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**BIOFUEL: REPLACING THE FOSSIL FUEL AS ENERGY SOURCE**

**KaziFazilat Sultana Javed Waliulla**, *Head of the Department, of Zoology., Anjuman Islam, Degree College of Science, Murudjanjira, Raigad, Maharashtra*

**Miss. Ahire Yayati**, *Student, Anjuman Islam, Degree College of Science, Murudjanjira, Raigad, Maharashtra*

**1. Introduction:** The major source of the energy being used in today's world comes mainly from the fossil fuels. All these fuels contain materials such as metal, sulfur, and nitrogen compounds in addition to carbon, hydrogen, and oxygen. Different harmful pollutants are generated such as fly ash, sulfur oxides, nitrogen oxides, and other volatile compounds during the process of combustion. Moreover, fossil fuels have non-renewable energy sources which are derived from pre-historic fossils. These are primarily formed from the remains of the decayed plants and animals of the carboniferous era. The main types of fuel sources that are being used to meet the energy and electricity demands of today's world are coal, natural gas, and oil/petroleum help. The source of these fuels is limited and are depleting at a faster rate (1). Particulate matter produced by the burning of fossil fuel can not only pollute the air, it also contaminates the water and soil leading to deterioration and degradation of the same. Wet and dry inorganic pollutant gets deposited leading to acidification of the environment. The obvious consequences are increased corrosion, deterioration of cultivated soil, forest etc. Besides, plant and wildlife is also susceptible such pollution. It is reported that wildlife has been extensively harmed in Europe and North America. Most of the food plants, crops, and other coniferous trees are not also resistant to oxides and thus leading to withered and falling leaves. Biofuels are energy-rich compounds alternative to conventional fossil fuels. Biofuels are produced from the biomass namely microalgae, plants, and bacteria. Other sources with a high value of the heat of combustion are also used as the source of biofuels such as biohydrogen, biodiesel, bioethanol, and biomethanol. Biofuel poses several advantages over fossils fuels. The sources used in the production of biofuel are renewable and releases less toxic compounds in the environment during combustion. Moreover, there is no scope for emitting CO<sub>2</sub> in the whole process saving the environment to some extent (2).

**2. Evolution of biofuel production:** Depending on the type of biomass usage, biofuels can be divided into the primary and the secondary ones. The primary biofuels are the natural biofuels directly produced from firewood, plants, forest, animal waste, and crop residue. This is the main fuel used in the Third World countries for heating, cooking and agricultural needs. They are also called as traditional Biomass. The secondary biofuel is produced from biomass usually from the primary biofuel. This particular category can be further classified into three more generations: first generation, second generation, and third generation biofuels depending on the various parameters such as:

- Use of general feedstock for fuel production,
- The processing methods, and
- Historical sequence of the fuel's appearance on the world energy market.

First generation biofuels are produced from biomass of food crops which are enriched with sugars, starch, and oils such as soybeans, sunflower seeds, and rapeseeds. Bioalcohols and biodiesel are two of the first generation biofuels that have been widely used. second generation biofuels are devised to overcome the setback of the first generations biofuels. They are produced from lignocellulosic biomass. The third generation of biofuel is produced from algal biomass and is a relatively new direction of bioenergetics production (3).



### 3. Sources of biofuel

#### *Biomass used in biofuel production*

**Wood:** this is the commonly used biomass that has been used for cooking and heating. Even in the present day, this is the main source of energy in developing countries.

**Algae:** main biomass used for the production of third generations of biofuels. Main sources of algae come from the stagnant ponds in the natural world, and more recently in algae farms. Recently algae have been used experimentally as a new form of green jet fuel designed for commercial travel (4).

**Carbohydrate (sugars) rich biomaterial:** the main source for this biomaterial is derived from products like wheat, beets, corn, sugar cane, and other existing food crops (1).

**Oils rich biomaterial:** this is used to produce the biodiesel for automobiles, and home heating, the Main source for this material is various food crops such as rapeseed, sunflower, corn, and others. The main advantage of this type of biomass is that it is not susceptible to microbial degradation, and can be re-used. It is being experimentally used in the production of green jet fuel (1).

**Biorefinery:** The biorefinery is a facility where the biomass is used to produce a spectrum of marketable products and energy. This biorefinery concept is somewhat similar to the petroleum refinery (5).

### 4. Mechanism of biofuel production

**Thermochemical conversion:** This method involves several processes such as gasification, liquefaction, pyrolysis, and hydrogenation and proved to be an efficient method of biofuel production from algal biomass. (6)

1. Gasification: in this process biomass is treated for temperatures above 1000 K and a gas mixture is formed including CO<sub>2</sub>, CO, H<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub> and other such compounds.
2. Liquefaction: in this process catalytic thermal decomposition of biomass produces unstable small components, which are then combined to form bio-oils.
3. Pyrolysis: this is an anaerobic decomposition of biomass (temperatures range from 650 to 800 K). The substance proceeds in a vapor phase and then condenses into the mixture, called bio-oil.
4. Hydrogenation: This is a simple reduction process involving the addition of hydrogen to the unsaturated organic compound. Generally, algal hydrogenation is performed in presence of the solvent and a catalyst in an autoclave.  
(:10.1016/j.enconman.2009.03.001)

#### *Biochemical conversion*

1. Fermentation: The fermentation reactions are caused by microorganisms, which feed on sugar-enriched feedstock. The process of fermentation requires less consumption of energy. Moreover, CO<sub>2</sub> produced as a by-product during this process can be used as carbon sources for microalgae in cultivation process and therefore reduce the emission of greenhouse gases (2).
2. Transesterification: Transesterification of vegetable oils and animal fats with methanol or ethanol is used for biodiesel production (2).

**5. Economic and environmental impact:** Biofuel has various advantages over fossil fuel. The main advantage is that it produces lesser amount of greenhouse gas (GHG) emissions with no net increase in atmospheric carbon dioxide (CO<sub>2</sub>). Another environmental benefit of biofuels is the fact that it is made from renewable resources (7). In addition to the environmental impact, biofuels tend to be cheapest when compared to the fossil fuels. One of the main reason behind the biofuel research was the high petroleum price. The cost of biofuel production can be further reduced by the use of inedible oils and used oils, instead of using edible vegetable oil (7).

**6. Conclusion and future perspective:** With the ever-increasing global energy demand, fossil energy has the continuing weaknesses with the significant risk to the environment. The amount of fossil fuel consumed globally is increasing with time and consequently depleting fast in an alarming manner. In addition, burning of fossil fuel creates several harmful impacts on the environment. Therefore, an increased use of biomass-derived fuels has the potential to meet the future demand for energy in an eco-friendly and cost-effective manner.

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## मराठी नाटकांचे चित्रपटातील रूपांतर!

डॉ.प्रा.शशिकांत चौधरी, 'सुमित्रा', ६३०/१-ए, बी वॉर्ड, जवाहरनगर, कोल्हापूर.

महाराष्ट्र नाट्य वेडा आहे. मराठी माणसाचे नाट्यप्रेमच मुळात अफलातून असल्यामुळे मराठी रंग•मीचा हा चालता, बोलता वसा आणि वारसा काळानुरूप बदलत आला आहे. बदल हे परिवर्तनाचे पहिले लक्षण आहे. मग तो बदल आचारात असेल, विचारात असेल, कलेतला असेल वा साहित्यातला असेल. पण तो डोळसपणे समजून घेणे महत्त्वाचे आहे. विष्णुदास •ावे, अण्णासाहेब किर्लोस्कर, कृ.प्र.खाडिलकर या मंडळींनी मराठी नाट्यसृष्टीचा पाया बळकट केला. संगीत नाटकाच्या माध्यमातून मराठी माणसाचे मन आणि कान तयार करण्यात ही मंडळी यशस्वी ठरली. त्यांच्या लेखणीने मराठी नाटक गतीमान झाले. पण ते गतिमान करण्यात जे कलावंत पुढे आले, त्यांचे योगदान खूपच मोठे आहे. विशेषत बाल गंधर्व यांच्या सौंदर्याने, अ•िनयाने, तत्कालीन मराठी रसिक घायाळ तर झालेच, पण फॅशनच्या क्षेत्रातले इंडियन आयडॉल म्हणूनच आजही त्यांच्या वेश•ुषेमुळे, केश •ुषेमुळे, अ•िनय आणि त्यांच्या दर्द•री गायनाकडे पाहिले जाते. नाटकाच्या दृष्टीकोनातून ज्यांनी त्यांना जवळून पाहिले, ती पीढी तर •ाग्यवान होतीच पण आपली पिढी त्या लौकिक इतिहासाकडे आजही डोळसपणाने पाहते आहे, हे त्यांच्या व्यक्तिमत्त्वाचे मोठेपण आहे.

नाटक हा लाईव्ह परफॉर्मन्स आहे. हजारो प्रेक्षकांच्या साक्षीने ते घडते. अ•िनयाचे, गायनाचे बारकावे आपल्याला पाहता येतात. पण चित्रपट माध्यमाचे तसे नाही. मराठी रंग•मीवरच्या नाटकाचे पुढचे रूप, रूपांतर म्हणजे चित्रपट आहे. तसे म्हणाल तर चित्रपट हे पडद्यावरच्या नाटकाचे पुढचे स्वरूप आहे असे म्हटले तर वावगे ठरणार नाही. कारण प्रारं•ीचे चित्रपट हे तत्कालीन सर्वसामान्य प्रेक्षकांना पडद्यावरचे नाटकच वाटत होते.

१९१२ ते १९३१ हा मराठी चित्रपट सृष्टीतल दोन दशकांचा काळ म्हणजे मुकपटाचा जमाना होता. एकीकडे मराठी नाट्यप्रेमी प्रेक्षक तन्मयतेने नाटक पाहण्यात रंगला होता. तर दुसरीकडे दादासाहेब फाळके सारखा माणूस मराठी रंग•मीवरच्या प्रेक्षकांना खेचून घेऊन, त्यांना चित्रपटाच्या माध्यमाकडे आकर्षित करण्यासाठी प्रयत्न करित होता. तसे म्हणाल तर पाश्चिमात्यांच्याकडून स्वीकारलेली. ही कला, मराठीत रूजविण्याचा पहिला प्रयत्न जर कोणी केला असेल तर तो त्यांनी. हे आवर्जून सांगावे लागेल. जसं कानडी नाटक पाहून विष्णुदास •ावे यांना हा प्रयोग मराठी करता येईल. याची जाणीव झाली. नेमकी ती आणि तशीच जाणीव दादासाहेब फाळके यांनाही झाली होती, हे आवर्जून मान्यच करावे लागेल. त्यांना हात•ार, पुढे प्र•ातने आणि व्ही.शांताराम, •ालजी पेंढारकर, मा.विनायक, अनंत माने, दिनकर द. पाटील, अशा असंख्य दिग्दर्शकांनी लावला आहे.

तसे म्हणाल तर शब्द हे कथा, कादंबरी, नाटकाचे माध्यम आहे. शब्द हे कादंबरी वाड्मयात सर्वे सर्वा असतात. पण हेच शब्द नाटकाच्या माध्यमात, संवादाच्या जोडीने उ•ारहतात, तर चित्रपट माध्यमात दृशांच्या •ूमिकेतून हा बदल समजून घेणे इथे महत्त्वाचे आहे. कारण तत्कालीन प्रेक्षकांना नाटकाने आणि मुकपटाने रंग•मीवर आणि पडद्यावर जे जे दिसते, ते ते

पाहण्याची आणि कानावर जे जे पडते ते ऐकण्याची सवय लावली हे या दोन्ही माध्यमातले साम्य आहे.

नाटक हे प्रेक्षकांच्या समोर घडते. म्हणजे लाईव्ह परफॉर्मन्सच असे म्हणता येईल. तिथे एखादा संवाद वा गाणे वन्समोअर घेऊ शकता. रसिकांच्या टाळ्यांची दाद तो कलाकार वसूलही करतो.

पण चित्रपट माध्यमात ते शक्य नाही. कारण चित्रपट हा कॅमेऱ्याच्या माध्यमातून चित्रीत केला जातो. त्यामुळे नाटकातला जिवंतपणा चित्रपटात येत नाही. कारण प्रतिमा, प्रतिकांच्या माध्यमातून चित्रपट बोलतो. सशक्त प्रतिमा हे चित्रपटांचे तर सशक्त संवाद हे नाटकाचे माध्यम आहे. हे अभ्यासकांनी समजून घेणे महत्त्वाचे आहे.

लेखकाचे लेखनाचे काम जिथे संपते. तिथे दिग्दर्शकाचे काम सुरू होते. कुशल दिग्दर्शक नटांना सोबत घेवून, तालमतीच्या माध्यमातून, पाठांतरातून तो ते नाटक बसवून घेतो. त्यामुळे दिग्दर्शकाचे काम जिथे संपते, तिथे नटाचे काम सुरू होते. आणि मग नट प्रेक्षक यांच्यात जो खेळ सुरू होतो, तो अर्ध नयाच्या माध्यमातून होतो. कारण नाटकातला अर्ध नय हा हजारो प्रेक्षकांच्या साक्षीने घडत असतो. नटाला आपल्या भूमिकेला न्याय देताना प्रेक्षकांच्या मनावर अधिराज्य गाजवता येते. भूमिका आवडल्याची पावती त्याला त्याच्या नजरेतून पहायला मिळते. मग ते नाटक शोकांतिक असो वा सुखांतिक. पण एका क्षणात त्याला त्याची पावती मिळते. अर्थात नाटकात हे शक्य आहे. चित्रपटात नाही. कारण कॅमेऱ्याच्या माध्यमातून टिपला जाणारा अर्ध नय हा मर्यादीत मंडळींच्या साक्षीने टिपला जात असतो. तिथे टेक, रिटेक वारंवार होतात. तुकड्या, तुकड्यांनी तो चित्रित केला जातो. त्यामुळे त्यात वारंवार बदल करता येतात. पण ही खेळी नाटक या माध्यमात चालत नाही. नाटक, चित्रपट ही दोन्ही माध्यमे दिग्दर्शकाचीच आहे. हे मात्र निर्विवादपणे सांगावे लागेल. चित्रपट माध्यम हे वास्तवतेच्या जवळ अधिक जाते. मूर्तिमंत वास्तव प्रेक्षकांसमोर उभे करू शकते. पण नाटक हे माध्यम हे शक्य होत नाही. नव्हे नाविण्यपूर्ण तंत्राची जोड दिली तरीही हे साध्य करता येत नाही. कारण नाटक माध्यमाला इथे मर्यादा असतात. पण चित्रपट माध्यम मात्र कौशल्यपूर्ण छायाचित्रण, प्रकाश योजना, दिग्दर्शक, प्रतिमा—प्रतिमांचा वापर करून एखादी निर्जीव वस्तूदेखील पडद्यावर सजीव करून दाखवण्यात यशस्वी होतो. यात तंत्रज्ञानाची जोड असते. हे लक्षात घेणे इथे महत्त्वाचे आहे.

नाटकावरून चित्रपट निर्मिती करणे किंवा चित्रपटावरून नाटक निर्माण करणे यात गैर कांही नाही. परिणामकारक आशय व्यक्त करण्यासाठी प्राप्त माध्यमांचा वापर आपण किती हुशारीने करतो, यावर त्याचे महत्त्व अवलंबून असते. चित्रपट हे प्रगत तांत्रिकतेतून जन्माला आलेले माध्यम आहे. दृकश्राव्यतेला ते प्राधान्य देणारे माध्यम आहे. पण नाटक माध्यम हे दीर्घ काळाच्या परंपरेतून, साहित्यिकांच्या पालन—पोषणातून विकसित झालेले माध्यम आहे. स्थल, कालाचे वेळेचे बंधन हे माध्यम तोडू शकत नाही. कारण रंगमंच हेच या माध्यमाचे घटना स्थळ आहे. आणि दोन—अडीच तास हाच त्यातला घटना काळ आहे. त्यामुळे वेळ काळाच्या बंधनामुळे नाटककार प्रेक्षकांच्या कल्पना शक्तीला आव्हान देत असतो. हे आव्हान चित्रपटाच्या माध्यमातून कुशल दिग्दर्शक, लोकेशन, छायाचित्रण, या माध्यमातून चित्रीत करीत असतो. ध्वनी—प्रकाशाचा वापर सहजतेने करीत असतो. त्यामुळे टेक, रिटेकचा वापर करीत हे माध्यम सलग निर्माण केलेली, तुकड्या तुकड्यांनी जोडलेली सलग प्रिंट प्रेक्षकांना खेळवून ठेवण्यात यशस्वी होते. तर नाटक लाईव्ह परफॉर्मन्स देण्यात यशस्वी होते. दोन्हीही माध्यमांत दृकश्राव्याचा

वापर केला असला तरी प्रेक्षकांच्या समोर घडणारे नाटक आणि नाटकाचे पडद्यावरचे रूप जाणून घेणारे प्रेक्षक यात फरक हा राहतोच. कारण चित्रपट हे पडद्यावरच्या नाटकाचे पुढचे रूप आहे. स्वरूप आहे. रूपांतर आहे. या दृष्टीने विचार करता, एका शतकाच्या इतिहासात नाटकावरून जे चित्रपट निर्माण, रूपांतरीत झाले, त्यांची यादी मी सोबत देत आहे. त्यावर नव्या संशोधकांनी संशोधन करणे गरजेचे आहे, हे आवर्जून सांगावेसे वाटते. १९१२ ते १९३१ हा मुकपटांचा जमाना होता. त्या कालखंडात १२ मराठी नाटकांचा आधार घेवून चित्रपट निर्मिती झाली आहे. त्यात दोन संस्कृत नाटकांचा समावेश आहे. एक इंग्रजी नाटक आहे. आणि तीन मराठी कादंबरींचा आणि दोन खंड काव्यांचा आधार घेवून चित्रपट निर्मिती झाली आहे. त्यामुळे एकूण पंधरा नाटके, तीन कादंबऱ्या, आणि दोन खंड काव्यांचा आधार घेवून चित्रपट निर्मिती, मुकपटाच्या जमान्यात झाली. अर्थात हा काल खंड २१ वर्षांचा आहे. त्यामुळे नाटक माध्यमाचा आधार घेवून चित्रपट निर्मिती होणे हेच या कालखंडाचे फलीत होते, असे म्हटले तर वावगे ठरू नये. ७४ वर्षांच्या कालखंडात मराठी चित्रपटात तांत्रिक बदल होत राहिले. हे जरी खरे असले तरी या कालखंडात ही मराठी चित्रपट दिग्दर्शकांनी २३ मराठी नाटकांचा, शेक्सपियरच्या ३ इंग्रजी नाटकांचा, २ संस्कृत नाटकांचा, १ बंगाली नाटकाचा आणि १ रशियन कथेचा आधार घेवून चित्रपट निर्मिती केली आहे. त्यामुळे एकूण २९ नाटके आणि १ रशियन कथा यांचा आधार मराठी चित्रपट सृष्टीने घेवून आपली चित्रपट निर्मिती केल्याचे दिसून येते. तर याच कालखंडात २७ कादंबऱ्या, ३ आत्मकथा, आणि ३ चरित्रांचा आधार घेवून चरित्रात्मक चित्रपटांची निर्मिती केली आहे. अर्थात हा आढावा देण्या पाठीमागचा माझा हेतू प्रांजळ आहे. नव्या पिढीने नविन विषय घेवून संशोधन करावे. ही या मागची माझी प्रांजळ धारणा आहे. विषयाच्या अनुषंगाने चित्रपटांची यादी मी दिली आहे. त्याचा नव्या संशोधकांनी जरूर विचार करावा. आणि आपले संशोधन करावे. आणि त्यांना मार्गदर्शन करणाऱ्या गाईडनीही आपली दृष्टी व्यापक ठेवून त्यांना सहकार्य केले तर नवे संशोधनही तितकेच सखोल आणि व्यापक होईल, याची खात्री वाटते.

#### मुक पट — नाटक

सन	चित्रपट	दिग्दर्शक	नाटक—लेखक
१९१२	• क्त पुंडलीक	दि.दादासोा तोरणे	पुंडलीक ले—रामराव बाळकृष्ण किर्तीकर
१९१५	नारायण पेशव्यांचा वध	श्री.ना.पाटणकर	श्रीमान नारायणराव पेशवे ले—हरिपंत पंडीत
१९१९	कच देवयानी	श्री.ना.पाटणकर	सं.विद्याहरण काकासोा खाडीलकर
१९२०	सिता स्वयंवर	श्री.ना.पाटणकर	सिता स्वयंवर विष्णूदास •।वे
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## QUALITY ASSESSMENT OF KHARAMBOLI DAM WATER BY STUDYING PHYSICO-CHEMICAL CHARACTERISTICS, MURUD, DIST-RAIGAD (M. S.)

**Prof. Sajid F. Shaikh**, *Assi. Prof., Department of Chemistry, Anjuman Islam Janjira Degree College of Science, Murud-janjira, Dist. Raigad, Maharashtra- 402 401, India.* [sajidshaikh@gmail.com](mailto:sajidshaikh@gmail.com)

**Dr. Bhagwan V. Jadhav**, *Department of Chemistry, Changu Kana Thakur College, New Panvel, Dist. Raigad, Maharashtra, India.*

**Aditi Narvankar**, *T.Y.BSc.Chemistry Students, Anjuman Islam Janjira Degree College of Science, Murud-janjira, Dist. Raigad, Maharashtra- 402 401, India*

**Marvika Kamble**, *T.Y.BSc.Chemistry Students, Anjuman Islam Janjira Degree College of Science, Murud-janjira, Dist. Raigad, Maharashtra- 402 401, India*

### Abstract

The water sample from Kharamboli dam of Murud Taluka was analyzed for their physicochemical characteristics. Laboratory tests were performed for the analysis of samples for Temperature, pH, Electrical conductivity, TDS, Alkalinity, Chloride, DO, BOD, Total hardness, Calcium hardness, Magnesium hardness and Salinity were analyzed in the month of November 2017. By observing the result it can be concluded that the parameters which were taken to study the water quality are below the pollution level for ground water which satisfies the requirement for the use of various purposes like domestic, agricultural, industrial etc. The usefulness of these parameters in predicting dam water quality characteristics were discussed

**Keywords:** Kharamboli Dam water, water quality standard, Physico-chemical Parameter

**INTRODUCTION:** Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70 % of water. But due to increased human population, industrialization, the use of fertilizers in the agriculture and man-made activity, it is highly polluted with different harmful contaminants. Therefore, it is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varying of water borne diseases. It is difficult to understand the biological phenomenon fully because the chemistry of water reveals much about the metabolism of the ecosystem and explain the general hydro – biological relationship [1]. Water pollution is a serious problem in India as almost 70 per cent of its surface water resources and a growing percentage of its groundwater reserves are contaminated by biological, toxic, organic, and inorganic pollutants. In many cases, these sources have been rendered unsafe for human consumption as well as for other activities, such as irrigation and industrial needs. This shows that degraded water quality can contribute to water scarcity as it limits its availability for both human use and for the ecosystem.

Due to growth of population, agriculture, and industries, demand for domestic water has increased many times during the last few years. Improper waste disposal and over exploitation of resources has affected the quality, not only of tap water, but also of ground water [2]. Prabhakar R. Pawar and Balasaheb G. Kulkarni [3] has studied assessment of water quality in the karanja creek (Raigad). Budharatna Bhavare, Miguel A. Rodriguez, Anil Kurthe [4] has studied different physico chemical parameter and nutrients in water of Bhatye estuary, Ratnagiri central, West coast of India. Francis Andrade, H.B. Arvinda, and E.T. Puttaiah [5] have studied Mangalore coastal water



**Kharamboli Dam**

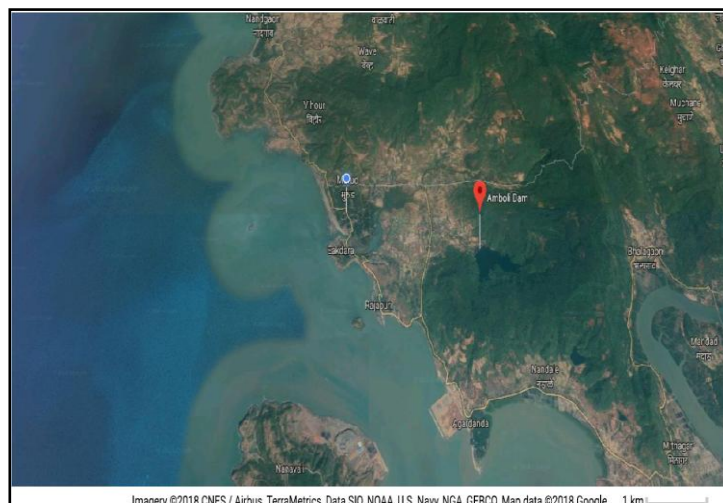
pollution by analysis of physical, chemical parameter. Ramalingam manikannan, Subramanian asokan and A.H.M.S. Ali [6] have studied Seasonal variation of physicochemical properties of the great vedaranyam swamp point calimere wildlife Sanctuary, South east coast of India. Sujata Sen, Dr. Minal Kanti Paul, and Madhab Borah [7] have studied the some physico chemical parameter of pond and river water with reference to correlation study. G.Velsamy, N. Manoharan, S.Ganesan [8] has studied analysis of physicochemical variations in sea water sample Uppanarestuary, Cuddalore, Tamilnadu (India). Amboli is a Village in Murud Taluka in Raigad District of Maharashtra State, India. It belongs to Konkan region. It belongs to Konkan Division. It is located 49 Km towards South from District head quarters Alibag. 11 Km from Murud. The dam is situated amidst lush greenery which makes it an amazing picturesque location. The sound of nature - water and birds - makes this location a more appealing one.

The water sample was collected from the dam early in the morning between 8.00 am to 10.00 am and was analyzed to compare the differences occurred in Physico-chemical parameters such as Temperature, pH, Electrical conductivity, TDS, Alkalinity, Chloride, DO, BOD, Total hardness, Ca-hardness, Magnesium hardness and Salinity.

The research work is carried out, keeping in mind the following objectives.

- To study the chemical composition and water quality parameters of dam.
- To investigate the possible sources and Cause of pollution in the dam if any.

To study if these effects can be attributed to the change in the chemical composition of the dam water



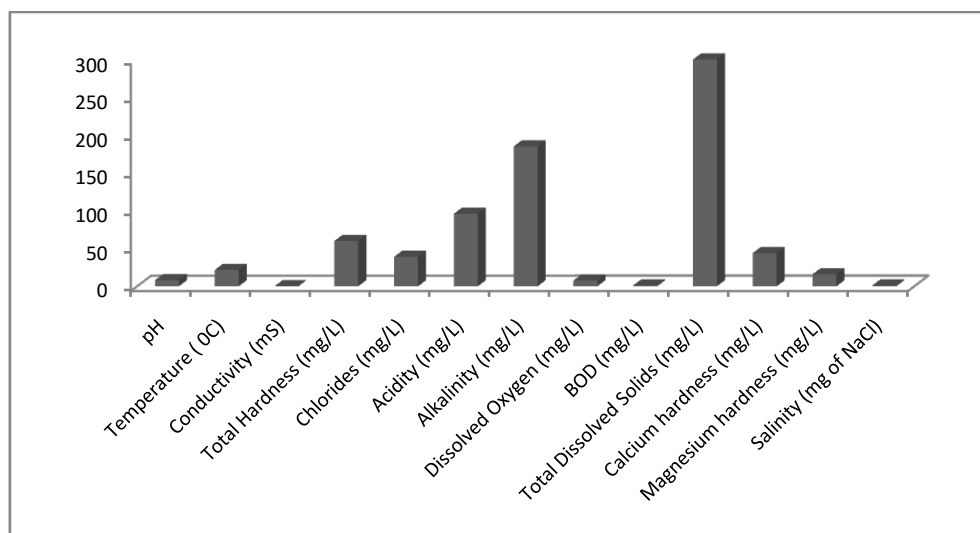
**MATERIAL & METHOD:-** Sample of water was collected in sterile plastic bottle of 2 litre capacity from the dam. At the same time the temperature & pH were noted. The physico-chemical analysis was carried out within 24 hours of collection in a laboratory as per APHA (1989), (1992), AWWA & WPFA, Trivedy & Goel (1986) [9-10]. The chemicals were used of A. R. grade and are standardized as per Inorganic quantitative analysis by Vogel (1964) & (2006) [11-12]. The result is statistically analyzed by calculating mean & standard deviation.

#### **RESULTS & DISCUSSION:-**

Parameters	Garambi Dam Mean±S.D
pH	8.10±0.02
Temperature ( °C)	21.7 ± 0.3
Conductivity (mS)	0.109 ± 0.002
Total Hardness (mg/L)	60 ± 1.0
Chlorides (mg/L)	39.05 ± 0.18

Acidity (mg/L)	$96 \pm 0.3$
Alkalinity (mg/L)	$185 \pm 0.3$
Dissolved Oxygen (mg/L)	$7.716 \pm 0.015$
BOD (mg/L)	$1.281 \pm 0.03$
Total Dissolved Solids (mg/L)	$300 \pm 1.0$
Calcium hardness (mg/L)	$44 \pm 0.3$
Magnesium hardness (mg/L)	$16 \pm 0.3$
Salinity (mg of NaCl)	$1.172 \pm 0.003$

**Table-1:- Values of different parameters of water sample of Kharamboli dam. (Mean and Standard deviation is calculated)**



**Graph showing concentration range of various parameters at Kharamboli dam.**

**1. Temperature:** Temperature is the most importance environment factor with effect on plants and animals. Water has several unique thermal properties which combine to minimize temperature change. The Water temperature depends on the depth of the water column, climatic and topographic changes [13]. A rise in temperature of water leads to the speeding up of chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odour. At higher temperature with less dissolved gases the water becomes tasteless and even does not quench the thirst and decreases the solubility of oxygen. Temperature also determines various other factors such as pH, Conductivity, saturation level of gases and various forms of alkalinity. The temperature of Garambi dam water is  $21.7 \pm 0.3$  °C.

**2. pH:** pH, one of the most common analyses in soil and water testing, is the standard measure of how acidic or alkaline a solution is. pH has no direct adverse effect on health. pH governs the distribution, transport and fate of heavy metals in aquatic ecosystem. It is measured a scale from 0 - 14. pH of 7 is neutral, pH is less than 7 is acidic and pH greater than 7 is basic. Aquatic organisms need the pH of their water body to be a certain range optimal growth and survival. pH of water sample collected is  $8.10 \pm 0.02$ .

**3. Electrical Conductance:** Conductivity is the measure of a substance or solution to conduct electric current. Presence of salts and contamination with wastewater increases conductivity of water. It is a indication of pollution. Electrical conductivity used to quickly estimate the ionic or soluble salt concentration in soils, water supplies, fertilizer solution and chemical solution. It is highly depended upon temperature Conductivity however is an important criterion in determining the suitability of

water for irrigation. The conductance of water sample is  $0.109 \pm 0.002$  mS. The observed value of electrical conductance is quite low and less electrolyte

**4. Total Hardness:** Total hardness is defined as the sum of calcium and magnesium hardness in mg/L as  $\text{CaCO}_3$ . Total hardness of water an important factor that indicates toxic effect and poisonous elements [14]. There is no adverse effect of hardness on health. Hard water is also not suitable for domestic and irrigation purposes. Total hardness of water collected is  $60 \pm 1.0$  mg/L. The degree of hardness of drinking water has been classified in terms of the equivalent  $\text{CaCO}_3$  concentration as follows: Soft - 0-60mg/L, Medium - 60-120 mg/L, Hard - 120-180 mg/L, Very hard - >180 mg/L. The observed value was quiet less than the acceptable limit of 300 mg/L

**5. Chlorides:** Chloride is mainly obtained from the dissolution of salts of hydrochloric acid as table salt (NaCl),  $\text{NaCO}_2$  and added through industrial waste, sewage, sea water etc. Surface water bodies often have low concentration of chlorides as compare to ground water. It has key importance for metabolism activity in human body and other main physiological processes. High chloride concentration damage metallic pipes and structure as well as harms growing plants. According to WHO standards concentration of chloride should not exceed 250 mg/L

The chloride content of the water sample is found to be  $39.05 \pm 0.18$  mg/L

**6. Acidity:** Acidity of water is its capacity to neutralize a strong base and is mostly due to the presence of strong mineral acids, weak acids and the salt of strong acids and weak bases. Addition of wastewater having acidity producing substances increases the acidity of water. The observed acidity of water sample is  $96 \pm 0.3$  mg/L of  $\text{CaCO}_3$ . The value is much less than threshold value i. e. 200 mg/L of  $\text{CaCO}_3$ . This indicates that sample of water are in safe range

**7. Alkalinity:** Alkalinity is a chemical measurement of water's ability to neutralize acid. Alkalinity is also a measure of water buffering capacity or its ability to resist changes in pH upon the addition of acids or bases. Alkalinity of natural water is due to primarily to the presence of weak acid salts, although strong bases may also contribute (i.e.  $\text{OH}^-$ ) in the extreme environment. Bicarbonate represents the major form of alkalinity in natural water, so its source being the partitioning of  $\text{CO}_2$  from the atmosphere and the weathering of carbonate minerals in rocks and soil. Other salts of weak acids, such as borate, silicates, ammonia, phosphate, and organic bases from natural organic matter may be present in small amounts The observed alkalinity of water sample is  $185 \pm 0.3$  mg/L of  $\text{CaCO}_3$ . The observed value of alkalinity of sample is within the permissible range i.e. below 200 mg/L.

**8. Dissolved Oxygen:** The amount of oxygen dissolved in water, such as a lake, river or stream. Dissolved oxygen is the most important indicator of the health of water bodies and its capacity to support a balanced aquatic ecosystem of plants and animals. Warm water released from industrial outlets, flowages or storm sewers can also reduce dissolved oxygen levels. Dissolved oxygen may play a large role in the survival of aquatic life in temperature lakes and reservoirs during summer months. Dissolved oxygen of water sample collected is  $7.716 \pm 0.015$ mg/L. It may be due to high temperature and inorganic reluctance such as hydrogen sulfide, ammonia, nitrites, ferrous ions and other oxidizable substances also tend to decrease dissolved oxygen in water

**9. Biochemical Oxygen Demand (BOD):** Biochemical oxygen measures the amount of oxygen that microorganisms consume while decomposing organic matter, it also measures the chemical oxidation of inorganic matter. BOD is a measure of organic material contamination in water, specified in mg/L. BOD is the amount of dissolved oxygen required for the biochemical decomposition of organic compounds and the oxidation of certain inorganic materials (e.g., iron, sulphites). The observed value of BOD is  $1.281 \pm 0.03$  mg/L which is within the permissible range i. e. 0.75-1.5 mg/L.

**10. Total Dissolved Solids (TDS):** Total dissolved solids are the total amount of mobile charged ions, including minerals, salts or metal dissolved in a given volume of water in mg/L. TDS is directly related to the purity of water and the quality of water purification system and affects everything that consumes, lives in, or uses water, whether organic or inorganic, whether for better or for worse. Common inorganic salts that can be found in water include calcium, magnesium, potassium and sodium, which are cations and carbonates, nitrates, bicarbonates, chlorides and sulphates which are anions. They give a particular taste to water at higher concentration and also reduce its palatability. The total solid present in water sample collected is  $300 \pm 1.0$  mg/L which is lower than threshold value of total solid content i.e. 500 mg/L.

**11. Calcium hardness:** Calcium is naturally present in water. Calcium is a determinant of water hardness, because it can be found in water as  $\text{Ca}^{2+}$  ions. As per Indian Standards the calcium content of water should not be more than 75 mg/L. This has been specified in the IS 10500:- Drinking Water –Specifications. In the study the calcium content in water sample has been found to be  $44 \pm 0.3$  mg/L which is within the limit as per Specification

**12. Magnesium hardness:** Magnesium is naturally present in water. Magnesium is a determinant of water hardness, because it can be found in water as  $\text{Mg}^{2+}$  ions. As per ISI the magnesium content of water should not be more than 50 mg/L. In the study the magnesium content in water sample has been found to be  $16 \pm 0.3$  mg/L which is within the limit as per Specification

**13. Salinity:-** Salinity which is defined as the total concentration of electrically charged ions in the water. These ions are the four major cations-calcium, magnesium, potassium and sodium, and the four common anions carbonates ( $\text{CO}_3$ ), sulphates ( $\text{SO}_4$ ), chlorides (Cl) and bicarbonates ( $\text{HCO}$ ). Other components of salinity are charged nitrogenous compounds such as nitrates ( $\text{NO}_3$ ), ammonium ions ( $\text{NH}_4$ ) and phosphates ( $\text{PO}_4$ ) [15]. In general the salinity of surface waters depends on the drainage area, the nature of its rock, precipitation, human activity in the area and its proximity to marine water [16]. Waters with salinity below 1‰ are fresh and waters with salinity higher than 1‰ are brackish/marine [17]. The observed value of salinity for water sample is  $1.172 \pm 0.003$  mg of NaCl.

**CONCLUSION:** The study assessed the evolution of water quality in dam water of Kharamboli, Murud taluka which was carried out by taking certain important parameters like Temperature, pH, Electrical conductivity, TDS, Alkalinity, Chloride, DO, BOD, Total hardness, Calcium hardness, Magnesium hardness and Salinity. The data of physico-chemical and biological parameters clearly shows that the water of Kharamboli dam is within the permissible range as per APHA (1989), (1992), Trivedi and Goel (1986). Such water is suitable for drinking purpose and can be used for domestic as well as irrigation purpose.

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## ANALYTICAL STUDY OF PREEMINENT COINAGE OF THE MARATHA EMPIRE (SHIVKAL)

**Pritam.S.Walanj**, (M. Sc. Phy. Chemistry & M.A History Part-I student Of IDOL University of Mumbai), Suchitra Sapakal<sup>2</sup>(M.Sc.physics & M.phil Student) E-mail: pritamwalanj101@gmail.com

### Abstract

Founder of The Maratha Empire is Chhatrapati Shivaji Maharaj and Maratha warrior group establishing Hindavi Swarajya. There were several coins in circulation like Vijaynagar, Nizamshahi, Adilshahi, Mughal, France, England etc. Maharaj Shivaji aware of the importance of currency. He minted coins during his coronation in 1674. He minted coins like Hon which is gold coin and today these coins are very rare with only few known specimens, another coin is Shivarai coins which are minted at various mints even post-humously and circulated till the middle of the eighteenth century. Hon as a gold coin and shivarai was copper coin. Was Maharaj shivaji casted silver coins or not? we have different opinions for this question, but there were some silver coins presented in the auction that shows the relation with shivaji maharaj or the time of shivaji coinage. Maharaj samhaji and Maharaj rajaram continued these coins even after the death of shivaji maharaj and also both of them casted coins of their own names. These all coins shows power of Maratha Empire.

**Keywords** : Hon, Shivrai, gujas, Phanams, lari.

**Introduction** : The history of India is full of the stories of countless heroes and gallants. Their deeds of bravery, gallantry, and heroism have left indelible marks. Maharaj shivaji is one of those Indian heroes who have been acknowledged as the most worthy and remarkable personalities. He was the first king who established hindavi swarajya in 17<sup>th</sup> century. On 6 June, 1674 coronation ceremony of shivaji Maharaj was performed. He assumed the title of king and became first chhatrapati of Maratha empire. After establishing his rule, Maharaj Shivaji implemented a competent and progressive administration with the help of a disciplined military and well-established administrative set-up. He was the first Maratha ruler to start the Raj Shaka (royal era). He was aware of the importance of currency. He minted coins like hon and shivari during his coronation. Maharaj Shivaji did not allow the coins of British East India Company [1]. Hon as a gold coin and shivarai was copper coin. Was Maharaj shivaji casted silver coins or not? we have different opinions for this question, but there were some silver coins presented in the auction that shows the relation with shivaji maharaj or the time of shivaji coinage. But some references show He did not strike silver coins [2]. Coins of Maharaj Shivaji show one of the most independent and well-established kingdom. Hon which is gold coin and today these coins are very rare, and copper coin is Shivarai circulated till the middle of the eighteenth century.

**Coinage**: At the time of shivaji maharaj land was cultivated by the farmers and farming was one of the main occupations, and money played a very little role in their economic life. Maharaj Shivaji was aware of the importance of currency. He minted coins during his coronation in 1674. These coins improved the economic system with their correctness. The metals used in these coins were equal to the price of the day plus the minting charges. At the Raigad fort, Shivaji had his own mint. In addition to his own mints, Maharaj Shivaji allowed private mint-owners to run the mints in his kingdom. It was a profitable business of the time to produce coins out of royal metals. There were free and open mints. This also entailed the danger of counterfeit private coins.

**1.Hon**: Maharaj Shivaji used 'Hon' as a gold coin. According to Sabhasad there were twenty six gold coins (hons) in circulation (3). Hon is also known as Hon Varahi or Varah. According to Sabhasad the hons were Gutti-hon, Adoni Hon, Dharwad Hon, Vellor Hon, Tanjor Hon and Ramnathpuri Hon (4). Maharaj Shivaji's hons bear only the Devnagari legend giving his name and titles. He never acknowledged the supremacy of any other power (5). Shivrai Hon was round, weighing two masha and seven Gunjas (Gunja seeds – *Abrus precatorius* is a poisonous herb used in Ayurvedic medicines

after detoxifying process) i.e. 42.12 grains or 2.7.128 Grams in diameter, 1/32 C. meter and touch 32.45(6). The rate of Gold was approximately sixteen rupees per Tola. It means, Shivrai Hons were of Rupees three and thirteen annas .This coin was in circulation for more than one hundred and fifty years. At the time of Maharaj Shivaji's death, in the State treasury, there were 79 lakhs gold coins including Shivrai Hons, and in his personal treasury, there were four lakhs 'Shivrai Hons', Gambar Mohars, Putlis, Patshahi Hons and Sangrai Hons etc. Phanams like Aphraji, Venkatrai,Ulaphkari, Devanhalli,Trishuli etc. were also in his treasury, in which Patshahi hons were more than 13 lakhs .Maharaj Sambhaji and Maharaj Rajaram followed his father's policy but he also minted some new coins.



(Fig:1)

Hon (Fig:1) in collection of chhatrapati shivaji maharaj vastu sangrahalaya.

This coin bear the title 'Chhatrapati' on the obverse and the legend 'Shri Raja Shiva' on the reverse of the coin.

The text is in Nagari script.

**Material:** Gold .

**Dimensions:** Size: 1.1 cms.

**Weight:** 2.9 gms.

**Shivarai:** Shivrai is a copper coin of Chhatrapati Shivaji Maharaj . Shivarai ( approx 10 to 13 gms.). This coin bear the title 'Chhatrapati' on the obverse and the legend 'Shri Raja Shiv' or 'Shri Raja Siv' on the reverse of the coin and having dotted border on it. There were 150 and above type of copper Shivarai coin. Rev Abat found in his research there were 8 types of specimens. According to Die Studies Model there was approximately 4,50,000 shivarai coin produced at that time. Abat wrote in his Bombay gaziyeter "old copper coins called chhatraptis also called shivarais, as the coin of Raja Shivaji, worth about a quarter of an anna are also current. The Chhatrapati contains 136 grains troy (three forth tola) of pure copper, or 45 grains troy (one forth tola) more than the current quarter anna piece. Peshwa's were casted same type of copper coin known as Dudandi but the main difference between Dudandi coins and Shivarai coins is Peshwa's removed dotted border which was printed at the edge of coin. (Fig:2) and (Fig:3) shows copper shivari coin in collection of coin collector.



(Fig:2)



(Fig:3)

**Material:** Copper.

**Weight:** 10-13 gms



**SHIVARAI SILVER COINS:** At the time of maharaj shivaji was he casted silver coins or not? for this question we have different opinians from different scholars . At that time Adilshahi and Nijamshahi saltanat had their own silver coin named as Lari. Amiteshwar jha mentioned in his bharatiy sikke book that there were some silver coins casted by Mahara j Shivaji and on which Raja Shiv Chhatrapati' inscribed on one side and other side Jagdamb prasanna inscribed. Mahadev govinda ranade mentioned in his Currencies and Mints under Maharashtra Rule' article ,As regards the silver rupee coined at Raigad,it is impossible to say what inscription it bore ,as no specimens of Shivaji's rupee coin are now available. according to numismatics circle, there are less than 10 coins minted in celebration of Mahraj shivaji's coronation. From these one of the silver coin selled for 15lakhrupes in 2016 (TOI) and in the same year but in another auction this coin was selled for 10.5 lakh rupees( the hindu newspaper) the coin was undated with 'jagdamba prasanna' inscribed on one side and 'Raja Shiv Chhatrapati' on other side.Jagdamba is one of the goddess and avatar of goddess bhavani.And bhavani devi is family deity of Maharaj Shivji .These coins are extremely rare coin. (Fig:4) and (Fig:5) shows silver shivari coin in collection of coin collector.



(Fig:4)

(Fig:5)

**Material:** silver.

**SHAMBHU CHHATRAPATI'S SHIVARAI :** Maharaj Sambhaji (May 14, 1657 – March 11, 1689) was the second ruler of the [Maratha kingdom](#). He was the eldest son of Maharaj [Shivaji](#), and his first wife [Saibai](#). He was successor of the realm after his father's death, and ruled it for nine years. Sambhaji's rule was largely shaped by the ongoing wars between the Maratha kingdom and [Mughal Empire](#) as well as other neighbouring powers such as the [Siddis](#), [Mysore](#) and the Portuguese in [Goa](#). His coronation was held on 20 july 1680 at the fort panhala and on 16 january 1681 at the fort raigad after the death of shivaji maharaj and sambhaji maharaj followed his father's policy but he also minted some new coins.sambhaji maharaj continued the shivari coin in his currency. he also minted the new copper coin and now collectors or scholars called it as shambhurai.It was also copper coin .This coin is approx 12 gms. This coin bear the title 'Chhatrapati' on the obverse and the legend 'Shri Raja Shambhu' or 'Shri Raja Sambhu' on the reverse of the coin and having dotted border on it.The text is in Nagari script. These coins are very rare. (Fig:6) and (Fig:7) shows copper shivari coin of Maharaj Sambhaji in collection of coin collector.



(Fig:6)

(Fig:7)

**Material:** Copper.

**Weight:** Approx 10-12 gms.

**MAHARAJ RAJARAM'S SHIVARAI:** Rajaram Raje Bhosale (24 February 1670 – 3 March 1700.) was the younger son of Maratha ruler Chhatrapati [Shivaji Maharaj](#), and half-brother of Maharaj [Sambhaji](#). He took over the [Maratha Empire](#) as its third [Chhatrapati](#) after Sambhaji Maharaj's death in 1689. Rajaram followed his father's policy but he also minted some new coins. This coin known as Maharaj Rajaram's Shivarai. This coin bears the title 'Chhatrapati' on the obverse and the legend 'Shri Raja Ram' on the reverse of the coin and having dotted border on it. The text is in Nagari script. This coin is having weight approx 9 gms. Mostly we get these coins in square shape, but some coins also found in rounded shape. These coins are also very rare. (Fig:8), (Fig:9), (Fig:10) and (Fig:11) shows copper shivarai coin of Maharaj Rajaram in collection of coin collector.



(Fig:8)



(Fig:9)



(Fig:10)



(Fig:11)

**Material:** Copper.

**Weight:** Approx 9-10 gms.

**CONCLUSION:** Ancient coins are the mediators, which tell us the history of today's currency. These coins throw light on the life, culture and economic conditions of any empire. In the whole history of Maharashtra Maratha Empire was one and the only empire which was established by a Maharashtrian man, and Maharashtra was ruled by a Maharashtrian person Maharaja Shivaji. Not only Maharashtra but he acquired some parts of Gujarat and Karnataka also. After the coronation Shivaji Maharaj casted his own coins because he was aware about the power of currency. A normal Shivaji became a great king due to his deeds and that's why the name of Shivaji Maharaj has been written by golden words in the history of Maharashtra. Shivarai was one of the important parts of his currency. This coin was used by common people and rich people also. To acquire more knowledge about the economic development, cultural development of Maratha Empire it is important to do study of these coins. It is important to conserve these archaeological coins, but at the same time analytical study of these coins is also important to reveal the more correct and pure history. Because future is always a reflection of past.

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**ESTIMATION OF WATER QUALITY PHYSICO-CHEMICAL PARAMETERS OF DRINKING WATER SOURCES OF USROLI VILLAGE OF MURUD TEHSIL DISTRICT- RAIGAD, MAHARASHTRA, INDIA**

**Assi. Prof. Sajid F. Shaikh**, Department of Chemistry, Anjuman Islam Janjira Degree College of Science, Murud-janjira, Dist. Raigad, Maharashtra- 402 401, India. ([sajidshaikh@gmail.com](mailto:sajidshaikh@gmail.com))

**Dr. Bhagwan V. Jadhav**, Department of Chemistry, Changu Kana Thakur College, New Panvel, Dist. Raigad, Maharashtra, India.

**Juhee Nandgaonkar**, T.Y.BSc.Chemistry Students, Anjuman Islam Janjira Degree College of Science, Murud-janjira, Dist. Raigad, Maharashtra- 402 401, India.

**Hrishikesh Vadkar**, T.Y.BSc.Chemistry Students, Anjuman Islam Janjira Degree College of Science, Murud-janjira, Dist. Raigad, Maharashtra- 402 401, India.

**Abstract**

Quality of water is an important criterion for determining the suitability of water for human consumption. Keeping in view the significance of good quality water for a healthy society, the physico-chemical analysis of the water sources of the Usroli village was carried out to evaluate their suitability for drinking purpose. The present study focused an acute awareness among the people about the quality of drinking water by taking water samples from different sources for analysis. The experiment analyses its various Physico-chemical and biological parameters such as Temperature, pH, Electrical conductivity, TDS, Alkalinity, Chloride, DO, BOD, Total hardness, Calcium hardness, Magnesium hardness and Salinity were analyzed in the month of December 2017. The results are compared with standards of WHO. From the obtained result it can be predicted that the parameters which were taken to study the water quality are below the pollution level for water which satisfies the requirement for the use of various purposes like domestic, agricultural etc.

**Keywords:** Drinking water resources, water quality standard, Physico-chemical Parameter.

**INTRODUCTION:** Rural India depends mainly on groundwater for drinking and agriculture. Villages once depend on sources like wells, lakes, ponds and streams for their water needs. Contamination of most surface water sources has rendered them unfit for consumption. And also increase in water demand by an increasing population has necessitated resource to tapping groundwater. Unsustainable withdrawal of groundwater has led to the spectra of depleting the problem of water scarcity. Every human society, be it rural or urban, industrially or technologically advanced, disposal of waste exceeds the limit of natural scavenging or removal process, they are bound to effect the normal functioning of the ecosystems and consequently they bear an adverse effect on the biota [1]. Water is one of the most important parameter to the ecosystem. The sustainable development will not be possible without adequate quantity and quality of fresh water [2]. Fresh water resource are becoming deteriorate day-by-day at the very faster rate. Now water quality is a global problem [2]. The healthy aquatic ecosystem is depended on the biological diversity and Physico-chemical characteristics [3]. Better quality of water is described by its physical, chemical and biological characteristics. But some correlation was possible among these parameters and the significant one would be useful to indicate quality of water. Water supply systems are important, but at the same time wastewater treatment systems are also equally important. Approximately 80% of water turns to waste water after its utilization. Water quality provides current information about the concentration of various solutes at a given place and time. Its quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions [4]. There is no single or simple measure for water quality. Water may be tested for a few characteristics or numerous natural substances and contaminants depending on their needs. The nature and extent of water pollution is characterized by several physical, chemical and biological parameters. The

increased anthropogenic activities due to industrialization have contributed to decline in water quality including climate and precipitation, soil type, vegetation, groundwater and flow conditions. The water quality of rivers and lakes changes with the seasons and geographic areas, even when there is no pollution presents [5]. The deterioration of water quality has led to the destruction of ecosystem balance, contamination and pollution of ground and surface water resources. Water quality degradation world-wide is due to many anthropogenic activities which release pollutants into the environment thereby having an adverse effect upon aquatic ecosystems. Quality of water can be regarded as a network of variables such as pH, oxygen concentration, temperature, etc. and any changes in these physical and chemical variables can affect aquatic biota in a variety of ways [6]. Since the quality water is directly related to health and is important for determination of water utility, it is very essential and important to test the quality of the water before it is used for drinking, domestic, agricultural or industrial purposes. The utility of river water for various purposes is governed by physicochemical and biological quality of the water [7]. It is well known that no straight forward reasons can be advanced for the deterioration of water quality, as it is dependent on several water quality parameters [8]. Ground water quality in the industrial areas is determined by measuring the concentration of some physico-chemical parameters and comparing them with drinking water standards [9]. Chandanshive Navnath Eknath [10] studied “The Seasonal Fluctuation of Physico-Chemical parameters of River Mula- Mutha at Pune, India and their Impact on Fish Biodiversity”. MVS Vaishnavi et al [11] studied “Study of levels of heavy metals in the river waters of regions in and around Pune City, Maharashtra, India”. Pali Sahu et al [12] studied “Physicochemical Analysis of Mula Mutha River Pune”. Nidhi Jain et al [13] studied “Comparative Review of Physicochemical Assessment of Pavana River”. Patil. P.N et al [14] studied “Physico-chemical parameters for testing of water”. According to Census 2011 information the location code or village code of Usroli village is 554241. Usroli village is located in Murud Tehsil of Raigarh district in Maharashtra, India. It is situated 10km away from sub-district headquarter Murud and 42km away from district headquarter Alibag. As per 2009 stats, Usroli village is also a gram panchayat. The total geographical area of village is 653.11 hectares. Usroli has a total population of 1,099 peoples. There are about 239 houses in Usroli village. Murud is nearest town to Usroli which is approximately 10km away. The water sample such as Pipe water, bore well water and well water was collected early in the morning between 8.00 am to 10.00 am and was analyzed to compare the differences occurred in Physico-chemical parameters such as Temperature, pH, Electrical conductivity, TDS, Alkalinity, Chloride, DO, BOD, Total hardness, Ca-hardness, Magnesium hardness and Salinity.

The research work is carried out, keeping in mind the following objectives.

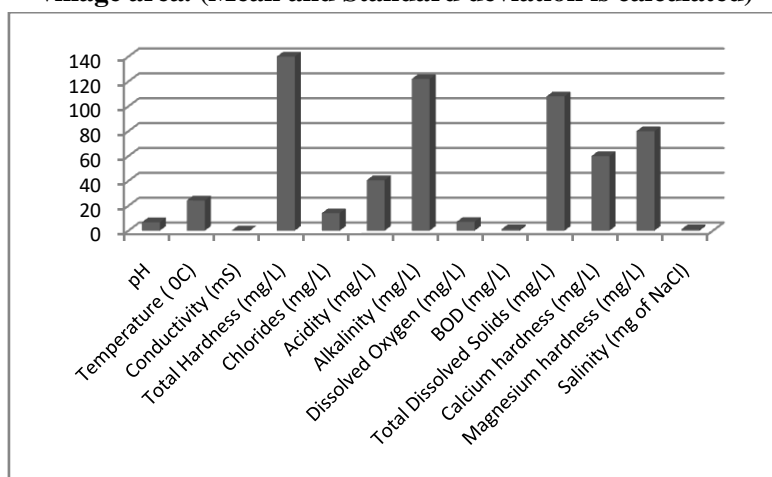
- To study the chemical composition and water quality parameters of different sources.
- To investigate the possible sources and Cause of pollution in the water if any.
- To study if these effects can be attributed to the change in the chemical composition of the different water sources.

**MATERIAL & METHOD:-** Sample of water was collected in sterile plastic bottle of 2 litre capacity from the dam. At the same time the temperature & pH were noted. The physico-chemical analysis was carried out within 24 hours of collection in a laboratory as per APHA (1989), (1992), AWWA & WPPFA, Trivedy & Goel (1986) [15-16]. The chemicals were used of A. R. grade and are standardized as per Inorganic quantitative analysis by Vogel (1964) & (2006) [17-18]. The result is statistically analyzed by calculating mean & standard deviation.

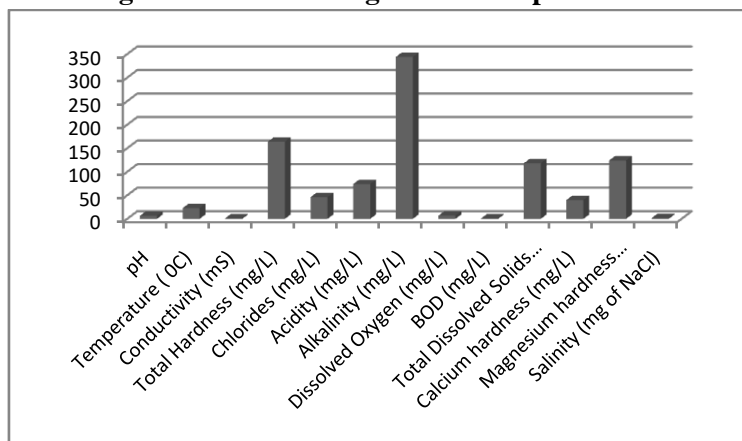
**RESULTS & DISCUSSION:-**

Parameters	Tap water Mean±S.D	Bore well water Mean±S.D	Well water Mean±S.D
pH	6.78 ± 0.02	6.53 ± 0.02	6.75 ± 0.02
Temperature ( °C)	24.3 ± 0.3	22.8 ± 0.3	24.7 ± 0.3
Conductivity (mS)	0.245 ± 0.002	1.344 ± 0.002	0.302 ± 0.002
Total Hardness (mg/L)	140 ± 1.0	164 ± 1.0	140 ± 1.0
Chlorides (mg/L)	14.05 ± 0.18	46.15 ± 0.18	27.13 ± 0.18
Acidity (mg/L)	40.6 ± 0.3	73.9 ± 0.3	46.3 ± 0.3
Alkalinity (mg/L)	122 ± 0.3	344 ± 0.3	140 ± 0.3
Dissolved Oxygen (mg/L)	7.126 ± 0.015	6.896 ± 0.015	7.266 ± 0.015
BOD (mg/L)	1.231 ± 0.03	0.993 ± 0.03	1.127 ± 0.03
Total Dissolved Solids (mg/L)	108 ± 1.0	118 ± 1.0	235 ± 1.0
Calcium hardness (mg/L)	60 ± 0.3	40 ± 0.3	68 ± 0.3
Magnesium hardness (mg/L)	80 ± 0.3	124 ± 0.3	72 ± 0.3
Salinity (mg of NaCl)	1.172 ± 0.003	1.758 ± 0.003	1.172 ± 0.003

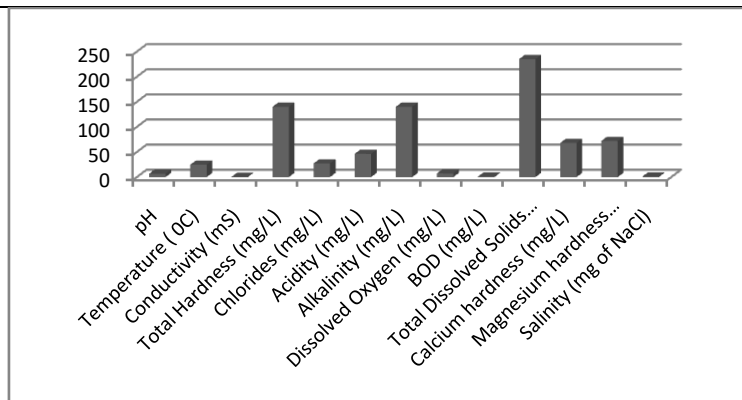
**Table-1:- Values of different parameters of water sample of different drinking sources in Usroli village area. (Mean and Standard deviation is calculated)**



**a. Graph showing concentration range of various parameters of Tap water.**



**b. Graph showing concentration range of various parameters of bore well water.**



c. Graph showing concentration range of various parameters of well water.

**1. Temperature:** Temperature is the most importance environment factor with effect on plants and animals. Water has several unique thermal properties which combine to minimize temperature change. The Water temperature depends on the depth of the water column, climatic and topographic changes [19]. A rise in temperature of water leads to the speeding up of chemical reactions in water, reduces the solubility of gases and amplifies the tastes and odour. At higher temperature with less dissolved gases the water becomes tasteless and even does not quench the thirst and decreases the solubility of oxygen. Temperature also determines various other factors such as pH, Conductivity, saturation level of gases and various forms of alkalinity. The temperature of Tap water is  $24.3 \pm 0.3$  °C, bore well water temperature is  $22.8 \pm 0.3$  °C and temperature of well water is found to be  $24.7 \pm 0.3$  °C.

**2. pH:** pH, one of the most common analyses in soil and water testing, is the standard measure of how acidic or alkaline a solution is. pH has no direct adverse effect on health. pH governs the distribution, transport and fate of heavy metals in aquatic ecosystem. It is measured a scale from 0 -14. pH of 7 is neutral, pH is less than 7 is acidic and pH greater than 7 is basic. Aquatic organisms need the pH of their water body to be a certain range optimal growth and survival. The pH of Tap water is  $6.78 \pm 0.02$ , bore well water pH is  $6.53 \pm 0.02$  and pH of well water is found to be  $6.75 \pm 0.02$ . Amongst these three samples, water is comparatively acidic in nature.

**3. Electrical Conductance:** Conductivity is the measure of a substance or solution to conduct electric current. Presence of salts and contamination with wastewater increases conductivity of water. It is a indication of pollution. Electrical conductivity used to quickly estimate the ionic or soluble salt concentration in soils, water supplies, fertilizer solution and chemical solution. It is highly depended upon temperature. Conductivity however is an important criterion in determining the suitability of water for irrigation. The conductance of Tap water is  $0.245 \pm 0.002$  mS, bore well water conductance is  $1.344 \pm 0.002$  mS and conductance of well water is found to be  $0.302 \pm 0.002$  mS. Amongst these three samples, bore well water is comparatively high electrical conductance. The observed values of electrical conductance for others are quite low and less electrolyte.

**4. Total Hardness:** Total hardness is defined as the sum of calcium and magnesium hardness in mg/L as  $\text{CaCO}_3$ . Total hardness of water an important factor that indicates toxic effect and poisonous elements [20]. There is no adverse effect of hardness on health. Hard water is also not suitable for domestic and irrigation purposes. Total hardness of Tap water is  $140 \pm 1.0$  mg/L, bore well water is  $164 \pm 1.0$  mg/L and the well water is  $140 \pm 1.0$  mg/L. he degree of hardness of drinking water has been classified in terms of the equivalent  $\text{CaCO}_3$  concentration as follows: Soft - 0-60mg/L, Medium - 60-120 mg/L, Hard - 120-180 mg/L, Very hard -  $>180$  mg/L. The observed values were quiet less than the acceptable limit of 300 mg/L for all water samples. It shows that water is hard.

**5. Chlorides:** Chloride is mainly obtained from the dissolution of salts of hydrochloric acid as table salt (NaCl),  $\text{NaCO}_2$  and added through industrial waste, sewage, sea water etc. Surface water bodies



often have low concentration of chlorides as compare to ground water. It has key importance for metabolism activity in human body and other main physiological processes. High chloride concentration damage metallic pipes and structure as well as harms growing plants. According to WHO standards concentration of chloride should not exceed 250 mg/L. The chloride content of the tap water sample is  $14.05 \pm 0.02$  mg/L, bore well water is  $46.15 \pm 0.18$  mg/L and Chlorides in well water sample is  $27.13 \pm 0.05$  mg/L.

**6. Acidity:** Acidity of water is its capacity to neutralize a strong base and is mostly due to the presence of strong mineral acids, weak acids and the salt of strong acids and weak bases. Addition of wastewater having acidity producing substances increases the acidity of water. The observed acidity of tap water sample is  $40.6 \pm 0.015$  mg/L of  $\text{CaCO}_3$ , bore well water sample is  $73.9 \pm 0.3$  mg/L. of  $\text{CaCO}_3$ . While acidity of well water samples is  $46.3 \pm 0.3$  mg/L of  $\text{CaCO}_3$ . The value is much less than threshold value i. e. 200 mg/L of  $\text{CaCO}_3$ . This indicates that sample of water are in safe range.

**7. Alkalinity:** Alkalinity is a chemical measurement of water's ability to neutralize acid. Alkalinity is also a measure of water buffering capacity or its ability to resist changes in pH upon the addition of acids or bases. Alkalinity of natural water is due to primarily to the presence of weak acid salts, although strong bases may also contribute (i.e.  $\text{OH}^-$ ) in the extreme environment. Bicarbonate represents the major form of alkalinity in natural water, so its source being the partitioning of  $\text{CO}_2$  from the atmosphere and the weathering of carbonate minerals in rocks and soil. Other salts of weak acids, such as borate, silicates, ammonia, phosphate, and organic bases from natural organic matter may be present in small amounts. The observed alkalinity of tap water sample is  $122 \pm 0.3$  mg/L of  $\text{CaCO}_3$ , bore well water sample is  $344 \pm 0.3$  mg/L. of  $\text{CaCO}_3$  while alkalinity of well water sample is  $140 \pm 0.3$  mg/L of  $\text{CaCO}_3$ . The observed values of alkalinity of tap water and well water are within permissible range i. e. below 200 mg/L of  $\text{CaCO}_3$ . The bore well water is not in safe range i.e. higher than permissible range of 200 mg/L of  $\text{CaCO}_3$ .

**8. Dissolved Oxygen:** The amount of oxygen dissolved in water, such as a lake, river or stream. Dissolved oxygen is the most important indicator of the health of water bodies and its capacity to support a balanced aquatic ecosystem of plants and animals. Warm water released from industrial outlets, flowages or storm sewers can also reduce dissolved oxygen levels. Dissolved oxygen may play a large role in the survival of aquatic life in temperature lakes and reservoirs during summer months. Dissolved oxygen of tap water sample collected is  $7.126 \pm 0.015$  mg/L, bore well water sample is  $6.896 \pm 0.015$  mg/L, whereas well water sample is  $7.266 \pm 0.015$  mg/L. It may be due to high temperature and inorganic reluctance such as hydrogen sulfide, ammonia, nitrites, ferrous ions and other oxidizable substances also tend to decrease dissolved oxygen in water.

**9. Biochemical Oxygen Demand (BOD):** Biochemical oxygen measures the amount of oxygen that microorganisms consume while decomposing organic matter, it also measures the chemical oxidation of inorganic matter. BOD is a measure of organic material contamination in water, specified in mg/L. BOD is the amount of dissolved oxygen required for the biochemical decomposition of organic compounds and the oxidation of certain inorganic materials (e.g., iron, sulphites). The observed value of BOD for tap water is  $1.231 \pm 0.03$  mg/L, for bore well water is  $0.993 \pm 0.03$  mg/L and for well water sample is  $1.127 \pm 0.03$  mg/L which is within the permissible range i. e. 0.75-1.5 mg/L.

**10. Total Dissolved Solids (TDS):** Total dissolved solids are the total amount of mobile charged ions, including minerals, salts or metal dissolved in a given volume of water in mg/L. TDS is directly related to the purity of water and the quality of water purification system and affects everything that consumes, lives in, or uses water, whether organic or inorganic, whether for better or for worse. Common inorganic salts that can be found in water include calcium, magnesium, potassium and sodium, which are cations and carbonates, nitrates, bicarbonates, chlorides and sulphates which are



anions. They give a particular taste to water at higher concentration and also reduce its palatability. The total solid present in tap water sample collected is  $108 \pm 1.0$  mg/L, for bore well water is  $118 \pm 1.0$  mg/L, while that of for well water sample is  $235 \pm 1.0$  mg/L which is lower than threshold value of total solid content i.e. 500 mg/L.

**11. Calcium hardness:** Calcium is naturally present in water. Calcium is a determinant of water hardness, because it can be found in water as  $\text{Ca}^{2+}$  ions. As per Indian Standards the calcium content of water should not be more than 75 mg/L. This has been specified in the IS 10500:- Drinking Water –Specifications. In the study the calcium content in water sample has been found to be for tap water sample is  $60 \pm 0.3$  mg/L, for bore well water is  $40 \pm 0.3$  mg/L and for well water is  $68 \pm 0.3$  mg/L. Tap water, bore well water and well water possess values calcium hardness which is within the limit as per Specification. The observed values for all water samples are within permissible range of concentration of calcium.

**12. Magnesium hardness:** Magnesium is naturally present in water. Magnesium is a determinant of water hardness, because it can be found in water as  $\text{Mg}^{2+}$  ions. As per ISI the magnesium content of water should not be more than 50 mg/L. In the study the magnesium content in water sample has been found to be for tap water sample is  $80 \pm 0.3$  mg/L, for bore well water is  $124 \pm 0.3$  mg/L and for well water is  $72 \pm 0.3$  mg/L. The observed values for tap water, bore well water and well water shows higher concentration of magnesium as per Specification.

**13. Salinity:-** Salinity which is defined as the total concentration of electrically charged ions in the water. These ions are the four major cations-calcium, magnesium, potassium and sodium, and the four common anions carbonates ( $\text{CO}_3$ ), sulphates ( $\text{SO}_4$ ), chlorides (Cl) and bicarbonates ( $\text{HCO}$ ). Other components of salinity are charged nitrogenous compounds such as nitrates ( $\text{NO}_3$ ), ammonium ions ( $\text{NH}_4$ ) and phosphates ( $\text{PO}_4$ ) [21]. In general the salinity of surface waters depends on the drainage area, the nature of its rock, precipitation, human activity in the area and its proximity to marine water [22]. Waters with salinity below 1% are fresh and waters with salinity higher than 1% are brackish/marine [23]. The observed value of salinity for tap water sample is  $1.172 \pm 0.003$  mg of NaCl, for bore well water sample is  $1.758 \pm 0.003$  mg of NaCl and for well water sample is  $1.172 \pm 0.003$  mg of NaCl.

**CONCLUSION:** The present paper deals with analysis of water quality in different drinking water resources available in Usroli village region which was carried out by taking certain important parameters like Temperature, pH, Electrical conductivity, TDS, Alkalinity, Chloride, DO, BOD, Total hardness, Calcium hardness, Magnesium hardness and Salinity. The data of physico-chemical and biological parameters clearly shows that the drinking water of Usroli village region is within the permissible range as per APHA (1989), (1992), Trivedi and Goel (1986) except few limitations in one or two parameters. Such water is suitable for drinking purpose and can be used for domestic as well as irrigation purpose.

**ACKNOWLEDGEMENT:** Authors are thankful to Principal Dr. S. S. Phulari for the encouragement and motivation.

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## DEVELOPMENT OF AN EXTRACTIVE SPECTROPHOTOMETRIC METHOD FOR DETERMINATION OF TI (IV) USING 2, 4-DIMETHYL -3H- 1, 5 BENZODIAZEPINE

**Sonali S. Patil**, Department of Chemistry, J.S.M. College, Alibag, Raigad, Maharashtra, India, 402201., Email: sonali\_suhas@rediffmail.com

### Abstract

A new analytical reagent 2, 4-dimethyl -3H- 1, 5 benzodiazepine (DBA) is proposed for the extraction and spectrophotometric determination of Ti (IV). The Reagent was synthesized and characterized by IR, NMR, elemental analysis as well as Mass spectrometry. DBA reacts with Titanium to give red colored complex which can be quantitatively extracted into n-butanol at pH 8.6. The organic extract shows maximum absorption at 435nm where absorption due to similarly prepared reagent blank is negligible. The beer's law is followed in the concentration range 1-10 µg/ml of Ti (IV). The molar absorptivity and sandell's sensitivity of Ti (IV) -DBA complex is 7320 Lit mol<sup>-1</sup>cm<sup>-2</sup> and 0.012427 mg/cm<sup>2</sup> respectively. The proposed method is rapid, sensitive, reproducible, and accurate and has been satisfactory applied for determination and separation of Titanium (IV) in commercial mixtures, pharmaceutical samples and alloys.

**Keywords:** Titanium (IV), Spectrophotometric determination, DBA reagent

**1. Introduction:** The symbol of Titanium is **Ti** and atomic number **22**. Metallic titanium is well known for its excellent corrosion resistance, having ability to withstand attack by dilute Sulphuric acid and hydrochloric acid or even moist chlorine. Titanium is highly resistant to the usual kinds of metal fatigue. Approximately 95% of titanium production is consumed in the form of titanium dioxide. Titanium alloys are principally used for aircrafts and missiles, where light weight strength and ability to withstand extremes of temperature are important. Its capacity for joining with bone and other tissue-Oseo integration makes it suitable for medical applications, such as total replacement of arthritis hips, knee joints, facial treatment and dental implants. Titanium exists in nature in its most stable and common oxidation state as titanium (IV). Titanium dioxide is extensively used as a white pigment in printing ink, ceramics and cosmetics. Ferro titanium is used as scavenger to remove oxygen, hydrogen and nitrogen in steel industry. The pure titanium resembles stainless steel. Many organic compounds of titanium such as phthalates, oxalates, tetraethylate and butyltitanate are widely synthesized and used extensively. A thorough literary survey has revealed that a few number of hydrazones are available for the spectrophotometric and extractive spectrophotometric determination of titanium (IV)<sup>1-6</sup> For the determination of titanium(IV) in micro levels, there are several frequently adopted methods using analytical techniques, such as AAS, ICP-AES, ICP-MS, x-ray fluorescence spectroscopy<sup>7-15</sup> spectrophotometry and such other techniques. Among these, spectrophotometric methods are preferred because they are cheaper and easier to handle, with comparable sensitivity.

### 2. Experimental

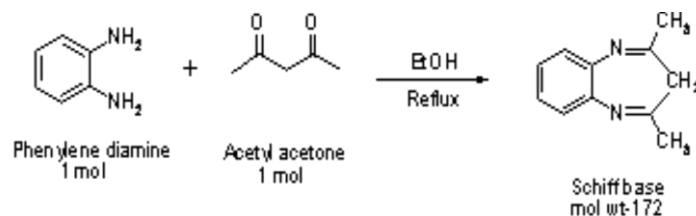
**2.1 Instruments:** A Shimadzu 2450 UV-Visible spectrophotometer with 1.0 cm quartz cell was used for absorbance studies. An Elico LI-120 digital pH-meter was used for pH adjustments. The experimental conditions are maintained as presented in Table 1.

Condition	Results
Absorption Maxima	435 nm
Solvent	n- butanol
pH range	8.6
Equilibration time	1.0 min
Stability of Chromium- reagent	72 hours
Beer's range	1 to 10 mg/cm <sup>3</sup>
Molar absorptivity	7320 Lit mol <sup>-1</sup> cm <sup>-2</sup>
Sandell's sensitivity	0.01427 mg/ cm <sup>2</sup>
Mole ratio of Cr :reagent	1:1

**Table 1 Experimental conditions**

**2.2 Synthesis of Reagent:** The reagent was synthesized by mixing 1 mole of O phenylenediamine and 2 moles of Acetyl acetone in Ethanol. The above mixture is refluxed for 2 Hours in round bottom flask. The solution thus obtained is poured in ice. Solid is formed, which is purified with ethanol. It is then characterized and used for extractive spectrophotometric determination of Ti (IV). A stock solution of reagent with concentration 0.05% was prepared in methanol. The scheme of reaction is as shown in Fig.1.

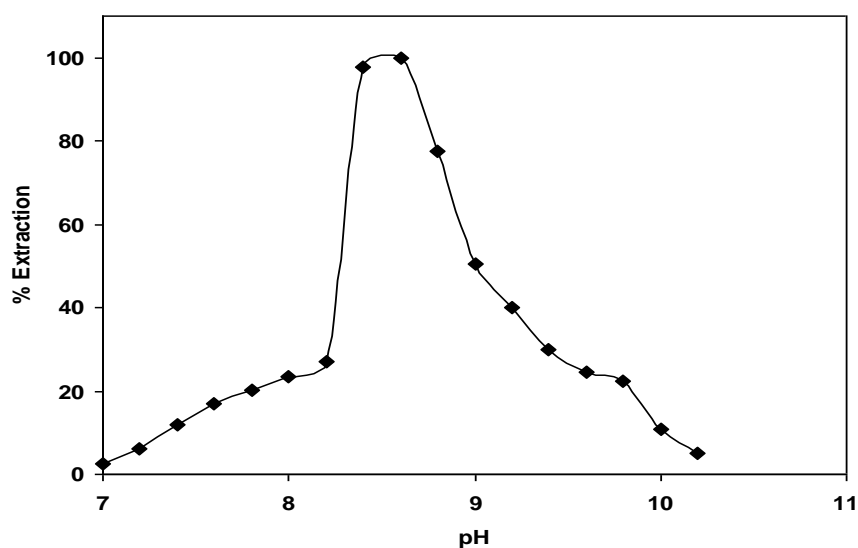
### Reaction



**Fig.1 Synthesis of Reagent 2, 4-DIMETHYL -3H- 1,5 BENZODIAZEPINE (DBA)**

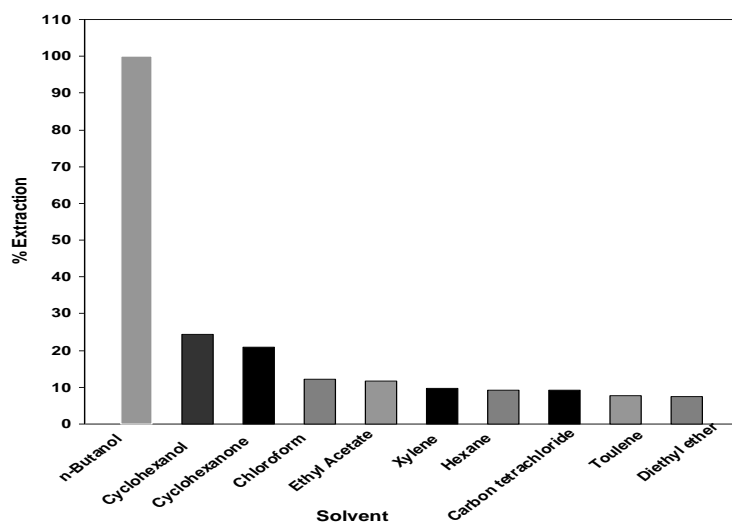
**2.3 Preparation of stock solution:** A weighed quantity titanium tetrachloride was dissolved in double distilled water then diluted to desired volume by double distilled water.

**2.4 Extraction as a function of pH:** The extraction of Titanium was carried out at various pH conditions ranging from the pH 1to pH11 using various buffer solutions. The ratio of organic phase to aqueous phase was kept 1:1. The present extraction was observed to be quantitative at pH 7.2. Therefore pH 7.2 was selected for further studies and presented in Fig.2.



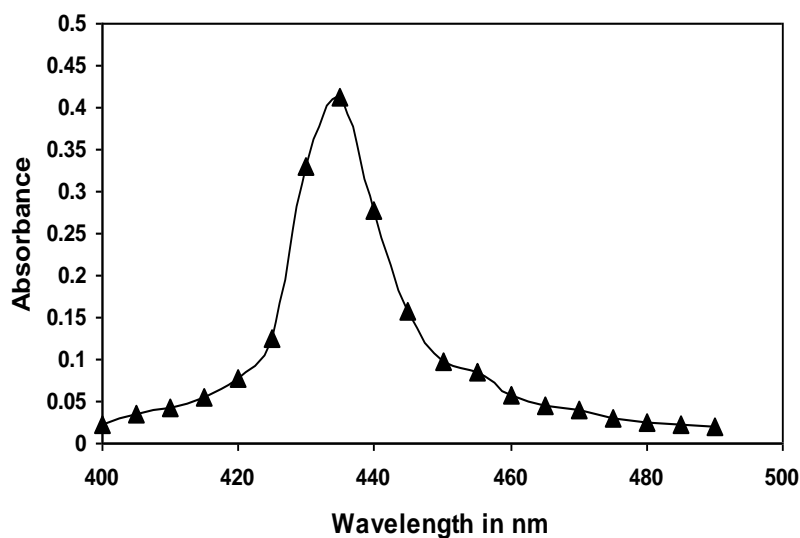
**Fig.2. Extraction as a function of pH.**

**2.5 Effect of solvent:** The suitability of extraction was studied using various organic solvents such as n-butanol, toluene, cyclohexanone, cyclohexanol, chloroform, ethyl acetate, carbon tetrachloride, xylene, diethyl ether and hexane. The extraction of chromium was observed to be quantitative in the organic solvent n-butanol. Therefore n-butanol is used for extraction of Titanium. Fig.3. indicate that n-butanol is observed to be an appropriate solvent.



**Fig.3. Effect of solvent**

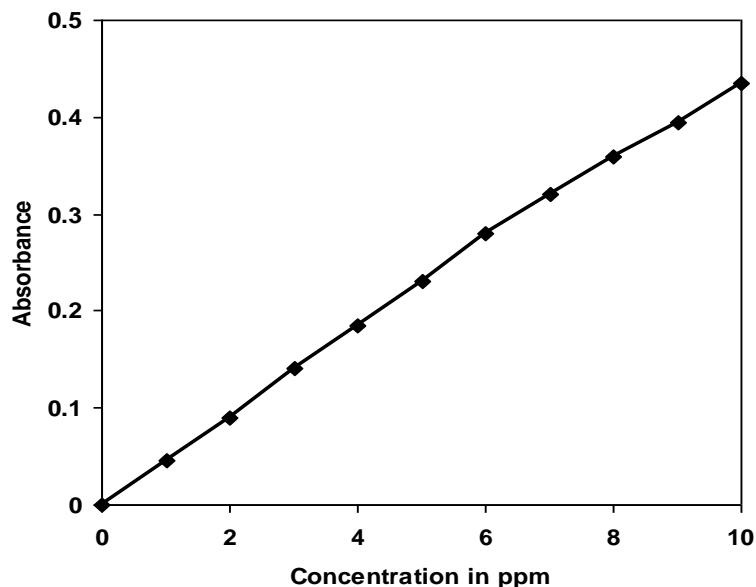
**2.5 Absorption spectrum:** Fig.4 depicted that the absorption spectrum in n-butanol observed to be maximum absorption at 445nm and the absorption due to reagent was found to be negligible at this wavelength. Hence 445nm was selected as wavelength for the absorbance measure in the spectrophotometric determination of Titanium against reagent blank.



**Fig.4. Wavelength of absorption**

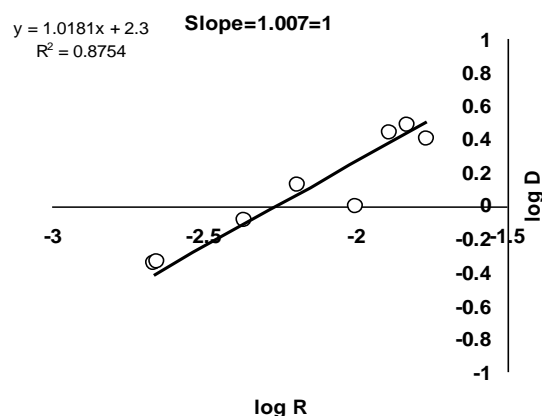
**3. Recommended procedure:** Mix 1 cm<sup>3</sup> aqueous solution containing 1-100mg of Titanium and 1cm<sup>3</sup> of 0.05% methanolic solution of reagent in 25 cm<sup>3</sup> beaker. Adjust the pH of the solution to required value with buffer solution Make the final volume 10 cm<sup>3</sup>. Transfer the solution into 125 cm<sup>3</sup> separating funnel and equilibrate for 1min with 10 cm<sup>3</sup> n- butanol. Allow the two phases to separate and measure the absorbance of organic phase containing the complex at 445 nm against reagent blank.

**3.1 Preparation of calibration plot:** The calibration curve was prepared by taking known amount of Titanium which was treated as described in the procedure. A graph of absorbance against concentration was prepared (Fig.2). The concentration of the unknown Titanium solutions is determined from the calibration plot as presented in Fig.5.



**Fig.5. Calibration Plot of Ti (IV) in mg/ml against Absorbance**

**3.2 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 Ti (IV): DBA reagent is 1: 1 and above results are confirmed from Fig.6.



**Fig.6. Slope Ratio method**

**3.3 Effect of foreign ions:** The effect of diverse ions on the Titanium (IV) determination was studied, in presence of a definite amount of a foreign ion. Various cations and anions were investigated in order to find the tolerance limit of these foreign ions in the extraction of Titanium (IV) as 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 Titanium (IV). The ions which interfere in the spectrophotometric determination of Titanium were masked by using appropriate masking agents as presented in **Table 3**.

S. No.	Interfering ions	Tolerance limit
1	Acetate, Oxlate, CN-, I-, Br-, NO <sub>3</sub> -, BrO <sub>3</sub> -, ClO <sub>3</sub> -, IO <sub>3</sub> -, NO <sub>2</sub> -, SO <sub>4</sub> -,SO <sub>3</sub> -	18
2	Tartarate	16
3	phosphate	14
4	Mg(II), Zn(II), Mo(VI), Ce(IV), Bi(III), Ca(II), As(III), Pb(II), Al(III),	14
5	V(V), Cd(II)	10
6	Na+, Ag+	18
7	Fe(II), Ni(II), Mn(II), Zr(II), Co(II), Fe(II),Cu(II), EDTA	Interfere strongly

Table 2 Effect of foreign ions

Interfering Ion	Masking agent added	Interfering Ion	Masking agent added
Cd (II)	Potassium Iodide	EDTA	Boiled with concentrated HNO <sub>3</sub>
Fe (II)	Sodium flouride	CN-	Boiled with concentrated HNO <sub>3</sub>
Ce (IV)	Sodium flouride	Ni (II)	Thiourea
Cr (VI)	Ammonium acetate	Zr (IV)	Sodium flouride
Mn (II)	Sodium flouride	Tartate	Sodium molybdate
Ag +	Potassium Iodide	V (V)	Thiourea

Table 3 Masking agents

**3.4 Comparison between reagents:** Various reagents were investigated by the earlier researchers for removal of Titanium (IV). The proposed reagent 2, 4-dimethyl -3H- 1, 5benzodiazepine (DBA) is found more superior as that of reported reagents and are presented in **Table 4**.

Name of the Reagent	Limitations
Pyridoxal salicylal hydrazone	Low Molar absorbtivity
2,4-dihydroxyacetophenone	More ions interfere
Diphenylglyoxalbis	Unstable complex
Salicylhydroxamic acid	Unstable complex
2-hydroxy-1-acetonaphthoneoxime	Low Molar absorbtivity

Table 4 Comparison between reagents

**4. Applications:** The present method was applied for determination of amount of Titanium (IV) in various samples of alloys, commercial mixtures; water samples etc. are in well agreement with standard methods as shown in **Table 5**. Every result is average of independent determinations.

S. No.	Sample	Amount of Ti(IV) in standard method	Amount of Ti(IV) in present method
1	Ferro-titanium	55%	55.05%
2	Titanium oxide	30%	30.5%
3	Ti (IV) + V(VI)	4.97 ppm	4.96 ppm

Table 5 Applications

**5. Conclusion:** The results obtained show that the newly developed method in which the reagent 2,4-DIMETHYL -3H- 1,5 BENZODIAZEPINE (DBA) was synthesized, can be used for quantitative estimation of Ti(IV). The proposed novel reagent is found to be more effective over reported reagent from earlier investigators. The proposed method is simple, rapid and requires less volume of organic

solvent. The method is also precise, less time consuming and easily employed anywhere as does not require sophisticated instruments.

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## NEED AND IMPORTANCE OF LIBRARY AUTOMATION

**Mr. Anjum Naeem Dakhwe**, Librarian, Anjuman Islam Janjira, Degree College of Science, Murud-Janjira

**Miss. Azba Sonde**, Student, Anjuman Islam Janjira, Degree College of Science, Murud-Janjira

### **Abstract**

*Automation of libraries leads to the increasing speed of all library operations. We can easily handle all the data of the library. It maintains all the statistics and records of library in a proper way and we can retrieve it easily with high speed. Cataloguing of library material is very easy as compared to manually cataloguing and we can easily search the holdings of the library with the help OPAC in a short period. This article states that historical background of library automation, growth of library automation, library automation meaning and definition, need, objectives and advantages of library.*

**Keywords:** Library automation, needs and objectives

**Introduction:** Libraries are known for using Information and Communication Technology (ICT) both for automation of its routine activities as well as for providing search services to the users. Computers are increasing used in libraries both for internal operations as well as for accessing information that is available four walls of the library. The application of computers avoid repetitive jobs and save labor and time both for users as well as outside the library staff. Computers are not only used as a data processing tool, but also for information storage, access and retrieval. The use of computers for information storage and retrieval began with the production of computer-generated and printed indices for scientific and technical literature in 1960s. Subsequently, several organizations started using computers not only for generation and printing of indices but also for creation of computer readable databases, By early 1970s, several published indexing and abstracting journals, such as Biological Abstracts, Chemical Abstracts, Index Medicus, etc. were not only produced by computer, they were also made available as computer-readable databases on magnetic tapes and several organizations started subscribing to them on magnetic media to organize local information storage and retrieval services.

**Historical Background of Library Automation:** A process of great change has been taking place today in libraries due the impact of information technology and application of computers in library work. We hear a lot about library automation in libraries and library automation is nothing but application of machines viz. computers to the routine library housekeeping operations such as acquisition, serial control cataloguing and circulation. Before proceeding into the depth of library automation, it is necessary to know the historical background of automation. Automation of library has passed through several of development, which can be divided into 3 phases:

1 Experimental Phase (1930-1960)

2 Local systems Phase (1960-1970)

3 Co-operative Systems Phase (1970)

### **1. EXPERIMENTAL PHASE (1930-1960)**

The first application of automatic data processing equipments in libraries can be traced back to 1936 when the University of Texas adapted a mechanical system for its circulation function. In the first half of the 20th century, i.e. in the early 1960s library automation began especially in the U.S.A. after the World War II. During this period, many libraries in North America and in the U.K began to experiment processing of information by using computers. Many techniques were introduced in the universities and national libraries. Several of these systems were like tabulators, sorters; punched cards were used for circulation i.e. for providing books on loan, serial control, acquisition, cataloguing etc. (Laxminarayan, 1986).

In the U.K. the Public Libraries of Camden and West Sussex and the University libraries of Newcastle and Southampton were involved in the Experimental phase. Many systems such as edge-notched cards, optical coincidence, punched cards, and early computers developed during this phase failed due to the following reasons:

- 1 Computer technology at that time was inadequate.
- 2 Librarians were not sufficiently definitive in their requirements of the computer based system.
- 3 Computer people thought that they knew the librarians' requirements of the computer based system.
- 4 It was thought that all the individual systems in a library should be simultaneously converted to computer based. (Tedd, 1977).

## 2. LOCAL SYSTEMS PHASE (1960-1970)

This period applied general purpose digital computer for retrieval of information. In this era, the computers were applied offline. During this period, many librarians made use of the computer as a tool in the organization of many of the library's procedures. Most of these systems were developed locally, either in an academic library, special library or public library. In this phase focus was mostly on acquisition, cataloguing and circulation process. During this phase, OPAC i.e. Online Public Access Catalogue was in an experimental stage in the U.S.A. During this phase, Machine Readable Catalogue i.e. MARC came into existence in year 1963 at the Library of Congress, U.S.A for providing standardization in automation. In 1967, the Ohio College Library Centre (OCLC) was set up which is an online system which marked the beginning of cooperative systems and union catalogue. In 1969, the Library of Congress started distribution of records in the new MARC II format.

(Tedd, 1977).

## 3. COOPERATIVE SYSTEMS PHASE (1970- )

In the 1970s there has been an increase in library cooperation and resource sharing by libraries developing computer based systems. In this phase, designing of online systems and conversion of batch systems into online mode was done and also the growth of library network and databases were seen in these Phase. Here magnetic tapes and floppy disks were used for storing information. In the 1980s there was in intensive use of online systems networks, optical disks, CD-ROMs etc. In this period, microcomputers came to be used in libraries. Late on through Internet and library networks, all processes of libraries were integrated. (Rajagopalan, 1986).

Kaul (1999) has given the growth of library automation can be better understood from the following table:

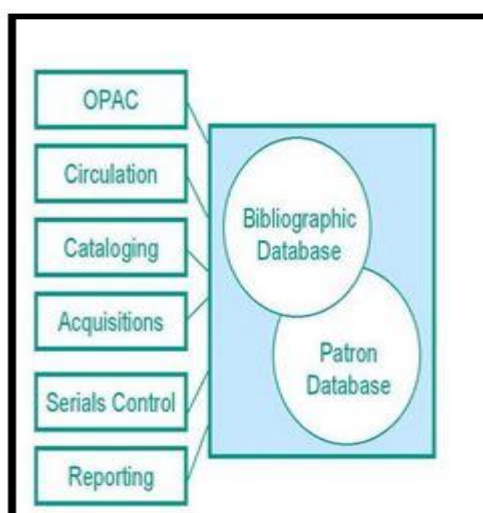
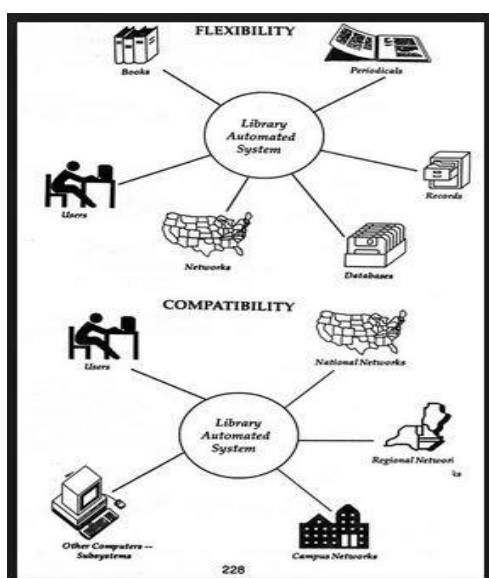
### GROWTH OF LIBRARY AUTOMATION

Year	Developments
1940-1949	Semi-mechanical applications including edge-notched cards, optical coincidence, peek-a-boo cards.
1950-1959	Use of punched cards, data processing equipments, early computers and micro image searching systems.
1960-1969	Application of general purpose digital computers, feasibility studies of online interactive and advance micro image systems, experiments in library networking.
1970-1979	Design of online systems and conversion of batch systems into online mode, growth of library network and databases.
1980-1989	Intensive use of online systems, networks, mini and microcomputers, optical disks, CD-ROMs, FAX etc.
1990s	Use of internet and library networks aims towards higher levels of computer application such as recording through electronic media, artificial intelligence etc

**Library Automation:** The word “automation” has been derived from Greek word “automose” means something, which has power of spontaneous motion or self-movement. The term “automation” was first introduced by D.S. Harder in 1936, who was then with General Motor Company in the U.S. He used the term automation to mean automatic handling of parts between progressive production processes.

**Definition:** According to Encyclopedia of Library and Information Science, “automation is the technology concerned with the design and development of process and system that minimize the necessity of human intervention in operation” (Kent, 1977). According to McGraw Hill Encyclopedia of Science and Technology automation as “a coined word having no precise generally accepted technical meaning but widely used to imply the concept, development, or use of highly automatic machinery or control systems” (McGraw, 1982). Webster’s Third new International Dictionary of English Language Automation is defined as “automatically controlled operation of an apparatus, process or system by mechanical or electronic device that takes place of human organs of observation, effort and decision”. (Gove, 1966) According to the Oxford English Dictionary automation as “application of automatic control to any branch of industry or science by extension, the use of electronic or mechanical devices to replace human labor”. (Simpson & Weiner, 1989). Library automation, stated in single term, is the application of computers and utilization of computer based product and services in the performance of different library operations and functions in provision of various services and production of output products. Library automation may be defined as the application of automatic and semiautomatic data processing machines (computers) to perform traditional library housekeeping activities such as acquisition, circulation, cataloguing and reference and serials control. Today “Library Automation” is by far the most commonly used terms to describe the mechanization of library activities using the computer. (Uddin, 2009).

Following are the images to describe concept of Library Automation.



**Need And Objectives Of Library Automation:** Information explosion has resulted in the production of a large amount of literatures in every field of knowledge. Accordingly the print documents are coming to the library in huge numbers which is not possible for a library to manage the collection

manually. Now a day no user has time to search the required and relevant information from the dense heap of information collection .They have no time to go shelve by shelve to pick up a book . So it necessitated for library automation. In most of libraries are yet to be automated.

#### **Objectives of Library automation**

- To improve over the library collection.
- To have an effective control over the entire operations.
- To share effectively the resources among various libraries at a local, regional, national and international level.
- To avoid duplication and repetitive work/tasks.
- To obtain various services of the existing staff effectively.

#### **Need and Importance of Library Automation**

- Information explosion.
- Availability of information in various formats (print, non-print, graphical, audio-visual etc.)
- Different approaches and needs of the user.
- Limitation of library (time, space and human power)
- Increasing no of users.
- Speedup of searching for users.
- Better access to the collection.
- Allows easy sharing of resources with other libraries.
- More interface with the library users with other information resources.
- Better facilities for the users as other libraries are also automated.
- Enhances consistency in the collection, streamlines circulation.
- Time saving of clerical and repetitive tasks.
- Ease of maintenances of statistics and overdues.
- Immediate report to the management.

#### **Basic Requirements for Library Automation**

- Adequate collection
- Financial assistance
- Hardware
- Software
- Trained staff
- User training
- Maintenance & development

#### **Advantages of Library Automation**

- Provides users with timely access to various library materials.
- Eliminates routine and repetitive tasks or performs them more quickly and effectively.
- Reduces the amount of time spent on material acquisition, serials, etc.
- Management, budget administration and record keeping.
- Supports new means of information retrieval system.
- Allows library users to use search strategies that exceed those that can be used with card catalogue.
- Also allows library users to search library's collection from anywhere locating beyond the boundaries.
- It motivates users equip them with problem solving and information retrieval skills and provides them with the lifelong learning experience.
- It increases productivity in terms of both work as well as in service.

- Professional staff need not spend much time to the routine work.
- Eliminates human errors while performing routine library work.
- Cataloguing is faster.
- Excellent control over circulation.

**Conclusion:** Automation of libraries leads to the increasing speed of all library operations. We can easily handle all the data of the library. It maintains all the statistics and records of library in a proper way and we can retrieve it easily with high speed. Cataloguing of library material is very easy as compared to manually cataloguing and we can easily search the holdings of the library with the help OPAC in a short period. It serves the fourth law of library science "Save the time of the user". Because Library Automation saves the time of the user as well as library staff.

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**PHARMACOGNOSTIC STUDY OF NATURAL CAT REPELLANT PLANT**

**N.H.Godse**, Research student email Id- nishagodse123@yahoo.co.in

**S.P.Jagdale**, Dapoli Urban Bank Senior Science College, Dapoli 415712

**Abstract**

The present study deals with the Phytochemical and Pharmacognostic studies of leaves and stem of *Plectranthus canninus* Roth (Synonym *Plectranthus spicatus*). It is a perennial herb belonging to family Lamiaceae. As the essential oil present in the leaves of this plant it possess a strong odour. This plant is used as natural cat repellent due to its strong odour. Pharmacognostic study of this plant leaf drug is carried out and it contains the dermal character like stomata, trichomes and anatomical features etc. The preliminary Phytochemical studies indicate the presence of volatile oils, alkaloid, fixed oils and glycosides and tannins. The present study is helpful or standardization for evaluation of drugs.

Figure:

References: 16

Tables:02

**Keywords** – *Plectranthus canninus*, Pharmacognostic studies, volatile oils, tannin

**Introduction** - Lamiaceae is an important medicinal plant family popular as mint family due to the aromatic fragrance emitted by the herbs and shrubs of its members. Popular plants in this family are Coleus, Ocimum, mint, lavender etc. The family Lamiaceae consists of approximately 300 species. *Plectranthus* are aromatic plants of this family are perennial but most of them are annual herbs with approximately 1 meter in height. *Plectranthus canninus* Roth is belonging to family Lamiaceae is an important plant in Indian system of medicine. It is a perennial fleshy herb, in arid places on rocky ground among bushes found in Coimbatore district of Tamil Nadu India and in Pune, Maharashtra. It grows up to 1 meter in height with branchlets hispid in nature. Traditionally this plant is used as a stimulant treatment of cough, diuretic, and cytotoxic. Literature reveals that *Plectranthus canninus* is used in the treatment of teeth and gum disorders. *Plectranthus canninus* is one of the plant species which are presently being tested for their suitability to be grown as Green Roof plants in the Durban region that have initially shown good results. They also occur naturally within a radius of 50 km of the Durban city centre.

***Plectranthus canninus* (Roth)**

Genus – *Plectranthus*

Species – *canninus*

Nomenclature Authority: Roth

**Vernacular name's**

English : Scary cat plant, Piss-off plant, Dog gone

This plant has been famed for scaring the canina fauna especially cats hence the name *canninus* (Eggle and Newton, 2004). The scary cat plant, or *Plectranthus canninus* does have a distinctive skunk smell which is worse when someone brushes up against the plant or bruises it. They are native to Southern Asia and eastern Africa and they attract butterflies and bees. These plants root easily from cuttings or just touching the ground. Both the leaves and flowers of the plant are sticky to the touch, and have a mild odour not unlike a marijuana.

**Material and Methods**

1. **Plant Material** - Plant was collected from the different study areas near Pashan lake Pune and hilly regions of Coimbatore district Tamilnadu. The collected plant was identified with the help of floras and expert opinions. Herbarium were made and authenticated in the Botanical Survey of India, Western region, Pune. The voucher specimen was deposited in the Herbarium, BSI, Pune (BSI/WRC/2016/509) and BSI, Coimbatore.

**2. Pharmacognostic studies-**

i) **Macroscopic study:** The macroscopy and microscopy of the plant were studied according to the method developed by Esau. The transverse sections were prepared and stained for the microscopical study as per the standard procedure described.

ii) **Powder analysis:** The powder was characterized by its morphological characters like green colour of powder, presence of specific aromatic odour and bitter taste.

**Table : 1 Preliminary test of *Plectranthus canninus***

Sr. No.	Test	Observation	Inference
1	Colour	Green	Leaves of <i>Plectranthus</i>
2	Odour	Specific	Aromatic crude drug
3	Taste	Bitter	Drug contain tannin

**3.Preparation of Extract** – The plant material were brought to the laboratory washed in the tap water and shed dried for a week then made into powdered and stored in clean plastic container till further use. Powdered material extracted in 5 different solvents like Water ,Ethanol, Acetone, Chloroform and Petroleum ether by soxhlet apparatus and dried material stored and use for further experiment.

**4. Preliminary Phytochemical screening** - The Preliminary Phytochemical screening of crude extract were subjected using different solvents of Petroleum Ether, Chloroform, Acetone,Ethanol and Water for different test for identification of phytochemicals as alkaloid, carbohydrates,tannins,resins,flavonoids protein, amino acids,saponins and coumarin.

#### Observations

**1) T.S. OF STEM** – The transverse section of the is circular in shape. The epidermis is outermost protective layer of stem. It is single layered and present in both upper and lower surface. The outer cell wall is greatly thickened and heavily cutinized. Epidermis is followed by hypodermis. Periderm, cortex, vascular cylinder and pith are seen from periphery to center. Periderm is superficial and uniform in thickness all throught the stem. The phloem cells are thin wall and tabular in shape and suberized. The covering and glandular trichomes found in periderm

**2) T.S. OF LEAF** – It is dicotyledonous leaf. The epidermis is outermost protective layer and upper epidermis is single layered and rectangular cells. The outer cell surface of the epidermis is covered with cuticle. Leaves have upper and lower epidermis with numerous stomata flanked by guard cells. Stomata are present on both the upper and lower epidermis. The mesophyll tissues are differentiated into Palisade cells and spongy tissues.Palisade cells are double layered,compact with radially elongated cells. Spongy parenchyma is 4- 6 layered. Lower epidermis is similar to upper epidermis and has many stomata and many trichome. Covering trichomes are uniseriate and multicellular ( 3-5 celled), mostly not straight and warty with blunt tips. Upper epidermal trichomes are less in number as compared to lower epidermis. Each vascular bundle is conjoint, collateral and closed. Xylem is present towards upper epidermis and phloem is towards lower epidermis

**3) TRICHOME** – The trichomes are present on both the upper and lower leaf surface. The trichomes of upper surface are uniseriate, multicelluar . The foot is embedded in the epidermal cell and tip of trichome is slightly bent. The trichomes of lower surface are more in number as compared to upper surface and uniseriate and multicellular. The foot is embedded in the epidermal cell and tip is pointed and slightly bent.

**4) STOMATA**– Leaf is simple and succulent type. The leaf surface is smooth. Stomata are present on the both upper and lower surface of leaf. on upper surface of leaf number of stomata are more in number as compared to lower surface.

**Phytochemical constituent** – The Preliminary Phytochemical analysis of leaf powder shows the presence of Alkaloid, Tannins, Flavonoids, Glycosides and Saponins while quinone is absent. (Table no.2)

**Table 2 - Preliminary Phytochemical screening of leaf powder**

Phytochemical	Test	WE	EE	AE	C E
Alkaloid	Dragendorff's reagent	++	++	-	-
Phenol	Ferric Chloride test	++	++	-	-
Tannin	Ferric chloride test	++	+	-	-
Sterols	Salkowski test	++	-	-	-
Flavonoid	Lead acetate	++	++	+	-
Glycosides	Keller killani test	+	+	-	-
Carbohydrate	Fehling's test	+	+	-	-
Quinone	Quinone	--	--	-	-
Saponin	Frothing test	++	++	+	-
Resin	Turbidity	++	-	-	-
Coumarin	Coumarin	++	-	-	-

WE- water extract, EE-Ethanol extract AE –Acetone extract,

CE – Chloroform extract

++ indicates strongly present, + indicates and – indicates absent

**Table 3 - Preliminary Phytochemical screening of stem powder**

Phytochemicals	Test	WE	EE	AE	C E
Alkaloid	Dragendorff's reagent	++	++	-	-
Phenol	Ferric Chloride test	++	++	-	-
Tannin	Ferric chloride test	++	+	-	-
Sterols	Salkowski test	++	-	-	-
Flavonoid	Lead acetate	++	++	+	-
Glycosoides	Keller killani test	+	+	-	-
Carbohydrate	Fehling's test	+	+	-	-
Quinone	Quinone	--	--	-	-
Saponin	Frothing test	++	++	+	-
Resin	Turbidity	++	-	-	-
Coumarin	Coumarin	++	-	-	-

**Result and Discussion:** Macroscopic characteristics: The herb grows upto 1meter in height. The branchlets are hispid by nature. The leaves are ovate in shape and they are succulent, pubescent with cordate –truncate base and crenate margin. Floral bracts are closely imbricate, ovate and acute. Calyx resemble like tube villows within and tomentose. The 5 unequal lobes are present whereas upper lip is ovate, flat and lower lip is obtuse and 4-toothed while mid lobe is shorter. In India, *Plectranthus* is a popular traditional plant and found in all the habitats. Various Phytochemicals have been known to possess medicinal properties and hence widely used to Indian systems of traditional medicine. This plant is rich in phenolic compounds. In the present study various Phytochemical constituents like alkaloid, tannins, Saponins, phenols, flavonoids, Glycosides etc. were present. All phytoconstituents are present in water extract whereas only quinone, sterol, coumarin and resin is absent in ethanolic



extract. Flavonoid and saponins only present in acetone extract and all Phytochemical are absent in chloroform extract. Microscopic characteristics: Leaf: The leaf is thick fleshy and soft. It is isobilateral and apparently less differentiated into midrib and lamina. The lamina of the leaf shows three distinct regions viz., upper epidermis, lower epidermis and mesophyll. Abundant covering and glandular trichomes emerged from the both epidermal layer. The trichoma's are multi-cellular, uniseriate and unbranched (2-7 cell) mostly straight and sometime warty with acute tips. Stomata are occasionally present which is more in numbers in upper epidermis and less in number in lower epidermis.

**Conclusion:** The Phytochemical qualitative analysis of *Plectranthus canninus* plant showed a positive reaction towards an aqueous extract as most of the phytochemicals was present in it. It is a good source of tannin and phenol, carbohydrates, alkaloid. The plant used for ethno-botanical uses like wound healing and itches. Thus all these properties can be observed due to various types of Phytochemical present in it. The Phytochemical characterization of the extract and identification of bioactive compounds and quality standards are necessary for future study.

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**SOLAR POWER SYSTEM AND INDIA**

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**Prof. Ayesha Penkar**, *Ass. Prof., Zakkiuddin Dawre (S.Y.BSc), Anjuman Islam Janjira Degree College of science. Murud, Maharashtra*

**Mr. Zakiuddin Dawre**, *Student, Anjuman Islam Janjira Degree College of science. Murud, Maharashtra*

**Abstract**

*As per the fastest growing technologies and developing countries like India, renewable energy sources is needed. Energy is considered a prime agent in the generation of wealth and a significant factor in economic development. Energy is also essential for improving the quality of life. Renewable energy sources and technologies have potential to provide solutions to the longstanding energy problems being faced by the developing countries like India. Solar energy is the most important alternative resource of the world and has a large potential of green energy. Solar energy can be an important part of India's plan not only to add new capacity but also to increase energy security, address environmental concerns, and lead the massive market for renewable energy. This report examines various ways in which solar power is precisely such an opportunity.*

**Introduction:** Energy is considered a prime agent in the generation of wealth and a significant factor in economic development. The increase in energy consumption, particularly in the past several decades has raised fears of exhausting the globe's reserves of petroleum and other resources in the future. The huge consumption of fossil fuels has caused visible damage to the environment in various forms. The most challenging thing in front of the world is how to fulfill the requirement of energy. Due to the limitation of the conventional resources, the world has to think about the alternate source of energy. To fulfill the requirement of energy resources that cannot be hazardous to the environment, most of the countries are emphasizing on the development of renewable energy resources. In the renewable energy resources, solar energy plays an important role. Solar power is a clean, environmental friendly source of energy [2]. There are no toxic byproducts or emissions. Solar power is the generation of electricity from sunlight. This can be direct as with photovoltaic's (PV), or indirect as with concentrating solar power (CSP), where the sun's energy is focused to boil water which is then used to provide power. The solar photovoltaic is a very important power source for meeting rural electricity demand in this region of the country. Thermal energy is required to fulfill several purposes in the domestic, agricultural, industrial, and commercial sectors of the economy. India is growing towards huge solar energy day by day.

**Thermal Power Plant: Concentrated solar power** (also called **concentrating solar power, concentrated solar thermal**, and **CSP**) systems generate solar power by using mirrors or lenses to concentrate a large area of sunlight, or solar thermal energy, onto a small area. Electricity is generated when the concentrated light is converted to heat, which drives a heat engine (usually a steam turbine) connected to an electrical power generator [3][4][5] or powers a thermochemical reaction (experimental as of 2013[6][7][8]). CSP technology utilizes focused sunlight. The plants consist of two parts: one that collects solar energy and converts it to heat, and another that converts the heat energy to electricity. Within the United States, CSP plants have been operating reliably for more than 15 years. All CSP technological approaches require large areas for solar radiation collection when used to produce electricity at commercial scale [9]. Solar thermal power plant can be distinguished according to the arrangement of their concentrated mirror. The best known technologies are the parabolic trough, the compact linear Fresnel reflector, the Stirling dish and the solar power tower. A parabolic trough consists of a linear parabolic reflector that concentrates light onto a receiver positioned along the reflector's focal line. The receiver is a tube positioned along the focal points of the linear parabolic mirror and is filled with a working fluid. The reflector is made to follow the sun during daylight hours by tracking along a single axis. Parabolic

trough systems provide the best land-use factor of any solar technology[16]. Compact Linear Fresnel Reflectors are CSP-plants which use many thin mirror strips instead of parabolic mirrors to concentrate sunlight onto two tubes with working fluid. This has the advantage that flat mirrors can be used which are much cheaper than parabolic mirrors[17][18]. The Stirling solar dish combines a parabolic concentrating dish with a Stirling engine which normally drives an electric generator. The advantages of Stirling solar over photovoltaic cells are higher efficiency of converting sunlight into electricity and longer lifetime. Parabolic dish systems give the highest efficiency among CSP technologies[19]The 50 kW Big Dish in Canberra, Australia is an example of this technology[20] A solar power tower uses an array of tracking reflectors (heliostats) to concentrate light on a central receiver atop a tower. Power towers can achieve higher (thermal-to-electricity conversion) efficiency than linear tracking CSP schemes and better energy storage capability than dish Stirling technologies[20].The PS10 Solar Power Plant and PS20 solar power plant are examples of this technology. STE plants are considered to have a minimum life of 20 years. According to some estimates, India can have a STE installed base of 4–5 GW by 2020. A large amount of Indian STE output is consumed in Delhi, Haryana, and Punjab, drawing upon supply sites in both Rajasthan and Jammu and Kashmir. Population centers in Gujarat are also well positioned to extract power from Rajasthan [10].

**Concentrating Photovoltaic system:** Concentrator photovoltaics (CPV) (also known as Concentration Photovoltaics) is a photovoltaic technology that generates electricity from sunlight. It uses lenses and curved mirrors to focus sunlight onto small, but highly efficient, multi-junction (MJ) solar cells. In addition, CPV systems often use solar trackers and sometimes a cooling system to further increase their efficiency[11].



Concentrator photovoltaics (CPV) modules on dual

#### **1 axis solar trackers in Golmud, China.**

Concentrator Photovoltaic (CPV) technology has entered the market as a utility scale option for the generation of solar electricity with 370 MWp in cumulative installations, including several sites with more than 30 MWp. This report explores the current status of the CPV market, industry, research, and technology. CPV is of most interest for power generation in sun-rich regions with Direct Normal Irradiance (DNI) values of more than 2000 kWh/(m<sup>2</sup>a). The systems are differentiated according to the concentration factor of the technology configuration (see Table 1). More than 90 % of the CPV capacity that has been publicly documented to be installed through the end of 2016 is in the form of high concentration PV (HCPV) with two-axis tracking. Concentrating the sunlight by a factor of between 300x to 1000x onto a small cell area enables the use of highly efficient but comparatively expensive multi-junction solar cells based on III-V semiconductors (e.g. triple-junction solar cells made of GaInP/GaInAs/Ge). Low concentration designs – those with concentration ratios below 100x

– are also being deployed. These systems primarily use crystalline silicon (c-Si) solar cells and single-axis tracking, although dual axis tracking can also be used[12][13][14].

Concentrated photovoltaic technology will pave the way to meet the goals of the Indian Government's Solar Mission that promotes sustainable growth while addressing India's energy security. It is an integral part of the initiative to respond to the global challenge of climate change. The first phase of the Mission aims to commission 1000 MW of grid-connected solar power projects by 2013. In addition to helping meet these targets in the most efficient manner, concentrated photovoltaic solar power will introduce a new solar technology to India [15].

Solar Power in India: power projects in Tamil Nadu, Rajasthan, Gujarat and Maharashtra. These states are also the top five states in India with highest wind electricity generation[21] The country's solar installed capacity reached 20 GW in February 2018[22]. India expanded its solar-generation capacity 8 times from 2,650 MW on 26 May 2014 to over 20 GW as on 31 January 2018[23][24]. The 20 GW capacity was initially targeted for 2022 but the government achieved the target four years ahead of schedule[23][24] The country added 3 GW of solar capacity in 2015-2016 and over 5 GW in 2016-2017, the highest of any year, with the average current price of solar electricity dropping to 18% below the average price of its coal-fired counterpart[25][26][27]. In January 2015 the Indian government expanded its solar plans, targeting US\$100 billion in investment and 100 GW of solar capacity (including 40 GW from rooftop solar) by 2022[30][31][31][32][33][34]. India's initiative of 100 GW of solar energy by 2022 is an ambitious target, since the world's installed solar-power capacity in 2017 is expected to be 303 GW[35][36]. The improvements in solar thermal storage power technology in recent years has made this task achievable as the cheaper solar power need not depend on costly and polluting coal/gas/nuclear based power generation for ensuring stable grid operation[37][38][39].

#### **Advantages of solar power:**

##### **Renewable Energy Source**

Among all the benefits of solar panels, the most important thing is that solar energy is a truly renewable energy source. It can be harnessed in all areas of the world and is available every day.

**Reduces Electricity Bills:** Since you will be meeting some of your energy needs with the electricity your solar system has generated, your energy bills will drop. How much you save on your bill will be dependent on the size of the solar system and your electricity or heat usage. Moreover, not only will you be saving on the electricity bill, but if you generate more electricity than you use, the surplus will be exported back to the grid and you will receive bonus payments for that amount (considering that your solar panel system is connected to the grid). Savings can further grow if you sell excess electricity at high rates during the day and then buy electricity from the grid during the evening when the rates are lower.

**Low Maintenance Costs:** Solar energy systems generally don't require a lot of maintenance. You only need to keep them relatively clean, so cleaning them a couple of times per year will do the job.

**Technology Development:** Technology in the solar power industry is constantly advancing and improvements will intensify in the future. Innovations in quantum physics and nanotechnology can potentially increase the effectiveness of solar panels and double, or even triple, the electrical input of the solar power systems [28]

**It's eco-friendly:** Solar energy is an alternative for fossil fuels as it is non-polluting, clean, reliable and renewable source of energy. It does not pollute the air by releasing harmful gases like carbon dioxide, nitrogen oxide or sulphur oxide. So, the risk of damage to the environment is reduced. Solar energy also does not require any fuel to produce electricity and thus avoids the problem of transportation of fuel or storage of radioactive waste [29].

**Conclusion:** In this paper, we have discussed how solar power work and also how India is taking the benefits of such system to fulfill the growing need of energy. Solar energy development in India can also be an important tool for spurring regional economic development, particularly for many underdeveloped states, which have the greatest potential for developing solar power systems which is unlimited and clean source of energy. It can provide secure electricity supply to foster domestic industrial development. So it can be concluded that photovoltaic power systems will have an important share in the electricity of the future not only in India, but all over world. The step of Indian government to increase the target is a very good to become India as one of the most solar powered countries in the world. Such types of steps will be required in the future

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**आंतरशास्त्रीय संशोधनात जैवविविधता**

डॉ. सुनिलदत्त एस. गवरे, शिवळे महाविद्यालय, शिवळे.

**प्रस्तावना :** जैवविविधता म्हणजे सजीवांमधील एखाद्या जाति, परिसंस्था, बायोम किंवा पूर्ण पृथ्वीवरील विविधता. परिसंस्थेमधील विविधता हे परिसंस्थेच्या निकोप पणाचे एकक आहे. जैवविविधता बऱ्याच प्रमाणात भूभागाच्या हवामानावर अवलंबून असते. उदा. उष्णप्रदेशीय भागामध्ये जैवविविधता अधिक तर ध्रुवीय भागामध्ये विविधता कमी असते. झापाट्याने होणाऱ्या परिसरातील बदलांमुळे सजीव सामूहिकरित्या लुप्त होतात. एका अंदाजानुसार पृथ्वीवर असलेल्या एकूण सजीवांपैकी एक टक्का सजीव लुप्त झाले आहेत. सजीवांची पृथ्वीवर निर्मिती झाल्यापासून आजपर्यंत पाच वेळा मोठ्या प्रमाणात आणि अनेक वेळा लहान प्रमाणात जैवविविधतेचा नाश झाला आहे. फेनेरोझोइक महाकल्पामध्ये (54 कोटी वर्षापूर्वी) जैवविविधतेचा महाविकास 'कॅम्ब्रियनकल्पामधील विविधतेचा स्फोट' या नावाने ओळखला जातो. बहुपेशीय सजीवांमधील सर्व संघांची निर्मिती झालेली होती. त्यापुढील 40 कोटी वर्षांमध्ये जैवविविधतेचा पुन्हा पुन्हा नाश झालेला होता. 'कार्बोनिफेरस' युगामध्ये सदारहित वनांमधील वनस्पती व प्राण्यांचा नाश झाला. 'पर्मियन ट्रायासिक' युगामध्ये 25 कोटी वर्षापूर्वी झालेला जैवविविधतेचा नाश सर्वात मोठा होता. तीन कोटी वर्षापूर्वी पृष्ठवंशी सजीवांनी पुन्हा एकदा आपला जम बसवला. साडेसहा कोटी वर्षापूर्वी झालेला 'क्रिटेशियस – टर्शरी विनाश' हा नजीकच्या काळातील जैवविविधतेचा नाश होय. याच काळात डायनासॉर नाश झाले. जैवविविधतेमध्ये माणसाचा प्रवेश झाल्यानंतर जैवविविधता जनुकीय विविधता हळूहळू नाहीशी होत आहे. यास 'हॉलोसिन विनाश' म्हटले जाते. मानवी हस्तक्षेपामुळे अधिवास नष्ट झाल्याने जैवविविधतेचा हा नाश होत आहे. संयुक्त राष्ट्र संघाने जैव विविधतेच्या नाशाकडे लक्ष देण्यासाठी इसवी सनाचे 2011-2020 हे दशक जैवविविधता दशक म्हणून जाहीर केले आहे. पूर्वी घराच्या आजूबाजूला वेगवेगळी फळांची व फुलांची झाडे लावली जायची जेणेकरून त्यावर पक्षी फुलपाखर बागडावीत पण आताच्या सध्याच्या स्तिथीत पाहिल तर सगळीकडे कोन्क्रीटीकरण वाढलेले आहे. त्यामुळे आजूबाजूला जास्त परिसरच नाहीये व जेवढा आी तेवढ्यात वेगवेगळी शो ची झाडे लावली जात आहेत.

**व्याख्या :** जैवक विविधता किंवा जैवविविधता व्याख्याचे अनेक अर्थ निघतात. सामान्य व्याख्याप्रमाणे जैवविविधता म्हणजे जाति विविधता आणि जातिमधील संपन्नता (जीवशास्त्रीय). जीवशास्त्रज्ञांच्या व्याख्याप्रमाणे "जैवविविधता म्हणजे जनुकांची व्यक्तता, जातीमधील विविधता आणि परिसंस्थेमधील विविधता". 2004 मध्ये कार्डिफ विद्यापीठाने आणि पेंबुकशायर मधील डार्विन सेंटरच्या प्राध्यापक अँथनी कॅंपबेल यांनी या व्याख्याते रेण्वीय विविधतेची भर घातली.

**जैवविविधता समृद्ध क्षेत्र :** जैवविविधता समृद्ध क्षेत्र अशा अनेक ठिकाणांना हॉट स्पॉट म्हणावे ही कल्पना डॉ. सबिना विर्क यांनी 1988मध्ये मांडली आहे. म्हणजे ज्या ठिकाणी मोठ्या संख्येने स्थानिक जातींचे वसतिस्थान आहे त्यास जैवविविधता समृद्ध क्षेत्र म्हणता येते. बहुतेक समृद्धी क्षेत्रे ही मानवी वस्त्यांजवळ आहेत. समृद्धक्षेत्रे जगभर विखुरलेली असली तरी उष्ण कटिबंधातील वनांत आणि सदाहरित जंगलात त्यांची संख्या सर्वाधिक आहे. ब्राझीलमधील अटलांटिका पर्जन्यवन हे त्यापैकी एक आहे. या वनामध्ये 20,000 प्रकारच्या वनस्पति, 1350 पृष्ठवंशी आणि लक्षावधी कीटक आहेत. यातील निम्याहून अधिक असे आहेत की की, ते इतरत्र कोठेही आढळत नाहीत. मादागास्कर बेटावर एकमेव अरण्य, मादागास्कर शुष्क वन आणि सपाठटीवरील पर्जन्यवन आहे. मादागास्कर मूळ आफ्रिकन भूमीपासून साडेसहा कोटी वर्षापूर्वी वेगळे झाल्याने या वनातील सजीवांमध्ये प्रदेशनिष्ठा दिसते. मादागास्करच्या भूमीवर अनेक जाती आणि परिसंस्था स्वतंत्रपणे विकसीत झालेल्या आहेत. इंडोनेशियामधील 17000 बेटांनी 19,04,560 चौरस

किलोमीटर क्षेत्र व्यापलेले आहे. या प्रदेशामध्ये जगातील 10 टक्के सपुष्प वनस्पति, 12 टक्के पृष्ठवंशी प्राणी, 17 टक्के सरपटणारे प्राणी, पक्षी आणि उभयचर प्राणी असे 24 कोटी माणसांच्या वस्त्यांच्या सहवासात आहेत. समृद्ध जैवविविधता असलेले काही भाग वैशिष्ट्यपूर्ण प्रदेशनिष्ठ भागापासून उगम पावलेले असल्याने त्यांच्यामध्ये नेहमीच्या बदलाहून वेगळे बदल घडून आलेले आहेत.

**जैवविविधता उत्क्रांति (विकास) :** आज अस्तित्वात असलेल्या जैवविविधतेमागे 350 कोटी वर्षांचा इतिहास आहे. सजीवांची नक्की निर्मिती केव्हा झाली हे जरी वैज्ञानिकांना सांगता आले नाही तरी पृथ्वीच्या उत्पत्तीनंतर वीस ते तीस कोटी वर्षांनंतर प्राथमिक रचना असलेले सजीव अस्तित्वात आले यावर वैज्ञानिक ठाम आहेत. चौपन्न कोटी वर्षापूर्वी फॅनरोझोक कल्पामध्ये झालेल्या कॅम्ब्रियन युगामध्ये जैवविविधतेमध्ये प्रचंड वाढ झाली. कॅम्ब्रियन युगामध्ये बहुपेशीय सजीवांची निर्मिती झाली. पुढील 40 कोटी वर्षांमध्ये विविधतेमध्ये बहुतांशी अपृष्ठवंशी सजीव अधिक संख्येने होते. या वाढीबरोबर अनेक पर्यावरणीय कारणाने जैवविविधतेचा नाश होत होता. समूह विलोपन क्रियेमुळे जैवविविधतेमध्ये घट आणि वृद्धी हे प्रकार सजीवांच्या निर्मितीपासून चाललेले आहेत. कार्बनिफेरस युगामध्ये झालेल्या विलोपनामध्ये पर्जन्यवने भूपृष्ठाखाली गाडली गेली. या काळात गाडल्या गेलेल्या जीवाश्मांवर उच्च दाब आणि कार्बन वेगळा होण्याच्या प्रक्रियेतून निर्माण झालेले दगडी कोळसा आणि क्रूड ऑइल आजच्या आपल्या इंधनाची 90 टक्के गरज भगवत आहे. गेल्या दोन तीन कोटी वर्षांच्या जीवाश्मांच्या अभ्यासावरून असे आढळून आले आहे की, आजच्या एवढी जैवविविधता कधीही अस्तित्वात नव्हती. सर्व वैज्ञानिकांना हे महणणे पूर्णपणे मान्य नाही. जीवाश्मीकरण सर्व सजीवांचे कधीही प्रतिनिधित्व करू शकत नाही हा त्यांचा आक्षेप. काही वैज्ञानिकांच्या म्हणण्यानुसार तीस कोटी वर्षापूर्वी आणि आजच्या जैवविविधतेमध्ये फारसा फरक नसावा. सध्याच्या सजीव जातींची संख्या 2 दशलक्ष ते 100 दशलक्ष एवढी असावी. सर्व पर्यायांचा विचार करून सजीवांची संख्या 130 ते 140 लाखांपर्यंत पोहोचते. यामधीलसंधिपाद प्राण्यांची संख्या सर्वाधिक आहे. ज्या ठिकाणी सजीवांमध्ये संघर्ष कमी आहे म्हणजे निसर्ग निवडीला सामोरे जावे लागत नाही अशा ठिकाणी जैवविविधता वृद्धिंगत होते.

**जैवविविधतेचा मानवास उपयोग :** जैवविविधता परिसंस्था टिकवून ठेवण्यास मदत करते. त्यामुळे कार्बन डाय ऑक्साइड चक्र सुरळीत राहते. हवेचे घटक संतुलित राहतात. जलचव सुरळीतपणे सुरू राहते. जलचक्रामुळे पाणी शुद्ध होते. जमिनीची धूप थांबते. अश्मयुगापासून मानवी हस्तक्षेपामुळे सजीव जातींचा विनाश व्हायला प्रारंभ झाला आहे. याआधी नैसर्गिक आपत्ति हेच फक्त जातिविनाशाचे एकमेव कारण होते. जीवाश्मांच्या अभ्यासावरून अश्मयुगापासून जातिविनाशाचा वेग शंभर ते दहा हजार पटींनी वाढल्याचे सिद्ध झाले आहे.

**अ) कृषि :** पिकांमधील विविधतेमुळे नेहमीचे पीक रोग किंवा किडीमुळे नष्ट झाल्यास पिकामध्ये हवे ते बदल घडवून आणण्यासाठी वन्य जातींकडून इनग्रीडिंग करता येते. शेतीमध्ये अधिक उत्पादन मिळावे यासाठी उकच पीक विस्तृत क्षेत्रावर घेण्याची पद्धत आहे. कृषि व्यवसायातील बहुतेक अरिष्टे एकाच वाणाची निपज विस्तृत क्षेत्रावर केल्याने झालेले आहेत. यातील प्रमुख म्हणजे युरोपमध्ये 19व्या शतकात मद्य उद्योगावरील संकट आणि अमेरिकेतील मक्यावरील रोगामुळे पडलेला दुष्काळ. मानवी वापरासाठी असलेले 80 टक्के अन्न फक्त वीस प्रकारच्या वनस्पतीपासून मिळविण्यात येते. त्याच्या 40 हजार जाती प्रत्यक्ष मानवी वापरात आहेत. यामध्ये निवारा, अन्न, फळे, औषधे आणि वस्त्रप्रावरणे यांचा समावेश होतो. पृथ्वीवरील जैवविविधता वाढत्या लोकसंख्येची गरज अजून भागवत आहे यात शंका नाही पण मानवी वापराच्या जातीमधील विविधता झपाट्याने कमी होत आहे. याचा विचार करण्याची वेळ आली आहे.

**ब) मानवी आरोग्य :** जैवविविधता आणि तानवी आरोग्य हे सध्या आंतरराष्ट्रीय राजकारणाचे कारण होत आहे. जैवविविधतेच्या नाशामुळे पृथ्वीच्या आरोग्यावर परिणाम होत आहे, यावर शास्त्रीय संशोधन झाले आहे. जागतिक हवामान बदलाचे कारण हे मानवी आरोग्यावर परिणाम करणाऱ्या अनेक कारणांपैकी एक



रोगाचे वाहक आणि कारक असणाऱ्या सजीवांचा प्रसार, गोड्या पाण्याची कमतरता, कृषि उत्पादनातील घट, कृषि उत्पादनामधील तोच तोच पणा इत्यादी. एखादी जाती नष्ट झाल्यानंतर निसर्गतः त्यास पर्याय उपलब्ध असायचा. आता असे पर्याय कमी उपलब्ध आहेत. ज्या जाती टिकून रहात आहेत त्या नवीन पोषितामध्ये संवमित होत आहेत. जुनेच आजार नव्या दाद न देणाऱ्या आजारात बदलले जात आहेत. बर्ड फ्लू, स्वाइन फ्लू आणि इन्फ्लुएंझा हे एकाच विषाणूचे बदललेले स्वरूप आहे. वेस्ट नाइल व्हायरस, लाइम आजार, हांटाव्हायरस असे नवीन विषाणू माणसामध्ये येण्यामध्ये त्यांच्या मूळ पोषितामध्ये झालेले परिवर्तन कारणीभूत आहे. पाण्याची वाढती मागणी आणि पिण्यायोग्य पाणी उपलब्ध नसणे हा मानवी आरोग्याशी निगडित प्रश्न बनलेला आहे. स्वच्छ पाण्याचे वितरण वाढले असले तरी अनेक देशात पाण्याचे स्रोत नाहीसे होत आहेत. 2008च्या जागतिक लोकसंख्येचा अभ्यासावरून निघालेल्या माहितीनुसार अविकसीत राष्ट्रामधील फक्त 62 टक्के व्यक्तींना स्वच्छ पिण्यायोग्य पाणी उपलब्ध आहे. जैवविविधतेशी संबंधित आणखी काही प्रश्न म्हणजे अन्न सुरक्षा आणि सकस अन्नाची उपलब्धता, संसर्गजन्य आजार, अरोग्य विज्ञान, औषधांची उपलब्धता, सामाजिक आणि मानसिक आरोग्य, जैवविविधतेमधून औषध निर्मिती आणि नव्या औषधांचा स्रोत इत्यादी. जगातील 80 टक्के लोकसंख्या प्राथमिक आरोग्यसेवेसाठी नैसर्गिक उपचारपद्धति किंवा नैसर्गिक औषधांवर अवलंबून आहे. आजपर्यंत थोड्या जातींचा त्यांच्या औषधी गुणधर्मांचा अभ्यास झाला आहे. जैवविविधतेच्या नव्या इलेक्ट्रॉनिक्स आणि बायोलॉजी यांच्यापासून निघालेली संयुक्त शाखा 'बायॉनिक्स' मध्ये झपाट्याने वापर सुरू आहे. 1980 नंतर औषध उद्योगामध्ये नव्या औषधांची निर्मिती कमी झाल्यासारखे वाटत आहे. जनुकीय शास्त्र आणि मानवी जनुक प्रकल्प पूर्ण झाल्यानंतर नव्या रासायनिक औषधांच्या निर्मितीवर भर पडत आहे. सागरी जैवविविधतेवर आधारित औषध निर्मिती नव्याने तपासून पाहण्याची गरज उत्पन्न झाली आहे.

**क) औद्योगिक वापर :** अनेक उद्योगांमध्ये सजीवापासून मोठ्या प्रमाणात मिळवलेल्या वस्तूंचा वापर होतो. घरे, कपडा, रंग, रबर आणि इंधन सर्वस्वी सजीवांपासून मिळवले जातात. जैवविविधता पाणी, इमारती, लाकूड, कागद, तंतू आणि अन्न यांच्या पुनः पुनः निर्मितीसाठी अत्यंत महत्त्वाची आहे. जैवविविधतेचा न्हास म्हणजे आर्थिक नुकसान होय.

**ड) छंद, संस्कृती आणि सौंदर्यदृष्टी :** जैवविविधतेमुळे अनेक संगीतकार, चित्रकार, शिल्पी, लेखक आणि कलावंतांमध्ये सौंदर्यदृष्टी आलेली आहे. अनेक संस्कृतीमध्ये जैवविविधता टिकवून राहणे म्हणजेच संस्कृति असा दृष्टिकोन उत्पन्न झाला आहे. महाराष्ट्र, गोवा, कर्नाटक आणि केरळमधील अनेक देवस्थानांच्या आश्रयाने वाढलेल्या देवरायामध्ये झाडाचे पानसुद्धा तोडायचे नाही अशा अलिखित नियमामुळे अनेक प्रजाति टिकून राहिलेल्या आहेत. बागामध्ये शोभेच्या वनस्पति लावणे, वाढवणे, औषधी वनस्पति उद्यान, घरगुती मत्स्यपालन, प्राणिसंग्रहालये, मत्सयालये अशा अनेक व्यवसायांचा उगम जैवविविधतेमध्ये आहे. सर्वसामान्य व्यक्ती अशा छंदाना मनापासून प्रतिसाद देते. व्यावसायिकपणे दुर्मीळ प्राणी जोपासणे, त्यांना वाढवणे, दुर्मीळ पक्षी सांभाळणे त्यांना परत निसर्गामध्ये सोडणे, त्यांचे संवर्धन अशा छंदांचे नेमके मूल्यमापन करणे हे कठीण काम आहे. पण केवळ निसर्गाच्या प्रेमापोटी काही संस्था हे काम पदरमोड करून करत आहेत. राजकीय दृष्ट्या ग्रीन पार्टी नावाचा पक्ष 1970 पासून जर्मनी, बेल्जियम, स्वीडन यांमध्ये पर्यावरणरक्षण या अजेंड्यावर काम करतो आहे. आज ही लाट युरोप आणि उत्तर अमेरिकामध्ये एक प्रभावी पक्ष बनली आहे.

**सजीव जातींची संख्या :** जागतिक सजीव वर्गीकरण विभागाने आणि युरोपियन डिस्ट्रिब्यूटेड इंस्टिट्यूट ऑफ ॲक्सॉनॉमी या संस्थानी सजीवांच्या प्रत्येक वर्गातील एकूण जातींचा 2010 मधील केलेल्या अंदाज प्रत्यक्षात असलेल्या जातीहून कितीतरी कमी असावा असे म्हटले आहे.

- |                     |                           |
|---------------------|---------------------------|
| 1. 1 ते 1 कोटी कीटक | 2. अर्धा ते 1 कोटी जिवाणू |
| 3. 15 लाख कवके      | 4. 10 लाख अष्टपाद         |

5. सूक्ष्म जीवांची संख्या किती याचा अजून अंदाज आला नाही.

**जैवविविधता न्हासाची कारणे :** अधिवास नाहीसा होणे, अतिशिकार, नव्या अधिवासात नव्या जातींचा प्रवेश आणि विलोपन यामुळे जैवविविधतेस धोका उत्पन्न होतो असे जेअर्ड डायमंड या निसर्गतज्ञाने सांगितले आहे.

1. एखादी जात हळूहळू नष्ट होणे हे नैसर्गिक असले तरी गेल्या काही दशकता जाती नष्ट होण्याच्या प्रमाणात चिंताजनक वाढ झाली आहे. गेल्या 25 वर्षात जगातील जैवविविधतेचे 15 अक्के नुकसान झाले आहे व अशा जाती नष्टप्राय होण्याच्या मार्गावर आहेत.
2. जती नष्ट होण्यामागील महत्त्वाचे कारण म्हणजे जातींच्या नैसर्गिक अधिवासात झालेली घट. विशेषतः पश्चिम घाटात शहरीकरणामुळे जंगलाचे प्रमाण 50 टक्क्यापेक्षा जास्त नष्ट झाले आहे. त्यामुळेच माणसे आणि वन्यप्राणी यातील संघर्ष वाढीला लागला आहे. जुन्नरजवळ बिबट्या, भीमाशंकर जवळ रानडुकरे, सिधूदुर्गात हत्ती मनुष्यवस्तीत, बागायतीत धुडगूस घालीत आहेत.
3. मनवाने आपल्या प्रगतीसाठी इमारती, रस्ते, धरणे, खनिजसंपत्तीसाठी पर्यावरणाचा अमर्याद वापर केला आहे. त्यामुळे त्या त्या भागात असणाऱ्या वनस्पती, कीटक, पशू, पक्षी यांचा अधिवास उद्ध्वस्त झाला आहे.
4. जैवविविधतेच्या न्हासाचे महत्त्वाचे कारण म्हणजे आर्थिक फायदा नुकसानीच्या हिशोगाशी असणारे सरळ नाते दाखविण्यात आलेले अपयश.
5. मानवाची उदासीनता व निसर्गातील प्रत्येक घटकाकडे पाहण्याचा बदलत चालेला दृष्टिकोन याला कारणीभूत आहे. त्यासह प्रदूषण, गोंगाट, बदलते निसर्गचक्र हे घटकही जैवविविधता नष्ट होण्यास कारणीभूत आहेत.
6. मोठ्या प्रमाणावर वृक्षतोड झाल्यानंतर पुनवैनीकरणामध्ये अस्तित्वात असलेल्या सर्व नवस्पति परत कधीच लावता येणार नाहीत. एकाच प्रकारच्या वृक्षांचे पट्टे लावण्याने त्या परिसरामध्ये असलेली विविधता नष्ट होते.

कदाचित म्हणूनच की काय, यातून धडा घेऊन कर्नाटकातल्या 'अधनाशिनी' नदीच्या भोवताली वसलेल्या स्थानिक लोकांनी व मच्छीमारांनी जीवशास्त्राच्या शिक्षकांना नदीतील कालवे, तिसरे, शिंपले, मासे, झिंगे इत्यादींच्या अभ्यासा मदत केली. त्यातून असे लक्षात आले की, यांच्या विक्रीतून होणारी आर्थिक उलाढाल वर्षाकाठी सुमारे पाच कोटी रुपये इतकी आहे. त्यामुळे नदी परिसरातील जैवसंपदेचे नुसतेच संरक्षण व संवर्धनच साध्य झाले नाही तर प्रदूषणकारी कारखाने तेथून हटवावे लागले. भारतातील सर्व जीवसंपदा काही थोड्या राष्ट्रीय उद्याने व अभयारण्यातच फक्त सुरक्षित ठेवता येणार नाही. त्यासाठी संरक्षित केंद्रांचे विकेंद्रीकरण करणे आवश्यक आहे. देवराया, शेती, नद्यातील डोह, पाणवठे ऐवढेच नव्हे तर शहरांमधूनही जीवसंपदा आहे आणि त्याच्याही संरक्षणाची आवश्यकता आहे. खाजगी हितसंबंधाची जपवणूक, लोकांपर्यंत चळवळ नेणे यांसारख्या गोष्टींमधून जीवसंपदेचे रक्षण होणार आहे. जैवविविधता जपणे हे प्रत्येक नागरिकाचे कर्तव्य आहे आणि यात फक्त सुशिक्षित लोचक योगदान देऊ शकतात असे नाही तर डोंगराळ भागातील अडाणी व्यक्तीसुद्धा फार मोठे काम करू शकते. परंतु त्यांना आपल्या आसपास जे आहे त्याबद्दल माहिती नाही. त्यामुळे पहिल्यांदा जैवविविधतेचे महत्त्व पटवून द्यावे लागणार आहे. मग तो आजच्याचा घनसाळ असो वा अन्य बियाणे त्यांच महत्त्व लोकांना सांगावे लागेल. त्यासह आपल्या आसपास असणारे प्राणी, कीटक हे निसर्गचक्रासाठी फार महत्त्वपूर्ण आहेत. मग त्यात उपद्रवी कीटकांचेही महत्त्व त्यांना समजावून द्यावे लागणार आहे. त्यासाठी स्थानिक पातळीवर समितीमाँत प्रबोधन करण्यात येणार आहे. ग्रामपंचायत पातळीवर त्यासाठी राखीव निधी ठेवावा लागणार आहे. सध्याच्या तरुणाईकडे तंत्रज्ञान आहे. त्याचा वापर करून ती लवकर प्रबोधन करू शकते. एखाद्या वेळेस जंगलात वणवा पेटल्यास मित्र, ओळखीच्यांना एकत्र करून तो विझविण्यास मदत करू शकेल. त्यामुळे हजारो

एकरांमधील जैवविविधता आगीपासून वाचू शकेल. पर्याटनस्थळी तिथल्या जैवविविधतेचं महत्त्व पटवून तरुणाईच्या विचारांना दिशा दिल्यास ते यामध्ये नक्कीच योगदान देऊ शकतील, यासाठी प्रयत्न करायला हवेत. त्यासह शेतकऱ्यांनीही मिश्रशेतीचा अवलंब केल्यास व शेताच्या बांधावर उंबर, वड, पिंपळ, आंबा, कडूनिंब अशी विविध वृक्षलागवड केल्यास प्रत्येक ऋतूत तिथे जैवविविधतेला पोषक वातावरण निर्माण होऊन अनावश्यक कीटकनाशकांवर केला जाणार खर्चही वाचू शकेल. जैवविविधतेचे रक्षण व संवर्धन हे प्रत्येक नागरिकाचे कर्तव्य आहे. उन्हाळ्याच्या दिवसात घराबाहेर पक्ष्यांसाठी पाणी व धान्य ठेवणे हे देखील जैवविविधता संवर्धनातील मोठे पाऊलच असणार आहे.

**संदर्भ :**

*पर्यावरणीय अर्थशास्त्र सिद्धांत आणि उपयोजना : कटार सिंह, शिशोदिया.*

<http://www.lokmat.com/kolhapur>

<https://mr.wikipedia.org/wiki>

<https://www.google.co.in/search> जैवविविधता

<https://www.google.co.in/search> जैव, विविधता, संवर्धन व उपाय

<https://www.google.co.in/search> जैवविविधतेचे प्रकार

<https://www.google.co.in/search> जैवविविधतेचे महत्त्व

## TO STUDY SEED VIABILITY, GERMINATION AND SEEDING GROWTH OF VIGNA UNGUICULATA UNDER INFLUENCE OF BORIC ACID AS CHEMICAL MUTAGEN

**Dr. Sharad Sahebrao Phulari**, Principal, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401

**Prof. Nutan Bagul-Gade**, Assit.Professor, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401

**Miss. Munazza Bangi**, Student, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401

### **Abstract**

To study the influence of Boric acid as a chemical mutagen on seeds of *Vigna unguiculata* are treated with 0.01%, 0.1%, 1% and 2% concentration w/v solution of Boric acid. The seed viability, germination percentage, plumule length, radicle length, number of rootlets per radicle, fresh weight of seeding and dry weight of seeding are parameters to study the influence of Boric acid. It is observed that –

- 1) There is adverse effect of Boric acid treatment on seed viability, germination percentage plumule length, radicle length, number of rootlets per radicle, fresh weight of seeding.
- 2) There is insignificant, negative influence of Boric acid treatment on seed viability, germination percentage, plumule length, radicle length, number of rootlets per radicle, fresh weight of seeding in general.
- 3) The adverse, insignificant, negative effect is directly proportional to the concentration of Boric acid solution. More the concentrated Boric acid treatment, more the adverse effect on seed viability, germination percentage plumule length, radicle length, number of rootlets per radicle, fresh weight of seeding in *Vigna unguiculata*.
- 4) It means the Boric acid influence as chemical mutagen, it creates mutants however in adverse, insignificant, negative form.

**INTRODUCTION** – There are chemical mutagens such as Diethyl Sulphates, Colchicine, EMS, NMU, ENU etc, (Medrano et al 1986; Szarejko and Forster, 2007). These are proven chemical mutagens to induce the mutation. Variability is raw material for plant breeding. More the variability, greater is the chance of plant breeding. For better variety/ varieties to develop, variability is to create. Mutation is one of the means to develop the variability for plant breeding. Szarejko and Forster in 2007 stated that mutation induction is an effective tool to enhance the genetic variation available to plant breeders, particularly for traits with a very low level of genetic variation. Much of our knowledge of genetics of higher organisms is based upon works utilizing induced mutations for analyzing gene function (Mc Callum et al. 2000). There are several examples of successful applications of mutation breeding to crops have been reported in literature, such as, Ahmad et. al. (1991); Bacells, (2001); Bhatia et al. 1999; Ferrie et al. 2008; Flower and Stefansson, 1972; Parry, et al. 2008. Mutation techniques have been applied to improve to characters like disease resistance, high yielding, better quality, drought resistance etc, especially by Parry, et al. 2009; Schnurbush et al. 2000. FAO/ IAEA, 2011 states that there are over 4000 mutant varieties have been develop by induced mutation.

*Vigna unguiculata* commonly known as cowpea, black eye pea, southern pea, yardlong bean, catjang and crowder pea (Timko et. al 2007). *Unguiculata* is Latin word, its meaning is ‘with small claw’, which reflects the small stalks on the flower petal, as per Small (2009).

*Vigna unguiculata* are grown mostly as edible food, especially for beans, although the leaves, green peas and green pods can also be consumed. Usually by boiling, the *Vigna unguiculata* are made edible (Hamid, et. al. 2016). These beans can be prepared in stews, soups, purees and caseroles- as per Cowpeas Recipe, 2017. They can also be processed into paste or flour (Gonkalves, et al. 2016). They further added that seeds of *Vigna unguiculata* provide rich source of proteins and calories, as well as minerals and vitamins. As per Rangel et al 2003, a seed of *Vigna unguiculata* consists of 25% protein

and has very low fat content. Hamid. et. al, 2016, said that *Vigna unguiculata* seeds are often referred as 'poor man's meat' due to the high levels of protein found in the seeds and leaves. It arrives conclusion that *Vigna unguiculata* is important food yielding plant having great importance as food plant, medicinal valued plant and complete diet plant.

The objective of present study is to screen the mutants of *Vigna unguiculata* by treatment of Boric acid as chemical mutagen. Boric acid is not a proven chemical mutagen. In present experiment an attempt is made to find the mutagenic property of Boric acid at various concentration. To study the influence of Boric acid as chemical mutagen, the germination, viability, and seeding dimensions are used as the parameters.

**MATERIAL AND METHODS** - Control treatment is of distilled water. The Boric acid solution is prepared of 0.1%, 1% and 2% by using distilled water. Ten dried seeds are sown in garden soil containing pot. Such five pots were prepared. Each pot is sown with 10 seeds of Boric acid. Control treated pot is watered with adequate amount of distilled water. The remaining pots with ten seeds of Boric acid were daily treated individually with 0.01%, 0.1%, 1.0% and 2.0% (W/v) Boric acid solution in required quantity respectively. The seeds of control pot and Boric acid treated pots were kept in dark for next ten days. The observations were recorded daily. The parameters considered to note the effect of Boric acid during sprouting phase upto the first ten days. The observations under study were recorded as, germination, percentage of sprouting, plumule length, radicle length number of rootlets per radicle and fresh weight of seedlings on tenth day of experiment. The same experiment is repeated simultaneously so as finding mean of observations. It helps to minimize the experimental errors. The results shown are the arithmetic mean of two replicas of experiments.

### RESULTS AND DISCUSSION –

Table I. Influence of Boric acid chemical as mutagen on seed viability in *Vigna unguiculata*.

Observation	Treatment of Boric acid ( w/v) solution				
	Control	0.01%	0.1%	1%	2%
Viability at 3 <sup>rd</sup> day of sowing	10	10	05	04	04
Viability of 6 <sup>th</sup> day of sowing	10	10	07	03	04
Viability at 10 <sup>th</sup> day of sowing	10	10	07	05	04

Table I shows that all seeds are viable since the third day of germination. Boric acid treated seeds shows less viability as compared to control. The viability is least in 2% Boric acid treated seeds. It means there is adverse influence of Boric acid solution on the viability of seeds of *Vigna unguiculata* the adverse effect intensifies as the concentration of Boric acid chemical goes on increasing.

**Table II- Influence of Boric acid chemical as mutagen on seed germination percentage in *Vigna unguiculata*.**

Observation	Treatment of Boric acid (w/v) solution				
	Control	0.01%	0.1%	1%	2%
Germination Percentage on 3 <sup>rd</sup> day of sowing	100%	100%	50%	40%	40%
Germination percentage in 6 <sup>th</sup> day of sowing	100%	100%	70%	50%	40%
Germination percentage on 10 <sup>th</sup> day of sowing	100%	100%	70%	50%	40%

From the Table II, it is clear that 100% seed germination shown by control condition in Vigna unguiculata since the 3<sup>rd</sup> day of germination. Same vigour, same germination percentage also observe in 0.01% Boric acid treated seeds. However as the concentration of Boric acid solution goes on increasing, then the germination percentage of seeds of Vigna unguiculata goes on decreasing. The minimum germination percentage of seeds is observed at highest concentration of Boric acid (2%). Thus, it can be concluded that the negative influence of Boric acid is there on germination percentage of seeds of Vigna unguiculata.

**Table III- Influence of Boric acid as a chemical mutagen on average length of plumule on 10<sup>th</sup> day of treatment in Vigna unguiculata.**

Observation	Treatment of Boric acid (w/v) solution				
	Control	0.01%	0.1%	1%	2%
Plumule length on 10 <sup>th</sup> day of treatment	8.8cm	7.0cm	5.0cm	4.5cm	4.1cm

Table III depicts that the plumule length of seedlings of vigna unguiculata. On the 10<sup>th</sup> day of sowing. There is maximum growth of plumule length. The intensity of adversity goes on increasing as the concentration of Boric acid solution increases in treatment.

**Table IV- influence of Boric acid as a chemical mutagen on average length of radical and number rootlets / radical on 10<sup>th</sup> day of treatment in Vigna unguiculata.**

Observation	Treatment of Boric acid (w/v) solution				
	Control	0.01%	0.1%	1%	2%
Radicle length	8.3 cm	6.5cm	4.8cm	5.0 cm	3.9 cm
Rootlets / radicle	24	13	10	07	04

To find out effectivity of Boric acid solution as an chemical mutagen, its effect was observed on length of radical and number of rootlets per radical were studied. Table IV shows the influence of Boric acid as chemical mutagen on average radical length. The observations were taken on 10<sup>th</sup> day of treatment. It is seen from Table. IV that the root length as well as rootlets per radicle is decreasing due to Boric acid treatment. The decrease in radicle length and rootlets per radical goes on decreasing as the concentration of Boric acid treatment goes on increasing.

**Table V- Influence of Boric acid as a chemical mutagen on average fresh weight and dry weight of seedlings on 10<sup>th</sup> day of treatment in Vigna unguiculata.**

Observation	Treatment of Boric acid (w/v) solution				
	Control	0.01%	0.1%	1%	2%
Fresh Weight	13.32 gm	10.42 gm	9.88 gm	9.52 gm	7.04 gm
Dry weight	4.15 gm	3.11 gm	3.25 gm	2.8 gm	2.35 gm

Table V shows the observations of fresh weight (in gm) and dry weight (gm) of seedlings of Vigna unguiculata after treatment of Boric acid as a chemical mutagen at various concentrations. On the 10<sup>th</sup> day, the control as well as treated seedlings were uprooted and average fresh weight as well as dry weight maximum in control condition, When the Boric acid treatment is provided then the fresh weight and dry weight get affects. It effects directly proportional to the concentration of Boric acid chemical solution.

Concentrations exceeding 1.5% Fe and 1% B in the priming solutions affected germination negatively. Ajouri et al. (2004), similarly studying the effect of seed priming on germination, showed that concentrations exceeding 0.04 M boric acid significantly reduced the germination rate in barley. A reduced germination percentage was also registered for treatment of sweet pepper (Capsicum annum L.) when higher dosages of micronutrients were used for seed priming (Diniz et al. 2009).

The importance of seedling vigor on the rapid stand establishment and early growth of medicinal plants to compete for water, light, and nutrients has been stressed by Tabrizian and Osareh (2007).

The results of the laboratory experiments carried by Mirshekari, 2012 indicated that the effect of the chemical (Boron) treatments on the final germination percentage was significant. The seedling vigor index of dill was restricted when the Fe and B concentrations increased beyond 1.5% and 1%, respectively. The highest seed yield was recorded for the concentration of 1.5% Fe + 1% B in solution, which produced nearly 20% greater yield than the control. The essential oil concentration of the seeds ranged from 2.60% for 0.5% Fe to 2.81% for 1.5% B for the priming solutions. There was a positive response to seed priming with Fe and B regarding the essential oil yield. Priming dill seeds in the 1.5% Fe + 1% B solution resulted in a further increase in dill yield.

Emrani et al. (2011) carried out the experiment to study the effect of chemical mutagens on seed viability, seed germination and seedling growth of *Brassica napus*. Their result revealed the significant effects of chemical dosages and treatment periods on seed viability and seed germination as well as on seedling characteristics for all the Chemical mutagens tested. Additionally, it was found that increased dosage and period of in each treatment led to significant reductions in seed viability for the tested mutagens.

Inverse relations were found between chemical mutagen concentration and both rate and percentage of seed germination in various plants as recorded by Afsar, et al.1980; Ahmed et al, 1991; Flower and Stefansson,1972; Padavai and Dhanavel, 2004; Singh and Kole 2005. Flower and Stefansson (1972) reported that increasing of EMS chemical concentration from 0 to 1% adversely affected germination percentage.

Carton et al.1968 Das and Haque, 1997; Gustafson, 1989; Hu and Rutger, 1992; Snusted and Simmons, 2006; Jabeen and Mirza 2004; Padma and Reddy. 1977 are some of researchers who carried out effect of chemical mutagens on the seed germination. According to Emrani et. al.(2011) the average germination percentage from 92.7% in the control to 7.9% in the treatment with 1.6% EMS chemical. Seedling height and radical length also decreased with increasing chemical EMS concentration and treatment period.

**CONCLUSION:** To study the influence of Boric acid as a chemical mutagen on seeds of *Vigna unguiculata* are treated with 0.01%, 0.1%, 1% and 2% concentration w/v solution of Boric acid. The seed viability, germination percentage, plumule length, radicle length, number of rootlets per radicle, fresh weight of seedling and dry weight of seedling are parameters to study the influence of Boric acid. It is observed that –

- 1) There is adverse effect of Boric acid treatment on seed viability, germination percentage plumule length, radicle length, number of rootlets per radicle, fresh weight of seeding.
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- 4) It means the Boric acid influence as mutagen, it creates mutants however, in adverse, insignificant, negative form.

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## DIVERSITY OF LADYBIRD BEETLES (COCCINELIDAE) IN THE MALSHIRAS TEHSIL MAHARASHTRA, INDIA

**Ashwini Hegade**, Department of Zoology, Shankarrao Mohite Mahavidyalaya, Akluj  
ashuhegade@gmail.com

**Raut G. A.**, Department of Zoology, D.B.J. College, Chiplun.

**Kulkarni J.J.**, Department of Zoology, Shankarrao Mohite Mahavidyalaya, Akluj.

**Vhargar C.S.** Department of Zoology, Shankarrao Mohite Mahavidyalaya, Akluj.

**Deshmukh A. L.**, Department of Zoology, Shankarrao Mohite Mahavidyalaya, Akluj.

### Abstract

The Ladybird beetles are best known as predators of family Coccinellidae, superfamily Cucujoidea and suborder Polyphaga. Order Coleoptera is largest order confining beetles. The ladybird beetles are characterized by round to elliptical, dome-shaped body and elytron morphology. The lady bird beetles having important biocontrol agent against hemipteran species and some are pests. During January 2015 to December 2017 surveyed thoroughly diversity of coccinellids (Coleoptera: Coccinellidae) from Malshiras tehsil and enlisted 7 different species belonging to 7 different genera and 2 subfamilies viz. *Coccinellatrans versalis* (Fabricius), *Menocheilus sexmaculata* (Fabricius), *Propylea japonica* (Thunberg), *Micraspis discolor* (Fabricius), *Illeis cincta* (Fabricius), *Brumoid saturalis* (Fabricius) and *Epilachna vigintioctopunctata* (Fabricius) are reported in present study.

**Keywords:** Lady bird beetle, Malshiras, Coccinellidae, Biocontrol agent, Diversity.

**Introduction:** Ladybird beetles also known as Ladybugs. The lady bugs belonging to the class Insecta, order Coleoptera, superfamily Cucujoidea and family Coccinellidae (Gordon 1985; Majerus, 1996). The worldwide known distribution of Coccinellidae is about 6000 species (Vandenberg, 2000) which comprises under seven subfamilies worldwide viz. Coccidulinae, Coccinellinae, Scymninae, Chilocorinae, Ortolinae, Sticholotidinae and Epilachninae.

All coccinellids except mycophagous Coccinellinae (Hylyziini and Tythaspis) and herbivorous Epilachninae, feeds voraciously on hemipteran insect species (scales, psyllids, white fly and aphids), Mites and sometimes on other insect larvae (Dixon, 2000). Due to predatory characteristics of these beetles, they known by biocontrol agent and beneficial insects but some species were phytophagous, act as pest. Their size varies (1 mm to 15 mm) species to species and depending upon the species their prey species should be different, therefore exploration of these biocontrol agents also give an idea about pest composition of given area (Obrycki and Kring 1998; Hodek and Honek 2009; Ali and Agrawal, 2014).

Present study is carried out within the Malshiras tehsil of Solapur district from southeast Maharashtra. Study area is selected for the present study based on diverse and unique habitat. At the northern boundary made by Nira river basin, this region was well irrigated and provides habitat and shelter to the diverse insect species including ladybird beetles. Entire area comes under rain shadow and always draught condition but irrigation made some green patches. Most of the area dry and available irrigated area covers by mostly Sugarcane along with other vegetable crops, fruit crops and in hilly region some plantation of various native as well as exotic species by government departments. The study area situated between 17° 86' N latitude and 74° 90' E longitude which covers 1522.2 sq/km area under 112 villages. Average rainfall is 422.8mm. Soil type is black, coarse gray and reddish and it is derived from Deccan trap.

**Material and Methods:** The coccinellids collection were made by net sweeping and hand picking method during active seasons of ladybug. 10 collection localities were selected from Malshiras tehsil

for collection and diversity study. The samplings were focused in cucurbitaceous and solanaceous vegetable fields and other vegetation also traced.

Sampling was done by visiting each locality by one-month interval. Collected specimen picked and killed in killing bottles with the help of ethyl acetate. After killing the specimen were pinned with entomological pins. The small sized beetles were preserved by cardning method. After proper drying specimen properly stored in collection box. Identification done with the help of Kapur (1958) and Rafi *et al.* (2005)

During present study the lady beetle diversity of Malshiras tehsil represented by 7 species distributed over 7 different genera.

### 1. *Coccinella transversalis* (Fabricius) (Image: 1)

**Material Examined:** 6♂, 10. 11. 2016. Yashwantnagar. coll. A. M. Hegade.

**Distribution:** India: Maharashtra, Karnataka, Kerala, Haryana, Tamilnadu, Haryana, Goa and Andhra Pradesh (Bielawski 1961, Poorani 2002).

Worldwide : Myanmar, Chagos, Sri Lanka, Nepal, Indonesia, Pakistan, Archipelago, Madagascar, South-East Asia, China, East Africa, Ghana, Togo, Seychelles, Tanzania, Mauritius, Reunion, Kenya (Kapur 1962, Booth and Pope1989).

**Remark:** Colour variation observed in this species, brick red, pale yellow, dark yellow and creamy orange. Blackish head having yellow spot, mouth part also shows color variation black to darkbrown ; antennae, eyes and scutellum are darkbrown and black respectively. Elytra hving color varition with black markings and ventral side and legs entierly black (Abhishek *et al.* .2014). Body shape oval and dorsally dome shape with 5.86mm long and 4.54 mm width. This species habitats in bushes, hide underside leaves and stem and observed feeding on aphids. Distribution occurs through out India but more abundant in penisular region of India.

### 2. *Cheilomenes (Menochilus) sexmaculata* (Fabricius)

**Material examined:** 25♂, 10. 11. 2016. Khudus. coll. A. M. Hegade.

**Distribution:** It is widely distributed in orient specially Afghanistan, Indonesia and Bangladesh (Manippan, 2012).

India- Kerala, Uttar Pradesh, Assam and Kashmir (Khan *et al.* 2012).

**Remark:** Body shape is rounded and convex at some proportion. Wide range of colour morphs were observed viz. orange, faint red, yellow or pinkish. Anterior pronotum having T- shaped band at medium line and attached to brought black on posterirarily. Elytra having six markings having two zig zag black line with black spot posteriorly. This species identified by having three specific shapes on each elytron i.e. inverted V shaped, complete w shaped and roundish. At the junction of elytra having brownish black strip. It is highly predacious on aphid found on maize, Rui and Sugarcane.

### 3. *Brumoid suturalis* (Fabricius)

**Material examined:** 1♂, 06. 02. 2018. Malinagar. coll. A. M. Hegade.

**Distribution:** Worldwide: Nepal, Myanmar, Malaysia, Kenya, East Africa, South Africa, Sri Lanka, Indonesia, Pakistan, Tanzania, Seychelles, Nepal, Reunion, Madagascar, Togo (Camways *et al.* 1999). India: Highly distributed in Uttar Pradesh, Tamil Nadu, Panjab, Orissa, Maharashtra, Kerala, Goa, Assam, Andhra Pradesh, and Karnataka (Bielawski 1961).

**Remark:** Oval body shape having 2.8to 3.8 mm length and 2.2 to 2.4 mm width. On elytra 3 brownish black bonds found longitudinally. One on each elytron and one on mid dorsal line on elytron. Brownish head & eyes with nine segmental antennae. At terminal tarsal joint, a pair of simple claws is present on the legs. It is found in natural and agro ecosystem. Predacious on mealy bug and pyrillids (Chakraborty *et al.* 2013). Psyllids and Aphid ( Ullah *et al.* 2012). Collected from okra plants.

### 4. *Propylea japonica* (Thunberg)

**Material examined:** 1♂, 20. 12. 2016. Falwani. coll. A. M. Hegade

**Distribution:** Worldwide: North America, Southeast Asia, Tanzania, Kenya, Togo, Indonesia, Reunion, Pakistan, Nepal, Malaysia, South Africa, Brazil, North Africa, Chagos, East Africa and China.

India: Uttar Pradesh, Kerala, Maharashtra, Haryana, Himachal Pradesh, Karnataka, Tamil Nadu, Andaman and Nicobar Island, Bihar, Punjab, Delhi, Rajasthan, North East and West Bengal (Bielawski 1961, Poorani 2002).

**Remark:** Oval shaped body having reddish yellow antennae and head. Mouth parts are yellowish brown, with black scutellum and shining black elytra with reddish yellow apices. Ventral side ranges from yellowish brown to dark brown in color with pale tarsi.

#### 5. *Micraspis discolor* (Fabricius)

**Material examined:** 2♂, 23. 11. 2015. Malkhambi. coll. A. M. Hegade

**Distribution:** Worldwide: Tanzania, Sri Lanka, Brazil, South East Asia, China, Myanmar, Madagascar, Pakistan, Malaysia, Brazil, Togo, Archipelago, Reunion, North America, North Africa, Tanzania, South Africa, Seychelles.

India: West Bengal, North east, Rajasthan, Andaman and Nicobar Island, Bihar, Kerala, Maharashtra, Uttar Pradesh, Delhi, Haryana, Himachal Pradesh and Karnataka. (Bielawski 1961, Poorani 2002).

**Remark:** Adult species length is 4.5 to 3.00 mm elytra is yellowish red with small, rounded black spots on each elytron. One at proximal end and another at distal end. forelegs and hind legs are brownish yellow and dark brown respectively. Body shape is oval with pair of compound eyes and it segmented antennae. It is found on maize crop.

#### 6. *Illies cincta* (Fabricius)

**Material examined:** 6♂, 05. 11. 2016. Malkhambi. coll. A. M. Hegade

**Distribution:** Worldwide: South Africa, Brazil, Myanmar, Nepal, Archipelago, North America, North Africa, Chagos, South East Asia, China, Chagos. (Kapur 1962, Booth and Pope 1989, Canepari 2003)

India: Maharashtra, Karnataka, Kerala, Haryana, Rajasthan, West Bengal, North East Himachal Pradesh, Delhi, Bihar, Punjab, Tamil Nadu, Andhra Pradesh, Tamilnadu, Uttar Pradesh, Andaman and Nicobar Island.

**Remark:** Yellowish head having a pair of black eyes .Shiny yellowish coloured elytra and thorax. Body length and width is 5.2 mm and 4.00 mm respectively. At the posterior margin of the thorax two spots were situated.

#### 7. *Epilachna vigintioctopunctata* (Fabricius)

**Material examined:** 6♂, 05. 11. 2016. Malkhambi. coll. A. M. Hegade

**Distribution:** Worldwide: South Africa, Brazil, Myanmar, Nepal, Archipelago, North America, North Africa, Chagos, South East Asia, China, Chagos. (Kapur 1962, Booth and Pope 1989, Canepari 2003)

**Remark:** Larvae are stout with spiny dorsal and lateral processes and their feeding causes the characteristic skeletonized pattern on leaves resulting in drying and dropping of leaves.

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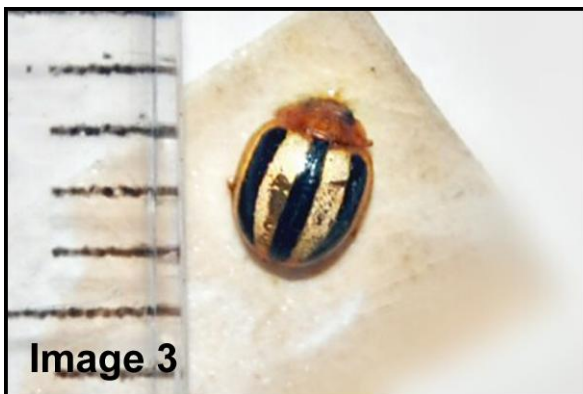
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## SCREEN LESS DISPLAY TECHNOLOGY

**Dr. Sharad S. Phulari** , *Principal, Ajuman Islam Janjira Degree College of Science ,  
Murud \_janjira, Raigad, Maharashtra India*

**Sonali Prabhakar Pawar**, *Assit. Prof Computer Science, Ajuman Islam Janjira Degree College of  
Science ,Murud \_janjira, Raigad, Maharashtra India*

**Shivani Subhedar**, *F.Y.C.S, Ajuman Islam Janjira Degree College of Science ,  
Murud \_janjira, Raigad, Maharashtra India*

### **Abstract**

*This paper discusses advent of the Screen less display which is an developing new technology , has become a good vision in the near future for a wide range of applications. This paper includes a review about the Screenless Display technology. It describes the system that enables the transmission of video data without using display screen with/without light display.As the name implies it deals with the display of several things without the use of screens using projector. It involves three different working principles. First is The Visual image, second is Virtual retinal display and third is Synaptic interface. This paper mainly illustrates and demonstrates how the screen less displays works and its uses in various fields of science.*

### **Introduction**

**Screenless** video describes systems for transmitting visual information from a video source without the use of a screen. Screen -less computing systems can be divided into three groups: Visual Image, Retinal Direct, and Synaptic Interface.

Visual Image screenless display includes any image that the eye can perceive. The most common example of Visual Image screenless display is a hologram. Holograms were used mostly in telecommunications as an another to screens. Holograms could be transferred directly, or they could be stored in various storage devices (such as holodiscs) the storage device can be hooked up with a holo projector in order for the stored image to be accessed Virtual retinal display systems are a class of screen less displays in which images are projected directly onto the retina.They are distinguished from visual image systems because light is not reflected fromsome intermediate object onto the retina; it is instead projected directly onto the retina.

Retinal Direct systems, once marketed, hold out the promise of extreme privacy when computing work is done in public places because most inquiring relies on viewing the same light as the person who is legitimately viewing the screen, and retinal direct systems send light only into the pupils of their intended viewer

Synaptic Interface screenless video does not use light at all. Visual information completely bypasses the eye and is transmitted directly to the brain. While such systems have only been applied in humans in rudimentary form - for example, displaying single Braille characters to blind people - success has been achieved in sampling usable video signals from the biological.

### **Working principle**

There are several new emerging ways for the technological development of the working principle of the screen less displays. Several software's are merging for the GEN-X wonder view. Any computer system that can run the mudoc software can present text that has been set in interactive movable type. Most of the mudocs that are consumed in the next few years will be consumed with conservative personal computers, e-book readers, and other kinds of display and projection devices that are now in use. Very soon it appears to be a new kind of input/output system will facilitate communication and interaction between the computer and the computer user. This new human/computer interface is the telereader terminal. Visual Image is a bitmap manipulation and composition product. Bitmaps can be manipulated independently, in the Image Mode or multiple bitmaps can be composited Together in

the Object Mode to create a "collage". Visual Image can create and Manipulate images of any size: the only limitation is the amount of memory resources your system has.

### Applications of the Screenless display

The main use of the screen less displays are used for the development of the mobile phones which are mainly used by the old and blind people . This type of the invention of the screen less displays was first done on the mobile phone named OWASYS 2CC.



useful for the old, blind, and even for the people with less vision power.

Application applied to mobile Technology Screen less displays technology is also implemented for the development of the screen less laptops. A laptop without an LCD can be a very useful portable solution when connected to CRT or fixed LCD monitors.

Laptops without screens would also be a green solution, giving value to donated CRT monitors that would otherwise be heading for landfills. Portability means that volunteers, who don't always have the time to travel to people's homes, can more easily maintain this computer. Screenless displays are also widely applicable in the field of the holograms projection.

Hologram projection is a result of a technological innovation that truly helps in touch less holographic interfaces. In fact, hologram projection projects 3D images of so high quality that it feels as if one can touch them. However, holographic projection is still to achieve mass acceptance as until now, conventional holograms, which offer 3D images.

Latest laser technology are also implementing the special technique of the screen less display through the presence of the several 3D scope animation or the screen provides the advantage of being combined with the Laser Valve Video Projector that helps in projecting video images by the use of the laser light instead of the Xenon Arc lamps as depicted in figure 8. Laser technologies have given an edge over the other technologies as the LVP gives the projector an excellent depth in the focus.

### Advantages of Screenless Display.

- It Displays the information directly into the retina of eye rather than displaying through screen like LCD monitor, touch screen display etc.
- It is one of the top 10 emerging technologies in IT field.
- We will be using screenless display technology during 2020s.
- 3D images are possible.
- Ability to present far point images.
- High quality and large angle of view are the other vital
- Light weight and hence greater portability.
- Lower power requirement.



### Disadvantages of Screenless Display

- VRD is not yet available in the significant number.
- Prototypes and special experimental models are now being built, but their cost per unit is high.
- The VRD technology is still under progress and development.

**Conclusion :** The paper has elaborately discussed screenless displays which is one of the most emerging computer technologies and has become a new exciting rage for the up coming generations as a field of the futuristic technology. Due to the ability of having several advantages which are involved in the making, designing, coding of the screenless , this needs plenty of knowledge and process for the development is still under the improvement. May be in the future the world may be dominated with the screen less display technologies and this enriches the world of technological empowerment in the field of the computer technology. Screenless displays promises the cost effective aspect and also brighter future in the computer technology

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## PRESSURE SWITCH REACTION OF METHANE: A TECHNIQUE OF TAPPING BIOMETHANE FOR COMMERCIAL USE

**Ramesh N Zade**, Dept. of Chemistry, Siddharth College of Arts, Science & Commerce, Fort, Mumbai-400001

**Kushal M. Mude**, Dept. of Physics, Bhavan's College, Andheri (west) Mumbai-400058

**Bhupesh M. Mude**, Dept. of Physics, Ramnarain Ruia College, Matunga (east) Mumbai-400019

**Pravin S. More**, Dept. of Physics, Mithibai College, Vile Parle (west), Mumbai- 400057

**Ashok Patange**, Dept. of Chemistry, Bhavan's College, Andheri (west) Mumbai-400058

### Abstract

*Biomethane is a green house gas on one side but very useful fuel on other side. So for commercial exploitation have been trying by many scientists and energy associations. Mostly they are using separation of impurities and use refined methane gas. This will increase the cost of purification as well as transportation. Therefore we are trying to explore biomethane by liquefaction of biomethane using pressure switch reactions. This aims towards easy liquefaction using differential pressure condition and easy transportation for commercial exploitation.*

**Key words:** biomethane, pressure switch

**Introduction:** The most needed but rapidly reducing resource is energy. Though endeavors are being made to trap energy in different forms such solar, tidal, wind energy, but are not meeting the present ever increasing need. Others sources of energy such as fossil fuels are also rapidly decreasing due to its exorbitant exploitation. So there is always need to search new renewable sources. Renewable gases such as biogas and biomethane are considered as key energy carrier when the society is replacing fossil fuels with renewable alternatives. On other hand methane is more potential green house gas than CO<sub>2</sub>, which are increasing global warming. Upgraded biomethane can cover a great number of applications as well as it reduces global warming. Nowadays biomethane is already used in public transportation and in power generation, while different projects are being run around the world to expand its use even in private sector as main fuel in boilers or biomethane powered cars. The economic analysis demonstrates that biomethane can be produced at a cost which is competitive with liquid biofuels and fossil fuels. The main hurdle is in the use of biomethane on large scale for commercial purpose is transportation from site of its formation to the site of its actual application.

The raw biogas produced consists primarily of CH<sub>4</sub> (55-70%) and CO<sub>2</sub> (25-40%) but trace components are often present (H<sub>2</sub>O, H<sub>2</sub>S (3-5%), Siloxanes, Hydrocarbons, NH<sub>3</sub>, O<sub>2</sub>, CO and N<sub>2</sub>). It's pH value ranges from 6.5 to 7.5 and dew point is < -80°C. Biogas consumption for household, power generation can be done at its site of production without purification. Upgrading processes are required to fit the heating value into the standard specifications. The main parameter used for the assessment of energy efficiency of biogas production processes is the Primary Energy Input to Output (PEIO). The results obtained show that PEIO value range from 10.5 to 64.0 %. But this use does not lead to commercial application specially at distant place. So as to explore it's commercial scale application at distant place, it should be transported through grid or bottles in pure form (upgraded biomethane). But it has seen that both the purification and its transport remained a challenge for it's commercial application. India's human population is 120 crores. Majority lives in villages and this rural population – directly or indirectly - is associated with agriculture. In 1961 the population of live stock was 335.4 million of which 51 million were buffaloes. The numbers went up to 510.2 million in 2007 of which 102.4 million were buffaloes. There is a 100% increase in the number of buffaloes in 46 years. The milk production went up by 100% from 51.4 million tons in 1989-90 to 112.5 million tons in 2009-10. [1] Taking this challenge into consideration, many techniques and studies have been reported. Usually these techniques are physical modification of biogas. To improve the quality of biogas, some used scrubbing CO<sub>2</sub> and drying for further transport of enriched biomethane [2]. Partial oxidation of

methane to form carbon monoxide and hydrogen, followed by Fischer–Tropsch chemistry, the direct oxidation of methane to methanol and formaldehyde, oxidative coupling of methane to ethylene have been studied.[3] [4] Ionic liquids (ILs) have emerged in the last few years as promising new acid gas absorbents, and thus, this remarkable interest, in both industry and academia, has led to a large collection of experimental and theoretical studies in which the most important aspects of the absorption process are analyzed. The viability of ILs as an alternative to the available amine based absorption processes, and showing the possible future directions of research.[5] A known host-guest assembly, organized only by means of relatively weak dispersive forces, exhibits hitherto unappreciated thermal stability. The hexagonal close-packed arrangement of calix-[4]-arene contains lattice voids that can occlude small, highly volatile molecules. This host-guest system can be exploited to retain a range of freons, as well as methane, not only well above their normal boiling points, but also at relatively high temperatures and low pressures. The usually overlooked van der Waals interactions in organic crystals can indeed be used in a highly stable supramolecular system for gas storage. [6] An experiments using Ni<sub>2</sub>(dhtp) and gas mixtures of CO<sub>2</sub>-N<sub>2</sub> and CO<sub>2</sub>- CH<sub>4</sub> demonstrate the ability of the material to separate these gases. It is shown that CO<sub>2</sub> is preferentially adsorbed over methane or nitrogen. In the case of CO<sub>2</sub>-N<sub>2</sub>, the retention is quantitative within the precision of the detection system. The performance in respect to CO<sub>2</sub>-N<sub>2</sub> separation was better than for CO<sub>2</sub>-CH<sub>4</sub> separation. Biogas upgrading is beneficial but its market is still relatively very small. In European region there are at present around 200 biomethane plants that employ five main technologies: water scrubbing (WATS), pressure swing adsorption (PSA), chemical scrubbing (CHEMS), physical scrubbing (PHYS) and membrane separation (MEMS). The most preferable technology is WATS with almost 40 % share, followed by PSA and CHEMS (both around 25 % share). The lowest share has MEMS with around 4 %. All five technologies are able to produce biomethane with required purity.[7] Dual nitrogen expander liquefaction process can be boosted using power from a nitrogen expander, with all power input via the main cycle compressor, improving efficiency and increasing LNG production. [8] Solubility of methane in various solvents such as hexane, cyclohexane, acetone, benzene, ethanol, methanol and water have been studied. It is concluded using Bunsen absorption coefficient that solubility decreases from hexane to water with decreasing polarity. But this solubility is not sufficient to use this concept for commercial transportation. [9] All ethylene glycol ethers (including the mixture PEGDME 250, NMP, and sulfolane) were liquid at ambient temperature. These liquids are used for studying solubility of methane and ethane using Henry's constant at ambient temperature [10].

Property	Liquid below $T_c$	Gas below $T_c$	Fluid above $T_c$	Critical region
			<b>Methane</b>	
Pressure %	2	0.3	0.3	0.3
Density %	0.2	0.3	0.1	5.0
Temperature %	0.1	0.1	0.1	1
Enthalpy (J/mol)	2	1	1	10
Entropy (J/mol)	1	1	1	2
Specific heat, $C_p$ %	5	5	2	10
Specific heat, $C_v$ %	5	5	2	10
Speed of sound %	2	0.5	0.5	2
Thermal conductivity %	5	4	3	8
Viscosity %	2	2	2	5
Dielectric constant %	0.05	0.05	0.05	0.3

Experiments, result and discussion: From all above techniques are mostly dedicated to purification of biogas to biomethane up to standard specification. This has also been done using physical techniques only. So need is to improve purification of biogas using chemical methods and using certain chemical methods to bring cost effective transportation of upgraded biomethane for commercial application. Our aim is to explore chemical methods to make transportation of biomethane a cost effective mean for commercial scale up. The techniques we are proposing are using chemical reactions of methane which are pressure driven. This study is based on physical and chemical properties of methane. Methane is the first hydrocarbon. A one-carbon compound in which the carbon is attached by single bonds to four hydrogen atoms. It is a colourless, odourless, non-toxic but flammable gas (b.p.  $-161^\circ\text{C}$ ). It is comparatively lesser reactive than impurities present in biogas. So we are aiming to develop a system in which increase pressure will make

methane soluble in suitable solvent. This liquid solution of methane will have volume almost same as that of the solvent. This makes transportation of the methane very easy. Array of different solvents such as nonpolar, polar and room temperature ionic liquids (RTIL) will be used to assess the reversible solubility of methane at different temperatures. This will provide data which solvent is more suitable for transportation of methane at different temperature.

Conclusion: Very few studies are done of solubility of methane especially for transportation of methane. Therefore this study will open a new avenue in solubility of methane, transportation and commercial application of methane. This also will reduce global warming and boost the rural economy in India.

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## CRYPTOGRAPHY ENCRYPTION

**Prof. Shruti C. Karbhari**, *Asst. Prof. , Professor, Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad, Maharashtra*

**Adnan Sarang**, *Student, Anjuman Islam Janjira Degree College of Science, Murud-Janjira, Raigad, Maharashtra*

### **Abstract**

*Data is any type of stored digital information. Security is about the protection of assets. Data security refers to protective digital privacy measures that are applied to prevent unauthorized access to computers, personal databases and websites. Cryptography is evergreen and developments. Cryptography protects users by providing functionality for the encryption of data and authentication of other users. Compression is the process of reducing the number of bits or bytes needed to represent a given set of data. It allows saving more data. Cryptography is a popular ways of sending vital information in a secret way. There are many cryptographic techniques available and among them AES is one of the most powerful techniques. The scenario of present day of information security system includes confidentiality, authenticity, integrity, non-repudiation. The security of communication is a crucial issue on World Wide Web. It is about confidentiality, integrity, authentication during access or editing of confidential internal documents*

**Introduction:** To secure the data, compression is used because it use less disk space (saves money), more data can be transfer via internet. It increase speed of data transfer from disk to memory. Security goals for data security are Confidential, Authentication, Integrity, and Non-repudiation. Data security delivers data protection across enterprise. Information security is a growing issue among IT organizations of all sizes. To tackle this growing concern, more and more IT firms are moving towards cryptography to protect their valuable information. In addition to above concerns over securing stored data, IT organizations are also facing challenges with everincreasing costs of storage required to make sure that there is enough storage capacity to meet the organization's current and future demands. Data compression is known for reducing storage and communication costs. It involves transforming data of a given format, called source message to data of a smaller sized format called code word. Data encryption is known for protecting information from eavesdropping. It transforms data of a given format, called plaintext, to another format, called cipher text, using an encryption key. Currently compression and encryption methods are done separately. Cryptography prior to the modern age was effectively synonymous with encryption, the conversion of information from a readable state to apparent nonsense. Modern cryptography is heavily based on mathematical theory and computer science practice; cryptographic algorithms are designed around computational hardnessassumptions, making such algorithms hard to break in practice by any adversary. It is theoretically possible to break such a system, but it is infeasible to do so by any known practical means. The growth of cryptographic technology has raised a number of legal issues in the information age. Cryptography's potential for use as a tool for espionage and sedition has led many governments to classify it as a weapon and to limit or even prohibit its use and export

**CRYPTOGRAPHY:** The art of cryptography is considered to be born along with the art of writing. As civilizations evolved, human beings got organized in tribes, groups, and kingdoms. This led to the emergence of ideas such as power, battles, supremacy, and politics. These ideas further fueled the natural need of people to communicate secretly with selective recipient which in turn ensured the continuous evolution of cryptography as well. The roots of cryptography are found in Roman and Egyptian civilizations.

The importance of information and communication systems for society and the global economy is intensifying with the increasing value and quantity of data that is transmitted and stored on those

systems. At the same time those systems and data are also increasingly vulnerable to a variety of threats, such as unauthorized access and use, misappropriation, alteration, and destruction.

The hiding of information is called encryption, and when the information is unhidden, it is called decryption. A cipher is used to accomplish the encryption and decryption. Merriam-Webster's Collegiate Dictionary defines cipher as —a method of transforming a text in order to conceal its meaning. The information that is being hidden is called plaintext; once it has been encrypted, it is called ciphertext

To hide any data two techniques are mainly used one is Cryptography other is Steganography. In this paper we use Cryptography. Cryptography is the science of protecting data, which provides methods of converting data into unreadable form, so that Valid User can access Information at the Destination. Cryptography is the science of using mathematics to encrypt and decrypt data

**Basic Terminology of Cryptography:** Computers are used by millions of people for many purposes. such as banking, shopping, military, student records, etc.. Privacy is a critical issue in many of these applications, how are we need to make sure that an unauthorized parties cannot read or modify messages

**Cryptography** is the transformation of readable and understandable data into a form which cannot be understood in order to secure data. cryptography refers exactly to the methodology of concealing the content of messages, the word cryptography comes from the Greek word "Kryptos", that means hidden, and "graphikos" which means writing.

The information that we need to hide, is called plaintext , It's the original text, It could be in a form of characters, numerical data, executable programs, pictures, or any other kind of information, The plaintext for example is the sending of a message in the sender before encryption, or it is the text at the receiver after decryption

The data that will be transmitted is called cipher text , it's a term refers to the string of "meaningless" data, or unclear text that nobody must understand, except the recipients. it is the data that will be transmitted Exactly through network, Many algorithms are used to transform plaintext into cipher text

**Cipher** is the algorithm that is used to transform plaintext to cipher text, This method is called encryption, in other words, it's a mechanism of converting readable and understandable data into "meaningless" data.

The Key is an input to the encryption algorithm, and this value must be independent of the plaintext, This input is used to transform the plaintext into cipher text, so different keys will yield different cipher text, In the decipher side, the inverse of the key will be used inside the algorithm instead of the key.

**Computer security** it's a generic term for a collection of tools designed to protect any data from hackers, theft, corruption, or natural disaster while allowing these data to be available to the users at the same time. The example of these tools is the antivirus program.

**Network security** refers to any activity designed to protect the usability, integrity, reliability, and safety of data during their transmission on a network, Network security deals with hardware and software. The activity can be one of the following anti-virus and anti-spyware, firewall, Intrusion prevention systems, and Virtual Private Networks.

### **Cryptography Goals**

By using cryptography many goals can be achieved, These goals can be either all achieved at the same time in one application, or only one of them.

These goals are:

**1. Confidentiality:** it is the most important goal, that ensures that nobody can understand the received message except the one who has the decipher key.

**2. Authentication:** it is the process of proving the identity, that assures the communicating entity is the one that it claimed to be. This means that the user or the system can prove their own identities to other parties who don't have personal knowledge of their identities.

**3. Data Integrity:** it ensures that the received message has not been changed in any way from its original form. The data may get modified by an unauthorized entity intentionally or accidentally. Integrity service confirms that whether data is intact or not since it was last created, transmitted, or stored by an authorized user. This can be achieved by using hashing at both sides the sender and the recipient in order to create a unique message digest and compare it with the one that received.

**4. Non-Repudiation:** it is mechanism used to prove that the sender really sent this message, and the message was received by the specified party, so the recipient cannot claim that the message was not sent. For example, once an order is placed electronically, a purchaser cannot deny the purchase order, if non-repudiation service was enabled in this transaction.

**5. Access Control:** it is the process of preventing an unauthorized use of resources. This goal controls who can have access to the resources, If one can access, under which restrictions and conditions the access can be occurred, and what is the permission level of a given access.

**Data Encryption:** A data encryption is a random string of bits created explicitly for scrambling and unscrambling data. Data encryption is designed with algorithms intended to ensure that every key is unpredictable and unique. Cryptography uses two types of keys: symmetric and asymmetric. Symmetric keys have been around the longest; they utilize a single key for both the encryption and decryption of the ciphertext. This type of key is called a secret key. Secret-key ciphers generally fall into one of two categories: stream ciphers or block ciphers. A block cipher applies a private key and algorithm to a block of data simultaneously, whereas a stream cipher applies the key and algorithm one bit at a time.

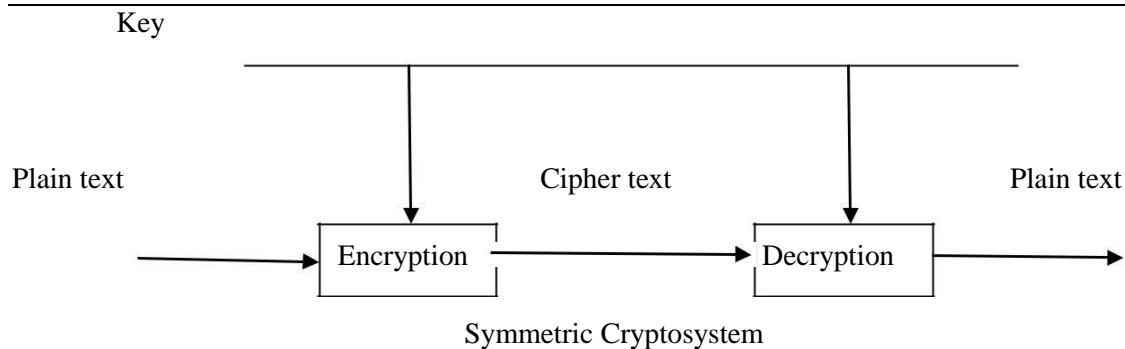
Most cryptographic processes use symmetric encryption to encrypt data transmissions but use asymmetric encryption to encrypt and exchange the secret key. Symmetric encryption, also known as private key encryption, uses the same private key for both encryption and decryption. The risk in this system is that if either party loses the key or the key is intercepted, the system is broken and messages cannot be exchanged securely.

### **Data Decryption**

One of the foremost reasons for implementing an encryption-decryption system is privacy. As information travels over the World Wide Web, it becomes subject to access from unauthorized individuals or organizations. Decryption is the process of taking encoded or encrypted text or other data and converting it back into text that you or the computer can read and understand. This term could be used to describe a method of un-encrypting the data manually or with un-encrypting the data using the proper codes or keys. Encryption is the process of translating plain text data (*plaintext*) into something that appears to be random and meaningless (*ciphertext*). Decryption is the process of converting ciphertext back to plaintext

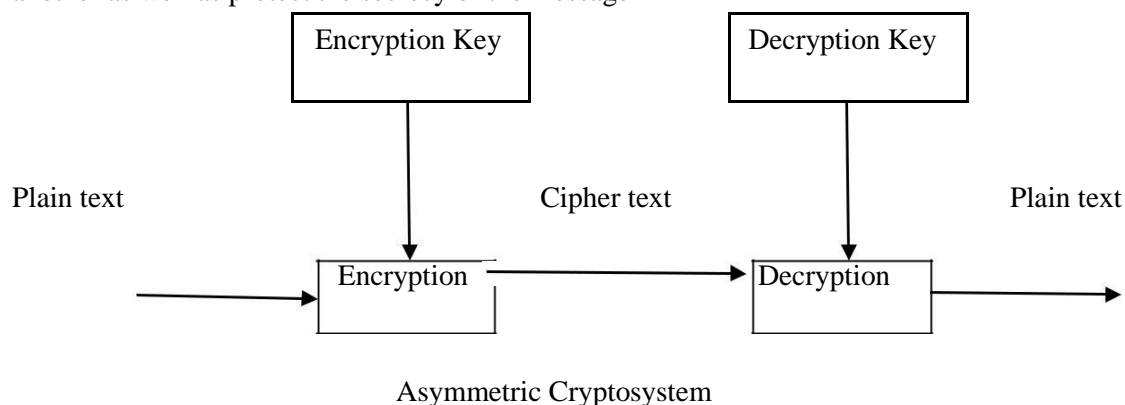
### **Symmetric Key Cryptography**

In symmetric key cryptography is also known as private-key cryptography, a secret key may be held by one person or exchanged between the sender and the receiver of a message. If private key cryptography is used to send secret messages between two parties, both the sender and receiver must have a copy of the secret key.



**Asymmetric Key Cryptography:** In the two-key system is also known as the public key system, one key encrypts the information and another, mathematically related key decrypts it. The computer sending an encrypted message uses a chosen private key that is never shared and so is known only to the sender. If a sending computer first encrypts the message with the intended receiver's public key and again with the sender's secret, private key, then the receiving computer may decrypt the message, first using its secret key and then the sender's public key.

Using this public-key cryptographic method, the sender and receiver are able to authenticate one another as well as protect the secrecy of the message



**COMPRESSION:** Data compression offers an attractive approach for reducing communication costs by using available bandwidth effectively. Compression algorithms reduce the redundancy in data representation to decrease the storage required for that data. Over the last decade there has been an unprecedented explosion in the amount of digital data transmitted via the Internet, representing text, images, video, sound, computer programs etc

Data compression implies sending or storing a smaller number of bits. Compression is the reduction in size of data in order to save space or transmission time. Many methods are used for this purpose, in general these methods can be divided into two broad categories: Lossy and Lossless methods. Lossy Compression generally used for compress an images. In this original data is not identical to compressed data that means there is some loss e.g. Block Truncation Coding, Transform Coding, etc... Lossless Compression used for compress any textual data

**CONCLUSION:** Cryptography is used to ensure that the contents of a message are confidentiality transmitted and would not be altered. this paper describes compression techniques. Confidentiality means nobody can understand the received message except the one that has the decipher key, and "data cannot be changed" means the original information would not be changed or modified



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## नटसम्राट एक नाटक आकलन – वि.वा. शिरवाडकर

प्रा. डॉ. भैरगुंडे एस.एस., (मराठी विभाग) वसंतराव नाईक कॉलेज, मुरुड – जंजिरा, जि. रायगड.

**आप्पा (गणपत बेलवलकर)** – मराठी साहित्याला ज्ञानपीठ पारितोषिकाचा बहुमान मिळवून देणाऱ्या वि. वा. शिरवाडकर या महान प्रतिभावंत कलावंताची नटसम्राट ही तितकीच श्रेष्ठ सुंदर नाटय कलाकृती आहे. नटसम्राट हे नाटक गणपतराव बेलवलकर या आप्पा म्हणजेच गणपतराव बेलवलकर आणि गणपतराव बेलवलकर म्हणजेच नटसम्राट म्हणून नटसम्राट हे अप्पांचे नाटक आहे. “नटसम्राट समिक्षा” ग्रंथात स्वतः नाटककार शिरवाडकरच म्हणतात. “हे नाटक मूलतः गणपतराव बेलवलकरांचे असल्यामुळे बाकीची पात्रे त्याच्याशी असलेल्या संबंधांपुरती मर्यादित महत्त्वाची आहेत.” म्हणजेच अप्पा ही या नाटकातील मध्यवर्ती व्यक्तिरेखा आहे. आणि या केंद्रस्थानाभोवती नाटकातील इतर पात्रे धरून उभे आहेत.

**1) दोन भिन्न जगाचा रहिवासी** – नटसम्राट मधील अप्पा हा नाटयकलेचा जीवन मानणारा एक महान कलावंत यष किर्तीची शिखरे सर करीत करीत अखेर नटसम्राट या गौरव शिखरावर पोहोचला. नाटयकलेचे जग हेच त्याचे वास्तव जग होते आणि वास्तव जग हेच त्याचे अवास्तव जग होते त्याची संपूर्ण जीवन निष्ठा, श्रद्धा आणि प्रेम रंगभूमिला बांधलेली होती. नटसम्राट पृष्ठ क्रमांक 20 पण खऱ्या पृथ्वीवर मी राहिलोच नाही माझी पृथ्वी वेगळी होती..... थेटर मधील अंतराळयान तोलून धरलेली चंद्र सूर्य नव्हे तर रंगमंचावरील दिव्याने प्रकाशित केलेले रूपया आप्पांचे जमा खर्च या माझ्या जगात फारसे पोहोचलेच नाहीत हे आप्पांचे उद्गार त्यांच्या नाटकाला वाहिलेल्या जीवनाचे दर्शन घडवितात. परंतु वार्धक्य आल्यानंतर त्यांना आजवर अवास्तव वाटलेल्या लौकिक जगात प्रवेश करावा लागतो. तरुण भारत दिवाळी अंक 1978 मध्ये शिरवाडकर म्हणतात, नटसम्राट हा सर्वाधिकार संपन्न मुकूट मस्तकावरून आप्पा उतरवितात आणि वडिलधान्या माणसाची काळी टोपी डोक्यावर चढवितात. कलात्मक जीवनाचे संदर्भ तुटून जातात या नव्या संसारात सगळे जवळचे (मुलगा, मुलगी, सुन, जावई) असूनही ते परकेच ठरतात. “चौकोनी खुंटी गोल छिद्रात बसत नाही.” येथेच त्यांच्या वास्तव जीवनातील षोकांतिकेला सुरुवात होते. कलावंताचे जीवन त्याला विसरता येत नाही आणि नव्या वास्तव जगाशी जुळवून घेणे अवघड होत रहाते. येथेच संघर्षाचे बीज पडते आणि षोकांतिकेची नांदी सुरू होते.

**2) आप्पा संस्कार संपन्न नट** – नटसम्राट नाटकाची सुरुवात आप्पांच्या प्रदिर्घ स्वागताने होते. त्यांच्या कला जीवनात इतिहास त्यातून उलगडत जातो. या निवेदनात जाणवणारे आप्पा एक संस्कार संपन्न व समृद्ध व्यक्तिमत्व असलेला नाटय कलेवर श्रद्धा असलेला रंगदेवतेचा पुजारी असे त्याचे व्यक्तिमत्व कलावंत म्हटले की लहरी, व्यसनी, अहंकारी, कलंदर वृत्तीचा असतो. असा एक समज आहे परंतु आप्पा तसे नाही. एक साक्षात्कारी नट असे त्यांचे व्यक्तिमत्व आहे. कवी मनाचा तत्वचिंतन आणि सभ्य असा हा माणूस जणू पारदर्शी पाण्याचा नितळ निर्मळ डोह ऋषीच्या अल्पतेने तो जगाकडे बघतो आहे असे वाटते हा कोणाच्या ही प्रेमात पडणारा नाही त्याच वेळी त्यांचे हे असामान्य व्यक्तिमत्व पाहून आपण पात्र त्यांच्या प्रेमात पडतो. “नटसम्राट समिक्षा” या ग्रंथात तारा – भवाळकर म्हणतात, “आप्पा बेलवलकरांनी उभ्या आयुष्यात नाटकाषिवाय काहीही पाहीलं नाही, नाटकाषिवाय काहिही अनुभवले नाही.” नोटा आणि नाण्यासाठी रोज रात्री तोंडाला रंग फसणारा तो पोटार्थी नट नाही तो तो सर्वार्थाने नटसम्राट व नट श्रेष्ठ कलावंत आहे.

**3) जीवन हे खडतर तपश्चर्या** – नटसम्राट हा सर्वश्रेष्ठ बहुमान मिळविण्यासाठी गणपतरावांना खडतर तपश्चर्या करावी लागली. वयाच्या 15 व्या वर्षी घराच्या चारी भिंती चार बाजुना कुजून पडल्या. डोक्यावर आकाषाचे छप्पर दिसायला लागले. सराई नसलेल्या वाळवंटातून वाटचाल करायला लावून पायाला

जाळीत होते. जमिन आणि मस्तकाला जाळीत होते आकाष पहिल्या अंकातील आप्पांच्या या स्वागतात त्याच्या रंगभूमी पूर्व जीवनातील दुःख, यातनांचे प्रतिबिंब उमटले आहे. परंतु आप्पा चालत राहिले अदृष्ट्यातून गुराख्यासारखे कोणीतरी मला हाकारीत होता.या जळत्या प्रकाशातच केव्हातर साक्षात्कार झाला. की आपल्याला जगायचे आहे ते रंगमंचावर प्रवेश केला. जीवनाचे देह आप्पांना सापडले. कलावंतांच्या जीवनाचे दार उघडले.

**4) कला साधन** – नटसम्राट हा बहुमान मिळविण्यासाठी आप्पांना उग्र तपश्चर्या करावी लागली. नाटकाच्या जगात त्याने सर्वस्व अर्पण केले. नाटककार अभिनव कला आणि प्रेक्षक यातच देवता मानून श्रद्धा भावाने त्याची पूजा केली या मुळेच आप्पा मधला कलावंत घडत गेला. आप्पा सांगतात पुण्यातील प्रेक्षकांसमोर कांचन गडची मोहिना नाटकाची प्रतापरावांची भूमिका मी जीव ओतून केली आणि कलावंत या पदवीला पात्र झालो पुढे वेगवेगळ्या नाटकातून 40 वर्षे सतत रोज रात्री प्राण पणाला लावून त्याची विविध भूमिका जीवंतपणे साकार केल्या. नाटय रसिकाची मने जिंकली गणपतराव जोषी सारख्या नट सम्राटाचे श्रेष्ठत्व व षाबासकी मिळाली. लोकमान्यांचे आर्षिर्वाद मिळविले. कृ.पा. खडिलकर राम गणेश गडकरी या दैवतांने पाठीवर हात ठेवला. आप्पांचे कलावंत म्हणून जीवन असे कृतार्थ झाले. या सारे यष वैभवाचे गमक आहे. आप्पांची रंगभूमीवरची नितांत निष्ठा आणि अलैकिक अभिनय. तिसऱ्या अंकात एक प्रेक्षक दुसऱ्या प्रेक्षकाला म्हणतो. अँथोल्लोची भूमिका गणपतराव बेलवलकरांनी केलेली तु पाहिली नाहीस! त्याच स्टेजवर पाउल टाकलें की, आफ्रिकेचे घनघोर जंगल मनामध्ये पिरत असे तो संताप उसळला की, वाटायचं स्टेजवर पेट्रोलची वारंवार धडाडून पेटली आहे. काय ती तीन्ही सप्कातून चित्यासारख्या धावणारा स्वर आहे. असे प्रेक्षकांना वाटायचं उगाच नाही. महाराष्ट्रानं नटसम्राट म्हणून त्यांना डोक्यावर घेतलं कोठे ते गौरी पंकर आणि कुठे ते वारूळ!(आजचे नट) पृष्ठ क्रमांक 80 – या प्रेक्षकांच्या संवादातून आप्पांच्या असामान्य अभिनयाचे आणि भूमिकेची तन्मय होण्याचे हे दोन्ही गुण व्यक्त होतात. म्हणूनच आप्पांच्या भूमिका आणि त्यांचा अभिनय महाराष्ट्रातील नाटय रसिकांनी हृदयात कायमचा जपून ठेवला. पुढे रंगभूमिलच्या पडत्या काळात आप्पा आपल्या गावी गेले. पण नाटकाचे जग ते विसरले नाहीत. पुन्हा रंगभूमिला चांगले दिवस आले आणि नाटय रसिकांनी या नटश्रेष्ठाचा नटसम्राट म्हणून गौरव केला. त्यांची जीवनयात्रा कृतार्थ सफल आणि पूर्णतः झाली. भावी श्रद्धाळू आणि रसिक नटसम्राट नाटकातील प्रसंगीच्या आप्पांच्या संवादाचे निरिक्षण करतांना काही गोष्टी चटकन ध्यानात येतात. नमस्कार, ताईत, दंडे, दोरे, पूजा, अर्चा इ. कर्म कांडावर विश्वास ठेवणारे आप्पा भाविक वाटतात. तर “कांचनगडची मोहिना” या नाटकाच्या प्रयोगापूर्वी घाबरलेल्या आप्पांनी काकासाहेब खाडीलकरांच्या पायाला मिठी मारली व त्यांनी ओठातल्या ओठात आर्षिर्वाद दिला. त्यात आप्पांना भास असा झाला. दिषादिषांतून सदाषिवाच्या डमरूसारख तो आवाज मला ऐकू आला. सगळ्या भितीचा निचरा झाला. अंतरबाहय प्रकाशाने निथळून गेलो. हे आप्पांचे उद्गार त्यांच्या मनाचा श्रद्धाळूपणा दाखवतात तर बालगंधर्व विषय बोलतात आप्पा म्हणतात, “ बालगंधर्व म्हणजे फुटलाईटच्या प्रकाशात उगवलेले इंद्रधनुष्या” हे आप्पांचे उद्गार त्यांच्या रसिक कृतीची साक्ष देते. विनोदी वृत्तीचा वत्सल पिता आप्पा नाटकांच्या जगात भाग्यवान ठरले. नट म्हणून उदंड यष, मान, सन्मान, किर्ती, गौरव रसिकांचे अफाट प्रेम सारे सारे मिळाले. पण आप्पांच्या वास्तव जगात कुटुंब संसारात आप्पांचा पुर्णतः पराभव झाले वत्सल कृतीचा पिता नटश्रेष्ठाचा राजमुकुट उतरवुन कुटुंब किर्तीची काळी टोपी चढवितो आणि पहिल्याच अंकात आपल्या जवळ होते नव्हते ते सगळे मुलगा आणि मुलगी यांना देवून टाकले. नंदू आणि नलू या आपत्यांवर आप्पांचे जीवापाड प्रेम आहे म्हणून सत्कार प्रसंगी मिळालेली थैली ते मुलांना देवून टाकतात. आपल्या मुलाचा आणि मुलीचा आप्पा परिचर करून देतात तेव्हा त्यांच्या षब्दांमध्ये कौतुक षिगोषिग भरलेले असते. नेहमीच्या बोलण्यात सुध्दा आप्पा बऱ्याच वेळ विनोदी उक्तीचे दिसतात. उदा. नलूकडे

गेल्यावर स्टेपनवर नोकर उषीराने येतो तेव्हा आप्पा म्हणतात, "आम्हाला ताटकळत ठेवून नावाला जागलास बाबा!"

**5) गोल छिद्रात न बसलेली चौकोनी खुंटी –** कुटूंब कर्ता म्हणून आप्पांच्या जिवनास सुरवात होते. कुटूंब विषयाचे कौतुकाने प्रेम व्यक्त करतात. मुलाला प्लॉट घ्यायला पैसेही देतात. या पुढील म्हातारपण सुखात जाणर असे भविष्याचे सुंदर स्वप्न आप्पा पाहतात. " म्हातारपण म्हणजे गुलाबकावलीचे फुल" या त्यांच्या उद्गारात त्यांची भविष्याकालाविषयाची अपेक्षा स्पष्ट होते. नंदुच्या प्लॉटवर रहायला जातात. हळूहळू त्यांच्या स्वप्नांना तडे जावू लागतात. प्लॉट संस्कृतीषी जुळते घेण्याचा खुप प्रयत्न आप्पा करतात. परंतु त्यांना ते जमत नाही. हळुहळु लाचारी , अपमान,अनादर,तिरस्कार त्यांना सहन करावा लागतो. कारण रंगभूमिवरील जगाचे आणि व्यवहारी जगाचे कायदे निराळे असतात.व्यवहारी जगाचे कायदे अप्पांना नाडीत असतात. आयुष्याला कडवटपण येत जातो. रंगभूमिवरचा हा सम्राट मूलाच्या घरात अडगळ होतो. " महाबळेश्वरी मधाची बुदली" असा आप्पांनी जीचा गौरव केला तीच सून असा मुलाने अपमानकारक ताडताड बोलू लागते. जर उंच आवाजात चहा मागितला तर ते ओरडणे होते. ठमीला ढालगज भवानी असे संबोधणारे आप्पा. आप्पांच्या मनातील ठमी विषयाचे प्रेम कोणालाच कळले नाही. ठमीषिवाय परंतु त्या प्लॉट संस्कृतीत ढालगज भवानी हे असंस्कृतपणाचे ग्राम्यतेचे लक्षण समजले गेले. एवढेच नव्हे प्रेमळ नातीला सून आप्पांपासून ओढून घेते. नोकराकडून सुध्दा अपमान सहन करण्याची पाळी या रंगभूमीच्या राजवर येते. मनाला भेगाच भेगा पडतात आणि अखेर मुलगा स्पष्ट षब्दात सांगतो. "मी माझ्या पत्नीचा आणि संसाराचा बळी तुमच्या पायावर देणर नाही." इतका कडवट अपमान आघात सहन करावा लागतो. परंतु नवऱ्याचा अपमान कावेरी सहन करू षकत नाही. आप्पा मुलाचे घर सोडतात आणि मुलीकडे जातात. आता सत्तरी ओलांडलेली असते नव्हे थोडा भ्रमीष्टपणा आलेला असतो. आप्पांच्या भावविश्वात खळबळ उडालेली असते. ठमीला ते विसरू षकत नाहीत. म्हणुन तर रेल्वे स्टेपनवर गाडीच्या खिडकीषी उभी असलेली मुलगी पाहून आप्पा तीला ठमी समजतात. गाडी सुरु होते. आप्पा त्या भ्रमात गाडीकडे धावत राहतात. आप्पांच्या भविष्यातील हे खळबळजनक काव्या वाचकाचे अंतःकरण हालवते. ज्याच्या पासून प्रेम मिळायचे त्याच माणसांनी पाठ फिरवली. अपेक्षा भंगाचा जबरदस्त तडाखा आप्पांच्या मनाला हादरून टाकतो. मुलीकडेही यापेक्षा वेगळ वाटयाला येत नाही. नियतीच कुर झालेली असते की काय? कळवणकरांच्या भेटीचा प्रसंग घडतो. आणि आप्पांचे दैवत असलेल्या गणपतराव जोषीची कळवणकर टवाळी करतात. आप्पा सारे काही सोसतील परंतु त्यांच्या श्रध्दास्थानावर झालेला आघात ते कदापी सहन करणार नाही. कारण गणपतराव जोषी, खाडीलकर,गडकरी या दैवतांच्या आर्षिर्वादानेच आप्पांना नटसम्राट हा बहुमान मिळाला. इंद्राचे भाग्य लाभते. म्हणून संतापलेले आश्रयाला आपण रहात आहोत त्या आश्रयदात्याचा कळवणकर हस वरिष्ठ अधिकारी. आप्पा दीन होतात. लाचार होतात. पष्चात्तापाने पोळून निघतात. परिणमतः आप्पांची खजगी आउट हाऊस मध्ये खाजगी होते. मायेचे व स्नेहाचे संबंध दुरावतात. हा दुःखाचा दंष आप्पांना सहन करण्याची पाळी येते. पण काल कुटाचा जहरीपणा पुढेच असतो. आप्पांवर त्यांच्य प्राणप्रिय मुलीकडून चोरीचा आळ घेतला जातो. आणि आप्पा पुरते उध्वस्त होतात. कावेरी हा आघात सहन करू षकत नाही. या प्रसंगीही जिवनातील मोठे सत्य आप्पांच्या लक्षात येते. "कोणी कुणचं नसतं एवढेच खरे " अंतराळातील आप्पां आमच्या वासनेच्या जीण्यातून खाली येतात. आणि आम्ही बाप झालो पण कोणीच कुणाचं नसतं हे सत्य लक्षात येते आणि याच वेळी दुदैवाचा दहा अवतारही पूर्ण होतो. आप्पांना समजून घेणारी आणि सतत सावरणारी त्यांच्या जीवनातील तुळषी वृंदावन असणारी कावेरी मृत्युमुखी पडते. आप्पांच्या वाटयाला मात्र रामासारखा वनवासच आला. पण हा वनवास रामापेक्षा ही भयानक होता. रामाला वनवास भोगावा लागला तो तरुण पणी, वनवासात साथ मिळाली ती लक्ष्मणाची अन सीतेची. आप्पांना मात्र कावेरी षिवाय कोणाचीच साथ मिळाली नाही. अन वनवास आला तो वृध्दपणी सारी षक्ती संपल्यानंतर राम वनवास संपल्यानंतर परत

घरी येतो. पण आप्पांचा वनवास त्यांच्या मृत्युनंतरच संपतो. असा विदारक वनवास ज्याच्या वाटयाला आला त्या आप्पांची मागणी तर काय होती? त्यांच्याच भाषेत सांगायचं म्हणजे.

सुर म्हणतो साथ दे  
दिवा म्हणतो वात दे  
उन्हामधल्या म्हाताऱ्याला  
फक्त तुझा हात दे

येथून पुढच्या आयुष्याचा विचार म्हणजे आप्पांच्या चिंधडया झालेल्या आयुष्याचा तपशील एक प्रचंड माणूस उध्वस्त झाला आणि हे गणपतराव नावाचे तुफान घराबाहेर उसळले. खऱ्या घराच्या षोधात "कुणी घर देता का घर." म्हणीत अखेर आयुष्याची बरीच फरपट होते आणि आप्पा मुंबईत येतात. तिथे त्यांना भेटतो राजा खरा माणूस काळजाच्या कराराने आप्पांशी जोडलेला "माणसे तगविली पाहीजेत" इतकी माणूसकी विषयाचे निष्ठा जपणारा. षेवटी मुलगा, मुलगी, जावई आप्पांना षोधून काढतात. आम्हाला क्षमा करा म्हणून आर्जव करतात. परंतु रस्त्यावर बरे वाईट होवू नये ही या प्रतिष्ठित माणसाला माहीत आहे भिती वाटते. अर्थात अखेर आप्पा आपल्याच षरीरातील महा पुरुषांना आवाहन करतात. असे आप्पांचे नाटक आणि जगण्याचे ही नाटक संपते.

आभाळ म्हणतं सावली दे  
जमीन म्हणते पाणी दे  
माळावरच्या म्हाताऱ्याला  
फक्त तुझी गाणी दे  
कावळा म्हणतो पंख दे  
चिमणी म्हणते खोपा दे  
माझ्यासारख्या आजोबाला  
फक्त तुझा पापा दे

पण आप्पांना यातलं कधीच काही मिळालं नाही. ज्या एका नातीचं थोडे बहूत देण्याचा प्रयत्न केला तिचेही पंख छाटून टाकले जातात. कावळे, चिमण्या सुध्दा घरटे बांधतात. आपल्या पिल्लांसहीत सुखा समाधानांने त्यात राहतात. पण आप्पांना हे साध सुख सुध्दा मिळत नाही. पोराच्या जीवावर रिटायर झालेल्या आप्पांना षेवटी पोरांनीच रिटायर केलं..... पार या जगातून ना त्यांना कुणी हात दिला..... ना कुणी त्यांना पाणी दिलं..... मग सावली तर खुपचं दूर राहिली. म्हणूनच नटसम्राट ही जषी एक नटाची षोकांतीका आहे तषी ती एक वृध्दाची षोकांतीका आहे. असा हा नाटसम्राट गणपतराव बेलवलकर म्हणजे षोकांतीकेचे प्राणतत्व आहे. डॉ. व. दी. कुळकर्णी म्हणतात. आप्पा म्हणजे जे षुध्द सुंदर आहे त्यासाठी आत्मसमर्पण करणाऱ्या नायकाचा आत्मा घेवून उभा राहिलेला माणूस ते कुणाचेच नसतात ते असतात फक्त एक Living Sprit (जागृत आत्मा) प्रखर आणि लखलखीत असेल जे त्याच्या मुला मुलीच्या थिटया आकलना पलीकडच्या असतात. म्हणूनच आप्पांची षोकांतीका होते.

**संदर्भ :-**

1. नाटक एक चिंतन – वसंत कानेटकर
2. षेक्सपिअरची षोकनाटये – परषूराम देषपांडे
3. नटसम्राट एक अभ्यास – प्रा. मो.द. ब्रम्हो
4. षोककारण मराठीत षोकांतीका – मनोहर माधव अळतेकर

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**RESEARCH ON WIRELESS SENSOR NETWORK TECHNOLOGY**

**Assi.Prof.Aatmja Anant Aglave**, Professor, Anjuman Islam Janjira Degree College of Science, Murud-Janjira. Raigad, Maharashtra

**Daniya Bharoon**, Student, Anjuman Islam Janjira Degree College of Science, Murud-Janjira. Raigad, Maharashtra

**Abstract**

*As wireless sensor technology improves; an increasing number of organizations are using it for a wide range of purposes. Zig Bee technology is a new standard in wireless personal area after Bluetooth. After an introduction to this technology, a new wireless meter-reading system based on Zig Bee protocol has evolved. This system, which is comprised of Zig Bee network and database management system, has many important advantages such as low cost, low power consumption, and low data rate. Wireless Sensor Network based on Zig Bee technology is a wireless network which is composed of many nodes of Zig Bee RF chip, sensor and MCU, especially suitable for application of the remote monitoring system in flammable and explosive environment. Fusion of RFID and Zig bee is also possible which turn out to be boon for wireless sensor network technology. A complete overview of wireless sensor network technology is given in this paper. Wireless sensor network technology has become one of technological basic needs of us.*

**INTRODUCTION:** With the development of network and communication technology, the inconvenience of wiring is solved with WSN into people's life; especially it has wide perspective and practicability in the area of remote sensing, industrial automation control, and domestic appliance and so on. WSN has good functions of data collection, transmission, and processing. It has many advantages compared to traditional wired network, for example, convenient organizing network, small influence to environment, low power dissipation, low cost, etc. At present, near field wireless communication technology has been used widely, especially Bluetooth, wireless local area network (WLAN), infrared, etc. But, they have a number of disadvantages, for example, complexity, large power dissipation, short distance, networking in small scale. In order to satisfy the demand of low power dissipation and low speed among wireless communication devices, a new type of wireless network technology-Zig bee emerges as the times require. In this paper, we will introduce the networking technology and application of Zig bee. How Zig bee & RFID combination can be used in applications. In this paper first Zig bee is explained, then its advantages application and finally its fusion with RFID along with applications is discussed.

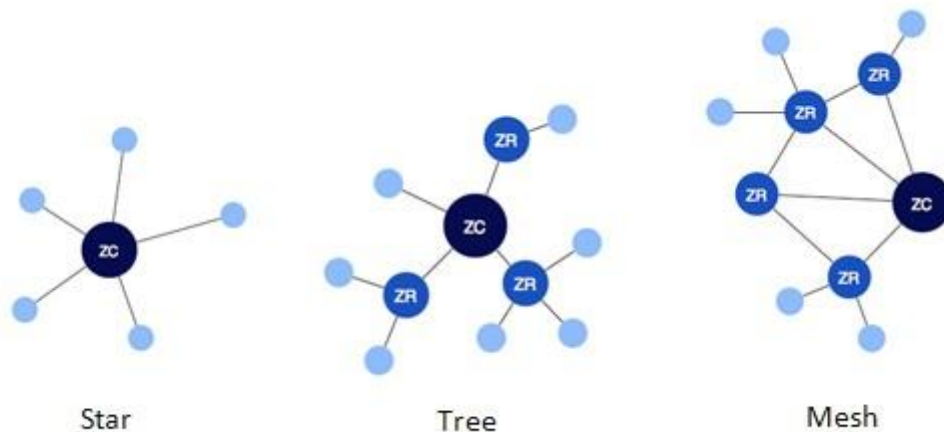
**ZIGBEE TECHNOLOGY:** Zig Bee is new wireless communication technology with short distance, low complexity, low energy consumption, slow data rate and low cost, and it is based on IEEE 802.15.4 Standard with the capacity of coordinating mutual communication among thousands of tiny sensors. Through the radio waves, these sensors can transmit the data from one sensor to another with small energy cost and high efficiency. Compared with various existing wireless communication technology, Zig Bee technology has the lowest energy consumption and cost. Because of the slow data rate and the small range of communication, Zig Bee technology is extremely suitable for agricultural field which has small amount of data flows. The technical features of this technology also make it the best choice for wireless sensor networks.

Zig Bee has the following features. Zig Bee uses a variety of power-saving modes to guarantee that it could be used for at least six months to two years powered by two AA batteries. Zig Bee uses the avoidance collision mechanism in CSMA/CA and pre-set a prior particular time slot for a fixed bandwidth communications service in order to avoid competition and conflict when sending data.

Zig bee has self-organizing features that one node can sense other ones without any human interventions, and connect with each other automatically to create a completed network. It also

obtains self-recovery function that the network can repair itself when a node is added or deleted, the position of a node is changed, or a breakdown occurred. It also can adjust the topology structure to ensure that the whole system can work normally without any human interventions.

**III. BASIC NETWORK STRUCTURES:** Zig bee supports multiple network structures, which mainly include star, tree, and mesh network, shown in Fig .They are composed of the Coordinator, the router, and end device. The Coordinator and the router need full function (FFD), but the end device could select either full function device (FFD) or reduced function device (RFD). RFD is only used to acquire data information and transmit the information to its parent node; it is not used to finish the work such as data transmission, route discovery, and route maintenance. The responsibility of FFD is used for building a new network, transmitting network beacon managing nodes in the network, and storing network information, etc. Star network is composed of a Coordinator and an end device or multiple end devices, the end device could only communicate with Coordinator, it cannot communicate with end device, so star network is called single-hop network. The tree network and mesh network have routing function, so they are called multi-hop network. Following Fig. The architecture of Zig bee network.

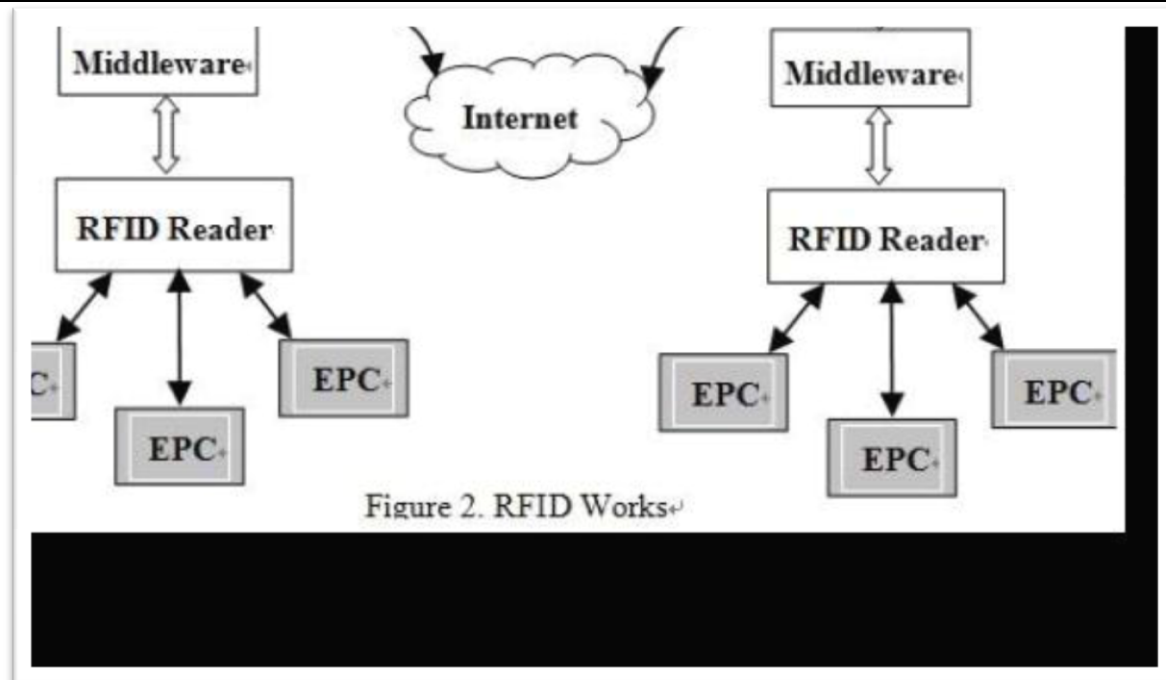


**Fig.1.The architecture of zigbee network**

### THE FUSION OF RFID AND ZIGBEE

RFID is a non-contact automatic identification technology that uses radio frequency signals automatic recognizes target and access to relevant data. The identification work does not require human interference and can work in variety of harsh environments. But if there is no network to transmit data, it will be difficult to play its advantage. Under the influence of environmental conditions, the traditional wired network may not be a better way to achieve. The feature of wireless sensor network is no center and self-organize, it is a powerful complement of RFID, and

can solve the drawback of poor anti- interference, the effective transmission distance short. Based on the Zig Bee technology and the RFID technology of information-fusion technology: the former used to monitor the target environment conditions, the latter used to identify target objects. Complementary and interdependent of the technology can effectively solve the problem of RFID data transmit in the mine and can also better perceive the safety hazard exists in coal mine Fig. 2 The fusion technology of wsn and RFID *Base on the Integration of WSN and RFID Technology to Solve the Problem of Mine Safe* The combination of Zig Bee wireless sensor networks and RFID technology, make up for the drawback of short transmission distance of the RFID which can also solve some of the following problems.



### APPLICATIONS OF WSN

Zig bee wireless communication technology has wide perspective, Zig bee will be used in a couple of years in the area of industry control, industrial wireless location, home network, building automation, medical equipment control, mine safety, etc, especially home automation and industry control will be the main application fields. Zig bee wireless communication is applied in families. With the development of people's life, the concept of smart home and home automation is well known, but it must relate to the transmission of information and signal if it comes true, so it is troublesome to wire cables. Zig bee is a new short-range technology for wireless communication, it is specially designed for applications of wireless communication of low speed and low power dissipation, and it is ideally suited for establishing family wireless net. It is effortless to realize home temperature regulation, remote control of interior lighting systems, and automatic adjustment of certain. Zig bee wireless communication technology is applied in meter reading system in the monitoring center just needs to analyze and calculate data acquired from users and obtain electricity consumption of users. After that, electric charge of the month is deducted from electricity account of users, the workers who is obliged to read the meter in user's home, the thing that users are not at home when workers are to read the meter is avoided. Compared to working real-time human-machine interface can be provided for worker.

**CONCLUSION:** Zig bee designed for sensor and controls network. Used for application that require low power consumption, low data rate and network security. It is high density nodes per network, it has low cost and low data rate. As a new wireless protocol in personal area, Zig Bee has its unique characteristics including low cost, low data rate, and low power consumption which corresponds to a large market. This paper provides an application in the field of building automation.

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## TO STUDY IMPACT OF PRESENCE OF VEGETABLE EXTRACT AND NON VEGETABLE EXTRACT DURING GERMINATION PROCESS ON GREEN MONG

**Dr. Sharad S. Phulari**, *Principal, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401*

**Khan Shoyeab Mutalib**, *Assit. Professor, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401*

**Gazge Namira**, *Students, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401*

**Kable Humera**, *Students, Anjuman Islam Janjira Deegree College of Science, Murud-Janjira, Dist. Raigad. Pin-402 401*

### **Abstract**

*To study the seed germination of Green mong under the aqueous extract of plant and animal origin of 1%, 5%, 10% and 20% concentration are used. The germination of seeds per day percentage of germination, average radical length and average plumule length in cm are parameters under study. The germination is more in control than treated seeds. Either plant extract or animal extract treatment is non stimulating and harmful to germination process in general. The effect of animal extract is very harmful than the plant extract treatment. Seed germination percentage is more in control than treatment. The seed germination percentage is more affected in aqueous extract of animal origin than plant origin. In both the treatment as the concentration increases, the maximum adverse effect is seen at 20% concentration of aqueous extract of animal origin average radical length is affected due to the treatment. The treatment of aqueous extract of prawn is more is destructive than the aqueous extract of spinach. There is adverse effect of aqueous extract of plant origin (spinach) and prawn on average plumule growth of Green mong seeds. Amongst the both treatment, aqueous extract of plant origin (spinach) shows less harmful*

**Introduction-** Green mong belongs to family fabaceae. It is annual plant with yellow flowers and fuzzy brown pods. Seed are having great nutritional values. According to USDA database, Green moong contain high fibers, Proteins, Carbohydrates, Vitamins A, vit B6, Vit C, Vitamin k, Phosphorous, Magnesium, Copper, Iron and Zinc. Importantly Mung beans are composed of about 20%–24% protein. Globulin and Albumin are the main storage proteins found in Mung bean seeds and make up over 60% and 25% of the total mung bean protein, respectively[1,2]. Mung beans are a good source of protein for the vegetarian's Mung bean protein is rich in essential amino acids, such as total aromatic amino acids, leucine, isoleucine, and valine, [3]. Green mong seeds are having great medicinal values the mung bean was recorded to be beneficial in the regulation of gastrointestinal upset and to moisturize the skin [4] The seeds and sprouts of mung beans are also widely used as a fresh salad vegetable or common food in India [5]. Mung beans can also be made into products like soups, porridge, confections, curries, and alcoholic beverages. In western cultures, mung bean sprouts are popularly used as a fresh salad vegetable [6]. As a food, mung beans contain balanced nutrients, including protein and dietary fiber, and significant amounts of bioactive phytochemicals. High levels of proteins, amino acids, oligosaccharides, and polyphenols in mung beans are thought to be the main contributors to the antioxidant, antimicrobial, anti-inflammatory, and antitumor activities of this food and are involved in the regulation of lipid metabolism [7, 8, 9, and 10] Germination is thought to improve the nutritional and medicinal qualities of mung beans [11]. Mung beans are a diabetic friendly food as they have a low GI. The energy offered by mung beans and sprouts is lower than that of other cereals, which is beneficial for individuals with obesity and diabetes [12,26]. Extracts of Moong beans improve glucose tolerance and increased insulin immunoreactive levels [13]. Trypsin inhibitors, hemagglutinin, tannins, and phytic acid found in the mung bean have also been reported to have biological functions, promoting digestion and eliminating toxins [14]. Mung and other beans

have protease inhibitors in them. These protease inhibitors are known to prevent cancer. They block and prevent the formation of cancerous cells and tumor cells Mung beans have been shown to exert antitumor effects through several different mechanisms [15].

Mung beans have zero cholesterol and are rich in soluble dietary fiber. Foods that are rich in soluble fibre are known to be helpful in lowering the “bad” LDL cholesterol. In order to reduce the amount of LDL cholesterol in the body it is advised to consume 10 to 25 g of soluble dietary fiber each day. Enzymes, peptides, and polyphenols extracted from mung beans have been shown to possess both antimicrobial and antifungal activities [16]. However, there are no scientific studies on the influence of aqueous extract of plant origin and animal origin of varying concentration on seed germination in Green mong. Miransari and Smith(2014) said that seed germination is an important process affecting crop production , and is influence by range of factors, including enzymes and hormones[17]. Seed germination is simple and non destructive technique for measuring plant biochemical growth and development. Therefore seed germination, germination percentage, radical length and plumule length are considered for understudy. The number of seed germinates per day, germination percentage of seed; radical length and plumule length on 10<sup>th</sup> day are the parameters consider to study. The treated petri dishes (6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> and 9<sup>th</sup>) with 10 seeds of Green mong each treated with adequate amount of aqueous extract of prawn of 1% , 5% ,10% and 20% for 10 days to study the seed germination of Green mong the germinate per day, germination percentage of seed and plumule length on 10<sup>th</sup> day of treatment are parameters consider for study. The entire process repeated for next 10 days. The observation are taken as an average of both the replicas.

#### **MATERIAL AND METHOD**

Green Mong are collected, placed ten each set of 9 Petri dishes. Each Petri dish is placed with normal blotting paper at bottom. First Petri dish is treated as control. It is poured with adequate distill water daily. Next four petri dish are treated with adequate amount of aqueous extract of plant (spinach leaves) remaining four petri dish are poured and treated with adequate amount of aqueous extract of animal origin (dried prawn). The control and treated petri dishes with 10 each Gram seed are under 10 day’s observation. It was to study the seed germination of Green mong under the aqueous extract of plant and animal origin.

For aqueous extract of plant origin preparation weight to volume ratio is consider for 1% aqueous extract of plant origin , 1 gm fresh spinach leaves homogenized with 100 ml distill water. The content is filter through the normal filter paper. The filtrate is used as 1% aqueous extract of plant origin, similarly 5% , 10% and 20% aqueous extract of plant origin is prepared daily freshly . Thus 1%, 5%, 10% and (w/v) concentrated aqueous extract of plant origin is prepared.

For aqueous extract of animal origin preparation, weight to volume ratio is considered for 1% aqueous extract of animal origin, 1 gm of dried prawn homogenized with 100 ml distill water. The content is filter through normal filter paper. The filtrate is used as 1% aqueous extract of animal origin. Similarly 5%, 10% and 20% aqueous extract of animal origin prepared daily freshly. Thus 1%, 5%, 10% and 20% (w/v) concentrated aqueous extract of plant origin is prepared.

The treated petri dish of Green mong treaed with aqueous extract of plant origin and animal origin of 1%, 5%, 10% and 20% for 10 days to observe seed germination of Green mong.

#### **RESULT AND DISCUSSION:-**

**Table 1. Number of seed germination 1 day of Green mong due to treatment of aqueous extract of plant and animal origin.**

Petri dish Number	Treatment		Number of seed germination/ day.									
			Day 1	Da y 2	Da y 3	Da y 4	Da y 5	Da y 6	Da y 7	Da y 8	Da y 9	Da y 10
1	Control	1	0	5	7	7	8	10	8	6	6	6
2.	Spinach Extract	1%	0	0	8	10	10	10	9	9	8	8
3.		5%	0	0	8	8	8	9	9	9	7	7
4.		10%	0	0	9	9	9	10	10	10	9	9
5		20%	0	0	2	2	3	3	3	3	2	2
6.	Control	2	0	5	9	10	10	10	7	7	6	6
7.	Prawn Extract	1%	0	0	10	10	10	10	8	8	5	5
8.		5%	0	0	9	9	9	8	8	8	5	5
9.		10%	0	0	9	9	8	8	6	6	6	6
10.		20%	0	0	0	1	3	3	3	3	2	2

From Table-1, it is clear that the germination of seeds of Green mong starts on second day in control. There is no germination in 1% of plant extract and there is germination on animal extract. Germination of seed increases on day to 10<sup>th</sup> day. Maximum germination of nine seeds on 10<sup>th</sup> day in control as well as 1%, 5% and 10% respectively the 20% animal extract (prawn extract) treated seeds shows less germination even on 10<sup>th</sup> day. In 5%, 10%, 20% plant extract treated seed germination is more as compare to the control after fifth day. In 5%, 10% prawn extract treated seeds the germination of seeds is less. It is almost non-significance.

From Table-1 it is clear that the number of seeds germination third to nine days in control and 1% plant extract treated seeds that 1% plant extract shows more germination than control seed. It may conclude that 1% plant extract stimulates the germination in Green mong.

The overall conclusion from discussion is to draw as the germination of seed of Green mong is somewhat more or less in control than treated seed. It means either plant extract treatment or animal extract treatment is non stimulating and harmful to germination process, except the 1%, 5%, 10% plant extract. The effect of animal extract is harmful than the plant extract treatment.

**Table-2. Seed germination percentage of Green mong after treatment of**

Petri dish Number	Treatment		Number of seed germination/ day.									
			Day 1	Da y 2	Da y 3	Da y 4	Da y 5	Da y 6	Da y 7	Da y 8	Da y 9	Da y 10
1	Control	1	00	50	70	70	80	100	80	60	60	60
2.	Spinach Extract	1%	00	00	80	100	100	100	90	90	80	80
3.		5%	00	00	80	80	80	90	90	90	70	70
4.		10%	00	00	90	90	90	100	100	100	90	90
5		20%	00	00	20	20	30	30	30	30	20	20
6.	Control	2	00	50	90	100	100	100	70	70	60	60
7.	Prawn Extract	1%	00	00	100	100	100	100	80	80	50	50
8.		5%	00	00	90	90	90	80	80	80	50	50
9.		10%	00	00	90	90	80	80	60	60	60	60
10.		20%	00	00	00	10	30	30	30	30	20	20

Seed germination percentage of Green mong after treatment of aqueous extract of plant and animal source origin is seen in Table 2. It shows the seed germination percentage per day up to ten days of

experiment for control and treated conditions from the table. It is clear that seed germination percentage maximum on 10<sup>th</sup> day of treatment in control aqueous plant extract treated as well as animal extract treated seed in control. The seed germination percentage is 50 on 2<sup>nd</sup> day in control. However it is interested to note that it is zero percentage in both treatment .It 70% in control while 80% and 80% in 1% and 5% plant extract treatment seeds. It seems to stimulating effect of plant extract on germination percentage. The seed germination percentage is 90% and 20% each on 10<sup>th</sup> day in 10% and 20% respectively plant extract treatment. In aqueous extract of plant origin it is hardly 100, 90%, 90% and 0% in 1%, 5%, 10% and 20% treatment respectively. It is to conclude that seed germination percentage is somewhat more or less control than treatment amongst the treatment unclear study; the seed germination percentage is more effect in aqueous extract of animal origin than plant origin. In both the treatments the concentration increases somewhat or less the adverse effect on seed germination increases. The maximum adverse effect is seen at 20% concentration of aq extract of animal origin.

**Table- 3. Average radical length on 10<sup>th</sup> day of treatment in Green mong, after treatment of aqueous extract of plant and animal origin.**

Treatment	Concentration	Average radical length on 10 <sup>th</sup> day of treatment
Control	-	0.3
Aqueous extract of plant Origin (spinach extract control)	1%	0.2
	5%	0.2
	10%	0.1
	20%	00
Control	-	0.3
Aqueous extract of Prawn	1%	0.1
	5%	0.1
	10%	0.1
	20%	0.0

From Table 3, it is clear that control seeds of green mong shows average radical length which is maximum (0.3 cm) than 0.2, 0.1, 0.1, 0 cm of aqueous extract of plant origin treated seeds with 1%, 5%, 10% and 20% concentration respectively. It means the average radical length is more in plant extracts treated seeds. It is decreasing as the concentration of spinach extract goes on increasing similarly from the table. It is also seen that the average radical length 0.1 cm at 1% aqueous extract of animal origin (prawn) treated seeds. It is 0.1 cm for 5% and 10%, and it is 0cm for 20% treated seeds. Above observation are arrived at conclusion that the average radical length is affected due to the treatment with aqueous extract of spinach and prawn. The treatment of aqueous extract of animal origin is more destructive than aqueous extract of spinach.

**Table-4- Average plumule length on 10<sup>th</sup> day of treatment of aqueous extract of spinach and prawn.**

Treatment	Concentration	Average plumule length on 10 <sup>th</sup> day of treatment(cm)
Control	-	0.2
Aqueous extract of spinach	1%	0.1
	5%	0.0
	10%	0.0
	20%	0.0
Control	-	0.2
Aqueous extract of Prawn	1%	0.1
	5%	0.1
	10%	0.0
	20%	0.0

Table-4. Depicts the average plumule length on 10<sup>th</sup> day of treatment in control and treated seeds of Green mong. It is noted that 0.2 cm is maximum average plumule length seen in control seed . 0.1 cm, 0 cm, 0 cm, 0 cm is average growth of plumule in aqueous extract of spinach treated seeds at 1% , 5%, 10% and 20% concentration respectively. The aqueous extract of prawn treated seeds of Green mong are showing the average plumule length as 0.1cm, 0.1cm, 0cm and 0cm for 1%, 5%, 10% and 20%. Means no plumule growth at all for 10% and 20% concentration of aqueous extract of prawn. This discussion conclude that there is adverse effect of aqueous extract of animal (prawn) on plumule growth of Green mong seeds. Amongst the both treatment, aqueous extract of plant origin shows less harmful than prawn extract [17,18,19]

C. Beasse (2000) studied effect of epidemics of mycophaerella pinocles on crop growth radiation interception efficiency (PIE) and radiation use efficiency by dispersion on ground of pea. Which decrease the photosynthesis in leaves [20].

Dry seeds do not germinate. Water is an essential factor to trigger off the process of seed germination. Shortage of water at any stage of plant growth usually results in a reduction in vegetative growth but many annual crop plants are sensitive changes in soil moisture condition during the period from flower initiation to the development of full flower [21-23].

Heat cultivation and micronutrient coupling are two relatively unknown methods that are used to increase the yield and size of the seed. Recent research has indicated that a combination of heat treatment along with the two vital micronutrients, phosphorus and nitrogen, are the most critical components to increasing the overall yield of Cicer arietinum[21]. Unlike other food crops, the perennial seed shows a remarkable capacity to change its nutritional content in response to heat cultivation. Treating the seed with a constant heat source increases its protein content almost threefold [21]. Consequently, the impact of heat cultivation not only affects the protein content of the seed itself, but the ecosystem that it supports as well. Increasing the height and size of seed plants involves using micronutrient fertilization with varying doses of inorganic phosphorus and nitrogen [22].

Temperature affects cellular metabolic and growth rates. Seeds from different species and even seeds from the same plant germinate over a wide range of temperatures. Seeds often have a temperature range within which they will germinate, and they will not do so above or below this range. Baskin, Carol C and Jerry M (2014) shows that variation in Seed Dormancy and Germination within and between Individuals and Populations of a Species [23].

Light or darkness can be an environmental trigger for germination and is a type of physiological dormancy. Most seeds are not affected by light or darkness, but many seeds, including species found in forest settings, will not germinate until an opening in the canopy allows sufficient light for growth of the seedling.

When the seed imbibes water, hydrolytic enzymes are activated which break down these stored food resources into metabolically useful chemicals.[24]. Oxygen is required by the germinating seed for metabolism.[25]. Oxygen is used in aerobic respiration, the main source of the seedling's energy until it grows leaves [24]. Oxygen is an atmospheric gas that is found in soil pore spaces, if a seed is buried too deeply within the soil or the soil is waterlogged, the seed can be oxygen starved.

**CONCLUSION:** To study the seed germination of Green mong under the aqueous extract of plant and animal origin of 1%, 5%, 10% 20% Concentration are used. The germination of seeds per day percentage of germination, average radical length and average plumule length in cm are parameters under study. The germination is more in control than treated seeds. Either plant extract or animal extract treatment is non stimulating and harmful to germination process in general. The effect of animal extract is very harmful than the plant extract treatment. Seed germination percentage is more in control than treatment. The seed germination percentage is more affected in aqueous extract of animal origin than plant origin. In both the treatment as the concentration increases the maximum adverse effect is seen at 20% concentration of aqueous extract of animal origin average radical length is affected due to the treatment. The treatment of aqueous extract of prawn is more is destructive than the aqueous extract of spinach. There is adverse effect of aqueous extract of plant origin (spinach) and prawn on average plumule growth of Green mong seeds. Amongst the both treatment, aqueous extract of plant origin (spinach) shows less harmful.

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## INDIAN LIFE INSURANCE INDUSTRY OVERVIEW & IT'S HUMANITIES

**Dr. Kamlakar E. Kamble**, *Dept. of Commerce, (M.Com. M.A.(Eco.) B.Ed., NET, Ph.D.)*

*Dr. C. D. Deshmukh, Commerce & Arts College Roha –Raigad,*

*E-mail ID: -kamlakar19752@gmail.com*

**Introduction:** - India has adopted the policy of liberalization, privatization, & globalization (LPG) in 1990's and transferred the traditional market mechanism to the threshold of a free market philosophy. Naturally, the Insurance sector is also not an exception to this change. Insurance sector in India was liberalized in March 2000 with the passage of the Insurance Regulations & Development Authority (IRDA). This has lifted the entry restrictions for private players and allowing foreign players to enter the market with some limits on direct foreign ownership. The potentials for growth of insurance industry in India is immense as nearly 80% Indian population is without life insurance cover while health insurance and non-life insurance continues to be well below international standard.

### OBJECTIVES OF THE STUDY

The person Research study is carried out with the following objectives in view

1) To study the Indian Life Insurance Industry Overview & It's Social Responsibility 2) To study the spread Life Insurance widely and in particular to the rural areas and to the socially and economically backward classes.

### RESEARCH METHODOLOGY

Secondary data also collected from various websites are as follows.

The said Research study is based on the secondary data. For this propose the researcher studied the various reference books on commerce, Economics, management & Insurance. The researcher also studied the various reports published by the LIC as well as other financial institutions

**Reform of Insurance Sector:-** The first step towards insurance sector reforms was taken in 1993 with the formation of Malhotra Committee, under the Chairmanship of former Finance Secretary & RBI Governor Mr. R.N.Malhotra. The Committee was formed with an object to evaluate the Indian insurance industry & recommend its future direction in the free market economy. This committee has made the important recommendations on Structure, Competition, Regulation Investments, Customers Services, etc. Some of the very important recommendations have focused below:-

- 1) An Insurance regulatory body should be set up.
- 2) Controller of insurance should be made independent.
- 3) Govt. stake in the insurance companies to be brought down to 50%.
- 4) All the insurance companies should be given greater freedom to operate.
- 5) Private Companies with minimum paid up capital of Rs. 1 billion should be allowed to enter the industry.
- 6) Foreign company may be allowed to enter the industry in collaboration with the domestic companies.
- 7) No Company should deal in both life & General Insurance through single entity.
- 8) Mandatory Investments of LIC Life Fund in Govt. securities to be reduced from 75% to 50%.
- 9) Insurance Company must be encouraged to set up Unit Linked Pension Plans.
- 10) Computerization of operation & updating of technology to be carried out.

Opening up of Insurance Sector to Private & Foreign Players:-

LIC had a monopoly from 1956 to 2000; that is for 44 years. The Insurance industry has been thrown open to competition. A number of big companies of the world have entered the Indian insurance market in joint venture with one or other domestic business group as shown below:-

**Life Insurers in Private Sector**

1. SBI Life Insurance
2. Metlife India Life Insurance
3. ICICI Prudential Life Insurance
4. Bajaj Allianz Life
5. Max Life Insurance
6. Sahara Life Insurance
7. Tata AIG Life
8. HDFC Standard Life
9. Birla Sunlife
10. Kotak Life Insurance
11. Aviva Life Insurance
12. Reliance Life Insurance Company Limited - Formerly known as AMP Sanmar LIC
13. ING Vysya Life Insurance
14. Shriram Life Insurance
15. Bharti AXA Life Insurance Co Ltd
16. Future Generali Life Insurance Co Ltd
17. IDBI Federal Life Insurance
18. AEGON Religare Life Insurance
19. DLF Pramerica Life Insurance
20. CANARA HSBC Oriental Bank of Commerce LIFE INSURANCE
21. IndiaFirst Life Insurance Company
22. Star Union Dia-ichi Life Insurance Co. Ltd

**Present Scenario in Insurance Sector:-**

The Indian economy has been growing rapidly and the growth is continued during 2005-06. There has been sustained manufacturing activity and impressive performance of the service sector. The industrial sector increased by 7.6 percent and the service sector maintained a higher growth of 10.3 percent. The agricultural and allied activities registered a growth of 3.9 percent. Thus, the growth in real GDP was 8.4 percent during 2005-06 as against 7.5 percent in 2004-05. Within service sector, finance, insurance real estate has shown improved performance. The opening up of the insurance sector has contributed favorably to industrial growth. GDP from insurance sector is increased to 19.3 percent in 2004-05 from 12 percent in 2000-01.

The premiums underwritten in India & abroad by life insurers in 2005 - 06 increased by 27.78 percent which was higher than the growth in 2004-05 i.e. 24.31 percent. It has shown an increase in the non-life insurance also from 11.57 percent to 15.61 percent for corresponding period. First year premiums including single premiums recorded a growth of 47.94 percent because of significant performance in the unit-linked business.

**Social Responsibility of Life Insurance Corporation of India(LIC)**

The present study covers in depth approach towards behavior of stakeholders regarding Social Responsibility policies adopted and implemented by Life Insurance Corporation of India. It is a case study of Life Insurance Corporation of India's Social Responsibility approach. The current governance in Life Insurance Corporation of India is the result of privatization of the sector. Therefore, there is a need to have the complete analysis of the corporation from social point of view.

As a country we face several problems and complexities. Several villages lack primary education, health care, drinking water and transport facility. Corers of people live below poverty line. In such a scenario it is necessary for our corporate to act responsibility and contribute towards social upliftment and well-being.

**Conclusion:-**There is a need of greater efforts in extending the benefits of insurance to the rural areas in the coming years. The public sector insurer has to take a lead in this regard because of their market share and geographically spread up net work. The private companies also requires to intensify their efforts in extending the benefits of insurance in rural areas. IRDA has notified Micro Insurance regulation facilitating insurer to tap the potentials of rural markets. As per these regulations, Non-Government Organizations (NGO) Micro Finance Institutions (MFI) and Self Help Group (SGP) have been recognized as micro insurance agents. It would facilitate penetration of insurance to rural & remote areas. In nutshell, Insurance sector in India has tremendous potentials for expansion. It is found that, in India out of every 100 peoples only 22 to 23 have been insured, which means that at least 77 people are not insured. With a large population & untapped market, insurance happens to be a big opportunity in India. Though, the premiums volume is increasing, the insurance penetration in the country is low. Insurance penetration or premium volume as a share of country's GDP for the year 2005 stood at 2.53percent for life insurance and 0.62 percent for non-life insurance. Rising middle class households is a potential for insurance industry in India. The penetration ratios of health and other non-life insurance in India is also very low as compared to international standards. These facts indicate immense growth potentials of the insurance sector. In brief, the opening up of the insurance sector has led to rapid growth of the sector. The potentials for growth of insurance industry in India is very high because of large population & untapped market along with increasing per capita income and saving habits of the people.

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## AMINE EXCHANGE REACTIONS OF MANNICH BASES WITH AROMATIC AMINES IN IONIC LIQUIDS

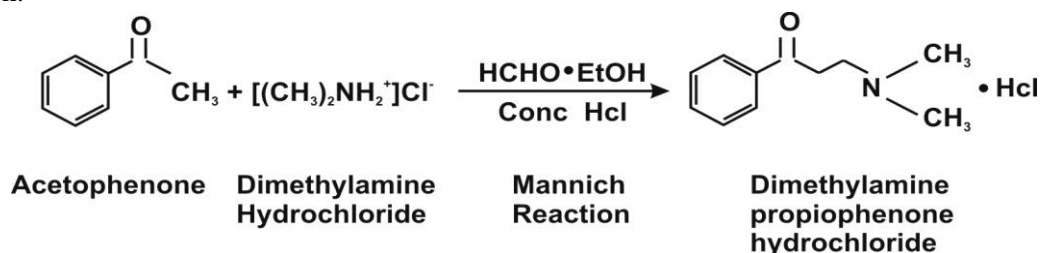
**Satish Patil**, Department of Chemistry, K.E.S.A.P.Science College, Nagothane – 402106 (MS), India.  
Email: [sdpatil72@gmail.com](mailto:sdpatil72@gmail.com)

### Abstract

Mannich reaction has found to have wide range of applications in synthetic and pharmaceutical fields. The efficiency of a chemical synthesis can be nowadays measured, not only by parameters like selectivity and overall yield, but also by its raw material, time, human resources and energy requirements, as well as the toxicity and hazard of the chemicals and the protocols involved. The use of Ionic liquids as a medium for organic reactions instead hazardous chemicals contribute to the development of environmentally friendly processes. In the present study, amine exchange reactions of Mannich bases with aromatic amines in room temperature ionic liquids were carried out to form aromatic amine Mannich bases with high yields.

**Keywords:** MannichBase, Ionic liquids, Amine Exchange

**INTRODUCTION:** The condensation of compound containing active hydrogen and ammonia or primary or secondary amines usually as their hydrochlorides (HCl being used as catalyst) to form amino methyl or substituted amino methyl derivatives is known as Mannich reaction. The base called Mannichbase, is usually isolated as its hydrochloride. Aryl amines do not normally respond to this reaction.



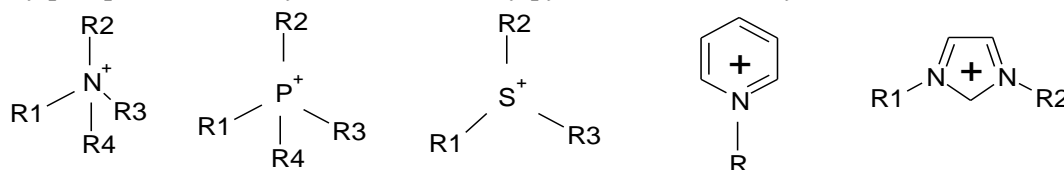
Many important natural products, especially alkaloids have been synthesized by this reaction. A classical example is Robinson's synthesis of tropinone by a double Mannich condensation and subsequent synthesis of atropine. Tuctacaine, a commercially useful anesthetic is prepared by this reaction. The amino acid, tryptophan is synthesized from the quaternary salt of gramine and acetamidomalonic ester.

Besides the common alkyl amines employed ever since the early work of Carl Mannich, more recent research in the synthesis of Mannich bases has proved that less common alkyl amines (mainly used with a view to creating pharmacologically active products), amino acids or phthalimide can be successfully used as amine components in direct amino methylation reactions. The amine exchange reaction between an alkyl amine Mannich bases and aryl amines also offers easy access to aryl amine Mannich bases in high yield under mild reaction conditions. This method, firstly introduced by Singh and later improved by Cymerman- Craig still is in spite of recent progress, a valuable preparative way for obtaining aryl amine Mannich bases.

Despite the impressive progress achieved in the amine exchange reactions there is still room for improvement, especially towards developing a novel green procedure with the rapid development in the field of synthetic chemistry, the researchers have started to pay more attention to detrimental effect on non-green processes to the environment. Carrying out organic reactions in green solvents has become highly desirable due to detrimental effect of toxic solvents to the environment.

The use of Ionic liquids as a medium for organic reactions would greatly contribute to the development of environmentally friendly processes.

Ionic liquids are basically liquids at room temperature; they composed entirely of ions and can be represented as  $[\text{Cation}]^+ [\text{Anion}]^-$ . Various cations can be tetraalkylammonium, tetraalkylphosphonium, trialkylsulfonium, N-alkylpyridinium, 1-3-dialkylimidazolium cations.



Various anions can be  $\text{NO}_3^-$ ,  $\text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{I}^-$ ,  $\text{AlCl}_4^-$ ,  $\text{BF}_4^-$ ,  $\text{PF}_6^-$ ,  $\text{CHCOO}^-$ ,  $\text{F}_3\text{CCOO}^-$ ,  $\text{CF}_3\text{SO}_3^-$  and  $(\text{CFSO})_2\text{N}^-$ . The ionic liquids are organic salts with melting points under  $100^\circ\text{C}$ , often even below room temperature. The common ionic liquids are imidazolium pyridinium derivatives.

They have very good dissolution properties for most organic and inorganic compounds, high thermal stability, non-flammable. Ionic liquids can be used as a solvent for synthetic and catalytic purposes, as biphasic system in combination with an organic solvent or water in extraction and separation technologies, as electrolytes in electrochemistry. Ionic liquids has advantages like optimization of compound characteristics through a broad choice of anion and cation combination, reaction rate enhancement, higher selectivity as well as higher yields and can be used as replacement for volatile organic compounds in chemical processes or extraction procedures.

Mannich reaction of 2-(1-cyclopentyl)-2-alkylcyclopentanone and amine exchange of aryl amines for the Mannich bases. In the discovery for new anti-inflammatory agents, a series of 2-(E)-(4-hydroxy-3-methoxybenzylidene)-5-(N-Substituted aminomethyl) cyclopentanones was synthesized via stock reaction, Mannich reaction and amine exchange reaction by Dong J. et al. A series of fifteen compounds were synthesized and all these compounds were characterized by spectral and elemental analysis. Mannich bases of o-hydroxyacetophenones gives amine exchange reaction with pyrazole and methyl or halogen substituted pyrazoles.

Roman G. et. al. (2003) derived Mannich bases from o-hydroxyacetophenones with N,N-dialkyldithiocarbamic acid salts result in the formation of the corresponding dithiocarbamic acid esters via an amine moiety replacement. They conducted this process in cold water; the synthesis was carried out in refluxing ethanol-water mixture led to the insertion of Carbon sulphide at the C-N bond of Mannich base.

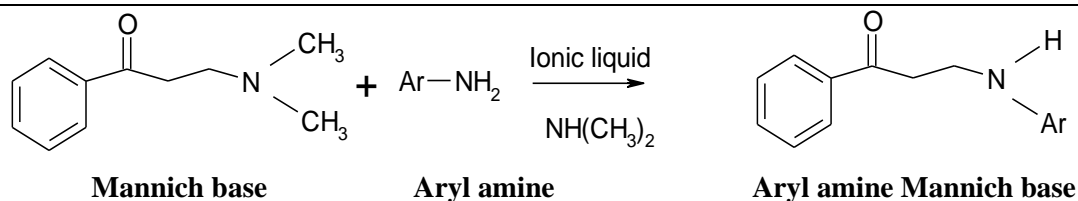
A series of seven Mannich bases were derived by Roman G. et. al. (2004) from cis trans 2-5-dimethyl piperazine and (Hetero) aryl methyl ketones were prepared both through direct aminomethylation and via amine exchange reaction. Roman G. et. al. (2002) derived Mannich bases from ortho-hydroxyacetophenone in amine exchange reactions with pyrazole and one or methyl substituted pyrazoles.

Dong J. et. al. (1998) synthesized nineteen kinds of 2-(E)-bezylidene-5-(N-substituted amino methyl) cyclopentanones via Mannich reaction or Amine exchange reaction and identified spectrometrically.

J. Cyperman Craig et. al. (1963) has performed variety of amine exchange reactions between Mannich bases and primary alkyl amines.

## MATERIAL AND METHODS

In the present work, we have carried Amine exchange reactions of Mannich bases with aromatic amines in room temperature ionic liquids. The Mannich base ( $\beta$ -dimethyl amino propiophenone) derived by reaction of Acetophenone with Dimethyl amine HCl and Paraformaldehyde was taken as key compound and treated with a series of aromatic amines in the presence of room temperature ionic liquid  $[\text{Bmim}]^+[\text{PF}_6]^-$ .



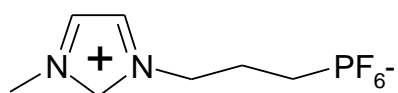
Experimental work involves following steps:

**Scheme 1:** Synthesis of Ionic liquid

**Scheme 2:** Synthesis of  $\beta$ -amino propiophenone

**Scheme 3:** The  $\beta$ -amino propiophenone treated with various aromatic amines such as Aniline, m-Aminotoluene, p-Aminotoluene, p-Chloroaniline, p-Anisidine, 2-Amino pyridine, 2-Amino thiozole, Naphthylamine, p-Aminoazobenzene, p-Aminobenzoic acid to form various aromatic amine Mannich bases.

**Scheme 1: Synthesis of Ionic liquid [1-butyl-3methyl imidazoliumhexafluorophosphate]**

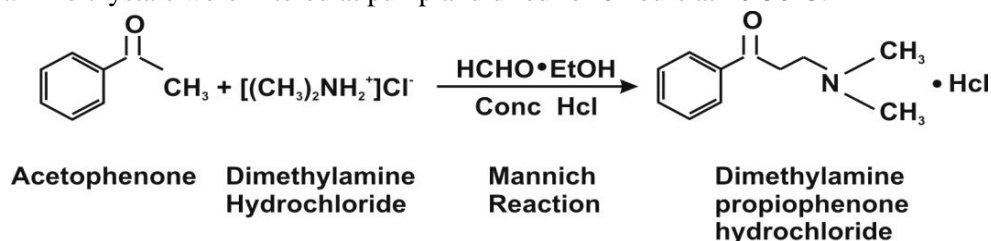


10 ml N-methyl imidazole, 22 ml butyl bromide and Toluene 12.5 ml were placed in 100 ml round bottom flask attached with reflux condenser with guard tube and mixture was refluxed on oil bath for 48 hours at 80°C.

After reflux the mixture was kept in refrigerator for two days for getting solid then the solvent (Toluene) was thrown away. Solid was washed with ether and tried to break in it. Then 100 ml Distilled water was added and the whole solution was transferred in 250 ml round bottom flask. Mixture was cooled in ice bath for 1 hour and 5ml HPF<sub>6</sub> + 5ml Distilled water was added 5 times in solution which was prepared in plastic measuring cylinder. Then whole solution was stirred for 2 hours. [Bmim]<sup>+</sup>PF<sub>6</sub><sup>-</sup> separated then 80 ml Dichloromethane added in the solution and stirred two layers of Dichloromethane and water were obtained, water layer was thrown away and Dichloromethane was washed with 100 ml distilled water till the water showed neutral Ph. Then Dichloromethane layer was passed through Cotton + silica gel + Na<sub>2</sub>SO<sub>4</sub> bed in funnel and Dichloromethane was evaporated under vacuum to get Ionic liquid.

**Scheme 2: Synthesis of 3-N,N Dimethyl Amino Propiophenone Salt**

5.3 gm (0.326 mol) Dimethylamine hydrochloride, 2 gm (0.33 mol) of paraformaldehyde and 6 gm (0.25 mol) of acetophenone were placed in 250 ml round bottom flask attached with reflux condenser. 8 ml of ethanol and 0.5 ml concentrated HCl were introduced in reaction mixture and mixture was refluxed on water bath for 3 hours. The reaction mixture was almost clear and homogeneous. While still warm 50 ml of acetone was added and cooled at room temperature and was left in refrigerator overnight. The crystals were filtered at pump and dried for 6 hours at 40-50°C.



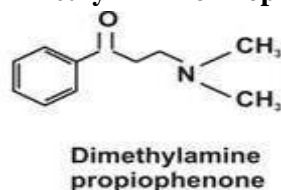
Theoretical yield = 10.5 gm

Practical yield = 7.2 gm

Practical % yield = 68.57%

Melting Point of Dimethylamine propiophenone Hydrochloride =156<sup>0</sup>C

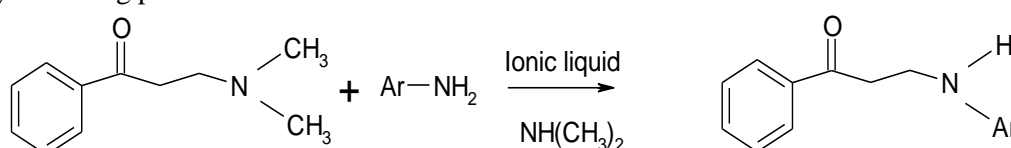
### Preparation of free base from 3-N,N Dimethyl Amino Propiophenone Salt



Whole quantity of Mannich salt was dissolved in minimum amount of water and the solution was kept in ice bath for 30 min, 50% NaOH was added in the solution till pH of the solution comes at 11 and then whole solution was extracted by using ether in separating funnel. Ether layer was collected and evaporated to get Mannich free base.

#### Scheme 3:

The  $\beta$ -amino propiophenone treated with various aromatic amines to form Aromatic amine Mannich bases by following procedure.

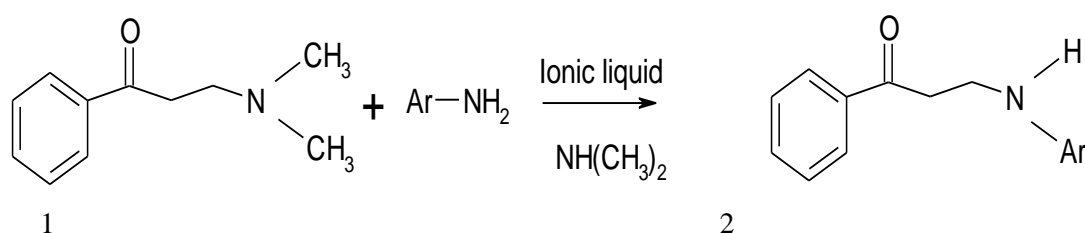


1 mili mole of Mannich free base (0.177gm), 1 mili mole of Ar amine and 2 ml of ionic liquid was taken in 5 ml round bottom flask and the mixture was stirred on magnetic stirrer. The reaction was monitored by using thin layer chromatography and reaction mixture was extracted by ether extraction to get product. The obtained compounds were then purified by column chromatography and analyzed by IR spectra.

The reaction of  $\beta$ -amino propiophenone (Mannich free base) with Aromatic amines leads to elimination of Dimethyl amine to give  $\beta$ -phenyl amino propiophenone in presence of ionic liquid. There is a exchange of dimethyl amine by aryl amine in presence of ionic liquid.

### RESULTS AND DISCUSSION

The replacement of the dimethylamine moiety in the Mannich free bases derived from acetophenone by arylamine Mannich bases is illustrated in the figure.



2a: Ar= Benzene

2b: Ar= 3-methyl phenyl

2c: Ar= 4-methyl phenyl

2d: Ar- 4-chlorophenyl 2e: Ar- 4-methoxy phenyl

2f: Ar- pyridine

2g: Ar- Thiozole

2h: Ar- Naphthalene

2i: Ar- Azobenzene

2j: Ar- benzoic acid

As a trial case 1 mili mole of Mannich base, 1 mili mole of Aniline and 2 ml of Ionic liquid were added in 5 ml round bottom flask and stirred at room temperature. The reaction proceeds smoother. Besides favoring the elimination of the easily leaving dimethylamino group, the mixture assures the

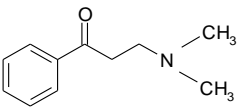
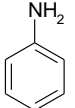
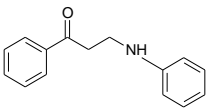
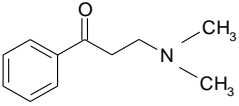
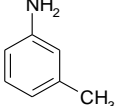
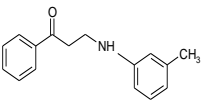
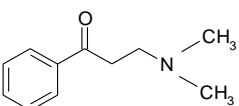
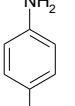
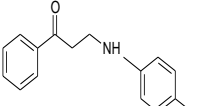
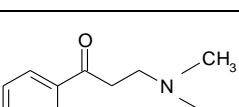
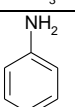
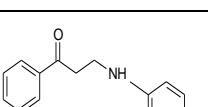
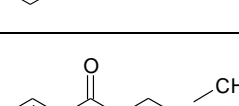
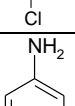
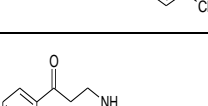
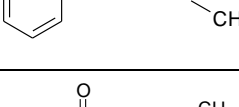
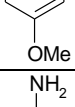
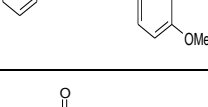
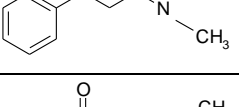
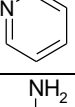
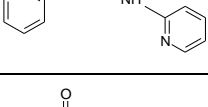
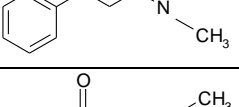
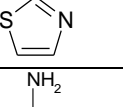
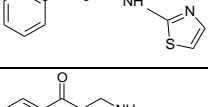
complete dissolution of both reactants and the comfortable separation of the resulting arylamineMannich bases.

Inspired by these results, the reactions were carried out using different arylamines. In all cases reaction precedes smoothly giving moderate good yields. The results obtained are summarized in the **Table no. 1.**

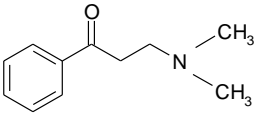
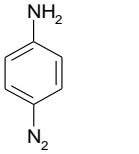
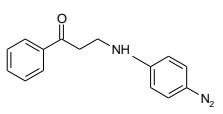
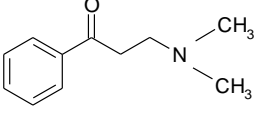
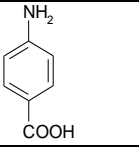
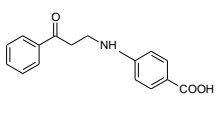
The amine exchange products separated from the reaction mixture by ether extraction. The arylamineMannich bases are purified by using coloumn chromatography, that are soluble in acetone, chloroform, diethyl ether and insoluble in water.

In the products IR spectra, the carbonyl group in the arylamine Mannich bases gave an intense sharp absorption band at about  $1650\text{ cm}^{-1}$ , the formation of a hydrogen bonding between this group and the adjacent phenolic one being responsible for the low absorption frequency. A single medium to intense sharp absorption band, attributed to N-H band vibration, was identified in the  $3350\text{-}3450\text{ cm}^{-1}$ .

**Table: 1**Data of the products obtained

Sr. No.	Reactant	Aryl amine	Product	Yield %	Melting Point °C	Melting Point (lit.)	IR range. $\text{cm}^{-1}$ (N-H stretch)
1				36	110	113-114	$3450\text{ cm}^{-1}$
2				63	105	-	$3441\text{ cm}^{-1}$
3				42	112	114-115	$3450\text{ cm}^{-1}$
4				50.94	130	134-135	$3450\text{ cm}^{-1}$
5				39.60	105	111-112	$3450\text{ cm}^{-1}$
6				50	85	88-89	$3436\text{ cm}^{-1}$
7				38.40	78	-	$3410\text{ cm}^{-1}$
8				46.20	147	150-151	$3400\text{ cm}^{-1}$



9				39	135	-	3400 cm <sup>-1</sup>
10				35.50	208	210-212	3400 cm <sup>-1</sup>

### CONCLUSION

The method for synthesis of B-aryl amino propiophenones using room temperature ionic liquids has found to have following advantages-

1. It is ecofriendly.
2. High yields of product.
3. No side reactions.
4. Ionic liquids can be used repeatedly.

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