of 25% Leaf extract of Gold nanoparticles

Green-synthesized Gold NP's in Leaf and Bark extract of *Vitex leucoxydon*:

UV-Vis Studies:

The absorption spectra show the production of NP's within an hour on the reduction of Au^{+++} ions in to Au^0 . The UV-Vis Spectra of reaction mixture of 1mM aqueous AuCl_4 solution and 25% leaf and 25% bark extract of plant *Vitex leucoxydon* is shown in the Fig.-2. The spectra clearly show the absorption band at around 548 nm in the leaf extract and at around 520 nm in the bark extract of gold nanoparticles.

Nanoparticle Tracking Analysis (NTA):

NTA analysis for gold nanoparticles indicated the average size of gold NP's synthesized in the leaf extract as 54 nm with the frequency of 25.51 particles per frame (**Fig.-5**). The nanoparticles synthesized using bark extract showed the average particle size of 58 nm with the average frequency of 10.91 particles per frame (**Fig.-6**). These results indicated the high frequency (25.51) of gold NP's synthesis in leaf extracts compare to bark extract (10.91). It is to be noted that the average size of Green-synthesized gold NP's was also more in bark extract (58 nm) against leaf extract (54 nm).

TEM Analysis for Gold Nanoparticles:

TEM samples of the aqueous suspension of gold nanoparticles after sonication for 15 minutes were produced by placing a drop of the suspension on Carbon coated copper grids and allowing water to evaporate in vacuum. TEM observations were performed on Philips Electron Microscope operated at an accelerating voltage of 200Kv with the resolution of 0.22. The shape of the Au NP's in Vitex leaf extract was spherical (**Photoplate-4**). This morphology of gold ions is obtained by reduction of Au^{+++} to Au^0 . In TEM analysis, the particles range observed was 8-20nm. The Au NP's in bark extract showed circular shape (**Photoplate-5**). These observations indicated the variations in the shape of nanoscale particles i.e. spherical in leaf and circular bark extract.

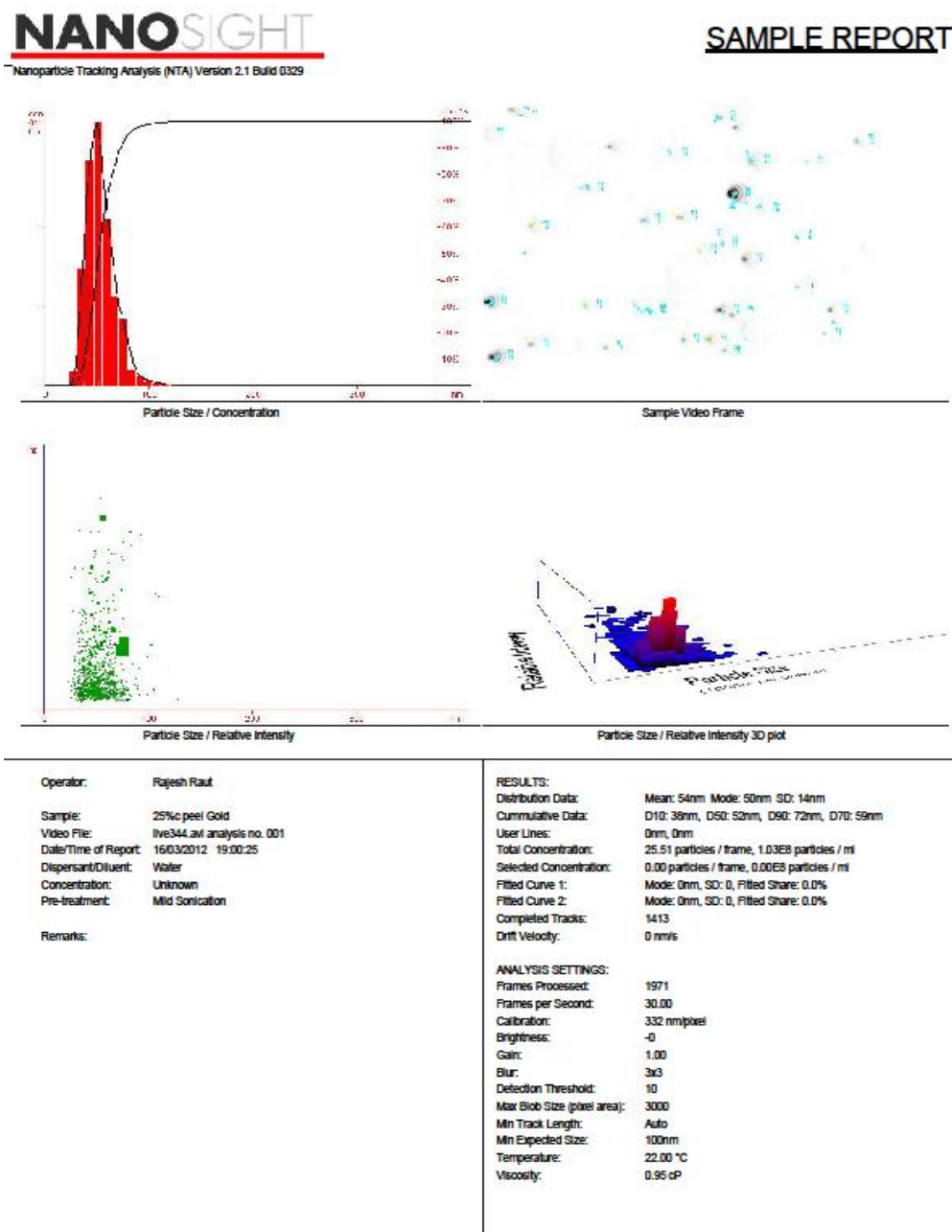
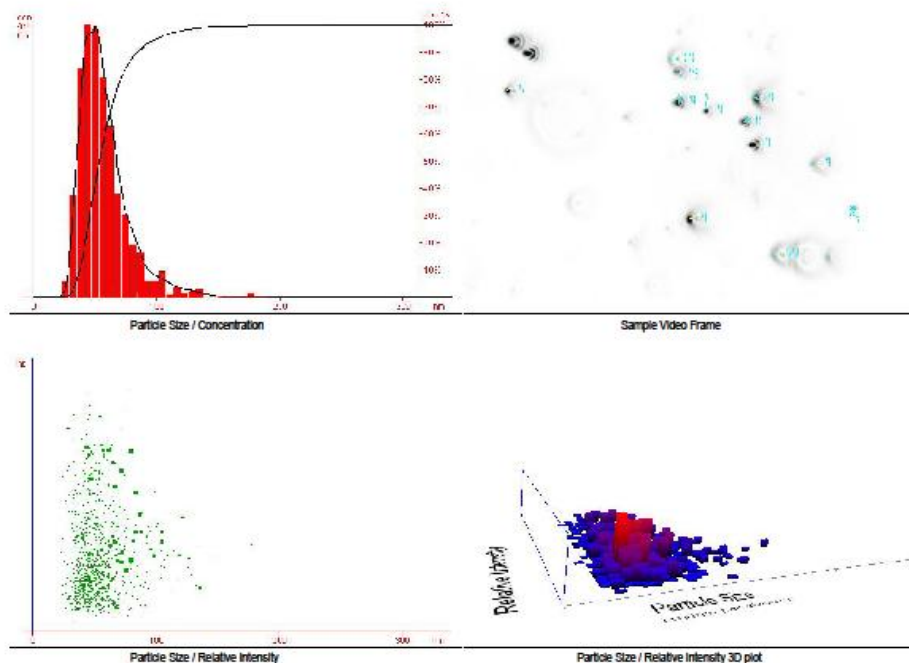


Figure 6: NTA analyses of 25% bark extract of Gold nanoparticles

NANOSIGHT

Nanoparticle Tracking Analysis (NTA) Version 2.1 Build 0329

SAMPLE REPORT



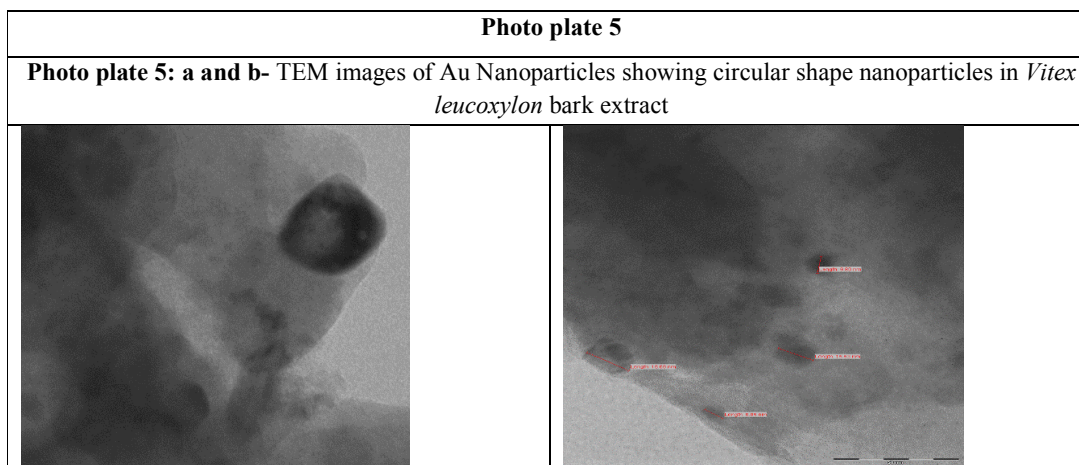
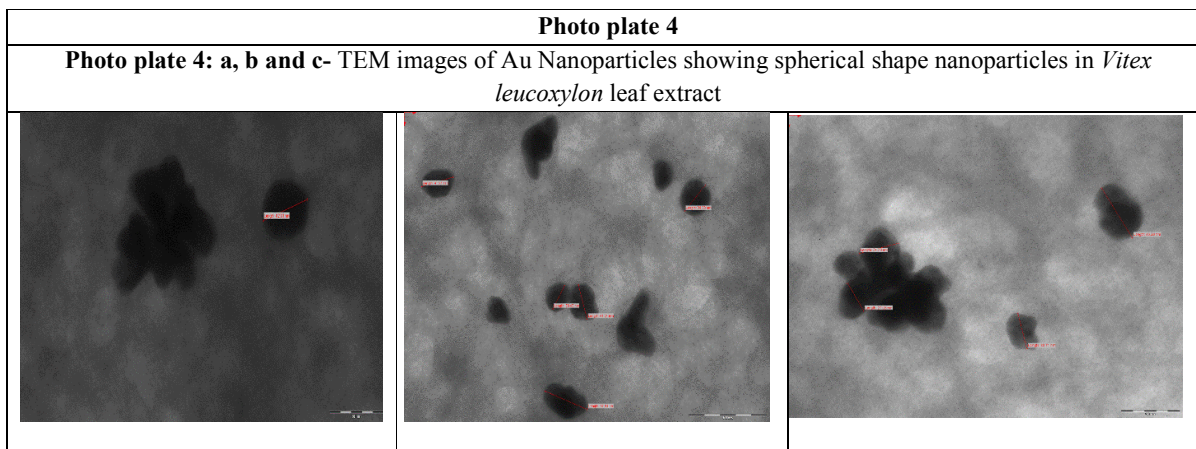
Operator: Rajesh Raut

Sample: 25% Bakti AUC4
 Video File: live331.avi analysis no. 001
 Date/Time of Report: 21/02/2012 17:49:43
 Dispersant/Diluent: Water
 Concentration: Unknown
 Pre-treatment: Nil

Remarks:

RESULTS:
 Distribution Data: Mean: 58nm Mode: 50nm SD: 20nm
 Cumulative Data: D10: 37nm, D50: 53nm, D90: 82nm, D70: 62nm
 User Lines: 0nm, 0nm
 Total Concentration: 10.91 particles / frame, 0.4488 particles / ml
 Selected Concentration: 0.00 particles / frame, 0.0008 particles / ml
 Fitted Curve 1: Mode: 0nm, SD: 0, Fitted Share: 0.0%
 Fitted Curve 2: Mode: 0nm, SD: 0, Fitted Share: 0.0%
 Completed Tracks: 1079
 Drift Velocity: 0 nm/s

ANALYSIS SETTINGS:
 Frames Processed: 3890
 Frames per Second: 30.00
 Calibration: 332 nm/pixel
 Brightness: -0
 Gain: 1.00
 Blur: 3x3
 Detection Threshold: 56
 Max Blob Size (pixel area): 3000
 Min Track Length: Auto
 Min Expected Size: 100nm
 Temperature: 22.00 °C
 Viscosity: 0.95 cP



Green- synthesis of nanoparticles is a coming up experimental exercise where the biological agents like Bacteria, Fungi, and Higher plants are used (Mukherjee *et. al.*, 2001a, Singaravelu *et. al.*, 2007) have reported the use of plant materials for the synthesis of nanoparticles. The use of inactivated biomass to recover metal ions from solution has been studied extensively. The possibility of using live bacteria for the remediation of metal-contaminated waters has shown the bacterial production of silver-carbon composite materials. Many reports on synthesis of metal and semiconductor nanoparticles using fungi or bacteria have appeared. In our quest for new eco-friendly “Green-” methods for the synthesis of noble metal nanoparticles, many workers have identified fungi (Mukherjee *et. al.*, 2001), Actinomycetes (Ahmad *et. al.*, 2003), and plant extracts (Shivshankaret. *al.*, 2003), for the synthesis of silver and gold nanoparticles (Shivshankaret. *al.*, 2003).

The synthesis of stable silver, gold and bi-metallic Ag/Au core shell nanoparticles using 20 g of leaf biomass have been reported by Shivshankaret. *al.* (2004) using *Azadiracta indica*. In vivo synthesis of nanoparticles of gold-silver-copper alloy has been reported by R.G. Haverkampet. *al.* 2007. Most of the above research involves the synthesis of colloidal silver or gold nanoparticles employing plant broths resulting from boiling fresh or dried plant leaves (Shivshankaret. *al.*, 2003, 2004, 2005 and 2006).

In the present work, the attempt was made to synthesize Silver and Gold nanoparticles employing the fruit leaf and bark extracts of *Vitex leucoxylon* Linn. *Vitex leucoxylon* is rich source in secondary metabolites especially polyphenols such as alkaloids, tannins, flavonoids and also steroids, triterpenes etc. which has lots of medicinal importance. The extract reaction mechanism of the nanoparticles synthesis by using biomaterials is yet to elucidate in detail; the work done proposes the involvement of redox enzymes in the reduction of silver and gold ions. Different chemical components present in the plant contribute the stability, shape and size of the Green-nanoparticles.

V. CONCLUSION

The present work was conducted in the bark and leaf aqueous extract of *Vitex leucoxydon* to synthesized silver and gold nanoparticles by treating with 1mM concentration of silver nitrate and gold chloride. The characterization of Green-synthesized nanoparticles in *Vitex* leaf and barks was done with the help of UV-Vis spectrometry, nanoparticle tracking analysis and transmission electron microscopy. The results obtained in the present work are concluded as follows:-

- In both the experimental samples (leaf and bark extract of *Vitex leucoxydon*), it is concluded that the biomass used yields good response for the Green-synthesis of silver and gold nanoscale particles.
- The UV-Vis Spectrophotometry analysis revealed the spectrum status for both the samples in accordance with nature of salt used.
- Nano tracking analysis for silver nanoparticles indicates high frequency of nano sized particles in bark extract compare to leaf extract of the experimented plant.
- The average size of the silver nanoparticle was more i.e. 61nm for a bark extract when compare to leaf extract sample.
- The gold nanoparticles appeared with high frequency in leaf extract however the size of nanoparticle was more (58 nm) in the bark extract sample compare to leaf extract.
- The TEM analysis indicates circular, spherical, and oval shaped Green-nanoparticles.
- Silver nanoparticles in leaf extract were spherical as well as oval in shape where as in bark extract only spherical nano sized particles were observed.
- The gold nanoparticles were circular in shape in bark extract where as in leaf extract sample the shape of nano scale particles was spherical.

The work conducted was useful to understand the process of nanoparticle synthesis using plant material. The work also given an inside to understand the characters of Green- nanoparticles using analytical techniques. This mode of synthesis is a part of nano biotechnology using Green- synthesis approach. These aspects generate more interest in plant science researchers because the Green-nanoparticles are capped with biological molecules which are either enzymes or the Green-constituent's derivatives of different bioactive groups. Therefore, the use of these nano size particles in modern medicine and drug delivery technology deserves high importance and generate more scope for research in future.

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Synthesis, Characterization and Antibacterial Studies of p-Dimethylaminobenzaldehyde Derivative of α -Benzilmonoximehydrazone ligand and its Zn(II), Cd(II) and Hg(II) Metal Complexes

Gajanan C. Upadhye and Vinay H. Singh

Konkan Gyanpeeth Karjat College of ASC Karjat Raigad Maharashtra

Abstract: It is difficult to imagine life without biological metal complexes. Human being can't ignore the role of coordination compounds in the various physiological processes taking place inside our body. Hence coordination compounds synthesized compounds can compete with the vital biological reactions taking place in the body. Therefore, the metal complexes can inhibit the life cycle of various microbes and find their application in the medicine world. Here, we report the synthesis of divalent metal ions of Zn, Cd and Hg complexes with derivatives of Benzilmonoximehydrazone as ligand. Synthesized complexes were characterized by using traditional instrumental data and attempt to figure out the geometry of the complexes based on spectroscopic data. Antimicrobial studies were performed to assess the biological properties against the both the gram positive and negative bacteria using streptomycin as a standard. The results obtained were encouraging.

Keywords: Coordination chemistry, Zinc, Cadmium, Mercury and Antibacterial Activity.

I. INTRODUCTION

Schiff bases and its derivatives are well known for its biological properties. Ligands with oxime functionality also considered as Schiff bases and they are equivalent in structural and application view point¹⁻⁵.

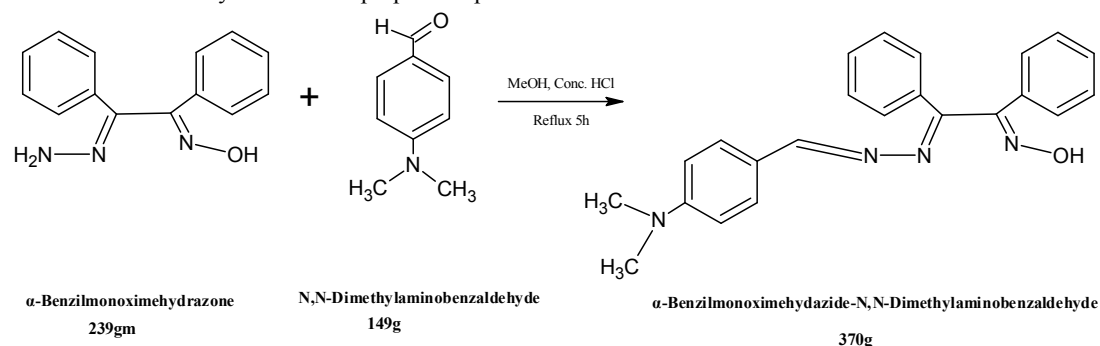
Oximes are ambidentate and it attempts to coordinate with its nitrogen and oxygen atoms with almost equal probability. In this view we wish to report synthesis, characterization and antibacterial studies of p-Dimethylaminobenzaldehyde derivative of α -Benzilmonoximehydrazone ligand and its Zn(II), Cd(II) and Hg(II) metal complexes. IUPAC name of the title ligand is 4-[-2-(hydroxyimino)-1,2-diphenylethylidene]hydrazinylidene} methyl]-N,N-dimethylaniline, for sake of convenience, it is abbreviated HBOHPDB. Bonding in these complexes is also likely to show interesting features. The characterization of the ligand and its metal complexes were investigated by elemental analysis, physico-chemical methods, FT(IR) spectra.

II. EXPERIMENTAL SECTION

All chemical used were of analytical reagent grade. Conductivity measurements were measured on EQ - 660 laboratory conductivity meter using Nitrobenzene as solvent. UV- visible spectra of the ligand and its metal complexes were recorded on JASCO V - 650 spectrophotometer where methanol/ 0.1N NaOH was used as a solvent for ligand, and Chloroform was used as solvent to record the spectra of the complexes in the UV-visible region. FT(IR) spectra in KBr discs were recorded on Perkin-Elmer spectrum 100 model. PMR spectra were recorded on Bruker AV300 NMR spectrometer using TMS as internal standard.

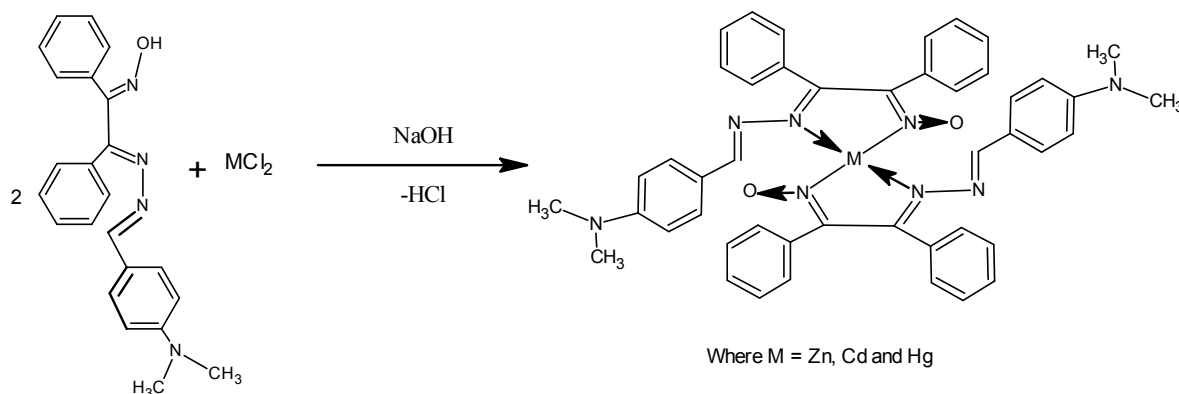
2.1 Preparation of ligand

α -Benzilmonoximehydrazone was prepared reported method⁷.



2.2 Preparation of Metal Complexes

The metal complexes reported herein, were prepared by the reaction between an ethonolic solution of ligand and an aqueous solution of the corresponding metal chloride in 2:1 molar ratio. 0.5N NaOH was used as necessary to obtain the respective complexes.



2.2.1 Preparation of bis(benzilmonoximehydrazone-p-dimethylaminobenzaldehyde)zinc (II)

A reaction between 1.48g (4mmol) of ligand in 25cm³ of ethanol was added to a solution of (0.50g, 2 mmol) $ZnCl_2 \cdot 6H_2O$, 0.5N NaOH was added to obtain a yellow precipitate which was digested in a waterbath for about 20-25 minutes and then filtered through Buchner funnel. The precipitate was washed with hot water and recrystallized from methanol, dried at 110°C and analyzed for Zn(II) content. M.P.: 199°C, UV-vis(Chloroform) λ_{max} : 328, 253nm; ¹H NMR (d_6 DMSO δ ppm) 7.8-7.9(m, 2H), 7.3-7.6(m, 10H); IR (KBr cm⁻¹) 3409, 1677, 1560, 1098, 1009, 697, 582, 533. Anal. Calc. for $C_{46}H_{42}N_8O_2Zn$ (%) C 63.83, H 4.45, N 15.68, O 5.88, Zn 10.98; found C 63.52, H 4.81, N 15.29, O 6.01, Zn 10.21.

2.2.2 Preparation of bis(benzilmonoximehydrazone-p-dimethylaminobenzaldehyde) cadmium(II)

A reaction between 1.48g (4mmol) of ligand in 25cm³ of ethanol was added to a solution of (0.367g, 2mmol) $CdCl_2$, 0.5N NaOH was added to obtain a colorless precipitate which was digested in a waterbath for 20-25 minutes and then filtered through Buchner funnel. The precipitate was washed with hot water and recrystallized from methanol, dried at 110°C and analyzed for Cd(II) content. m.p. 203°C, UV-vis(Chloroform) λ_{max} : 248nm; ¹H NMR (d_6 DMSO δ ppm) 7.8-7.9(m, 2H), 7.3-7.6(m, 10H); IR (KBr cm⁻¹) 3361, 1678, 1551, 1083, 1009, 693, 515, 490. Anal. Calc. for $C_{46}H_{42}N_8O_2Cd$ (%) C 62.29, H 4.41, N 15.58, O 5.96, Cd 19.10; found C 62.82, H 4.00, N 15.03, O 5.28, Cd 18.62.

2.2.3 Preparation of bis(benzilmonoximehydrazone-p-dimethylaminobenzaldehyde) mercury(II)

A reaction between 1.48g (4 mmol) of ligand in 25cm³ of ethanol was added to a solution of (0.543g, 2 mmol) $HgCl_2$, 0.5N NaOH was added to obtain a yellow precipitate which was digested in a waterbath for 20-25 minutes and then filtered

through Buchner funnel. The precipitate was washed with hot water and recrystallized from methanol, dried at 110°C and analyzed for Hg(II) content. m.p. 198°C, UV-vis(Chloroform) λ_{max} : 252nm; ^1H NMR (d_6 DMSO δ ppm) 7.7-7.8(m, 2H), 7.3-7.6(m, 10H); IR (KBr cm^{-1}) 3057, 1676, 1550, 1099, 1000, 695, 492, 458. Anal. Calcd for $\text{C}_{46}\text{H}_{42}\text{N}_8\text{O}_2\text{Hg}$ (%) C 49.66, H 3.54, N 12.41, O 4.72, Hg 29.65; found C 49.11, H 3.92, N 12.92, O 4.18, Hg 29.02.

2.3 Study of Antimicrobial Screening

The filter paper disc method was applied⁸. The test bacteria were seeded in tubes with nutrient broth (NB), the seeded NB (1mL) was homogenized at 45°C in the tubes with 9mL of melted nutrient agar (NA) and the homogeneous suspensions were poured into petri-dishes. The discs of the filter paper (diameter 4mm) were ranged on the cooled medium. After cooling the formed solid medium of the investigated compounds were applied using a micropipette. After incubation for 24h in the thermostat at 25-27°C, the inhibition (sterile) zone diameters of the discs were measured and expressed in mm. An inhibition zone of diameter over 7mm indicates that the tested compounds are active against the bacteria under investigation. The antibacterial activities of the investigated compounds were tested against three gram positive bacteria (*B. subtilis*, *S. aureus*, *S. typhi*) and three gram negative bacteria (*E. coli*, *K. pneumoniae*, *P. aeruginosa*). The concentration of 1000 ppm of each solution was prepared. Commercial DMF was employed to dissolve the test samples. Streptomycin was deployed as standard drug for comparison of findings with the values of prepared compounds.

2.4 Results and Discussion

The reaction of HBOHPDB (1) with $\text{ZnCl}_2 \cdot 7\text{H}_2\text{O}$, CdCl_2 , HgCl_2 gave $[\text{Zn}(\text{BOHPDB})_2]$ (2) as colorless, $[\text{Cd}(\text{BOHPDB})_2]$ (3) as colorless, $[\text{Hg}(\text{BOHPDB})_2]$ (4) as yellow complexes respectively. The ligand HBOHPDB were characterized on the basis of elemental analysis, FT(IR), ^1H NMR, electronic spectral data. The molar conductance of Zn(II), Cd(II), Hg(II) complexes were 3.32, 1.87, 2.65 for 10^{-3} M respectively, indicating that the complex to be non-electrolyte⁷.

Table 1: Physical and analytical data of ligand (HBMHDAB) and its metal complexes

Compound (Colour)	M.W.	M.P. / D.T.	Yield (%)	Λ_m $\text{Scm}^2\text{mol}^{-1}$	Elemental analysis in % found (calculated)					μ_{eff} (B.M.)
					C	H	N	O	Metal	
HBMHDAB (Yellow)	370	191	79.6 3	---	74.59 (73.88)	5.97 (5.98)	14.14 (15.00)	4.32 (4.39)	---	---
$[\text{Zn}(\text{BMHDAB})_2]$ (Yellow)	804.2 9	211	90.5 9	3.32	68.63 (68.02)	5.22 (5.32)	13.93 (13.72)	3.98 (3.90)	8.13 (8.11)	Diamagnetic
$[\text{Cd}(\text{BMHDAB})_2]$ (Yellow)	851.2 9	235	81.1 2	1.87	64.84 (64.21)	4.93 (4.83)	13.96 (14.01)	3.76 (3.63)	13.20 (12.72)	Diamagnetic
$[\text{Hg}(\text{BMHDAB})_2]$ (Yellow)	939.4 7	280	84.7 2	2.65	58.76 (58.81)	4.47 (3.83)	11.92 (12.15)	3.41 (3.38)	21.35 (20.84)	Diamagnetic

2.4.1 Electronic Absorption Spectra

The electronic spectrum of HBOHPDB in methanol for the UV region reveals two high intensity bands at 230nm and 249nm respectively. These may be due to $\pi \rightarrow \pi^*$ transitions possible from the azomethine and oximino environments in the molecules. The UV spectrum of HBOHPDB in dilute alkali (0.1N NaOH) solution shows that, the band at 230nm in methanolic solution spectrum has suffered along with a bathochromic shift to 266nm. It means that this band could have its origin in the oximino linkage in the molecules as such; the band at 249nm in the dilute alkali solution spectrum could be assigned to the azomethine linkage. This band is suffered as bathochromic shift compared to methanolic solution. The electronic spectra of Zn(II), Cd(II) and Hg(II) complexes in exhibit absorption bands at 425 - 518nm with high molar extinction coefficient (**Table-2**). All metal complexes show only the charge transfer transitions, which can be assigned to charge transfer from the ligand to metal, no $d-d$ transition expected for d^{10} configuration and magnetic properties are diamagnetic. The electronic spectra and magnetic moments correlate with each other. It seems that all complexes are in tetrahedral geometry.

Table 2: Electronic spectral data for HBOHPDB and its metal complexes in λ_{nm}

Compound	λ_{nm}	Assignments
HBOHPDB (methanol) (0.1N NaOH)	230 and 249	$\pi \rightarrow \pi^*$
	266 and 317	$\pi \rightarrow \pi^*$
Zn(BOHPDB) ₂	425	Metal to Ligand Charge Transfer
Cd(BOHPDB) ₂	438	Metal to Ligand Charge Transfer
Hg(BOHPDB) ₂	518	Metal to Ligand Charge Transfer

2.4.2 FTIR Spectra

Absence of any band between 3300-3400 cm^{-1} in present ligand, in α -benzilmonoximehydrazone reported¹⁹ at 3287 cm^{-1} for $-\text{NH}_2$ group indicating successfully replacement of amino group during condensation. In order to study the binding modes of Schiff base to metal in the complexes, IR spectrum of the free ligand was compared with the spectra of the metal complexes. A strong and broad band is observed at 3267 cm^{-1} for the free ligand due to N-OH which is absent in metal complexes, suggests the deprotonation of the hydroxyl group of the oxime in the process of formation of the complexes⁹. This observation was supported by insolubility in dilute alkali solution. The band at 1587 cm^{-1} due to $\nu(\text{C}=\text{NO})$ of the oximino group in ligand was shifted to higher frequencies at in the region 1597-1603 cm^{-1} in its complexes suggests that the coordination of oximino group with the metal ion¹¹. Also the band at 1549 cm^{-1} which was assigned to the azomethine ($\text{C}=\text{NN}$) group of ligand was shifted to lower energy at in the region 1537-1540 cm^{-1} , in the metal complexes, indicating the participation of the azomethine group in the coordination. In the metal complexes with the ligand in which an oxime group coordination through its nitrogen atom, the formation of $\text{N} \rightarrow \text{O}$ linkages an essential feature. The facts are further supported by the appearance of new bands in the regions 504-528 cm^{-1} in the Zn(II), Cd(II), Hg(II) complexes which were assigned to the Zn-N, N $\rightarrow$ Zn, Cd-N, N $\rightarrow$ Cd, Hg-N, N $\rightarrow$ Hg, stretching vibrations respectively¹².

Table 3: Important IR bands (cm^{-1}) and their assignments for HBOHPDB and metal complexes

Tentative assignments	Ligand	Zn(II) complex	Cd(II) complex	Hg(II) complex
Hydrogen bonded νOH group	3267	-	-	-
$\nu\text{C}=\text{NOH}$	1587	1598	1597	1603
$\nu\text{C}=\text{NN}$	1549	1540	1537	1540
$\nu\text{N}-\text{O}$	1008	1009	1009	1007
$\nu\text{N} \rightarrow \text{O}$	---	1287, 1540	1288, 1506	1289, 1488
$\nu\text{M}-\text{N}$	---	528	525	526
$\nu\text{M} \rightarrow \text{N}$	---	508	504	505
$\nu\text{C}=\text{C}$ Ar.	3053	3055	3056	3056

2.4.3 PMR Spectra

The ^1H NMR spectrum of the ligand and its complexes are done in d_6 DMSO solvent. The ^1H NMR spectrum of the prepared ligand exhibits a multiplet signal at 6.7-8.50 δ (m, 14H) suggests that the aromatic groups present in ligand. This band is unshifted in complexes, indicate non-involvement of aromatic group in the coordination and also two methane group observed in the region 1.2- 1.6 δ are unshifted in complex, suggests they are not involve in coordination. A sharp and singlet band observed at 10.20 δ (s, 1H) in title ligand is absent in the prepared complex, confirm that the oximino group is deprotonated during complex formation. Other bands are unchanged in complex, suggests non-involvement of these group in coordination.

Table 4: PMR spectrum of HBMHDAB and its metal complexes in D_6 DMSO

Compound	multiplicity	δ ppm	assignment
HBMHDAB	Singlet 1H	11.80	Oximino $>\text{C}=\text{N}-\text{OH}$ group
	Singlet 1H	0.30	Methane $-\text{CH}=\text{}$ group
	Singlet 3H	2.50-2.90	Methyl $-\text{CH}_3$

	Multiplet	6.80- 8.40	Aromatic Protons
[Zn(BMHDAB) ₂]	Singlet 1H	0.30	Methane –CH= group
	Singlet 3H	2.50-2.90	Methyl –CH ₃
	Multiplet	6.70- 8.50	Aromatic Protons
[Cd(BMHDAB) ₂]	Singlet 6H	2.50-2.90	Methyl –CH ₃
	Multiplet	6.80- 8.50	Aromatic Protons
	Singlet 1H	0.30	Methane –CH= group
[Hg(BMHDAB) ₂]	Multiplet	6.80- 8.50	Aromatic Protons
	Singlet 1H	0.30	Methane –CH= group
	Singlet 3H	2.50-2.90	Methyl –CH ₃

III. MICROBIOLOGICAL INVESTIGATION

The antibacterial activity of ligand and its Zn(II), Cd(II) and Hg(II) metal complexes were tested against bacteria, we used more than one test organism to increase the chance of detecting antibiotics principles in tested materials. The organism used in the present investigation included three gram positive bacteria (*B. subtilis*, *S. aureus*, *S. typhi*) and three gram negative bacteria (*E. coli*, *K. pneumoniae*, *P. aeruginosa*) bacteria. The results of the bactericidal screening of the synthesized compounds are recorded in **Table-5**. An influence of the central ion of the complexes in the antibacterial activity against the tested gram positive and gram negative organism show that the complexes have an enhanced activity compared to the streptomycin standard.

Table 5: Antibacterial activity data of ligand and its complexes inhibition (in mm)

Compounds	<i>B. subtilis</i>	<i>S. aureus</i>	<i>S. typhi</i>	<i>E. coli</i>	<i>K. pneumoniae</i>	<i>P. aeruginosa</i>
Ligand	18	17	17	10	16	11
Zn(II)	28	24	19	11	19	13
Cd(II)	23	21	18	13	17	12
Hg(II)	28	19	22	15	24	10
Streptomycin	30	28	28	25	31	24

IV. CONCLUSION

The title ligand is soluble in most of the organic solvents and dilute alkali, but its Zn(II), Cd(II) and Hg(II) metal complexes are insoluble in ethanol, dilute alkali and soluble in methanol, chloroform, DMF and they are Zn(II), Cd(II) and Hg(II) metal complexes are non electrolytic nature. Spectral measurements data suggest that all metal ions are bonded with HBOHPDB ligand through nitrogen atom for M-N₄ composition and geometries for metal complexes are of tetrahedral shape. Zn(II), Cd(II) and Hg(II) metal complexes are screened for their biological activities against bacteria species. All synthesized compounds found to be better antibacterial species.

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Green Synthesis of Palladium nanoparticles from Eucalyptus globulosa Leaves Extract

Characterization and Biological Activity studies

Tilottama M. Thakur¹, Rama S. Lokhande¹, Milind M. Thigle² and V. R. Patil³

School of Basic Sciences, Department of Chemistry, Jaipur National University, Jaipur¹

Polyheal Systems, Dombivali MIDC²

Department of Chemistry, University of Mumbai, Mumbai³

Abstract: Effective biological methodologies have been broadly designed for the preparation of metal nanoparticles. Hence, the use of biogenic materials such as plants, bacteria biomass, algae, enzymes and fungi has been utilized to synthesize various metal nanoparticles as an efficient, economical and sustainable process. Aqueous extract of dried leaves of Eucalyptus globulosa is used as a biogenic reducing agent for ecologically sound synthesis of palladium nanoparticles. Dynamic Light scattering (DLS), UV-visible spectroscopy, Fourier-Transform infrared spectroscopy (FTIR), Energy Dispersive X-Ray analysis (EDAX) and Scanning electron microscope (SEM) analyses were used to characterize the formed Palladium nanoparticles. The synthesized palladium nanoparticles exhibited antimicrobial activities.

Keywords: PdNps, Bioreductant, Stabilizing Agents.

I. INTRODUCTION

Nanotechnology is the potentiality to construct material, systems and devices with atomic precision. Nanoscale science and technology are founded on the established concept that nanostructures should have qualities that differ from bulk materials in terms of electrical, optical, magnetic, chemical and mechanical capabilities. When comparing bulk material with nanoparticles in similar applications; it is proved that nanoparticles have superior performance properties².

Metal nanoparticles, particularly noble metal nanoparticles, appear to be of great interest, not only because of their vast surface areas, but also because of their unique function. Transition metal NPs' characteristics are becoming increasingly important. The seed mediated method¹, heatless synthesis², and weak reductant method³ can all be used to make nanoparticles with interstitial nanostructure. Nanomaterials are ideal for usage as possible catalysts because of their large surface area to volume ratio. Palladium is a highly efficient metal in catalysis. Palladium-based materials have been widely studied in a variety of catalytic applications, including the production of carbon-carbon bonds⁴, oxidations⁵, hydrogenation⁶, and electrochemical reactions in fuel cells⁷. Palladium's uses, on the other hand, are not limited to catalysis. PdNPs have a wide range of applications in the biological arena. Prodrug activators, antibacterial agents, photothermal agents, photoacoustic agents, gene/drug carriers, and anticancer agents have all been revealed for PdNPs.

II. LITERATURE REVIEW

Subramanyan Bharathiraja et al.⁸ used chitosan oligosaccharide to make structured PdNPs and devised a photothermal therapy to improve particle biocompatibility. They have the ability to eliminate the tumor. Yu Liu et al.⁹ created flower-like polypyrrole (PPy) coated PdNPs, and in-vitro photochemical heating of the nanoparticles in the presence of Hela cells resulted in cell death after 10 minutes when the cells were exposed to laser irradiation. Using Rosmarinus officinalis leaf extract at room temperature for 24 hours, Rabiee et al.¹⁰ created Pd nanoparticles with an average size of 15-90 nm and a semi-spherical and polyhedral shape, which showed antifungal activity against Candida parapsilosis, Candida albicans, Candida glabrata, and Candida krusei. Petla, R. K. et al.¹¹ used Glycine max (Soybean) leaf extract to create spherical PdNPs nanostructures around 15 nm that have antibacterial activity against M.luteus, E.coli, S.aureus and S.epidermidis. Thus, alkaloids, polyols, vitamin C, carbohydrates, glycosides, flavanoids, polyphenols, oxalic acids, amino acids, and other critical phytochemical bioreductants which are used to synthesize PdNPs that can be obtained from various plant parts such as stem, fruit, flowers,

and leaves. PdNps prepared using various plant species were reported. PdNps have been synthesized utilizing *Curcuma longa*¹² (tuber extract) with a size of nearly 10-15nm, coffee and tea¹³ (powder extract) with a size of 5-100 nm, *Camellia sinensis*¹⁴ (leaves extract) with a size of 7nm, and *Cinnamomum camphora*¹⁵ (leaves extract) with a size of 3.2-6 nm. Biogenic reduction can also be done with bacteria, algae, diatoms, and human cells, in addition to plant elements. Such biogenic synthesis procedures are ecologically sound, sustainable, low cost, biocompatible, utilizing less energy and are alternative to toxic and expensive chemical and physical procedures. Hence these synthesis are also very much beneficial as they avoid noxious organic reagents and solvents as the plant element extract serves the property of both reducing and capping agent. However it is a remarkable challenge to fabricate and produce PdNps in a biogenic way as the process is one pot process. Hence biogenic nanotechnology deals with environment friendly methodologies and /economically feasible solvents and reagents.

The primary supporting aspect in modifying various sizes and shapes in nano particle synthesizing is the difference in concentration as well as confirmation of effective biomolecules of various plants¹⁶. Metal salt reductions using plant extract at ambient temperature is used to synthesize desired nano particles in a relatively comfortable environment. Normally, the metal solution and the plant extract are thoroughly combined. The size, morphology, and quality of the synthesized nanoparticles are influenced by a variety of parameters of the reaction solution such as metal salt concentration, plant extract volume and concentration, pH of reaction solution and other reaction variables, such as temperature, reaction time¹⁷. The preparation of NPs is greatly influenced by the pH approximation of the reaction solution¹⁸. Temperature plays an important role in influencing the characteristics of NPs during synthesis¹⁹. This study aims to alter the concentration of metal ion and amount of *Eucalyptus globulosa* leaves extract to fabricate the nanoparticles and determining its antimicrobial activity. Furthermore, in the clinical environment there is a common call for prevention of microbial infections like *S. aureus* and *E. coli*. This bacterium has rapidly evolved resistance to multiple drugs. *S. aureus* is a commensal organism that is commonly being a major hospital acquired pathogen. Although the majority of *E. coli* strains are safe, some of them can cause significant food poisoning in their hosts and can cause food contamination²⁰. *S. aureus* and *C. albicans* are the second and third leading causes of bloodstream infections. The opportunistic pathogen *Staphylococcus epidermidis* is regarded as important. *Staphylococcus epidermidis*, along with its more aggressive relative *Staphylococcus aureus*, is the leading cause of nosocomial infections. The current innovation deals with synthesis of PdNps using *Eucalyptus globulosa*. *Eucalyptus globulosa*: Common Names Tasmanian blue gum, bloodwood, gum tree, blue gum, ironbark, eucalyptus tree. *Eucalyptus* is a member of the Myrtaceae family which includes plants with antibacterial, antifungal, and anti-inflammatory effects. *Eucalyptus* is most vital among genera of Myrtaceae family; a wide genus of shrubs and evergreen trees including 700 species²¹. The essential oil of *Eucalyptus globulosa* is the plant's main product, and it has a wide range of therapeutic applications. Eucalyptol (1, 8-cineol)²² is present in the oil. It's also a good source of kinos, a plant gum made by a variety of plants and trees that's commonly used in medicine and tanning treatments. *Eucalyptus* oil has long been used to treat boils, wounds, and other ailments. *Eucalyptus* leaves include isoprenoids, a volatile phytochemical, as well as a variety of other compounds that have antibacterial properties²³. *Eucalyptus* extract is widely used in cosmetics and can be utilized as a food ingredient. Saponins, Flavanoids, Tannins, and Alkaloids are all found in *Eucalyptus* leaf extract. Antimicrobial action is seen in alkaloids and flavanoids²⁴.

III. METHODOLOGY

3.1 Reagents and Materials

PdCl₂, concentrated HCL, absolute alcohol of research Lab were purchased. Double distilled water was used to wash all the glassware properly and these glasswares were dried in oven. Throughout the experimentation, double distilled water was used.

Eucalyptus globulosa leaves collection and selection.

Fresh leaves of *Eucalyptus globulosa* were collected from Alibag, Nagaon region. *Eucalyptus globulosa* plant selection was done from the less polluted area where the trees and plants were densely populated on a small hilly area. The selected *Eucalyptus globulosa* plant was healthy and disease free. As the essential oil is the major product of the *Eucalyptus globulosa*, the bioactivity of the essential oil is dependent on the kind and type of ingredients. Species, season, climate, soil type, location, age of leaves, fertility regime, procedure used for drying the plant material, etc. are the prime factors for the

activity of this essential oil (Brooker and Kleinig²⁵, 2006). The *Eucalyptus globulous* leaves were plucked during rainy season or at the end of a rainy season.

3.2 Biogenic *Eucalyptus globulous* plant extract preparation

The *Eucalyptus globulous* leaves were washed with distilled water and further washed with absolute alcohol and shade dried for 5 days (Fig.1). The shade dried leaves were kept for 2 hours at 45°C. Later they were crushed to produce fine powder using a mixer grinder (Fig.2). The ground powder was stored in the airtight container for later use. In a conical flask, 10gm of ground powder was heated with 100 ml of distilled water. The extract was then filtered using Whatmann paper No. 1 and Millipore filter 0.22µm.

3.3 Synthesis of Palladium nano particles

The Palladium ion 2 mM solution was prepared using Palladium (II) chloride. 2 mM of Palladium chloride and 40 mL produced extract were combined with 400 mL double distilled water and stirred continuously at 1000 rpm at room temperature. The Palladium solution turns out from yellow (Fig. 3) to black (Fig. 4), indicating reduction to Palladium nanoparticle. The reaction mixture was monitored by UV visible spectroscopy Palladium Nanoparticles were obtained and centrifuged at 10,000 rpm for 30 minutes later being rinsed with water.

3.4 Instrumentation

UV visible spectroscopic analysis was conducted on (Shimadzu UV-2450) with quartz cuvettes of 1cm path length. By examining the spectrum of reaction mixture, the reduction of Palladium into Palladium nano particles is estimated. The Zetasizer Nano ZS (Malvern Instruments Ltd. UK) was used to measure dynamic light scattering (DLS) using a photo diode detector with a quantum efficiency more than 50% at 633 nm and a Helium-neon laser at 633 nm. The Malvern dispersion technology software DTS 7.10 was used to unfold and estimate the data. The Perkin Elmer FTIR Frontier model was used for spectroscopic research. The surface morphological features of nanoparticles were examined using a scanning electron microscope (SEM) with an operating voltage of 5.00 kV, the FEI inspect F-50 FESEM. EDAX was used to determine Palladium's elemental presence.

3.5 UV-Visible absorption studies

The production of PdNps was studied using a UV-Vis Spectrophotometer (Shimadzu UV-2450) with quartz cuvette (1cm path length). Surface Plasmon resonance peak was recorded initially when 40 ml of *Eucalyptus globulous* extract was added to the Pd (II) solution (2mM) at ambient temperature. Later SPR peak was recorded for the reaction mixture containing measured amount of extract and 2mM Pd (II) solution after 12 hr which indicates the completion of reaction as the initial colour of the reaction mixture which was yellow and later on it turns to black coloration.

3.6 Dynamic size study for size and stability, Dynamic light scattering (DLS)

The Zetasizer Nano ZS was used to perform dynamic light scattering (DLS) studied (Malvern Instruments Ltd. UK). Formed PdNps were monitored at 298K through DLS so as to observe the acquired size. After the completion of the reaction which was indicated by the colour change (yellow to black) after almost 12 hours of duration the DLS measurements were recorded. The selected combination of *Eucalyptus globulous* extract and Pd (II) ion solution showed results in good terms.

3.7 Antimicrobial Study

Antimicrobial activity of the nano particles synthesized was tested with determination of a minimum inhibitory concentration using REMA (Resazurin Microtitre Assay). Both antibacterial and antifungal tests were carried out using the PdNPs. This study was carried out at National Facility for Biopharmaceuticals, G. N. Khalsa College, Matunga, Mumbai.

IV. RESULTS AND DISCUSSIONS

Eucalyptus globulous which was used as a bioreductant also acts as stabilizing agent in the synthesis of palladium nanoparticles. 5 ml of 2 mM of PdCl₂, 4 ml of *Eucalyptus globulous* plant extract 40 ml of double distilled water. The total volume obtained was 49 ml. The prepared reaction mixture was kept for stirring for 12 hours at 1000 rpm at room

temperature.

4.1 Dynamic light scattering (DLS)

During the DLS studies the average size obtained was 76.4 nm (Fig. 5). This methodology was confirmed as the particles obtained showed size below 100 nm.

4.2 UV-Visible spectrum of palladium nanoparticles.

The reduction of Pd (II) ion was monitored through UV-Visible spectroscopy. Further the PdNPs thus obtained were separated by centrifuging at 10000 rpm for 30 min. Hence it was concluded that by mixing the diluted metal solution with eucalyptus leaves extract, nanoparticles of the desired size can be obtained. During the UV-visible monitoring the colour of the reaction solution changed from yellow to black. The obtained colour change is due to SPR (Surface Plasmon resonance) which is the result of the excitation of the surface electron on the conduction band²⁶. During the process, the Pd ion peak at 330 nm vanished and was shifted to 270 nm (Fig. 6) indicating the creation of PdNPs. Similar result were observed and peak shift was observed for *Prunus x yedoensis* leaf extract²⁷.

4.3 FTIR analysis of palladium nanoparticles.

In FTIR (Fig. 7), peak at 700 cm^{-1} indicates the reduction of Pd (II) to Pd (0). Strong and intense peak is seen at 1000 cm^{-1} denotes C-O stretching vibrations. Less intense and weak peak observed at 1350 cm^{-1} indicates -COO- carboxylic acid group. C=C stretching vibration is indicated by the weak peak at 2100 cm^{-1} . The 2980 cm^{-1} strong and sharp peak indicates -NH stretching. The broad nature in the range of $3400\text{ to }3000\text{ cm}^{-1}$ region can be attributed to presence of -OH group. The medium intense and sharp peak at 1650 cm^{-1} indicates aromatic ring. Due to these IR bands in the spectrum of Eucalyptus globulosa extract fabricated PdNPs concludes the presence of organic compounds of Eucalyptus extract, a bio-reductant as well as capping ligands on the surface of the PdNPs^{28, 29}.

4.4 Elemental and morphological analysis (SEM)

The morphology and size of the particles were analyzed using a scanning electron microscope. The obtained shape was distorted spherical along with particle size 60 nm to 100 nm. Elemental Dispersive X-Ray Analysis estimate the peak at 2.7 keV and 3.2 keV gives the indication of presence of palladium (Fig. 8). The peak at 0.1 keV and peak at 0.2 keV confirms the presence of carbon and oxygen. The carbon content was due to organic compounds of Eucalyptus leaves extract (Fig. 9). and the oxygen was either due to organic compounds from Eucalyptus leaves extract or may be from air²⁸. Gil et al. prepared PdNPs ranging 100nm using chaga mushroom. Nadagouda et al. prepared PdNPs which shows size of 5-100nm using coffee and tea extract¹³.

4.5 Antimicrobial analysis.

Antimicrobial activity of the nano particles synthesized was tested with determination of minimum inhibitory concentration using REMA (Resazurin Microtitre Assay)

4.6 Minimum inhibitory concentration

Inoculum preparation: - In a Luria Bertani broth, a loopful of culture was implanted and grown for 24 hours at 37°C . Fungal culture was grown in Sabouraud's broth incubating at room temperature. To get $1.5 \times 10^8\text{ CFU/ml}$, the culture OD was scaled to the 0.5 McFarland standard. A final density of $1 \times 10^6\text{ CFU/ml}$ was achieved by homogenising the cell suspension. **Sample preparation-** 30 μg of Pd nanoparticles in 1.0 ml double distilled water. A 100 μl sample was used for actual studies. Using the resazurin microplate test, the samples' minimum inhibitory concentration (MIC) against the test organism was evaluated. The testing was conducted out on 96-well transparent microplates with a flat bottom. Every column's first row was mixed with 100 μl of Mueller Hinton broth with conventional antibiotics, while the second row was filled with 100 μl of media. 100 μl 2X media as well as 100 μl samples were placed in the third row (each column with different sample). Then, starting with the fourth row, every well was poured with 1X Media (Mueller Hinton broth). From the third till the twelfth row, equivalent two-fold serial dilutions were prepared. Finally, all of the wells were completely stirred. The resultant concentrations of the 3rd to 12th rows ranged from 50% dilutions to 0.1 percent dilutions, and microbial cells were introduced to every well as a final cell count of $1 \times 10^6\text{ CFU/ml}$. The cultivated microplates were capped with lids and

incubated for 24 hours at 37 degrees Celsius. After adding 5L of 5mg/mL Resazurin to those wells and incubating at 37 °C for 30 minutes, the MIC of the samples was evaluated. The change in colour of Resazurin in the microplate wells was used to assess microbial growth (blue when there is no growth and pinkish-red formazan when there is growth). The MIC was established as the minimum sample concentration that did not change colour (was clear) and completely inhibited microbial growth. The inhibition percentages for *Escherichia coli*, *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Candida albicans* are shown in Table – I.

V. CONCLUSION

This research work is an effective and quick synthesis of stable nanostructured palladium particles was demonstrated using *Eucalyptus globulus*. The *Eucalyptus globulus* leaves extract serve as a reducing as well as capping agent. By changing the concentration of Palladium salt and amount of extract stable PdNPs were effectively generated using a easy, cheaper, ecologically sound and ideal technique involving low energy consumption. This methodology avoid the use of hazardous chemical making the process green. As a result, this research leads to the invention of a simple biological process for the preparation of palladium nanoparticles.

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Fig. 1 – Eucalyptus Leaves: Shade dried



Fig. 2 – Eucalyptus Leaves: Finely ground powder

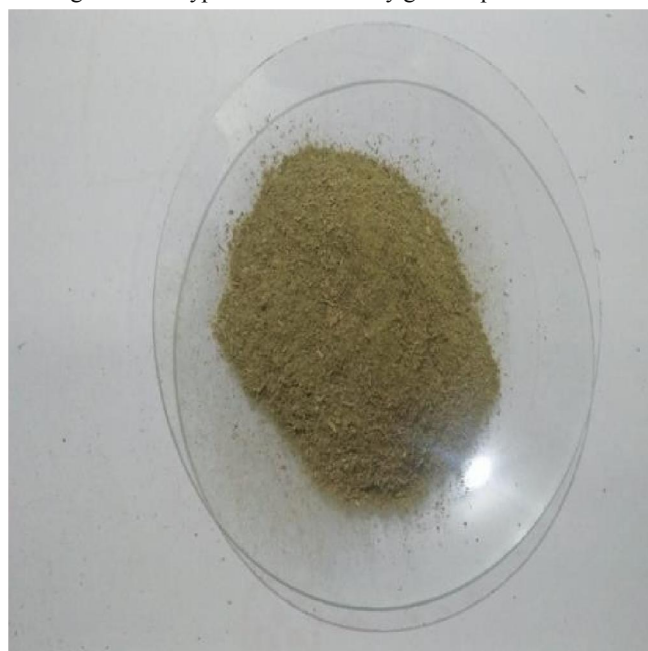


Fig. 3 – Initial colour



Fig. 4 – Final colour



Fig. 5 – Dynamic light scattering

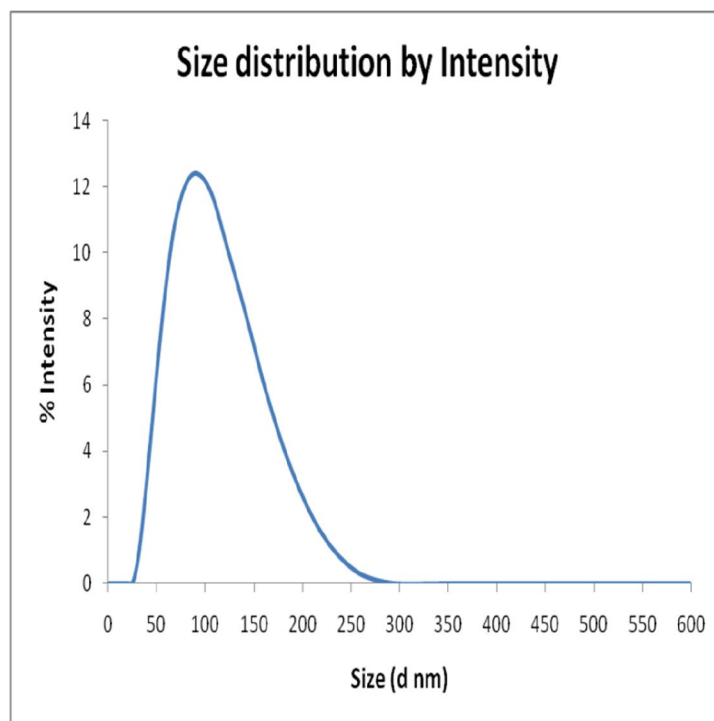


Fig. 6 – UV-Visible Spectroscopy

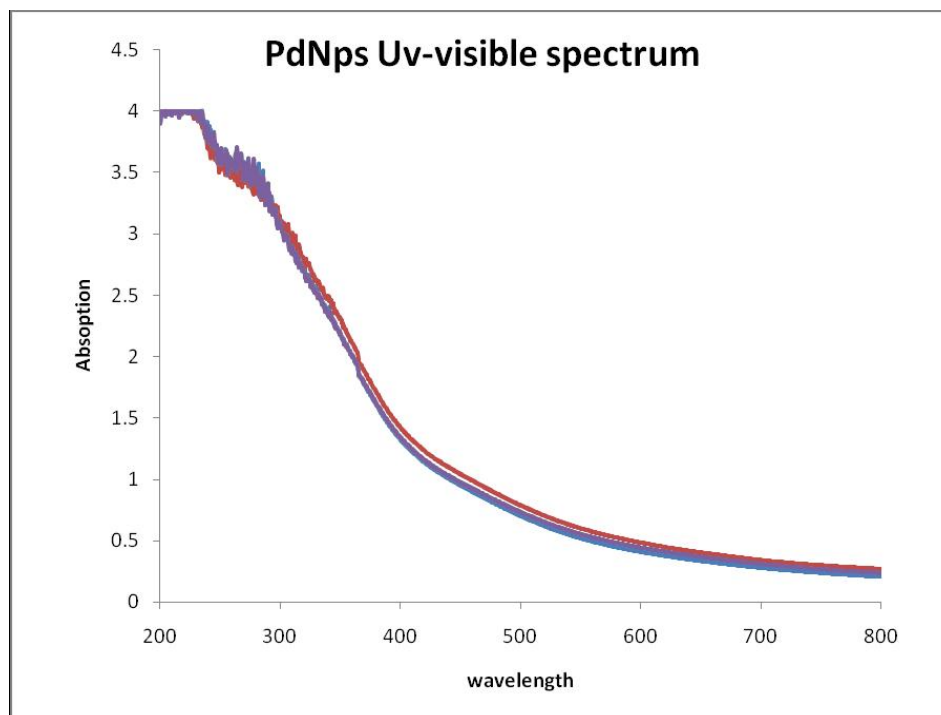


Fig 7 – Fourior Transform Infrared Spectroscopy

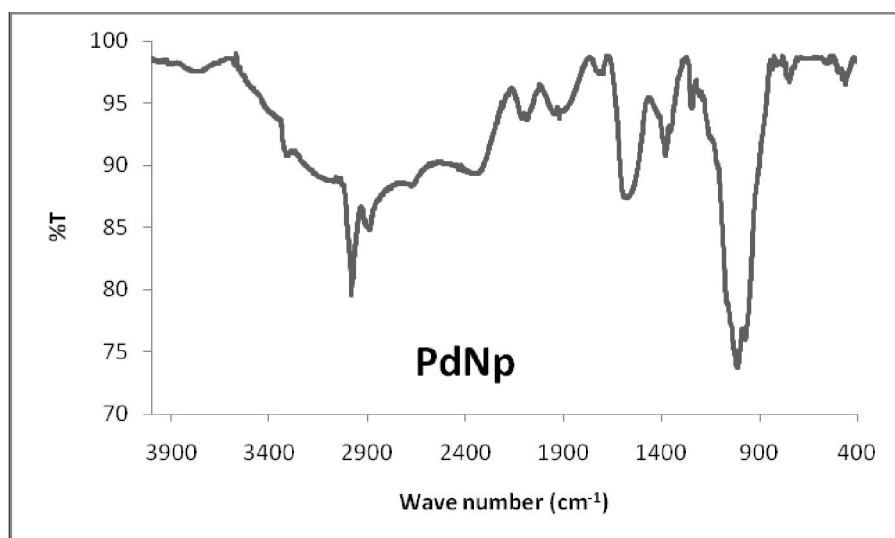


Fig. 8 – Scanning Electron Microscopy

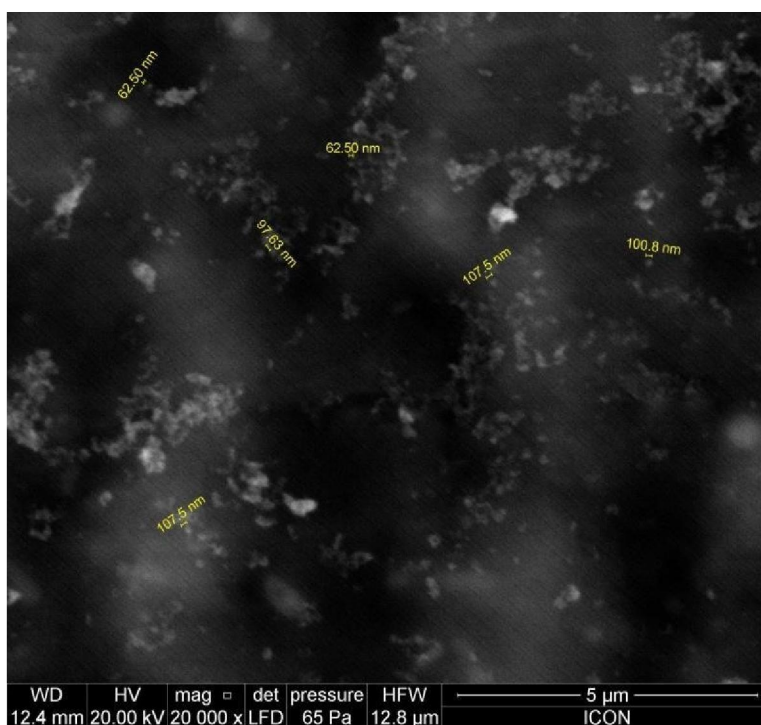


Fig. 9 – Energy Dispersive X-Ray Analysis

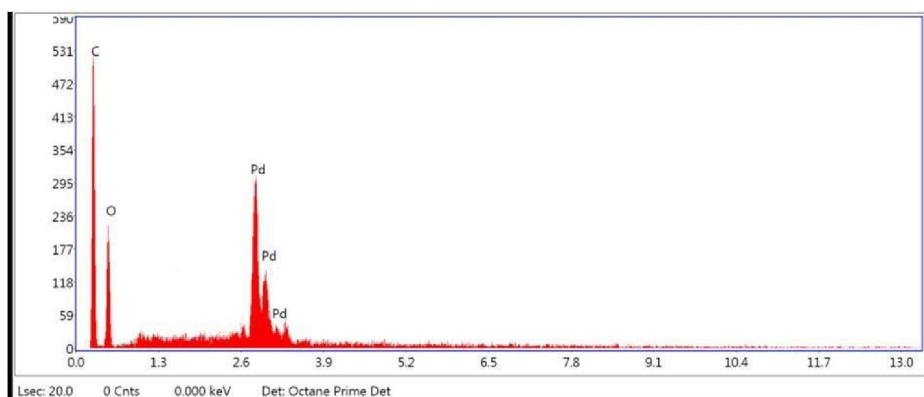
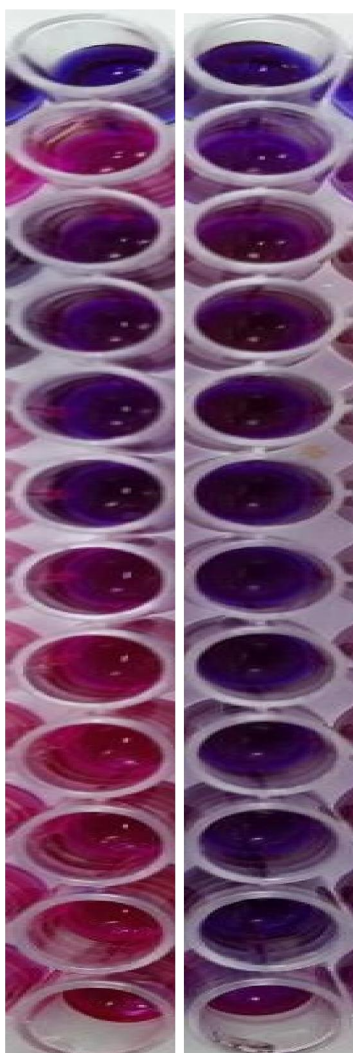


Fig. 10 – Minimum Inhibitory Concentration



S.aureus E.coli S.epidermidis C.albicans

Table – I: Inhibition Percentage

Name of Organism	Sample (in %)
Escherichia coli	0.20
Staphylococcus aureus	12.50
Staphylococcus epidermidis	0.78
Candida albicans	12.50

One-pot Three-Component Synthesis of Biologically Active Functionalized Thiazolidinones

Dattatray B. Yedage¹ and Dattatray V. Patil²

Department of Chemistry, Willingdon College, Vishrambag, Sangli, India¹

Department of Chemistry, Kirti M. Doongursee College, Dadar (w), Mumbai, India²

dbyedagedb@gmail.com and dvspatil@gmail.com

Abstract: A simple and environment friendly protocol was developed to synthesize Bis-thiazolidinones via one-pot three component reaction of readily available arylaldehydes, diamines and thioglycolic acid using choline chloride based deep eutectic solvent. The advantages of this protocol are shorter reaction time, easy work-up, catalyst free, atom-economical reaction and higher yields of the desired products. The eutectic solvent could be recycled up to five runs without significant decrease in the yield of the desired product.

Keywords: Choline chloride, environmentally benign, thiazolidinone, deep eutectic solvents

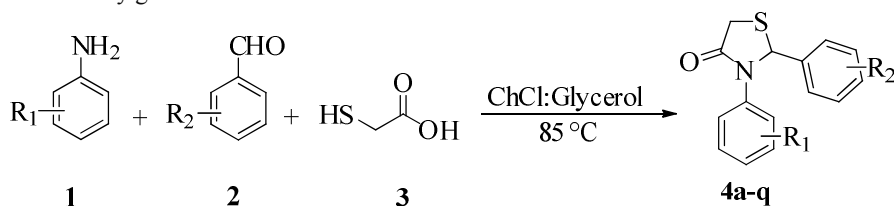
I. INTRODUCTION

Owing to the high potential pharmacological activities thiazolidinone and its derivatives are one of the most extensively studied class of organic compounds.^[1] They show diverse therapeutic activities such as anti-bacterial,^[2] anti-cancer,^[3] anti-convulsant,^[4] anti-inflammatory,^[3] anti-tubercular,^[5] antifungal,^[6] antioxidants^[7] and antihyperglycemic and antidyslipidemic agents.^[8]

In recent years, many synthetic methods for the synthesis of thiazolidine-4-one ring system in the presence of catalyst or activators such as Baker's yeast,^[9] [Et₃NH][HSO₄],^[5] HBTU,^[10] DCC,^[11] Montmorillonite K-10,^[12] DBSA^[13] MCM supported Schiff base^[14], La(NO₃)₃.6 H₂O^[15], nano-Fe₃O₄@SiO₂ supported ionic liquid^[16] and supported protic acid^[17] have been employed. However, most of these procedures suffer from one or more drawbacks such as use of low yield, hazardous organic solvents, long reaction time, use of expensive catalyst, or tedious workup procedures.

In order to overcome these disadvantages some new types of greener solvents are strongly needed. In the sense, quaternary ammonium salt like choline chloride based eutectic solvents have been explored as an environmentally benign solvents for several organic transformations, metal deposition, purification of biodiesel and material chemistry.^{[18][19]} These (DESS) currently receive more attention due to their negligible vapor pressure, thermal stability, biodegradability, non-flammability and ability to catalyze many types of reactions like, addition, condensation, cyclisation, oxidation and several useful multicomponent reactions.^[18]

Recently, we developed various 1,3-thiazolidin-4-one derivatives successfully using ChCl:Gly eutectic solvent. (Scheme 1).^[20] Present work discussed here is extension of our previous efforts to develop biological active functionalized thiazolidinone derivatives by greener method.



Scheme 1: Multicomponent reaction of 1, 2 and 3 to form 1, 3-thiazolidin-4-one.

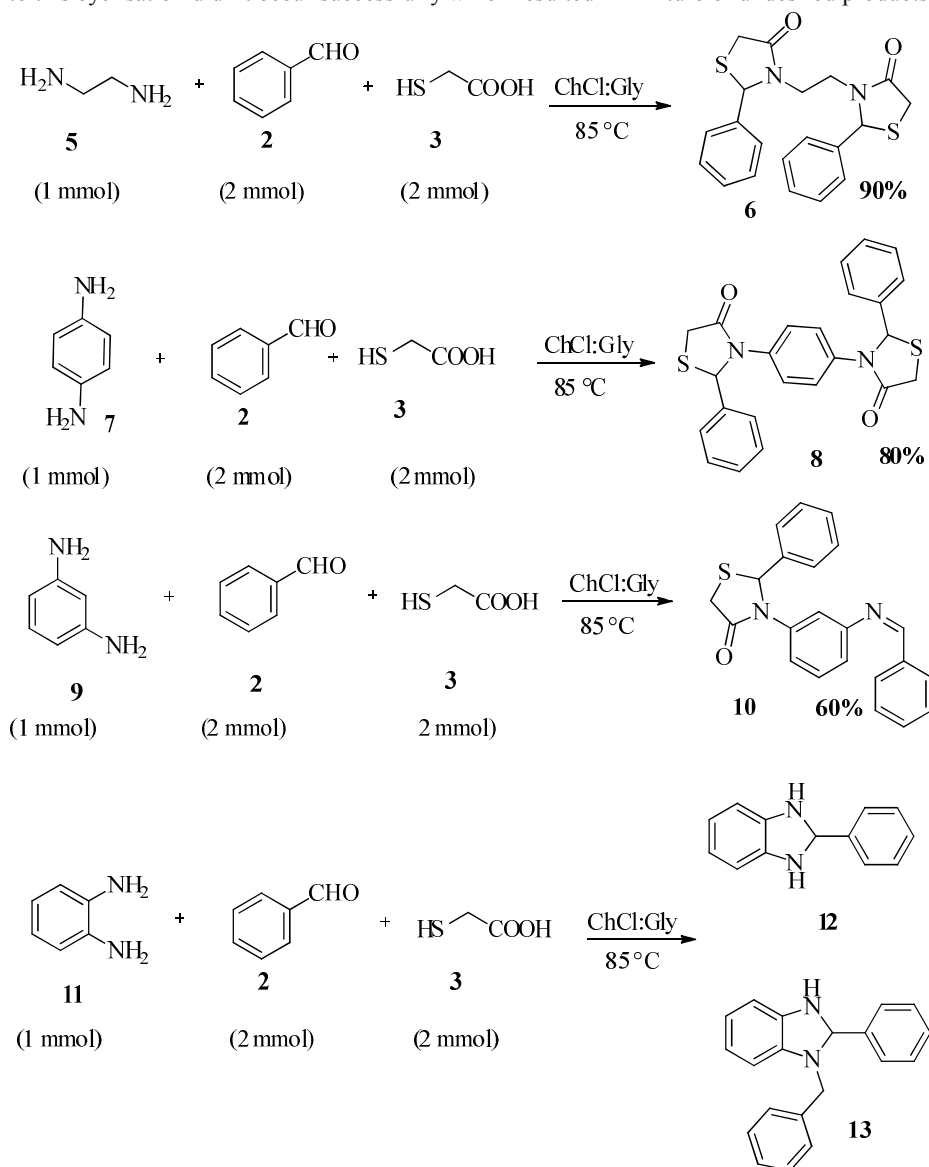
In this protocol, the scope and applicability of the reaction has been extended. Choline chloride based deep eutectic solvent (DES) was again used for the synthesis of selected thiazolidinone derivatives by cyclisation of aryl aldehydes, diamines and

thioglycolic acid under mild reaction conditions. (Scheme 2). We also reported some functionalized thiazolidinones in later section. (Scheme 3).

II. RESULT AND DISCUSSIONS

As a consequence of our interest in green solvent in the organic synthesis as an environmentally benign reaction media and our continual work on the synthesis of biologically active heterocyclic moieties. Herein, initially we describe a mild, simple, and convenient procedure for the synthesis of thiazolidinones with one-pot reaction of arylaldehyde, diamines and thioglycolic acid without using any catalyst with good yields of final product. The experimental process is also very simple and easy.

Ethylene diamine and p-phenylene diamine are having amino groups are away from each other and cyclisation took place easily and resulted in good yields of products. In case of ortho and meta-phenylenediamines the amino groups are closer to each other due to this cyclisation didn't occur successfully which resulted in mixture of undesired products. (Scheme 2).



Scheme 2: Reactions of diamines with aldehyde and thioglycolic acid.

In the model reaction, synthesis of Bis-thiazolidinone was investigated with the reaction of ethylene diamine (1 mmol), benzaldehyde (2 mmol) and thioglycolic acid (2 mmol). In our study, we initially carried out the reaction without any catalyst or solvent at room temperature for 12 hours, but no product was obtained. We carried out the same reaction at 65 °C but reaction didn't take place (Table 1 Entry 1, 2). Furthermore, we used some greener solvents including deep eutectic solvents at 65 °C to evaluate the model reaction and the results are summarized in Table 1. It is observed that considerably good yield was obtained with ChCl: Gly (1:2). (Table 1, Entry 13). The results confirm the effective use of DES ChCl: Gly (1:2) as a catalyst cum reaction media for the preparation of bis-thiazolidinones.

Considering the promoting catalytic activity of choline chloride-based deep eutectic solvent ChCl:Gly (1:2) we carried out a blank reaction of ethylenediamine (1 mmol), benzaldehyde (2 mmol) and thioglycolic acid (2.0 mmol) in ChCl: Gly (1:2) at ambient temperature but low yield of the product was observed. Thus, we decided to optimize the temperature and evaluated the same reaction at different temperatures ranging from 65 to 95 °C. It was observed that an increase in temperature gradually increased the yield of the product and at 85 °C reaction gave an optimized yield of 90 % within 55 minutes (Table 1, Entry 15).

Moreover, we studied the concentration of DES ChCl: Gly (1:2) for the model reaction. The expected product was not observed, in the absence of the eutectic solvent. After varying the concentration of DES (ChCl: Gly) at 0.5, 1.0, 1.5, 2.0, 2.5 g at 85 °C, the desired product was observed at 45%, 50%, 65%, 80%, 85%, 85% respectively. It suggests that 2.0 g of eutectic solvent (ChCl: Gly) is sufficient for a better yield of the desired product.

Therefore, the optimized reaction conditions for this reaction are as follows: 2-aminobenzimidazole (1 mmol), aryl aldehyde (2 mmol) and thioglycolic acid (2 mmol), DES 2.0 g at 85 °C for 55 minutes (Table 1, Entry 15).

When the model reaction performed in glycerol, only 62 % yield observed, whereas, ChCl produced no significant yield at optimal reaction conditions. It suggests that the reaction produces better yield due to DES (ChCl: Gly) and not because of its individual components. (Table 1, Entry 16, 17).

Table 1: Optimization of reaction conditions.^a

Entry	Solvent	Temp. (°C)	Time (min)	Yield (%) ^b
1.	-	RT	720	-
2.	-	65	720	-
3.	Water	65	90	10
4.	MeOH	65	90	15
5.	Toluene	65	90	10
6.	Acetonitrile	65	90	20
7.	ChCl: Urea (1:2)	65	90	60
8.	ChCl: Thiourea (1:2)	65	90	58
9.	ChCl: Oxalic Acid (1:1)	65	90	50
10.	ChCl: Adipic Acid (1:1)	65	90	45
11.	ChCl: Succinic Acid (1:1)	65	90	45
12.	ChCl: Malonic Acid (1:1)	65	90	40
13.	ChCl: Glycerol (1:2)	65	55	70
14.	ChCl: Glycerol (1:2)	75	55	80
15.	ChCl: Glycerol (1:2)	85	55	90
16.	ChCl: Glycerol (1:2)	95	55	90
17.	Glycerol	85	55	62
18.	ChCl	85	55	trace

^a Reaction conditions: ethylenediamine (1 mmol), benzaldehyde (2 mmol) and thioglycolic acid (2 mmol) in ChCl:Gly (2.0 g); ^b Isolated yield; ChCl: Choline chloride.

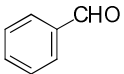
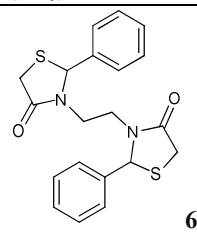
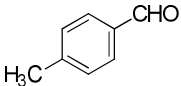
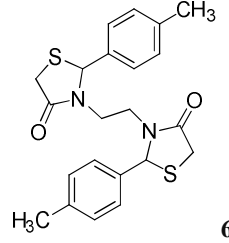
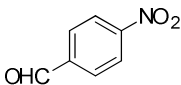
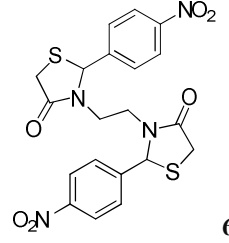
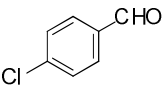
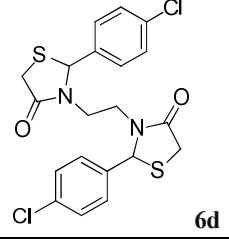
The deep eutectic solvent ChCl: Gly (1:2) was prepared by simple mixing glycerol (200 mmol) and choline chloride (100 mmol) and heated to 85°C with stirring till a homogeneous clear solution was formed, which was used further without any purification.

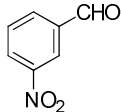
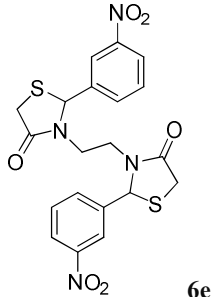
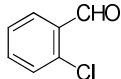
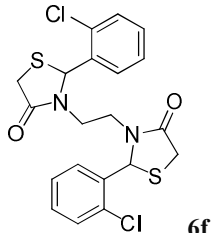
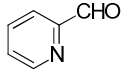
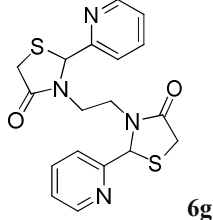
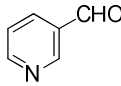
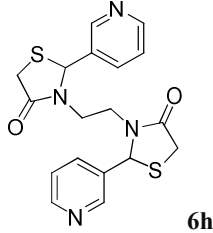
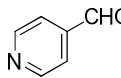
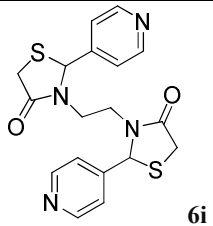
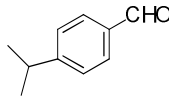
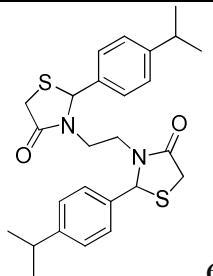
In this methodology we used diamines like o/m/p-phenylenediamines and ethylene diamines instead of aniline derivatives. Diamines such as ethylene diamine, o,m,p-phenylenediamine, thioglycolic acid and arylaldehyde underwent a one-pot three component reaction and leads to the desired product bis-thiazolidinone in excellent yields.

Initially, ChCl: Gly eutectic solvent was used in cyclisation reaction of p-phenylenediamine with aryl aldehyde and thioglycolic acid which gave 80 % yield of desired product **6**. Furthermore, when used ethylene diamine with **2** and **3** we observed 90% yield of the **8**. However, the same reaction with m-phenylenediamine didn't result in bis-thiazolidinone instead of that it gives **10**. Whereas o-phenylenediamine produced mixture of products **12** and **13**.

Under optimized reaction condition, to elaborate the generality and scope of this protocol various aromatic and heterocyclic aldehydes were studied and the results are summarized in table 2. Aromatic aldehydes, such as nitrobenzaldehyde, benzaldehyde, ortho and para chlorobenzaldehyde and nicotinaldehyde, shown to be effective substrate and produced Bis-thiazolidinone in excellent yields (85-92%). However aliphatic aldehydes didn't participate in the reaction. To study the industrial applicability of the reaction, scale-up experiment was done, ethylene diamine (20 mmol) with benzaldehyde (40 mmol) and thioglycolic acid (40) mmol in DES was carried out under the optimized conditions and the bis-thiazolidinone in 90% isolated yield was observed.

Table 2. DES mediated synthesis of Bis-thiazolidinone derivatives (6a-j).

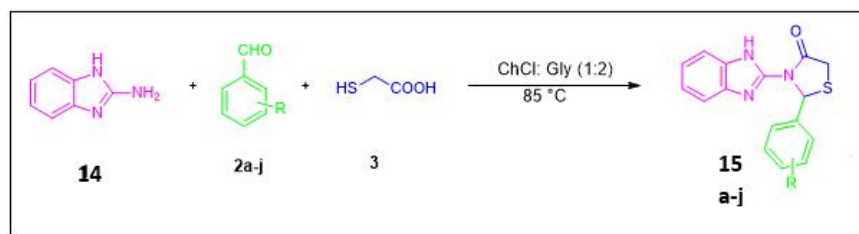
Entry	Aldehyde	Product (6a-j)	Time (min)	Yield (%) ^b	Melting Point (°C)	Reference
1.		 6a	55	90	155-157	155-157 [21]
2.		 6b	55	90	156-58	158-60 [21]
3.		 6c	50	92	165-67	164-166 [21]
4.		 6d	50	92	151-153	150-152 [21]

5.			50	90	222-224	222-224 ^[21]
6.			50	92	143-145	143-145 ^[21]
7.			55	90	168-170	170-172 ^[21]
8.			55	90	193-195	191-193 ^[21]
9.			55	95	222-224	221-223 ^[21]
10.			60	85	163-65	163-165 ^[21]

^a Reaction conditions: ethylenediamine (1 mmol), benzaldehyde (2 mmol) and thioglycolic acid (2 mmol) in ChCl:Gly (2.0 g); ^b Isolated yield; ChCl: Choline Chloride.

In order to develop structurally diverse and biologically active heterocyclic functionalized thiazolidinone compounds, we employed this choline chloride based deep eutectic solvent for the synthesis of 3-benzimidazolyl-2-aryl thiazolidine-4-one by using heterocyclic amine 2-aminobenzimidazole with arylaldehyde and aniline derivatives.

The reaction of 2-aminobenzimidazole (1.1 mmol), aromatic aldehyde (1 mmol) and thioglycolic acid (1 mmol) was selected as a model reaction. (Scheme 3). The optimized reaction conditions for this reaction are as follows: 2-aminobenzimidazole (1.1 mmol), aryl aldehyde (1 mmol) and thioglycolic acid (1 mmol), DES 2.0 g at 85 °C for 55 minutes (Table 1, Entry 15). The reaction produced better result under this optimized reaction conditions.

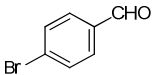
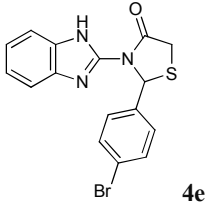
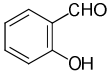
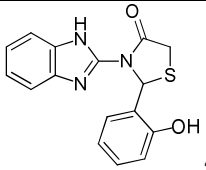
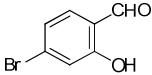
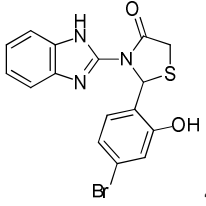
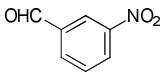
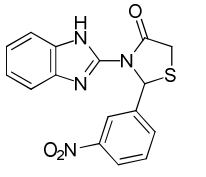
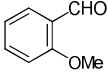
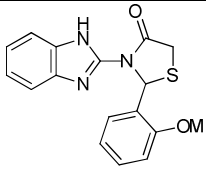
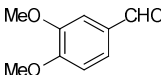
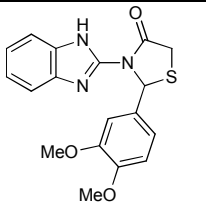


Scheme 3: Synthesis of 3-benzimidazolyl-2-aryl thiazolidinones using DES.

The aforesaid results encouraged us to generalize this methodology. We extended the reaction of 2-aminobenzimidazole with different aryl aldehydes and thioglycolic acid under similar reaction conditions providing the respective 3-benzimidazolyl-2-aryl thiazolidine-4-ones in good to excellent yields. The results are summarized in Table 3. Physical and spectral data of known compounds are in agreement with those described in literature.^[15]

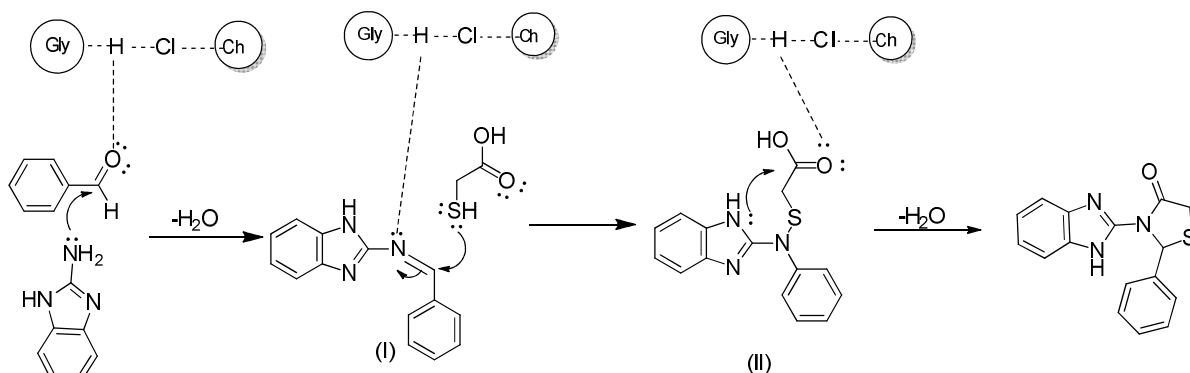
Table 3: DES mediated synthesis of 3-benzimidazolyl-2-aryl thiazolidine-4-one derivatives.

Entry	Aldehyde	Product	Time (min)	Yield (%)	Melting Point (°C)	
					Obs.	Lit. ^[15]
1.		4a	55	90	208-210	208-210 ^[15]
2.		4b	55	85	215-217	215-217 ^[15]
3.		4c	50	93	207-210	207-210 ^[15]
4.		4d	50	95	230-232	229-230 ^[15]

5.			50	94	244-246	244-246 ^[15]
6.			55	90	244-246	245-246 ^[15]
7.			55	92	259-261	260-261 ^[15]
8.			50	88	147-149	146-148 ^[15]
9.			55	85	262-264	263-266 ^[15]
10.			55	80	166-168	167-170 ^[15]
^a Reaction conditions: 2-aminobenzimidazole (1.1 mmol), benzaldehyde (1 mmol) and thioglycolic acid (1 mmol) in ChCl:Gly (2.0 g); ^b Isolated yield; ChCl: Choline Chloride.						

From above Table 3, we conclude that the experiential results were excellent in terms of reaction time, yields and purity of products. Electron withdrawing substituent on aryl aldehydes favors the formation of product in the presence of DES.

Based on the literature,^[20] a mechanism for the formation of 3-benzimidazolyl-2-aryl thiazolidine-4-one catalyzed by the eutectic solvent is outlined in Scheme 4. Initially, DES interacts with the oxygen atom of the carbonyl group of aryl aldehyde through H-bonding and increases the electrophilicity of the carbonyl carbon which enhances the attack of NH₂ group and leads to the formation of imine intermediate (I). Sulfur atom of thioglycolic acid attacks to intermediate (I) and forms the carbon-sulfur linkage. Further, DES activates the intermediate (II) which cyclizes to the product. Extensive hydrogen bonding within DES and successful activation of carbonyl groups during cyclisation is the key aspect of this mechanism, which enhances the rate of the reaction.



Scheme 4: Plausible mechanism for the formation of 3-benzimidazolyl-2-aryl thiazolidine-4-one.

The synthesis of bis thiazolidinones also proceeds through the same mechanistic pathway.

Recyclability

In consideration of the greener approach, the DES (ChCl:Gly) catalyst cum reaction media was further studied for the recyclability. The model reaction of 2-aminobenzimidazole (1.1 mmol), benzaldehyde (1 mmol) and thioglycolic acid (1 mmol) carried out under optimized conditions. Upon completion of the reaction, the reaction mixture was neutralized by a saturated solution of sodium bicarbonate. The product was extracted using ethyl acetate. The DES which is water soluble recovered by evaporating the water under reduced pressure. The recovered eutectic solvent (ChCl:Gly) was recycled for the next run without any purification. The eutectic solvent reused and recycled up to five times without any loss in the yield of the product. (Fig 1). Hence the protocol is beneficial over previously reported methods.

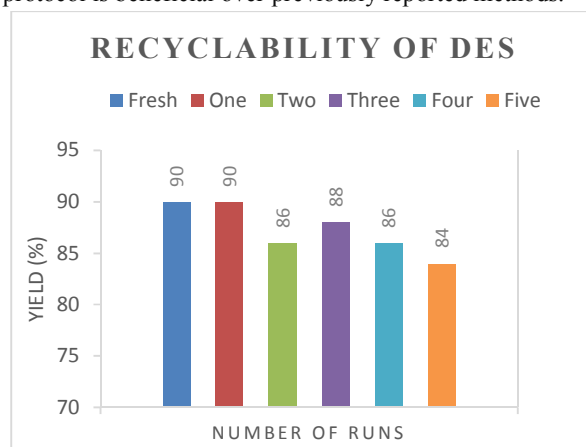


Figure 1: Recyclability of DES (ChCl: Gly).

Experimental

All commercially available reagents were used without purification and all solvents used were of reagent grade. The progress of all reactions was monitored by using TLC (Silica gel 60 F254). Melting points were determined in open capillaries and are corrected. The IR spectra of products were recorded on Perkin Elmer spectrometer. ¹H NMR and ¹³C NMR of purified compounds were recorded on a Bruker-300 MHz instrument using CDCl₃ as a solvent and TMS as an internal standard.

Procedure for preparation of DES:

A mixture of choline chloride (100 mmol) and glycerol (200 mmol) was added to 100 cm³ round bottom flask and stirred magnetically at 70 °C until homogeneous liquid obtained. [22] The resulted DES was used without any purification. This method gave 100 % atom economy since it forms a deep eutectic mixture with no side product formation.

Procedure for synthesis of bis-thiazolidinone (6a-j):

A mixture of thioglycolic acid (2 mmol), benzaldehydes (2 mmol) and o/m/p phenylenediamines or ethylene diamines (1 mmol) was stirred at 85 °C for 50-60 minutes (Scheme 2). The reaction progress was monitored by TLC using ethyl acetate-hexane as a solvent system. Upon completion of reaction, the reaction mixture was cooled at room temperature and neutralized by using saturated solution of sodium bicarbonate. The resulting product was extracted with ethyl acetate. The solvent (ethyl acetate) was evaporated under reduced pressure to obtain the desired product. The obtained products were recrystallized using EtOH.

General Experimental Procedure for preparation of 3-benzimidazolyl-2-aryl thiazolidine-4-one (15 a-j)

A mixture of 2-aminobenzimidazole (1.1 mmol), aromatic aldehyde (1 mmol) and thioglycolic acid (1 mmol) in 2.0 g ChCl: Gly (1:2) was added. The reaction mixture was stirred magnetically at 85 °C for 50-55 minutes. The progress of the reaction was monitored by using TLC using ethyl acetate and hexane as a solvent system. Upon completion of the reaction, the reaction mixture was cooled and neutralized by using a saturated solution of NaHCO₃. The product was extracted using ethyl acetate, which was later evaporated under reduced pressure. The obtained crude product was recrystallized using EtOH and air dried.

Representative Spectral Data

6a: 3,3'-(ethane-1,2-diyl)bis(2-phenylthiazolidin-4-one): The compound 6a was obtained by cyclocondensation between benzaldehyde, ethylene diamine and thioglycolic acid in 55 minutes as a white solid; Yield: 90 %; Melting point: 155-157 °C (Lit^[21] 155–157 °C), ¹H NMR (300 MHz, DMSO-d₆) δ (PPM): 2.48-2.83 (m, 2H), 3.61-3.64 (m, 2H), 8.5 3.72-3.78 (d, J = 16 Hz, 2H), 3.93-3.96 (dd, J = 1.8, 1.6 Hz, 2H), 5.56 (d, J = 1.6 Hz, 2H), 7.26-7.39 (m, 10 H); ¹³C NMR (400 MHz, CDCl₃) δ 32.673, 40.180, 63.868, 127.253, 129.225, 129.493, 138.915, 171.680; IR (FTIR) cm⁻¹: 2930, 1657, 1419, 694; LC MS (m/z): 385.10 [M+H]⁺.

6d: 3,3'-(ethane-1,2-diyl)bis(2-(4-chlorophenyl)thiazolidin-4-one): The compound 6d was obtained by cyclocondensation between p-chlorobenzaldehyde, ethylene diamine and thioglycolic acid in 50 minutes as a white solid; Yield: 92 %; Melting point: 151-153 °C (Lit^[21] 150-152 °C), IR (FTIR) cm⁻¹: 2929, 1650, 1413, 1260, 687.

20a: 3-(1H-benzo[d]imidazol-2-yl)-2-phenylthiazolidin-4-one: The compound 20a was obtained by cyclocondensation between 2-aminobenzimidazole, benzaldehyde and thioglycolic acid in 55 minutes as a light yellow solid; Yield: 90 %; Melting point: 208- 210 °C (Lit^[15] 208–210 °C); ¹H NMR (300 MHz, CDCl₃-d₆) δ: 3.91 (1H, d, J = 16.53 Hz, SCH₂), 4.20 (1H, d, J = 16.56 Hz, SCH₂), 6.70 (1H, s, CH), 7.12 (2H, m, H-Ar), 7.28– 7.48 (6H, m, H-Ar), 7.77 (1H, d, J = 7.50 Hz, H-Ar), 12.48 (1H, s, NH)

III. CONCLUSION

In conclusions, we reported a simple and green protocol for the formation of bis-thiazolidinone and 3-benzimidazolyl-2-aryl thiazolidine-4-one derivatives produced using ChCl:Gly as a eco-friendly, biodegradable and cost-effective eutectic solvent. The recovered DES from previous run could be recycled up to five batches. The reaction procedure is rapid, catalyst free and proceeds under mild reaction conditions and gave the desired products in excellent yields.

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Cytotoxic Assay on Bacteriocin B25 produced by Marine *Lactobacillus pentosus* B25

Dr. Bharti Wadekar

Assistant Professor, Microbiology ID,
ZSCT's Thakur Shyamnarayan Degree College, Kandivali East, Mumbai
bhartiwadekar@tsdcmumbai.in

Abstract: The *in vitro* antimicrobial efficiency of the bacteriocin B25 is well documented, however its clinical application needs investigation, as its toxicity may well be totally different in *in vitro* (haemolytic and bactericide activity in blood and toxicity towards traditional human cell lines). The cytotoxic result of bacteriocin on traditional human blood cells (lymphocytes) was evaluated by MTT assay. Inhibition of cell proliferation was quantitated. A gentle cytotoxic result of bacteriocin was found on lymphocytes. The bacteriocin concentration fifty $\mu\text{g/mL}$ to two hundred $\mu\text{g/mL}$ used and the death of lymphocytes was ascertained in bacteriocin treated lymphocytes, twenty $\mu\text{g/mL}$ to a hundred and sixty $\mu\text{g/mL}$ from concentration, when a hundred and sixty μL there have been not found any changes in lymphocytes. It had shown the gentle toxicity. The IC_{50} worth was obtained as a hundred and sixty $\mu\text{L} \pm 20 \mu\text{L}$. The Student's two-tailed *t*-test was accustomed verify applied mathematics significance of the variations between untreated cells and cells treated with the varied concentrations of bacteriocin.

Keywords: Toxicity, Bacteriocin, MTT Assay, Lymphocytes

I. INTRODUCTION

In recent decades, bacteriocins have received substantial attention as antimicrobial compounds. Though bacteriocins are preponderantly exploited as food preservatives, they're currently receiving raised attention as potential clinical antimicrobials and as doable immune-modulating agents. Infections caused by antibiotic-resistant bacterium are declared as a world threat to public health. Bacteriocins represent a possible answer to the present worldwide threat because of their broad or slender spectrum activity against antibiotic-resistant bacterium. Notably, despite their role in food safety as natural alternatives to chemical preservatives. In gift study, we have a tendency to studied on toxicity of bacteriocin ageing human lymphocytes.

1.1 Cytotoxicity Assay

While finding out the toxicity of nisin and colicins against civilized simian virus 40-transfected human colon (SV40-HC) and Vero monkey urinary organ (Vero) cells (Murunds et al., 2003). He had shown SV40-HC cells incontestable larger sensitivity than Vero cells. The result of bacteriocin made by *Lactococcus* sp. HY 449 against skin-inflammatory bacterium like *Staph epidermidis* ATCC 12228, *Staph aureus* ATCC 65389, *Strep pyogenes* ATCC 21059 and *Propionibacterium acnes* ATCC 6919 (Oh et al., 2005) and ascertained the LC_{50} of bacteriocin on human formative cell was 50 mg/mL at that the inhibition of cell proliferation wasn't ascertained. More Kumar et al., (2014) evaluated each native and rec-pediocin from *Pediococcus acidilactici* MTCC 5101 for his or her toxicity against HepG2 (a hepatocellular carcinoma cell line), Norse deity (a cervical adenocarcinoma), MCF7 (a mamma adenocarcinoma) and Sp2/0-Ag14 (a spleen lymphoblast) cell lines and according a considerably higher toxicity of rec-pediocin and injury of body polymer in bacteriocin tested cell lines. Sevda et al., (2014), had according workplace need to possess sure antineoplastic properties and investigated the antiproliferative effects of the acellular filtrate and therefore the acellular preserved filtrate of three workplace (Lactic Acid Bacteria: *Pediococcus pentosaceus*, *Eubacterium plantarum*, and *Weissella confusa*) on human body part carcinoma cell line Caco-2. The toxicity assay of bacteriocins made by *E. durans* GEn09 and *L. lactis* subsp. *lactis* GLc03 that was done by Todorov et al., in 2014 and obtained lowest toxicity values were 172 $\mu\text{g/mL}$ and 295 $\mu\text{g/mL}$.

II. MATERIAL AND METHOD

2.1 Toxicity Assay

In vitro pharmacology and connected sciences have historically evaluated the consequences of assorted agents on cell growth and proliferation by perceptive the changes in cell numbers and in cell morphology. Current customary approaches embody the assays conducted to live distinct cell growth and metabolism connected endpoints, like the activity of intracellular enzymes, integrity of cellular membranes, deoxyribonucleic acid synthesis, and ATP standing (Schroterova *et al.*, 2009).

2.1.1 Cell Culture Medium:

DMEM (Glutamax, Life Technologies, USA) was supplemented with low toxin craniate bovine blood serum (FBS, Life Technologies, USA), one hundred U/ml antibiotic drug (Gibco), one hundred µg/ml antibiotic (Gibco), two metric linear unit L- amino acid (Gibco), twenty five metric linear unit HEPES buffer (Life Technologies, USA) and one metric linear unit Na pyruvate, lymphocytes separation medium (Himedia, India)

2.1.2 Preparation of Lymphocytes:

4 ml of human blood sample in heparinised vials was collected. The human erythrocytes were lysed by RBC lysis buffer. The PBMCS cells were washed (centrifuge at one hundred x g for ten min) with ten metric capacity unit of sterile DMEM double. The cells were re-suspended in one metric capacity unit of sterile Dulbecco's changed eagle medium. Cells were counted by haemocytometer exploitation W.B.C. diluting fluid. (cell concentration at 1×10^6 cells/ml with Dulbecco's changed eagle medium (DMEM) supplemented with I Chronicles of Penicillin-streptomycin answer and 100% FBS. The approximate yield of cells from 4 ml of blood varies between 10^7 - 10^8 . The 100 µl of cell suspension seeded during a 096 well culture plate.

2.2 Determination of Cell Viability by MTT Assay

The cell viability result of Bacteriocin on traditional blood cells was evaluated by Vybrant® MTT Cell Proliferation Assay Kit (Life technologies INC.USA). The cells were plated at $\sim 1 \times 10^3$ cells in every well of ninety six well plate in 100 µl of various medium and zero, 20, 40, 80, 100 µl samples were superimposed to every well. Every samples were continual three times for every cell line. Cell viability determined 24h when incubation in carbonic acid gas apparatus at 37°C. MTT (5 mg/ml in PBS) was superimposed to every well and incubated for four h. The procedure was followed in line with manufacturer's directions. The absorbance was recorded at 490 nm employing a ninety six well Multiscan Ascent (Thermo INC.USA). The restrictive result of Bacteriocin on cell growth was assessed as p.c cell viability, wherever cells while not treatment were thought of 100% viable.

III. RESULT AND DISCUSSION

3.1 Determination of IC50

Initially, lymphocytes were treated with the Bacteriocin and antiproliferative result was evaluated by MTT assay. As shown in (Figure one) sample 1 doesn't induce any death in traditional human blood cells.

The cytotoxic result of bacteriocin on traditional human blood cells (lymphocytes) was evaluated by MTT assay. Inhibition of cell proliferation was quantitated. A light cytotoxic result of bacteriocin was found on lymphocytes. The bacteriocin concentration fifty µg/mL to two hundred µg/mL used and the death of lymphocytes was ascertained in bacteriocin treated lymphocytes, 20 µg/mL to 160 µg/mL from concentration, when 160 µL there have been not found any changes in lymphocytes. It had shown the gentle toxicity. The IC50 worth was obtained as 160 µL $\pm$ 20 µL. The Student's two-tailed t-test was accustomed confirm applied math significance of the variations between untreated cells and cells treated with the varied concentrations of bacteriocin.

In our study, we have a tendency to evaluated the antiproliferative effects of the bacteriocin B25 of *L. pentosus* B25 on blood cells lymphocytes. The bacteriocin B25 was found to gentle inhibition the expansion of blood cells lymphocytes during a dose-dependent manner as detected by the MTT assay. Among the foremost typically used assays square measure those who square measure conducted to live the metabolic activity of viable cells exploitation quantitative chemical analysis changes supported tetrazolium salt reduction. The MTT assay utilizes 3-(4,5-dimethylthiazol-2-yl)-2,5- diphenyltetrazolium

bromide (MTT) reduction to blue colored formazan by metabolically active cells. The intensity of the color of the dissolved formazan is proportional to the amount of viable cells. The MTT assay was tested for its validity with numerous cell lines (Mossmann, 1983). A dose-dependent response has been according for the anticarcinogenic and/or antimutagenic skills of some carboxylic acid microorganism (Salminen *et al.*, 1998). Paolillo *et al.*, (2009) studied the cytotoxic result of live cells of *L. plantarum* on Caco-2 cells and according *L. Plantarum* exhibited no important result on the viability of Caco-2 cells twelve h post treatment compared to cells alone, when twenty four h and forty eight h of exposure, the amount of viable cells was $92 \pm 3d$ and $91 \pm 3-d$ severally, each over the controls ($73.6 \pm 2.9\%$ and $68.25 \pm 2.8\%$, respectively).

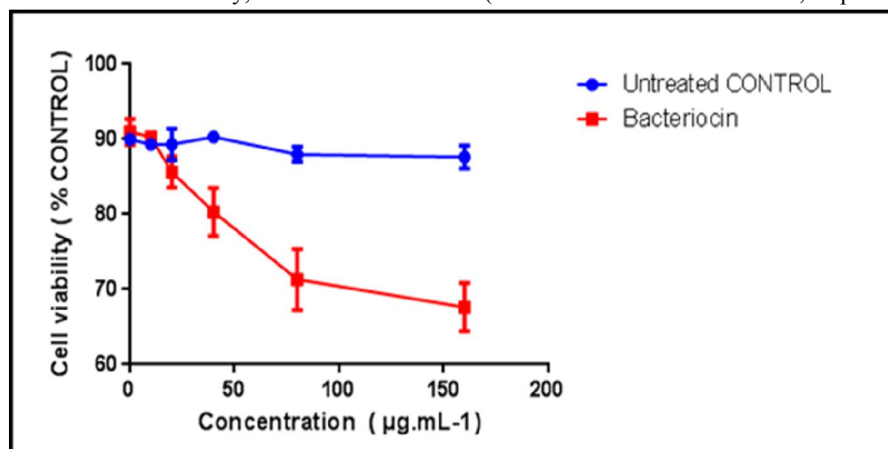


Figure 1: Result of bacteriocin on growth in Human blood (lymphocytes) cells.

IV. CONCLUSION

Bacteriocins have properties because of that they'll be used for a broad variety of food and medical applications. Thus, the protection of bacteriocins needs a lot of attention. Antimicrobial activity of bacteriocins has been widely studied; but, there's an absence of accessible in vitro and in vivo knowledge concerning safety and toxicity of bacteriocins. So as to concern the protection of bacteriocins, investigation of their immunogenicity and each in vitro and in vivo toxicity is critical. In fact, for this purpose, totally different assays square measure required to be performed to assess their toxicity in organism cells, ability to induce caspase-mediated cell death, growth restrictive result, lysis activity, acute and subchronic toxicity, etc. In our finding, bacteriocin B25 had shown the gentle toxicity against human somatic cell lymphocytes.

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Scientific Study for Content of N-Nitrosodimethylamine in Valsartan by GCMS Technique

Vinayak Nachankar¹, Rama S Lokhande², Purnima Nag³, Ravi Yadav⁴

Research Scholar, Department of Chemistry, Jaipur National University, Jaipur, India¹

Head, School of Basic Science, Head, Department of Chemistry, Jaipur National University, Jaipur² Senior Additional

Director, School of Engineering and Technology, Jaipur National University, Jaipur³

Senior Director, Cipla Limited, Vikroli R & D Centre, Mumbai, Maharashtra, India⁴

vinayaknachankar@gmail.com

Abstract: *Active pharmaceutical ingredients are making vital role in preparation or formulation of any medicines. It is the prime duty of ourselves to monitor the overall quality of pharmaceutical drugs as well as products for safety and efficacy. With the advancement in science of chemistry and other branches of instrumental devices including analytical sciences and biotechnology, the scope of analytical chemistry has reached to, much higher extent. The main focus in current usage of analytical methods advance analytical technology has made it possible not only to evaluate the potency of active ingredients in dosage forms and API's but also to get deep knowledge in characterization, structural elucidation, identifying and quantifying stereo isomers active moiety, possible impurities, metabolism, chirality of API and anticipation of possible degradations likely impurities being generated. Pharmacopoeias rely more on instrumental techniques rather than the classical wet chemistry method. In my research work a scientific attempt, I am going to adopt strategy of development, validated analytical methods for the determination of API single dosage form using GCMS technique.*

Keywords: Content of N-Nitrosodimethylamine

I. INTRODUCTION

According to WHO, Active pharmaceutical ingredient (API) may be defined as, "A substance used in finished pharmaceutical product intended to furnish pharmacological activity or to otherwise have direct effect in the diagnosis, cure, mitigation, treatment or prevention of disease, or to have direct effect in restoring, correcting or modifying physiological functions in human beings." The other common terms used for an API are Bulk Pharmaceutical chemicals, Drug substances.

To be effective on commercial scale, a drug substance when administered to patient by any route of administration in any finished pharmaceutical product dosage forms, should, Provide desired effect only at desired site of action i.e. effect should be localized. Desired effect at desired site of action should be consistent in terms of how quickly It is observed and its magnitude and it should not provided any surprise side effects It should not provide any severe toxicity. It should be stable under prescribed conditions of storage. APIs are rarely administrated in as such form and are mostly administered as part of finished pharmaceutical product along with excipients.

In a finished pharmaceutical product, an API represents biologically active form, while the inactive ingredients are usually excipients. They generally are added to finished pharmaceutical product, with specific purpose like stabilization during self life, enhancing therapeutic activity of API by increasing their absorption, reducing viscosity etc. Since APIs render finished pharmaceutical product their therapeutic activity, control over their quality is of utmost importance. Their quality in terms of purity and also safety should be controlled to avoid any harm to civil society's health at large. Hence role and responsibility of global health regulators, quality inspectors as well as Pharmaceutical industry is of at-most importance. Continuous, coordinated joint efforts are required by all these 3 major stake holders to ensure that only medicines of highest standards in terms of Quality, safety, reach major part of global population at affordable prices.

Hence identification and quantification of impurities is a crucial task in pharmaceutical process development for quality and safety.

Any material that can affect the purity of an API or finished pharmaceutical product is considered an impurity. ICH defines impurity as “Any component of the new drug substance that is not the chemical entity defined as new drug substance.” Impurities are not introduced in the manufacturing process accidentally or maliciously. Since they are not of any therapeutic value and may have toxicity concerns, they must be controlled.

Development of Related substances method is the common name of a group of analytical activities, the aim of which is the detection, identification and quantitative determination of impurities in API and pharmaceutical formulations.

II. METHODOLOGY

Following is the short summary for the research methodology work of Valsartan molecules. Valsartan is in a class of medications called angiotensin II receptor antagonists. It works by blocking the action of certain natural substances that tighten the blood vessels, allowing the blood to flow more smoothly and the heart to pump more efficiently. Valsartan is used to treat high blood pressure and congestive heart failure. , FDA announced a recall of valsartan tablets because of the potential for certain product to contain an impurity, N-nitrosodimethylamine (NDMA). This impurity is classified as a probable human carcinogen and is believed to have been introduced into the finished products as a result of the manufacturing process of the drug substance. Hence develop a gas chromatography-mass spectrometry (GC-MS) headspace method and to detect the presence of NDMA content in valsartan drug substance and drug products.

2.1 Instrument

A Gas Chromatograph Mass Spectrometer capable of temperature programming equipped with a capillary column, split / split less Injector, a Quadra pole Mass Detector and liquid auto sampler with a suitable software.

2.2 Chromatographic condition (GC-MS)

Column type	: 60m x 0.32 mm ID, 1.8 μ , VF-624 is suitable.
Carrier gas	: Helium
Carrier gas flow rate	: 1.8 ml/minute
Injection mode	: Split
Split Ratio	: 1:2
Detector	: Quadra pole Mass Detector
Injector Temperature	: 160
Interface temperature	: 250
Detection mode	: SIM
Ion Selection m/z for, N-Nitrosodimethylamine	: 74m/z
Ion Voltage	: Relative tuning 0.4kV
Ion source	: 250 °C

Oven Temperature	: Initially at 90°C and hold for 2.0 minutes then increase at the rate of 12°C/minute to 155°C and hold for 1 minutes. Then increase upto 250°C with the rate of 25°C/minute and hold for 10 minutes.
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Injection volume	: 3 μ l
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2.3 Liquid Operating Condition:

Injection volume	: 3 μ l
Air volume(μ l)	: 1
Pre clean solvent 1	: 5
Pre clean solvent 2	: 5

Pre clean with sample	: 3
Filling volume(μl)	: 5
Filling speed(μl/sec)	: 2
Filling stroke	: 5
Pull up delay(ms)	:300
Inject to	: Appropriate injector
Injection speed(μl/sec)	: 50
Pre injection delay(ms)	: 500
Post injection delay(ms)	: 500
Post clean solvent 1	: 5
Post clean solvent 1	: 5

Diluent: 30% Ammonia solution: purified water (25:75 v/v).

Standard Stock solution of NDMA: Weigh about 100 mg each of N-Nitrosodimethylamine standard in a 100 ml volumetric flask containing about 50 ml of diluent. Dilute up to the mark with diluent and mix well. Dilute 1 ml of above solution to 10 ml with diluent. Further dilute 1 ml to 100 ml with diluent. Further dilute 5.0 ml to 100 ml with diluent and mix well.

Standard solution: Transfer 2 ml of standard stock solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Blank: Transfer 2 ml of diluent to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Test solution: Weigh accurately about 556 mg of Valsartan sample and transfer to a 15 ml centrifuge tube. Add 2 ml of diluent and vortex immediately to dissolve the sample. Sonicate if needed. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Procedure: Separately inject Blank, Standard solution (1) (6 replicates), Standard solution (2), Blank, Test preparation (1), Test preparation (2), Blank and Standard Solution (1) into the chromatographic system. Record the chromatogram and check system suitability parameters. Disregard peak area due to blank interference.

System Suitability Parameters:

1. The Relative Standard Deviation for the peak area response of N-Nitrosodimethylamine for replicate injections of Standard solution (1) and replicate injections of Standard solution (1) including Bracketing Standard should not be more than 15.0% and Relative Standard Deviation for Retention Time for the peak of N-Nitrosodimethylamine for replicate Injections of Standard solution and replicate injections of Standard Solution (1) including bracketing standard are not more than 2.0%.
2. The similarity factor for N-Nitrosodimethylamine between

Calculation: Content in ppm

$$= \frac{(A - B) \times \text{weight of Impurity (mg)} \times 1 \times 1 \times 5 \times 2 \times 10^6}{(C - D) \times 100 \times 10 \times 100 \times 100 \times W_2}$$

Where, A = Peak area response of respective impurity in test solution.

B = Mean peak area response of respective impurity as interference from blank for test Solution.

C = Mean peak area response of respective impurity in standard solution (1).

D = Mean peak area response of respective impurity as interference from blank for standard Solution (1).

W₁ = Weight of respective impurity taken for Standard Stock Solution (1) in mg.

W₂ = Weight of sample taken in mg.

P = Purity of respective impurity standard on as such basis.

Limit: For N-Nitrosodimethylamine : Not more than 0.18 ppm

NDMA has been found to increase the occurrence of cancer in animal studies. These animal studies were done using amounts of NDMA much higher than the impurity levels in recalled valsartan batches.

These findings suggest that the consumption of NDMA contaminated valsartan is associated with a slightly increased risk of hepatic cancer; Purpose of study is to develop method of NDMA content in Valsartan with shorter run time duration.

III. LITERATURE REVIEW

We had performed literature search on work performed on these molecules in field of Method development and validation for tests of related substances. Based on this following literatures were identified of having significant value addition for my research work,

1. Monograph of Valsartan API in United States Pharmacopeia DOI Ref. 5ue1i
2. Test method for the determination of NDMA by LC/MS/MS in Valsartan finished products Contact: Oliver el-Atma Chemisches und Veterinäruntersuchungsamt (CVUA) Karlsruhe, Germany (OMCL BW) Tel. 0049-721-926-3609 Oliver.el-Atma@cva.ka.bwl.de Dr. Birgit Gutsche Chemisches und Veterinäruntersuchungsamt (CVUA) Karlsruhe, Germany (OCCL BW) Tel. 0049-721-926-5628 Birgit.Gutsche@cva.ka.bwl.de
3. GC/MS Headspace Method for Detection of NDMA in Valsartan Drug Substance and Drug Products, Division of Pharmaceutical Analysis, US FDA
4. https://www.ema.europa.eu/documents/press-release/update-nitrosamine-impurities-ema-continues-work-preventimpurities-medicines_en.pdf
5. <https://www.ema.europa.eu/en/news/ema-review-ranitidine-medicines-following-detection-ndma>
6. <https://www.USFDA.gov/news-events/press-announcements/statement-alerting-patients-and-health-careprofessionals-ndma-found-samples-ranitidine>

I had evaluated all these literatures and came to conclusion that out of these literatures. There is substantial shortfall of current/existing available source of literature.

Based on evaluation of this literatures following was the crux of present work available in research area Regulatory authorities emphasizing on determination of genotoxic impurities content in API. Several methods available for NDMA content of valsartan but no method available with short run time. Also some of the method use of internal standard, diluents incompatibility, matrix effect. Hence there is scope to develop short run time method without use extraction technique which can allows only concern impurity to determine and quantify it with much more accuracy. It will not only save cost of each analysis by using less quantity of resources, but will also have positive impact on cost of medicine and useful for society.. Also it will lead to less drainage of solvent waste and hence will have positive outcome from environmental point of view also.

IV. RESULTS AND DISCUSSION

Table 1: Relative standard deviation of NDMA

Sr. No	Sample name	Area	Retention time
1	Standard-A	84614	7.035
2	Standard-A	89425	7.035
3	Standard-A	92297	7.033
4	Standard-A	88235	7.033
5	Standard-A	80564	7.035
6	Standard-A	83759	7.031
Mean		86482.3	7.0
Std. Dev		4277.3	0.0
%RSD		4.9	0.0

Limit of Detection and Limit of Quantitation:

- **Limit of Detection:** Chromatographic conditions, Mass spectrometer conditions, and Blank preparation same as given in Method details.
- **LOD Stock Solution:** Weigh about 100 mg of N-Nitrosodimethylamine standard in a 100 ml volumetric flask containing about 50 ml of diluent. Dilute up to the mark with diluent and mix well. Dilute 1 ml of above solution

to 10 ml with diluent. Further dilute 1 ml to 100 ml with diluent. Further dilute 1.5 ml to 200 ml with diluent and mix well.

- **Preparation LOD Solution:** Transfer 2 ml of LOD stock solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Table 3: Limit of Detection

Level	Concentration of LOD level solution (ppm w.r.t spl)	Signal to Noise ratio
NDMA	0.015	15

Procedure: Inject blank solution and LOD solution in three replicates.

Acceptance criteria:

1.	The signal to noise ratio for limit of detection level for the peak of N-Nitrosodimethylamine should be equal to or more than 3.
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Figure 6: Limit of detection chromatogram

Limit of Quantitation

Chromatographic conditions, Mass spectrometer conditions, and Blank preparation same as given in Method details.

- **LOQ Stock Solution:** Weigh about 100 mg of N-Nitrosodimethylamine standard in a 100 ml volumetric flask containing about 50 ml of diluent. Dilute up to the mark with diluent and mix well. Dilute 1 ml of above solution to 10 ml with diluent. Further dilute 1 ml to 100 ml with diluent. Further dilute 1.5 ml to 100 ml with diluent and mix well.
- **Preparation LOQ Solution:** Transfer 2 ml of LOQ stock solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Table 4: Limit of Quantitation

Level	Concentration of LOD level solution (ppm w.r.t spl)	Signal to Noise ratio
NDMA	0.03	26

Procedure: Inject blank solution and LOQ solution in three replicates.

Table 5: Relative standard deviation of NDMA

Sr. No	Sample name	Area	Retention time
1	LOQ-1	23228	7.037
2	LOQ-2	24384	7.035
3	LOQ-3	23427	7.036
Mean		23679.7	7.0
Std. Dev		618.0	0.0
%RSD		2.6	0.0

Linearity and Range

Chromatographic conditions, Mass spectrometer conditions, and Blank preparation same as given in Method details.

- **Linearity Stock Solution:** Weigh about 100 mg of N-Nitrosodimethylamine standard in a 100 ml volumetric flask containing about 50 ml of diluent. Dilute up to the mark with diluent and mix well. Dilute 1 ml of above solution to 10 ml with diluent. Further dilute 1 ml to 100 ml with diluent.

Preparation of linearity levels:

Preparation Linearity-I (Lin LOQ) Solution: Dilute 1.5 ml of Linearity stock solution to 100 ml with diluent and mix well. Transfer 2 ml of above solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Preparation Linearity-II (Lin 50%) Solution: Dilute 2.5 ml of Linearity stock solution to 100 ml with diluent and mix well. Transfer 2 ml of above solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Preparation Linearity-III (Lin 100%) Solution: Dilute 5.0 ml of Linearity stock solution to 100 ml with diluent and mix well. Transfer 2 ml of above solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Preparation Linearity-IV (Lin 150%) Solution: Dilute 7.5 ml of Linearity stock solution to 100 ml with diluent and mix well. Transfer 2 ml of above solution to a 15 ml centrifuge tube. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Table 6: Preparation of Linearity levels

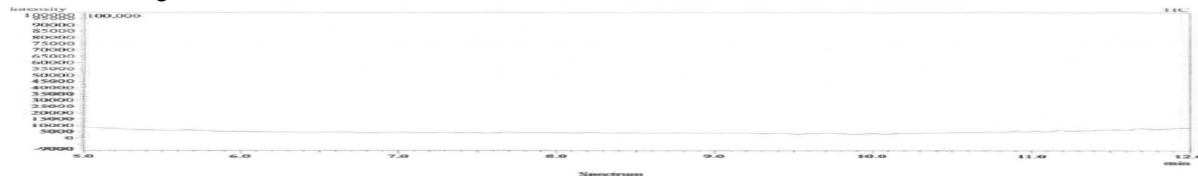
Level	Concentration of NDMA Linearity level solution (ppm w.r.t spl)
LIN I (LOQ)	0.03
LIN II	0.05
LIN III	0.10
LIN IV	0.15

Procedure: Inject Level 1 (LIN I/LOQ) (Six replicates), Level 2 (LIN II) to Level 3 (LIN III) (duplicate) and Level 4 (LIN IV) (six replicates).

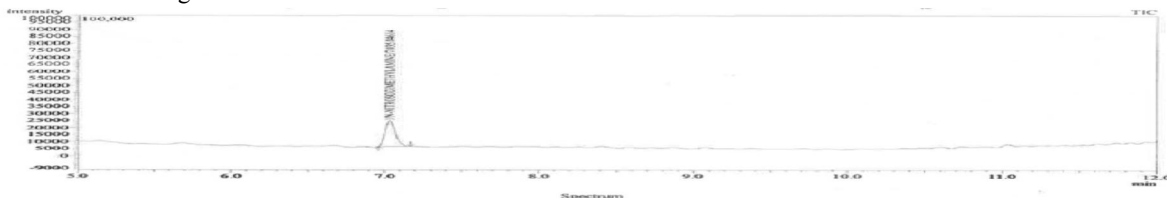
Table 7: Data for linearity (NDMA)

Level	Concentration (ppm)	Area	Response Factor
Level-I/I	0.03	23228	1515792.2
Level-I/II	0.03	24384	1591229.4
Level-I/III	0.03	23427	152877.4
Level-I/IV	0.03	27186	1774079.9
Level-I/V	0.03	27677	1808121.1
Level-I/VI	0.03	28087	1832676.5
Level-II/I	0.05	41171	1812020.4
Level-II/II	0.05	48380	1933437.7
Level-III/I	0.1	91039	1782282.7
Level-III/II	0.1	91108	1783633.5
Level-IV/I	0.15	131388	1714800.3
Level-IV/II	0.15	132088	1723836.3
Level-IV/III	0.15	140548	1834351.3
Level-IV/IV	0.15	130667	1705390.2
Level-IV/V	0.15	130858	1707863.1
Level-IV/VI	0.15	140671	1835956.7
Average			1730190.8
Correlation coefficient		0.998	
%Y intercept		-1.07	

Blank chromatogram



NDMA Chromatogram



Valsartan Sample Chromatogram

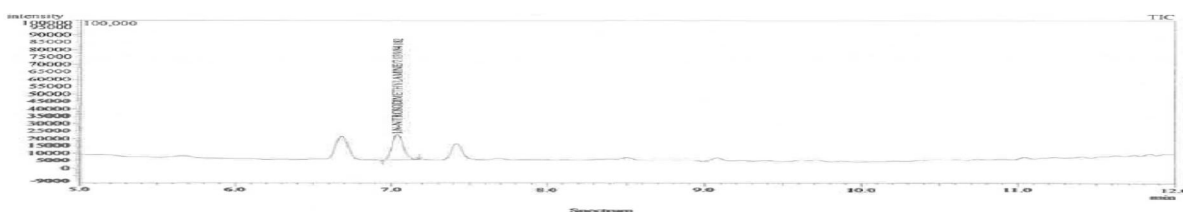


Figure 9: Linearity of Level-I (LOQ) Fig. Linearity of Level-III (100%) Fig. 12 Linearity of Level-IV (150%)

Acceptance criteria:

1.	The Linearity Correlation Co-efficient should not be less than 0.99.
2.	The % Y- intercept for should be within ± 5.0 .
3.	The % RSD of Retention time for three replicates of Linearity Level 1 and Level 4 should not be more than 2.0%.
4.	The % RSD of peak area response for three replicates of Linearity Level 1 and Level 4 should not be more than 15.0%.
5.	The % RSD of Response factor should not be more than 10.0%.

Precision

Chromatographic conditions, Mass spectrometer conditions, Standard solution A and Standard solution B and Blank preparation same as given in Method details.

Sample Preparation: Weigh accurately about 1.0g of sample and transfer to a 15 ml centrifuge tube. Add 2 ml of diluent and vortex immediately to dissolve the sample. Sonicate if needed. Add 2 ml Dichloromethane to it and vortex for 10 minutes. Allow the layers to be separated for about 1 hour. Separate the lower organic layer and use for analysis.

Note: Six different Samples to be prepared.

Procedure: Separately inject Blank preparation, Standard solution A (6 replicates), Standard solution B, Blank, each of sample preparation (1 to 6) and Blank preparation into the chromatographic system. Record the chromatogram and check system suitability parameters. Disregard peak area due to blank interference.

Table 9: Similarity factor accuracy table for NDMA and NDEA

	Area of standard	Area in accuracy	Accuracy (%)
Level	NDMA	NDMA	NDMA
Level-I (LOQ)	25665	26027	101.4
		26418	102.9
Level-II (50%)	44776	38678	86.4
		38713	86.5
Level-III (100%)	91074	79857	87.7
		79423	87.2
Level-IV (150%)	134370	118386	88.1
		118346	88.1

Acceptance criteria:

Sr. No.	In the chromatogram of Working solution.
1	The Similarity factor between Standard solution A (six replicates) and Standard solution B (separately prepared and injected) for the peak of N-Nitrosodimethylamine should be between 0.85 and 1.15.
2	The Relative standard deviation for the peak area response of N-Nitrosodimethylamine for six replicate injections of Standard solution A should not be more than 15.0 %.
3	The Relative standard deviation for the retention time of N-Nitrosodimethylamine for six replicate injections of Standard solution A should not be more 2.0 % .

V. CONCLUSION

The GCMS method developed for NDMA Content is simple, specific, linear, sensitive, precise and efficient and is suitable for its intended purpose. The method developed has shorter run time, thus ensuring optimum utilization of the GCMS Instrument system. It avoided use of any internal standard and hence it was cost effective as well as user friendly.

Run time of this method is very short due to shorter retention time of peak due to NDMA (i.e. about 7 minutes) Hence the proposed method is on GC MS with shorter run time obtained using advance and cost effective techniques is fulfil. Also shorter run time ensured lesser consumption of solvents in turn reducing further cost per analysis and also generating lesser solvent waste. The shorter run time also enabled analysis of multiple batches in short duration thus enhancing the out-put of batch analysis.

The method was validated by critical principles stated in ICH guidelines, showing satisfactory data for all the method validation parameters tested. Evaluation of validation data confirmed that method had comparable system suitability parameters as well as precision as those specified in literature reference. Also its linearity range was established to confirm linear response across the concentration range. Further during robustness study, it was established that variations in temperature, flow, column length, column ID, did not have significant impact on Chromatographic pattern.

Hence, the proposed method can be employed for assessing NDMA Content of Valsartan. This study provides an idea how to perform validation process to prove that the method is accurate for its intended purpose and to assure the capabilities of the test method. The definitions of method validation parameters are well explained. Document the experimental design study, the approach to validation is varied and opened to interpretation, and validation requirements differ during the development process of pharmaceuticals. Validation is an important procedure in the API Study and it is utilized to ensure that inbuilt quality is there in to the processes supporting drug development and manufacture to get expected outcome of research study.

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Review on Adsorption of Different Heavy Metals on Natural Adsorbent Sawdust

Dr. S. V. Choudhari

K.E.S. Anandibai Pradhan Science college. Nagothane, Raigad, India

Abstract: *Natural adsorbent i.e. Sawdust has been proved to be effective low cost adsorbent for removal of metals, dyes from their aqueous solutions. Sawdust is available in ample amounts in nearby area, so its use can be greener way of water purification. This paper reviews the findings of some researchers for the use of saw dust in different forms for heavy metal removal. Reported optimizing factors of adsorption, its isotherm analysis and kinetics are reviewed in this paper. It has been found that generally Langmuir and Freundlich adsorption isotherms fit well to batch experimental data. Pseudo-Second-order kinetic model best describe these processes. In some cases intraparticle and Elovich models are also used. Observations of effectiveness of Saw dust can be useful in future for designing water purification technology.*

Keywords: Adsorption, Sawdust, Heavy Metals, Adsorption Capacity, Isotherms, Kinetics

I. INTRODUCTION

Water pollution is biggest problem that world is facing today. In need of potable water new techniques of water purification are in demand. Scientists, Chemists, Environmentalist are aiming towards proper water treatment and management processes. Different sources for water contamination are industries, agriculture and human activities. Excessive levels of heavy metals causes problems to human beings and also ecosystems. Industrial effluents, agricultural runoff increase the levels of metals like Iron (Fe), Nickel (Ni), Cadmium (Cd) etc in water bodies and therefore their removal is necessary. Adsorption with natural adsorbents is attempted in last decades by researchers. This is an attempt to find efficient adsorbents to reduce the contamination. Many researchers tried saw dust of different trees as natural adsorbents. Many scientists reviewed the use of sawdust as adsorbent. (R. Chikri), (Renu, Agarwal, & Singh, 2017) This paper aims to summarize the different types of saw dusts, their use as adsorbent, their application by different researchers, their use to remove heavy metals.

1.1 Saw Dust as Good Adsorbent

Saw dust works as adsorbent because it has functional groups like -COOH, -OH, amide groups in which are responsible for chemisorption. (Renu, Agarwal, & Singh, 2017). Saw dust is composed of lignin, Cellulose, hemicellulose (R. Chikri). In process of adsorption on adsorbent, modifications in surface area is focused. This cheap adsorbent can be used also in its activated carbon form which can be prepared by chemical and physical activation methods

1.2 Adsorption Experiments with Saw Dust Adsorbent

Many researchers used Sawdust of different trees such as Beech sawdust for removal of Cu, Ni, Zn (Dragana Bozić, 2013), Sawdust of Walnut for removal of Lead, Cadmium and Nickel (Bulutyasemin, 2007), algae, sawdust of pine and Absol (Mehmet Emin Argun, 2007), modified oak sawdust by means of HCl treatment for removal of Zn, Cu, Pb, Ni and Cd (Mehmet Emin Argun, 2007), UAD, TAD & CAC

Adsorbent prepared from *Borassus aethiopum* (Adaji Idoko Johnson¹, 2021), the wooden biomass of *Dalbergia sissoo* for removal of Ni & Zn (Samin Sirusbakht, 2017), Sawdust for removal of Cr(VI) (Samin Sirusbakht, 2017). Batch experimental studies are carried out and best efficiency of saw dust is determined by optimizing factors like pH, contact time, adsorbent dose, etc. At optimized conditions different researchers reported maximum efficiency of the saw dust as follows

1. Ola Andersson (2016) reported the adsorption efficiency of algae, sawdust of pine and Absol (Sand, lime, cement and water). Out of them percentage of adsorbed metals on sawdust in single-metal system is for Cu, Ni,

Zn, Cd, Pb at 2mg/l is 81%, 60%, 66%, 74 %, 98% and Percentage of adsorbed metals on sawdust, multi-metal system, for 2 mg/L percentage adsorbed is 85%, 53%, 65 %, 19%, 96% on sawdust, i.e. sorption is of 65-90% of the metals at lower concentrations (0.2-2 mg/l).

- Modified oak sawdust by means of HCl treatment Cu, Ni, and Cr showed adsorption percentage as 93%, 82% and 84%, for metal concentrations 0.1 to 100 mg/L. (Mehmet Emin Argun, 2007)
- Using Sawdust as adsorbent percentage removal was $94.5\% \pm 0.3\%$ for Pb^{+2} at pH5, in 1 hour contact time and with adsorbent dose of 7.5 g/L, (T.K. Naiya, 2008)
- Beech sawdust adsorb Cu & Ni-4-4.5 mg/g and Zn- 2 mg/g at pH>4 (Dragana Bozić, 2013), Similarly Sawdust of Walnut saw dust removes Pb, Cd, Ni at equilibrium time of 60 minutes (Bulutyasemin, 2007).
- Modified holly Sawdust showed q_{max} 18.86 mg/g at pH 7. for adsorption of Cr(VI) metal ions. (M. Shirzad Siboni, 2011).
- Mohammad Nurnabi et al, 2020 used Sawdust of *Albizia lebbbeck* when used as sodium methylate, epichlorohydrin and n-dodecylamine modified adsorbent (DDA-SD) the observed adsorption q_{max} as 17.37 mg/g (for Pb^{2+}) and 9.4 mg/g (Cu^{2+}) ions.
- Daina Simon, 2020 reported use of pine sawdust to have maximum efficiency by stirring $NiCl_2$ solutions with pine sawdust for 24 h. and $NiCl_2$ and pine sawdust and sawdust mixture which is mixed with natural clay and biomass with adsorbed metals.
8. For maximum removal of Chromium $+6$ ions from solutions with sawdust optimum conditions reported are contact time 120 min., 50 mg/L concentration and 4 pH value was 4 at 30°C temperature. (Ibrahim Yaagoub Erwa, 2016)

Following table no 1 gives the summary of Sawdust adsorbents and their adsorption capacities

Metal	Adsorbent	q_{max}	Reference
Cu, Ni, Zn	Beech sawdust	Cu-4-4.5 mg/g Ni-4-4.5 mg/g Zn- 2 mg/g	(Dragana Bozić, 2013)
Cu, Cr	non-modified beech sawdust	Cu^{2+} -30.22 mg g ⁻¹ Cr^{3+} - 41.86 mg g ⁻¹	(Witek-Krowiak, 2013)
Cr	Saw dust	Cr-50	(Ibrahim Yaagoub Erwa, 2016)
Pb Pb+HCl Pb+NaOH	pine bark	Pb-0.101 Pb+HCl-0.057 Pb+NaOH -0.071	(Sławomir Wierzbkaa, 2019)
Ni	Pine saw dust	Cu- 19.59 Pb- 13.48	(Daiana Simón, (2020))
Pb^{2+} , Cu^{2+}	Sawdust of <i>Albizia lebbbeck</i> treated with sodium methylate and epichlorohydrin and n-dodecylamine	Pb^{2+} -17.37 mg/g Cu^{2+} -9.4 mg/g	(Mohammad Nurnabi, 2020)
Cr	The walnut shell, chestnut shell, wood	0.39–1.63 mg/g	(LUÍSA CRUZ-LOPES, 2020)

Table 1 gives the summary of Sawdust adsorbents and their adsorption capacities

Following table no2 gives the summary of Sawdust adsorbents and percentage removal of the metal

Metal	Adsorbent	% removal	Reference
Cu, Ni, Cr	Modified oak sawdust by means of HCl treatment	Cu- 93% at pH 4, Ni- 82% at pH 8, Cr(VI) -84% pH 3.	(Mehmet Emin Argun, 2007)
Pb, Cd, Ni	Sawdust of Walnut		(Bulutyasemin, 2007)
Cu, Ni, Cr(VI)	HCl treated Oak Sawdust	Cu- 93% at pH 4 Ni- 82% at pH 8 Cr(VI)- 84% at pH 3	(Mater., 2007)

Zn, Cu, Pb, Ni and Cd	Algae, sawdust of pine and Absol (Sand, lime, cement and water)	65-90%	(Andersson)
Pb(II)	Sawdust	94.5% $\pm$ 0.3%	(T.K. Naiya, 2008)
Hg, Pb, Cd	Cottonwood & Pine wood	Cotton wood -Hg-50%, Pb- 70%, Cd-40% Pine wood -Pb-40%	(PESIC, 2017)
Zn, Cu, Pb, Ni and Cd	Algae, sawdust of pine and Absol	65-90%	(Andersson)

Table 2 gives the summary of Sawdust adsorbents and percentage removal of the metal

Adsorption Isotherm & Kinetic Models

To study this process different models like Freundlich isotherm, Langmuir isotherm models are employed. Similarly to explain the adsorption rate different kinetic models are applied. Following are linear form and nonlinear equations given in table .3- summary is as follows –

Kinetic & isotherm models	Equations	Terms
Pseudo first order kinetic model	$\log (q_e - q_t) = \log q_e - (k_1 / 2.303) t$	q_e and q_t = quantity of the metal ions adsorbed (mg/g) on adsorbate
Pseudo second order kinetic model	$t/q_t = 1/(K_2 q_e^2) + t/q_e$	K_2 = adsorption rate constant
Intra particle diffusion	$q_t = K_1 t^{1/2}$	K_1 (mg/g/min) and A=constant
The Freundlich isotherm	$\log q = \log K_f + 1/n \log C_e$	q_e = quantity of adsorbed metal ion per unit mass adsorbent, K_f = affinity of adsorbate towards adsorbent $(L/mg)^{1/n}$
Langmuir isotherm	$C_e/q_e = 1/(q_m \cdot b) + C_e/q_m$	q_m = monolayer adsorption capacity b = Langmuir bio-sorption constant

Table 3 showing summery of kinetic models and isotherm models used in adsorption studies (Intidhar J Idan, 2017)

Adsorption of the different metals on sawdust adsorbents, their isotherm and kinetics is given below Table 4

Metal	Adsorbent	Isotherm	Kinetics	Reference
Cu, Ni, Zn	Beech sawdust	Langmuir equation	pseudo-second order	(Dragana Božić, 2013)
Pb, Cd, Ni	Sawdust of Walnut	Freundlich & Langmuir isotherm models.	pseudo first, second order intraparticle diffusion	(Bulutyasemin, 2007)
Zn, Cu, Pb, Ni & Cd	algae, sawdust of pine and Absol (Sand, lime, cement and water)	Freundlich and Langmuir isotherms	Pseudo second order	(Andersson)
Cu, Ni, & Cr	modified oak sawdust by means of HCl treatment	Langmuir and D-R adsorption isotherms	pseudo-second-order	(Mehmet Emin Argun, 2007)
Ni and Zn	the wooden biomass of <i>Dalbergia sissoo</i>		Pseudo-second-order kinetics	(Shatakshi Tiwari, 2021)
Chromium (VI)	Sawdust			(Samin Sirusbakht, 2017)

Pb ²⁺ , Cu ²⁺	Sodium methyllate treated Sawdust of <i>Albizia lebbeck</i> and epichlorohydrin and n-dodecylamine	Langmuir and D-R adsorption isotherms	pseudo-second-order	(Mohammad Nurnabi, 2020)
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Table 4 Summary of the Isotherm & Kinetics of adsorption of metal on sawdust

Such Kinetic and isotherm modeling helps us to calculate different parameters such as sorption capacity, sorption intensity by plotting graphs and with linear regression and help to understand the mechanism involved in adsorption.

III. MECHANISM INVOLVED IN ADSORPTION

Mehmet Emin Argun et al. (2007) described the adsorption process as spontaneous and endothermic. These adsorptions are favored by exchange of Ca from sawdust with metal ions. (Dragana Bozić, 2013). Normally chemisorption, covalent interactions take place. The similar results are reported by *D. sissoo* sawdust natural adsorbent for removal of Ni²⁺ and Zn²⁺. (Shatakshi Tiwari, 2021)

IV. CONCLUSION

For lesser concentrations of heavy metal ion in water bodies, so old water treatment methods of metal removal cannot be applied here. From the review of the various application of sawdust, it proved that it is cost effective but modification in adsorbent is required. The modifying agents can be heat, acids, bases, and other chemicals. So in future Saw dust can be effective low cost adsorbent capable of using in the water treatment. But in industry proper designs for industrial use are needed. Gap between experimental and industrial use must be shortened. More efforts are required. There is vast scope for research in this field for successful implementation of adsorbents such as Saw dust. Modifications should be done in adsorbent and its environmental impact also should be checked. Future research should be carried out on the extension of batch tests.

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Simultaneous HPTLC Determination of Aceclofenac and Drotaverine Hydrochloride in Tablet Dosage Form

Dr. Madhukar Arjun Badgujar

Department of Chemistry, Sheth J.N. Paliwala College Pali, Raigad, India
mabadgujar@gmail.com

Abstract: A normal-phase simple, rapid and precise high performance thin – layer chromatographic method has been developed for simultaneous quantitative determination of Aceclofenac and Drotaverine hydrochloride in a tablet dosage form. The analysis was performed on Silica gel 60F₂₅₄ on aluminum plates with acetonitrile – ethyl acetate – triethylamine, 2 : 7.6 : 0.4 v/v as a mobile phase. Detection and quantitation were performed densitometrically at wavelength 282nm. The developed method was validated for linearity, precision, solution stability, accuracy and robustness parameters. The linearity of Aceclofenac and Drotaverine hydrochloride were in the range of 50-150 µg/mL and 40-120µg/mL respectively. The correlation coefficient of Aceclofenac and Drotaverine hydrochloride were observed 0.9992 and 0.9995 respectively. Accuracy was checked by performing recovery studies from the pharmaceutical preparation. The average was found to be 99.48 ± 1.62% for Aceclofenac and 99.32 ± 1.52% for Drotaverine hydrochloride. The proposed HPTLC method was found to be accurate, precise and rapid for the simultaneous determination of Aceclofenac and Drotaverine hydrochloride in tablet dosage form.

Keywords: Drotaverine hydrochloride, Aceclofeanc, HPTLC

I. INTRODUCTION

Aceclofenac which has molecular formula C₁₆H₁₃Cl₂NO₄, molecular weight 354.19. Aceclofenac (ACF), {[2-(2',6'-dichlorophenyl) amino] phenyl acetoxyacetic acid} is a new phenyl acetic acid [1] derivative with potent analgesic and anti-inflammatory properties with improved gastric tolerance. Drotaverine is an antispasmodic drug that works by inhibiting phosphodiesterase-4 (PDE4).⁵ It is a benzyloisoquinoline derivative that is structurally related to papaverine, although it displays more potent antispasmodic activities than papaverine. Drotaverine Hydrochloride (DTV) chemically 1-[3, 4-(diethoxyphenyl)methylene]-6,7-Diethoxy-1,2,3,4-tetrahydroisoquinoline is an papaver analogue mainly used as antispasmodic and smooth muscle relaxant.[1]

Drotaverine has been used in the symptomatic treatment of various spastic conditions, such as gastrointestinal diseases, biliary dyskinesia, and vasomotor diseases associated with smooth muscle spasms. Literature survey revealed that various methods have been reported for the simultaneous determination of Aceclofenac and Drotaverine hydrochloride in pharmaceutical formulations,[1,3] viz, HPLC, UV and HPTLC [4-12]

II. EXPERIMENTAL

2.1 Working Standards and Chemicals

DTV and ACE working standard were obtained from ZESTICA Pharma (India). Tablet containing DTV(80mg) and ACE(100mg) were obtained from local market, AR grade methanol, acetonitrile and triethylamine were purchased from Merck India.

2.2 Instrumentation and Chromatographic Condition

The samples were spotted in the form of bands of width 5 mm with a desaga 100 µL sample syringe on silica gel precoated Al plate 60 F₂₅₄, with 200 µm thickness. These bands were applied with the help of Desaga AS 30- sample applicator at a distance of 10mm from X axis and 15mm from Y axis at the edge of the HPTLC plate with the speed of 150nl/sec for

methanol. The plates were prewashed by methanol and activated at 110°C for 5min prior to chromatography. The space between two bands was kept at 10mm. The slit dimension was kept at 4 x 3 mm and 4.0mm/s scanning speed was employed. The monochromator bandwidth was set at 10nm, each track was scanned thrice and base line correction was used. The mobile phase composed of acetonitrile – ethyl acetate – triethyl amine, in the ratio 2 : 7.6 : 0.4 v/v.

Linear ascending development was carried out in a twin trough glass chamber saturated with the mobile phase. The optimized chamber saturation time for mobile phase was 30min at room temperature ($25^{\circ}\text{C} \pm 2$) at relative humidity of $55\% \pm 5$. TLC plates were dried in current of air with the help of air dryer. Detection and quantification was performed in the absorbance mode using Desaga TLC scanner with Pro-Quant software. During the method development the spots on the TLC plate were visualized in a UV chamber equipped with a UV lamp at wavelength 254nm. The developed TLC plate was scanned between 200nm and 400nm wavelength using CD- 60 Densitometer. The wavelength selected for further quantification was 270nm.

2.3 Preparation of Standard Solution

100mg of ACE and 80 mg of DTV was accurately weighed and transferred to a 100mL standard flask. It was dissolved in a methanol and then diluted up to the mark with methanol.

The concentration of the solution obtained was 1000µg/mL for Aceclofenac and 800µg/mL for Drotaverine hydrochloride (solution A). 5 mL of this solution A was diluted to 50mL in a volumetric flask with methanol. The concentration of the solution obtained was 100µg/mL for ACE and 80µg/mL for DTV.

2.4 Preparation of Sample Solution

Twenty tablets were weighed and the average weight was calculated. These tablets were powdered and a weight equivalent to one tablet was taken in a 100mL volumetric flask and dissolved in minimum amount of methanol and was sonicated for about 30 minutes then diluted upto the mark with methanol. This solution was filtered through syringe filter. Then 5 mL of the sample solution was taken in a 50mL dilution flask and was diluted upto the mark with methanol (solution A). This is the sample solution of 100% level.

III. VALIDATION OF THE METHOD

The method was validated for linearity, precision, accuracy, specificity and solution stability.

Standard plots were constructed for both ACE and DTH in the range of 50-150µg/mL. The experiment was repeated thrice on the same day and additionally on two consecutive days to determine intra- and inter-day precision, respectively.

The intermediate precision (ruggedness) of the method was determined by repeating the experiment on two different instruments. Accuracy was determined by recovery studies. It was carried out by standard addition method by spiking 10%, 20% and 30% of the standard drugs in the 100 % sample solution. Three determinations were performed at each level. Further specificity of the method was tested by study of the resolution factor of the drug peaks from nearest resolving peaks. Robustness of the method was carried out by small changes in the mobile phase composition (± 0.1 mL for each component) and the effects on the results were studied. Time from spotting to chromatography and from chromatography to scanning was varied by ± 15 minutes.

3.1 Analysis of Marked Formulation

The developed method can be applied in determination of ACE and DTV in a tablet DROTANEC SPAS (ZESTICA Pharma) which is marketed oral solid dosage formulation. To determine the contents of Aceclofenac and Drotaverine hydrochloride (label claim : 100mg ACE and 80mg DTV per tablet), the contents of the tablet were emptied and weighed. The drug from the powder was extracted with 15mL of methanol. To ensure complete extraction of the analytes, it was sonicated for 30 min. The resulting solution was allowed to settle for about an hour and the supernatant was suitably diluted to give desired concentration. 10µL of the solution was applied on TLC plate followed by development, visualization and scanned. The analysis was repeated in triplicate. The possibility of excipients interference in the analysis was studied.

IV. RESULTS AND DISCUSSIONS

4.1 Optimization of the Chromatographic Conditions

In order to develop a normal phase HPTLC method for the determination of Aceclofenac and Drotaverine hydrochloride in combined dosage form the chromatographic conditions were optimized. For better separation and resolution, the mixtures of different solvents of varying polarity were tried.

The different compositions of mobile phases were changed for getting better separation of analytes. Initially, chloroform-ethyl acetate 4 : 6 (v/v) and acetonitrile, toluene 5 : 5 (v/v) were used. The best results were obtained by the use of acetonitrile, ethyl acetate and triethylamine in the ratio of (2 : 7.6 : 0.4v/v/v). This mobile phase showed good resolution and separation of ACE and DTV peak from other formulation components or excipients tested as seen in fig 2.

Densitometric scanning of all the tracks showed compound with R_f value 0.38 ± 0.05 for Aceclofenac and 0.59 ± 0.04 for Drotaverine HCL. As the separation was takes place in a short time period the proposed method is quicker as compare to reported method.

Parameters	Chromatographic conditions
Development chamber	Twin trough chamber
Stationary phase	Silica gel
Mobile Phase	Acetonitrile : Ethyl acetate : Triethylamine (2 : 7.6 : 0.4v/v/v)
Chamber saturation	15 min
Sample applicator	AS 30 - SAMPLE APPLICATOR
Band	8mm
Space	12mm
Scanning speed	20mm/sec
Development distance	8 cm
Drying of plate	Room temperature
Densitometric scanner	CD 60 - DENSITOMETER / SCANNER
Lamp	Deuterium
Wavelength	282 nm
Volume	10µl

Table 1: Optimized chromatographic conditions

4.2 Method Validation

A. Linearity and Range

Linearity was observed over the concentration range of 50 - 150µg/mL for ACE and 37.5 – 112.5µg/mL for DTV (Table 2). The linearity was confirmed by the high value of the correlation coefficients of r²= 0.9992 for ACE and 0.9995 for DTV

Table 2. Linear regression data

Drug	Linearity range	Correlation coefficient (r ²)	Slope	Intercept
Aceclofenac	50 - 150µg/mL	0.9992	3.250	-6.485
Drotaverine HCl	40 - 120 µg/mL	0.9995	7.846	-12.75

B. Precision

The developed method was validated for system precision and method precision. The precision study of the proposed method gave the results in the prescribed limits of relative standard deviation. This is less than 2 % for both analytes. The low value of RSD showed that the proposed method was reliable and reproducible.

Table 3: Precision study for Paracetamol and Mefenamic acid

Obs No	Aceclofenac		Drotaverine HCl	
	Peak Area	% Assay	Peak Area	% Assay
1	2450	101.61	1051	101.50
2	2475	101.50	1075	99.82

3	2445	101.05	1085	98.92
4	2499	100.80	1045	99.34
5	2442	98.98	1048	97.94
6	2482	99.78	1105	99.80
	Mean	100.62	Mean	99.55
	S.D	1.036	S.D	1.180
	%R.S.D	1.029	%R.S.D	1.186

C. Solution Stability

Stability of a sample solution was checked by using sample prepared in the precision study. The sample solution was stored at room temperature for 24 hrs then it was withdrawn at the intervals of 2 hr, 4 hrs, 12 hrs and then applied on the chromatographic plate stored at room temperature for 24 hours, withdrawn at the intervals of 2hrs, 4 hrs, 12 hrs and 24 hrs and then applied on the chromatoplate.

After development, the chromatogram was evaluated for additional spots if any. There was no indication of compound instability in the sample solution. The results shows that the solutions were stable for 24 hrs at room temperature.

D. Specificity

An investigation specificity was conducted during the validation of identification tests, the determination of impurities and the assay. Demonstration of specificity requires that there should not be any interference of impurities and excipients. In practice this was done by taking the chromatogram of sample solution and the assay result was unaffected by the extraneous material. It has been found that there was no interference of the diluents, placebo at the Rf value of the analytes.

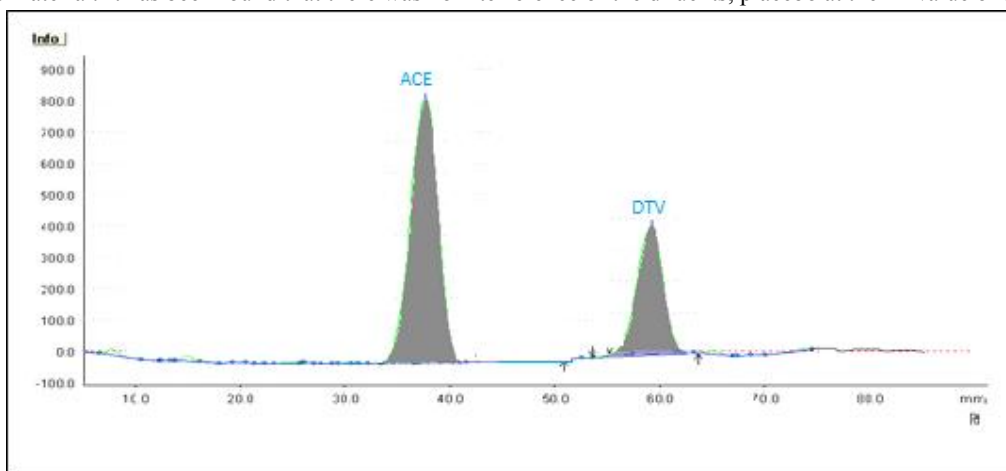


Figure 2: Typical HPTLC chromatogram 1) Aceclofenac 2) Drotaverine HCl

E. System Suitability Test

A system suitability test should be carried out to see if the HPTLC system is performing properly. System suitability tests were carried out as per the USP to confirm the suitability and the reproducibility of the system. The experiment was carried out using 100% level mixed standard solution of ACE and DTV. This solution was spotted five times on the chromatographic plate under the optimized chromatographic conditions. % RSD of the peak area shows that (Table 4) the proposed method was suitable for the system.

Table 4: System suitability for Aceclofenac and Drotaverine HCl

Obs No	100% Level			
	Aceclofenac		Drotaverine Hydrochloride	
	Peak area	Rf value	Peak area	Rf value
1	2433	0.38	1051	0.59

2	2450	0.39	1102	0.60
3	2451	0.39	1086	0.59
4	2459	0.39	1075	0.61
5	2425	0.38	1015	0.60
Mean	2443	0.386	1065	0.598
S.D	14.06	0.0054	33.92	0.0083
% RSD	0.5755	1.418	3.18	1.399

4.3 Accuracy (Recovery Experiment)

The accuracy of the method was determined by the standard addition method at three different levels. The sample solution of 100% level was considered as a zero level and 10% , 20% and 30% of the standard drug of ACE and DTV were added respectively. Each determination was performed in triplicates. The accuracy was then calculated as the percentage of the standard drug recovered by the recovery study. Mean recoveries for ACE and DTV from the sample solution are shown in Table 5 and 6. The results are within the acceptance limit and hence the method is accurate.

Table 5: % Recovery of ACE

Amount of Aceclofenac in ppm								
Sr. No	% Added	Original amount	Added amount	Total amount	Mean (n = 5)	% Recovery	S.D	% RSD
1	10	100	10.40	110.40	109.98	99.61	0.3881	0.3886
2	20	100	20.25	120.25	120.05	99.83	0.4922	0.4996
3	30	100	30.10	130.10	130.78	100.52	0.645	0.651

Table 6: % Recovery of ACF

Amount of Aceclofenac in ppm								
Sr. No	% Added	Original amount	Added amount	Total amount	Mean (n = 5)	% Recovery	S.D	% RSD
1	10	80	10.35	90.35	90.41	100.06	0.042	0.044
2	20	80	20.12	100.12	99.94	99.82	0.127	0.128
3	30	80	30.16	110.16	109.92	99.78	0.169	0.172

V. CONCLUSION

The HPTLC method for the determination of Aceclofenac and Drotaverine HCL from their tablet dosage form was found to be accurate, precise, specific and rapid. The results of the recovery studies show the high degree of accuracy of the proposed method. The advantage of the proposed method is that it require less time and cost effective method. Solvent consumption during the analysis is less. Therefore the proposed method can be applied successfully in routine analysis.

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Study of Natural Bio-Coagulants Moringa Oleifera and Cicer Arietinum for the Purification of Waste Water

P. D. Joshi¹ and V.R Jadhavar²

Department of Chemistry

K.E.S A.P. Science College Nagothane, Maharashtra^{1,2}

poonammuddebhalkar@gmail.com and vilasjadhavar1974@gmail.com

Abstract: Water is the most vital parameter among natural resources. Turbidity impart enormous problem in waste water treatment. In this present study, an attempt has made to evaluate the comparative effectiveness of chemical coagulant alum with natural coagulant such as Moringa Oleifera & Cicer Arietinum seed powder & oil extract. The pH, COD, BOD & turbidity was determined in treated sample of coagulant & maximum reduction efficiency was found in combined use of Moringa Oleifera & Cicer Arietinum seeds. As a result, it shows that the seed extracted powder of Moringa Oleifera and Cicer Arietinum removes the turbidity of water by nearly 96.5 to 98.3%. Moringa Oleifera and Cicer Arietinum seeds are very common & can easily available in nature and having low cost. Hence it was very cheap & every person can prepare it in their own at home in any village and can be used for the purification of water.

Keywords: Moringa Oleifera & Cicer Arietinum seeds, Waste water, Turbidity, Natural bio coagulants, etc.

I. INTRODUCTION

The use of Moringa Oleifera and Cicer Arietinum seeds for cleaner process in the water treatment has been proposed to treat raw water for the low income location for its abundant availability. Alum increases toxic metals and ions in treated water and can cause diseases like Alzheimer disease. Moringa Oleifera seed powder is non-toxic and biodegradable. Moringa Oleifera and Cicer Arietinum seeds can be used as an alternative to commercial coagulant Poly Ammonium Chloride (PAC) for water treatment in lake water & municipal water. Moringa Oleifera Seeds are more efficient than PAC in treating high turbid water. It is one of the most efficient main bio coagulant for water treatment including turbidity of surface water, alkali, organic contaminant in municipal water & industrial waste water including textile, coffee fermentation, pharmaceutical waste water, micro algae.

1.1 Objective of the Study

- To replace the use of alum to Moringa Oleifera or Cicer Arietinum seed extract as it increases toxic metals and ions in treated water & can cause Alzheimer's diseases.
- To reduce the cost for producing coagulants.
- To lower the turbidity of highly turbid water including municipal water and river water.

II. MATERIAL AND METHODS

Firstly measure the BOD, COD, pH & turbidity of six different water samples having different turbidity. Then we setup two different experiments, one using oil extract and second using powder form as combination of Moringa Oleifera and Cicer Arietinum seeds. In this experiment, natural coagulant Moringa Oleifera & Cicer Arietinum seeds were used to treat the samples & process parameters such as pH, turbidity, COD & BOD content were determined. This prepared coagulant includes 50:50 ratios of Moringa Oleifera & Cicer Arietinum seeds. Seed has a fairly soft kernel, so the oil can be extracted by hand using a screw press (also known as a 'spindle' or 'bridge' press). The seed is first crushed, 10% by volume of water is added, followed by gentle heating over a low fire for 10–15 minutes, taking care not to burn the seed (Meenakshi M. et al, 2015; Amaziah and Arthur Wokocha, 2016 and Suresnarayasamy, halimimohdsaud, 2014).



Cicer Arietinum Seeds & Powder

1. Moringa Oleifera



Fig.1 Moringa oleifera seed and powder

We take six different jar containing water samples. In first setup we use oil extract form of coagulant & stir under magnetic stirrer for 10-15 min. Then allowing them to settle for 3-4 hours. We will measure the change in pH, COD, BOD & turbidity. In second setup we use powder form as coagulant & repeat the same procedure then measure the pH, COD, BOD and turbidity of water sample (Mohammed Sulaiman,2017).

BOD is empirical test which measures oxygen required by microorganisms for the biochemical degradation of organic matter to carbon dioxide and water. COD can be measured by the method in which the organic matter present in sample gets completely oxidised by $K_2Cr_2O_7$ in presence of H_2SO_4 to form carbon dioxide and water. The excess of $K_2Cr_2O_7$ remaining after the reaction is titrated with Ferrous Ammonium Sulphate the $K_2Cr_2O_7$ used oxygen required for oxidation of organic matter. Which form is effective either oil extracts or powder form will be compared.

III. RESULT AND DISCUSSION

Moringa Oleifera and Cicer Arietinum Seed Powder: The seeds of Moringa Oleifera and Cicer Arietinum were collected from the various locations. The seeds were dried under sun for 4-5 days . Then the seeds were crushed and grounded in domestic mixer to lowest possible size.

Water Sample: The study is done by experimental method by taking water samples from different sources. The series of samples having different turbidity was prepared.



The prepared Moringa Oleifera and Cicer Arietinum seed powder was proved to be very good bio-coagulant compared to some traditional coagulant like alum since it remove nearly 97 to 98% turbidity of water.

As results shows that, the seed extracted powder of Moringa Oleifera and Cicer Arietinum removes the turbidity of water by nearly 96.5 to 98.3%. Moringa Oleifera and Cicer Arietinum seeds are very common & can easily available in nature so it was cost efficient. Hence it was very cheap & every person can prepare it in their own home in any village where there is no advance method for the purification of water.

As this research proves that Moringa Oleifera seed powder is a good bio-coagulant to remove turbidity of water, it will be better if we use activated charcoal in addition with powder.

V. CONCLUSION

Water is the most vital parameter among natural resources. Turbidity impart enormous problem in waste water treatment. In this present study, an attempt has made to evaluate the comparative effectiveness of chemical coagulant alum with natural coagulant such as Moringa Oleifera & Cicer Arietinum seed powder & oil extract. The pH, COD, BOD & turbidity was determined in treated sample of coagulant & maximum reduction efficiency was found in combined use of Moringa Oleifera & Cicer Arietinum seeds.

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An Insight into the Physico-Acoustical Properties of Biologically Active heterocycles: Chalcones in Different Solvents at Various Temperatures

Kallappa Mahajan, Balaji Gop and Sitaram Chavan

P.G. Department of Chemistry, D.B.F. Dayanand College of Arts and Science, Solapur, Maharashtra, (India)
kjmahajan8275@gmail.com, bgop24@gmail.com, dr_skchavan@yahoo.co.in

Abstract: *The density, viscosity and ultrasonic velocity have been measured for synthesized (2E)-3-(4-Chlorophenyl)-1-(4-fluorophenyl) propenone (FCC) in DMF, THF and CHCl₃ solutions of various concentrations at 300.15K with a view to understand the molecular interactions in these solutions. The experimental data have been used to calculate various acoustical parameters, which are interpreted in terms of solute-solute and solute-solvent interactions in different solvents.*

Keywords: FCC, Density, Viscosity, Ultrasonic Velocity, DMF, THF, CHCl₃, Acoustical Parameters.

I. INTRODUCTION

Chalcones are unsaturated ketones containing the reactive keto and ethylenic group --CO--CH=CH-- and are colored compounds due to presence of the chromophore and auxochromes [1, 2]. Chemically they are open-chain flavonoids in which the two aromatic rings are joined by a three carbon α, β unsaturated carbonyl system. Chalcones are characterized by their possession of a structure in which two aromatic rings are linked by an aliphatic three carbon chain. The presence of different substituents around the chalcone ring system shows very different physical and chemical characteristics which are reflected in their biological activities [3-8]. The chemistry of chalcones has generated intensive scientific studies throughout the world, due to their biological and industrial applications. Chalcones are characterized by their possession of a structure in which two aromatic rings are linked by an aliphatic three carbon chain. Different methods are available in the literature for the synthesis of chalcones. The most convenient method is the one, which involves the Claisen-Schmidt condensation of equimolar quantities of aryl methyl ketones with aryl aldehyde in presence of alcoholic alkali [9-13]. The chalcones have been found to be useful for the synthesis of variety of heterocyclic compounds and are associated with different biological activities.

Now a days, lots of interest has been generated on the use of ultrasound radiation in synthetic organic chemistry, which includes decrease of reaction time, increase of yield, lower reaction temperature etc. [14-17]. By ultrasonic sound velocity measurements, the molecular interactions in pure liquid [18], aqueous solutions [19-21] and liquid mixtures [22] have also been studied.

Several physico-chemical parameters are available in the list and few of them are of much interest. It was well understood by the literature that physico-chemical properties such as acoustical properties, density, viscosity, ultrasonic sound velocity, etc. of the organic as well as heterocyclic compounds. These properties have contributed advancement in the physical sciences and also in daily human life. The study of physico-chemical properties of compounds in solutions gives complete understanding of the behavior of compounds in different solvents. These properties are the sensitive indicators for understanding molecular interactions.

Thus, in the present work, (2E)-3-(4-Chlorophenyl)-1-(4-fluorophenyl) propenone (FCC) was synthesized and characterized by IR and NMR spectra. Various physico-chemical properties and acoustical properties such as density, viscosity and ultrasonic sound velocity have been studied in dimethylformamide (DMF), tetrahydrofuran (THF) and Chloroform (CHCl₃) for different concentrations of 3-(4-Chloro-phenyl)-1-(4-fluorophenyl) propen-1-one (FCC) solution were done at 300.15K, 305.15K and 310.15K with a view to understand the molecular interactions in these solutions. From these experimental data, various acoustical parameters such as isentropic compressibility, Rao's molar sound function, specific acoustical impedance, internal pressure, Vander Waals constant, free volume etc. were evaluated and results are discussed.

II. MATERIALS AND METHODS

2.1. Preparation of (2E)-3-(4-Chlorophenyl)-1-(4-fluorophenyl) propenone (FCC)

Chalcones are usually synthesized in the laboratory by various synthetic methods. The present compound was synthesized by Claisen-Schmidt condensation using ethanol as reaction medium. Melting points (°C) were determined with a MELTEMP II capillary apparatus (LAB Devices, Holliston, MA, USA) without correction. IR spectra were recorded on FT-IR spectrometer (Perkin Elmer) using KBr disc method. ¹H NMR spectra were recorded on Bruker 400 MHz spectrometer in CDCl₃ as a solvent. TLC was performed on silica gel coated plates for monitoring the reactions.

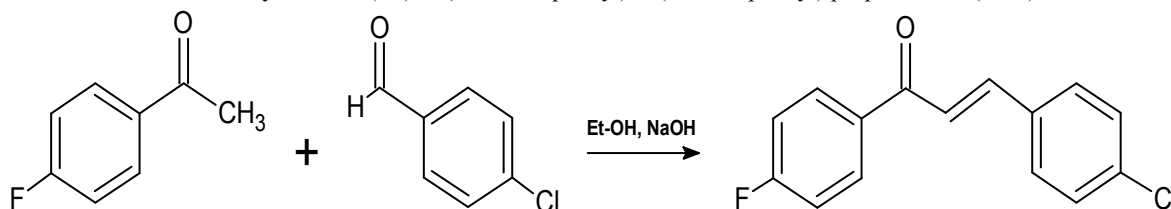
2.2 Evaluation

The general procedure for the synthesis of (2E)-3-(4-Chlorophenyl)-1-(4-fluorophenyl) propenone (FCC)

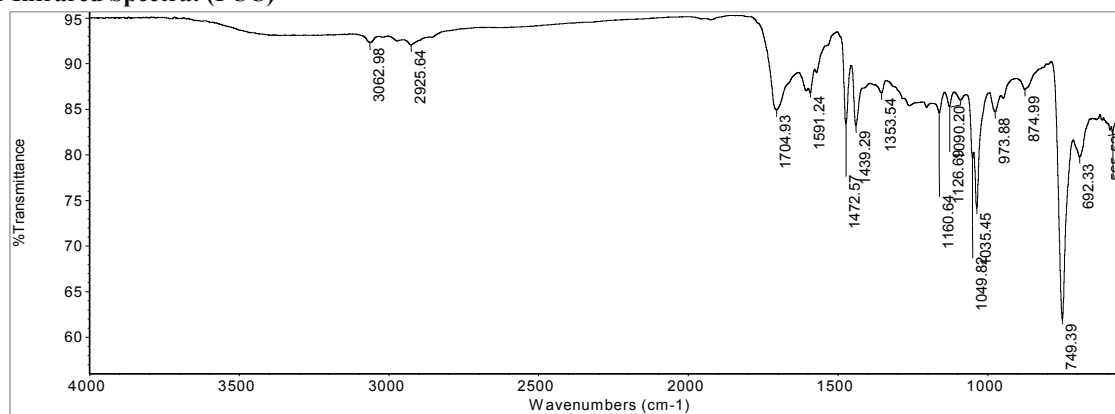
A mixture of 4-methyl benzaldehyde (1 mmol) and 4-chloroacetophenone (1 mmol) was dissolved in 15 mL ethanol. To this mixture, sodium hydroxide (20%, 1mL) was added and the reaction mixture was stirred at room temperature for 12hr. After completion of the reaction (monitored by TLC), the crude mixture was worked up in ice-cold water (100 mL). The product which separated out was filtered and recrystallized from ethanol to afford title compound.

Melting points were determined by Deep Vision instrument. The purity of the compound was checked by TLC using silica gel coated plates and spots were visualized by exposing the dry plates in iodine vapour chamber. IR spectra were recorded in the solid state, use of the FT-IR-Spectrometer. The ¹H NMR spectra of the compounds were carried out in Bruker AMX 400 MHZ. NMR instrument using CDCl₃ as a solvent and TMS as internal reference (chemical shift in δ ppm). The mass spectra of the compounds were carried out in ESI Mass.

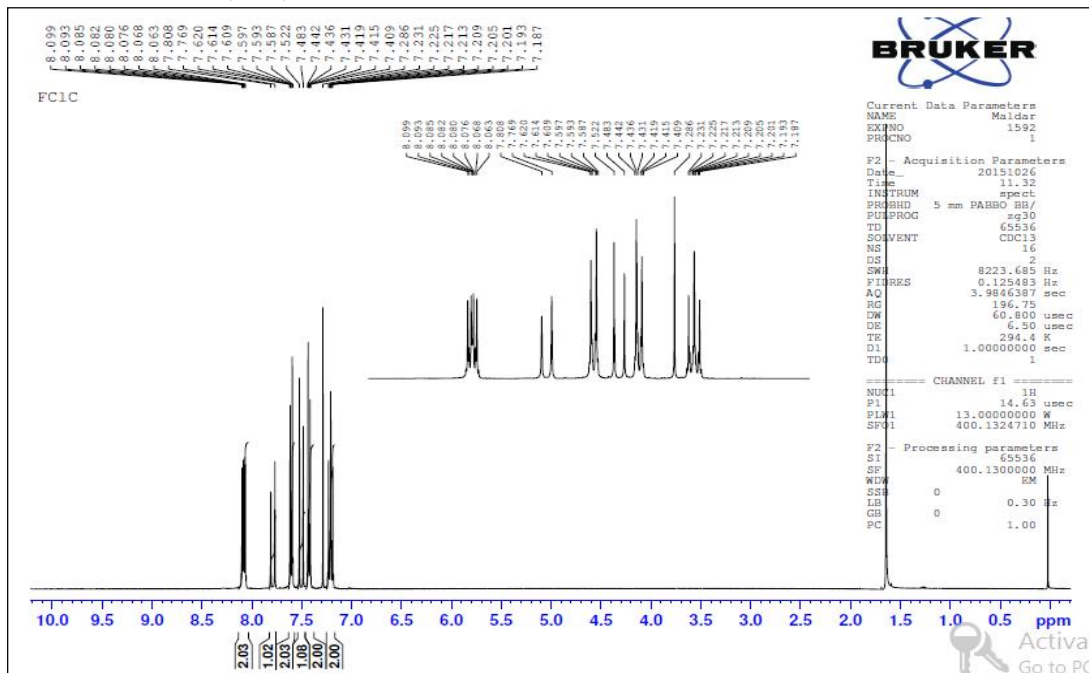
Scheme: Synthesis of (2E)-3-(4-Chloro-phenyl)-1-(4-fluorophenyl) propen-1-one (FCC)



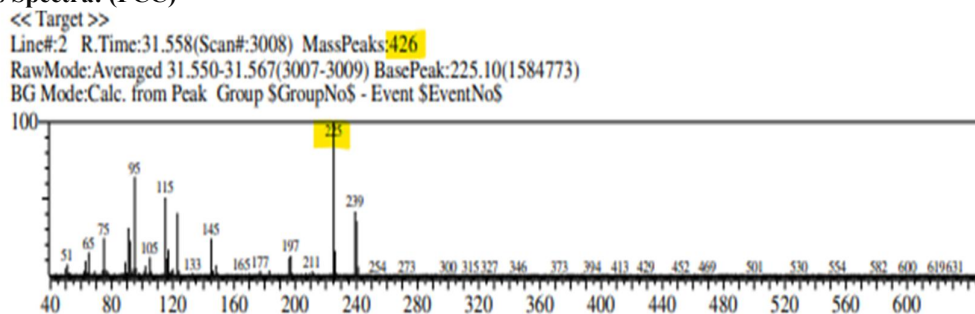
2.2.1 Infrared Spectra: (FCC)



2.2.2 ¹H NMR SPECTRA: (FCC)



2.2.3 Mass Spectra: (FCC)



2.3 Spectral Characterization

Yield: 58 %; **M. F.:** C₁₅H₁₀ClFO; **Mol. Wt.:** 260.69; **Colour:** light pink; **M. P.:** 140 °C

IR (cm⁻¹)

2930.37, 1665.50, 1597.61, 1320.85, 1219.23, 840.58.

¹H NMR

(400 MHz, CDCl₃) δ: 7.18 – 7.23 (2H, m), 7.41 – 7.45 (2H, m), 7.51 (1H, d, *J* = 16 Hz), 7.59 – 7.62 (2H, m), 7.78 (1H, d, *J* = 16 Hz), 8.06 – 8.09 (2H, m).

GCMS (ESI)

m/z [M] calcd. C₁₅H₁₀OCIF, for: 260.69; found: 260

2.4 Choice of Solvents

N,N-Dimethylformamide (DMF), Tetrahydrofuran (THF) and Chloroform (CHCl₃) have been chosen as solvents in the present article. The densities, viscosities and ultrasonic velocities of solvents and solutions of different concentration were measured at 300.15, 305.15, 310.15 K by using pycnometer, an Ubbelohde suspended level viscometer and ultrasonic interferometer¹⁸.

2.5 Experimental

The densities, viscosities and ultrasonic velocities of solvents and solutions of different concentration in DMF, THF and CHCl_3 were measured at 300.15K, 305.15K and 310.15K by using pycnometer, an Ubbelohde suspended level viscometer and single frequency ultrasonic interferometer operating at 2 MHz, with the uncertainties of 0.0001g/cm³, + 0.06 % and 0.01% respectively.

Density Measurements (ρ)

The density, of a substance is its mass per unit volume.

$$\text{Density } (\rho) = \frac{\text{Mass}(M)}{\text{Volume}(V)}$$

The experimentally densities were evaluated by using following equation,

$$\text{Density}(\rho) = \frac{(\text{wt. of solvent or solution})(\text{density of water})}{(\text{wt. of water})} \text{ g/cm}^3$$

Viscosity Measurement (η)

The determination of the viscosity of liquids or solutions are more accurately carried out by using Ubbelohde viscometer. Using the time taken for the distilled water and solution, the viscosity of unknown solutions is determined.

$$\frac{\eta_s}{\eta_w} = \frac{t_s \rho_s}{t_w \rho_w}$$

Where η_w , ρ_w and t_w are the viscosity, density and time flow of distilled water respectively and η_s , ρ_s and t_s are the viscosity, density and time flow of unknown liquid or solution respectively.

Ultrasonic Velocity Measurement (U)

The solvent/solution were filled in the measuring cell with quartz crystal and then micrometer was fixed. The circulation of water from the thermostat of required temperature was started and test solvent/solution in the cell is allowed to thermally equilibrate. The micrometer was rotated very slowly so as to obtain a maximum or minimum of anode current (n). A number of maximum reading of anode current were counted. The total distance (d) travel by the micrometer for n=10, was read. The wave length (λ) is determined by using the equation,

$$\lambda = \frac{2d}{n}$$

The sound velocity (U) of solvent and solutions were calculated from the wavelength and frequency (F) according to equation

$$U = \lambda F$$

From the experimental data of density, viscosity and ultrasonic sound velocity, various acoustical parameters are evaluated using standard equations [23-26].

Initially, all required concentrations of solutions for synthesized compounds were prepared in different solvents using calibrated volumetric flasks. All the prepared samples were retained at the desired temperature for 24 hr. to ensure their solubility at the temperature.

The experimentally calculated data of density (ρ), viscosity (η) and ultrasound velocity (U) of pure solvents and solutions of synthesized compounds in DMF, THF and CHCl_3 at three different temperatures are reported in tabular form (tables: 1 to 9) as follows:

Table: 1. Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in DMF at 300.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm ⁻³)	Viscosity ($\times 10^{-3}$ Nsm ⁻²)	Sound velocity (ms ⁻¹)
1	00	0.9349	0.6596	1401.5
2	2.0	0.9361	0.6843	1408.7

3	4.0	0.9366	0.7143	1419.4
4	6.0	0.9370	0.7235	1428.2
5	8.0	0.9377	0.7391	1436.7
6	10	0.9380	0.7596	1448.2

Table 2: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in DMF at 305.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	0.9343	0.6056	1383.3
2	2.0	0.9344	0.6515	1390.1
3	4.0	0.9349	0.6868	1389.5
4	6.0	0.9363	0.7037	1409.7
5	8.0	0.9358	0.7202	1427.0
6	10	0.9374	0.7427	1429.8

Table 3: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in DMF at 310.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	0.9337	0.5739	1363.9
2	2.0	0.9347	0.6235	1370.9
3	4.0	0.9353	0.6531	1379.5
4	6.0	0.9360	0.6720	1391.3
5	8.0	0.9364	0.6821	1397.3
6	10	0.9370	0.7016	1409.5

Table 4: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in THF at 300.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	0.8684	0.8505	1256.3
2	2.0	0.8689	0.8580	1265.3
3	4.0	0.8690	0.8627	1268.8
4	6.0	0.8698	0.8670	1273.2
5	8.0	0.8711	0.8720	1276.4
6	10	0.8701	0.8766	1279.6

Table 5: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in THF at 305.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	0.8679	0.8383	1234.2
2	2.0	0.8684	0.8450	1241.0
3	4.0	0.8690	0.8546	1244.7
4	6.0	0.8691	0.8605	1247.6
5	8.0	0.8693	0.867	1253.7
6	10	0.8702	0.8702	1258.8

Table 6: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in THF at 310.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	0.8675	0.8256	1208.0
2	2.0	0.8677	0.8320	1215.2
3	4.0	0.8680	0.8388	1219.3
4	6.0	0.8687	0.8470	1223.0
5	8.0	0.8690	0.8523	1227.1
6	10	0.8695	0.8585	1234.1

Table 7: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in CLF at 300.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	1.4773	0.5303	986.65
2	2.0	1.4783	0.5340	988.97
3	4.0	1.4790	0.5361	990.58
4	6.0	1.4791	0.5371	992.33
5	8.0	1.4799	0.5380	994.00
6	10	1.4803	0.5383	995.62

Table 8: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in CLF at 305.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	1.4714	0.5111	965.64
2	2.0	1.4720	0.5131	967.90
3	4.0	1.4737	0.5140	969.64
4	6.0	1.4739	0.5155	971.36
5	8.0	1.4745	0.5164	972.80
6	10	1.4756	0.5190	974.45

Table 9: Experimental data of density (ρ), viscosity (η) and ultrasonic velocity (U) of FCC with different concentrations in CLF at 310.15 K.

Sr. No.	Conc. ($\times 10^{-3}$ M)	Density ($\times 10^{-3}$ kgm $^{-3}$)	Viscosity ($\times 10^{-3}$ Nsm $^{-2}$)	Sound velocity (ms $^{-1}$)
1	00	1.4684	0.4966	943.46
2	2.0	1.4690	0.4987	945.63
3	4.0	1.4700	0.4993	947.09
4	6.0	1.4705	0.4995	948.73
5	8.0	1.471	0.5001	950.43
6	10	1.4720	0.5020	952.01

2.6 Graphs

Fig.: 1. Variation of density with temperature concentrations of FCC in DMF

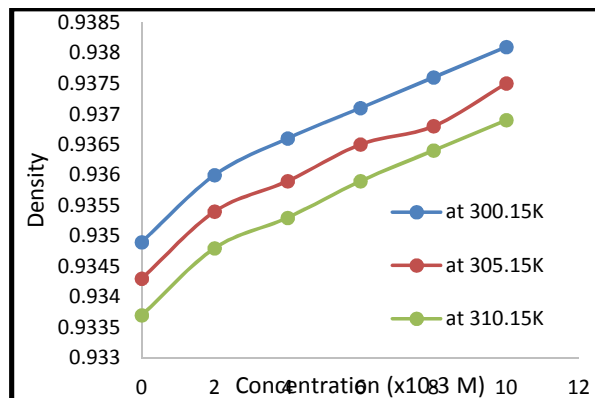


Fig.: 2. Variation of density with temperature at different concentrations of FCC in THF:

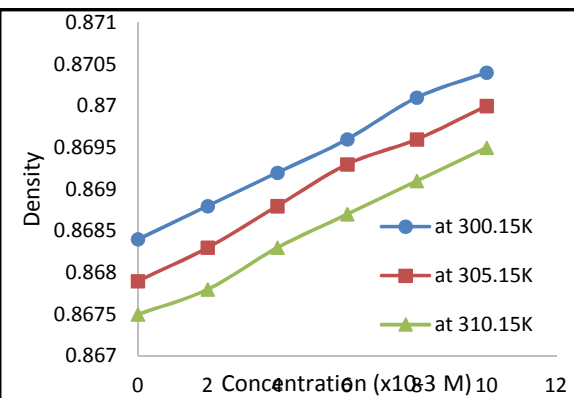


Fig.: 3. Variation of density with temperature at different concentrations of FCC in CLF

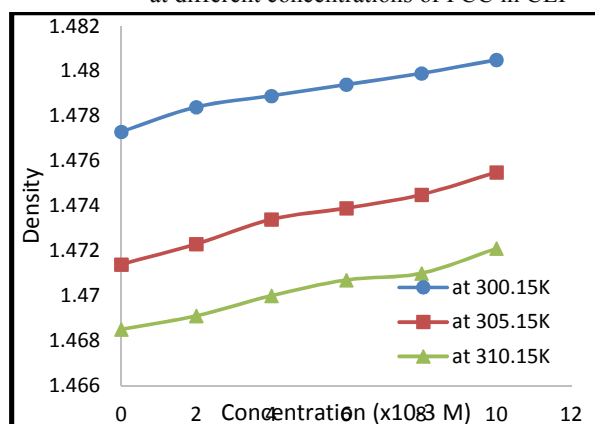


Fig.: 4. Variation of viscosity with temperature different concentrations of FCC in DMF:

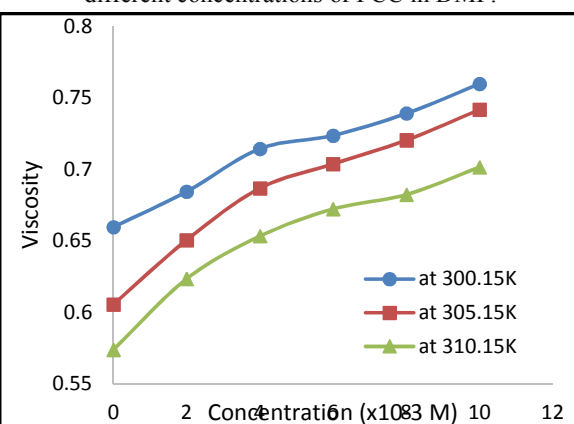


Fig.: 5. Variation of density with temperature at different concentrations of FCC in THF

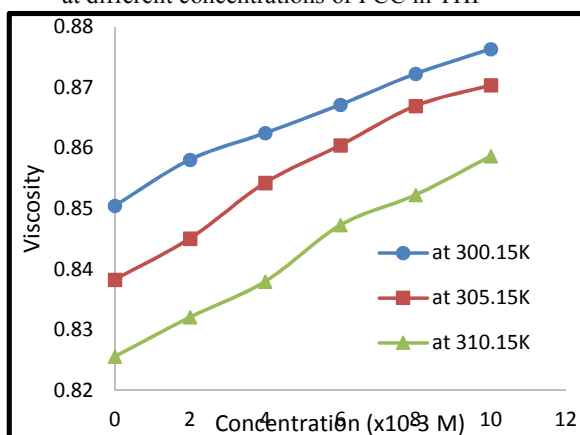


Fig.: 6. Variation of viscosity with temperature at different concentrations of FCC in CHCl₃

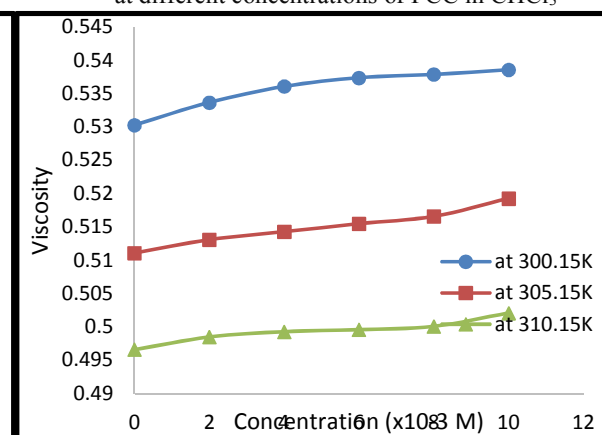


Fig.: 7. Variation of ultrasonic velocity with temperature at different concentrations of FCC in DMF:

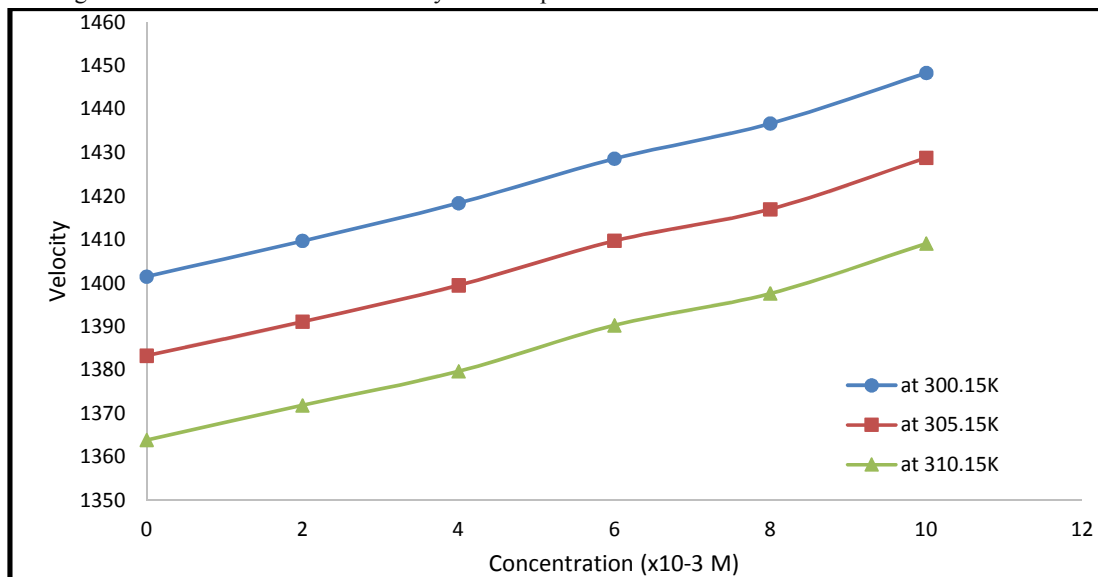


Fig.: 8. Variation of ultrasonic velocity with concentrations of FCC

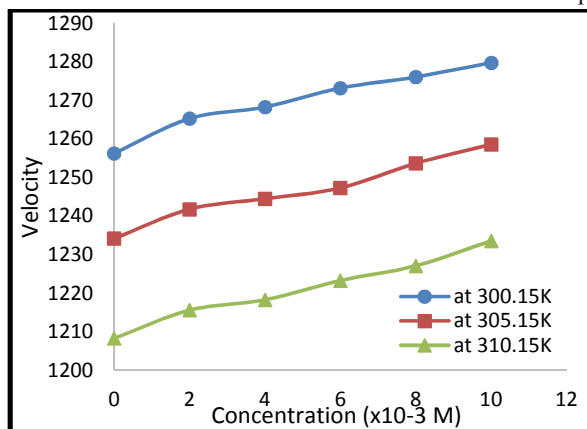
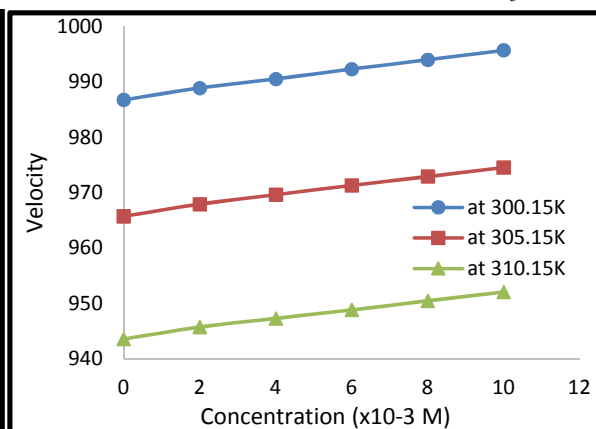


Fig.: 9. Variation of ultrasonic velocity with temperature at different concentrations of FCC in CHCl₃ in THF



2.7 Biological Activity:

In the present article, In Vitro Anti-oxidant activity and Anti-inflammatory activity of synthesized compound (2E)-3-(4-Chloro-phenyl)-1-(4-fluorophenyl) propen-1-one was studied.

Table 10: In vitro anti-oxidant activity FCC:

1	FCC	25	0.919	0.886	-
			0.861		
			0.878		
		50	1.004	0.895	-
			0.764		
			0.918		
		100	0.674	0.564	33.88
			0.501		
			0.516		

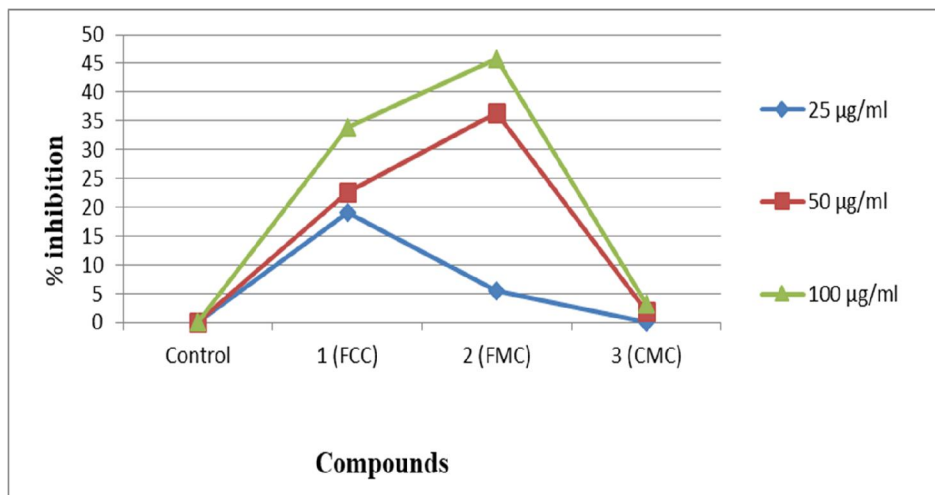


Figure 10: In vitro anti-oxidant activity

The (2*E*)-3-(4-Chloro-phenyl)-1-(4-fluorophenyl) propen-1-one (FCC) compound have been synthesized and evaluated for antibacterial activity against specifically *Bacillus Subtilis* and *Pseudomonas aerogenosa* bacteria by Biofilm formation assay method. Among the synthesized compounds, the compounds FCC have shown the excellent activity showing significant inhibition which may lead to the development of the new drug.

Table 11: In vitro anti-inflammatory activity FCC:

1	FCC	10	0.26	03.70	125.30
		30	0.25	07.40	
		100	0.17	37.03	

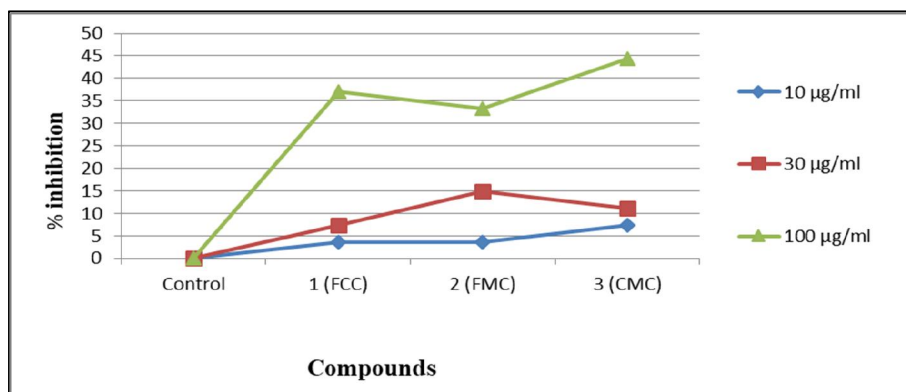


Figure 11: Anti-inflammatory activity

The (2*E*)-3-(4-Chloro-phenyl)-1-(4-fluorophenyl) propen-1-one was synthesized and evaluated for their anti-inflammatory activity by Membrane Lysis Assay. The result of anti-inflammatory activity reveals that all compounds were found to possess significant activity. Thus, this compound constitute an interesting template for the evaluation of new anti-inflammatory agents and may be helpful for the design of new therapeutic tools.

III. RESULTS AND DISCUSSION

Physicochemical properties of pure and mixtures of solute and solvent are having great importance in the field of science and industrial engineering. In particular tension on the surface of film caused by some attraction, density affects some important steps in the production process such as absorption on surface and separation from the mixtures (extraction). The

need of viscosity can useful to detect various types of fluids mainly liquids on molecular and atomic basis. Temperature dependence of viscous/sticky behavior of inorganic mixture were play on important role for characteristics the materials. In the present work, density, viscosity and ultrasonic sound velocity have been studied in DMF, THF and CHCl_3 for different concentrations of FCC at 300.15, 305.15 and 310.15K. From the experimental data (Table 1 to 9) and figures from 1 to 9 shows variation in density(ρ), viscosity(η) and ultrasonic sound velocity(U) of pure solvents (DMF, THF and CHCl_3) and the solutions of synthesized compound. It is observed that density, viscosity and ultrasonic velocity (U) increases with increase in concentration of the compound due increase in amount of compounds. The increase in temperature a solution causes molecules to speed up and causes slightly further apart, occupying a larger volume that results in a decrease in density. The increase in temperature causes the kinetic or thermal energy to increase and the molecules become more mobile, due which attractive binding energy is reduced and therefore the viscosity is reduced. The temperature variation of the solutions indicates that the strength of intermolecular interaction increases with increase in temperature.

IV. CONCLUSION

In summary, the ultrasonic velocity, density and viscosity measurements of titled (FCC) compound are carried out in various organic solvents at various temperatures. The strong molecular interactions are confirmed. The trends and deviations in derived parameters were confirmed further the existence of strong interactions and dipole-dipole interaction. The linearity in properties concluded the specific interaction between the solute and solvent molecules. At lower values the strong molecular interaction through H -bonding. It is confirmed that at low value of concentrations shows the weak interaction among the solute-solvent interaction. This suggests that interactions exist among solute-solute and solute-solvent in these systems.

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