

# SANSHODHANA - 2

2017



## **ROYAL COLLEGE OF ARTS, SCIENCE & COMMERCE**

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# SANSHODHANA - 2

*Edited By:*

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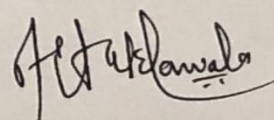
## Preface

God creates everything but leaves it to humans to uncover the deepest truth, to unfold the laws of nature and revolute discoveries and use them for the betterment of this planet. On these lines our academicians walk those tiny but significant steps to explore, innovate and substantiate new theories and also to create social awareness.

In keeping with our efforts to seek and harness intellectual labour and our commitment to provide opportunities for teachers to showcase their research work and experimentations, we are happy to bring out this second issue of **Sanshodhana** which encompasses a wide spectrum of pure, and social sciences from bio re-mediation to geo politics.

Original research papers and proceedings of National conferences/workshops conducted by our college are also being presented in this issue. Our Chemistry department proactively subjected its own procedures to check and review the quantum of pollution arising out of its toxic emissions. This self introspective research and those that address ecological issues need a special mention.

We envisage this collection to inspire academicians to expand views and explore areas for additional research in their quest for truth and knowledge in particular and human evolution at large.



Prof. A. E. Lakdawala  
The Founder & Hon. Director

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**National Conference  
on  
BIOREMEDIATION – Recent Trends and Future Prospects**

A national level UGC sponsored conference on Bioremediation, Recent trends and future prospects was organized by department of Microbiology on 9<sup>th</sup> August 2014. Bioremediation is defined as the process whereby organic and / or inorganic wastes are biologically degraded under controlled conditions to an innocuous state, or to levels below concentration limits established by regulatory authorities. The aim of organizing this conference was to create awareness about the ill effects of anthropogenic activities leading to degradation of environment and various measures taken to minimize them. It served as a platform to exchange ideas related to the recent trends and future prospects in Bioremediation. Researchers who have worked on this theme and their work has been acknowledged by peers and authorities were invited as resource persons with the objective to inspire the new generation of researchers. The conference also had paper and poster presentation by upcoming researchers. They got a platform for sharing their research work and a feedback from their peers and seniors to continue further. 42 Delegates (18 academicians and 24 students) attended the conference. **Dr. Sharad P. Kale**, Nuclear Agriculture, and Biotechnology division, B.A.R.C., Mumbai, addressed the audience on “Environmental Sustainability and Our Responsibility”. He created awareness about the ill effects of anthropogenic activities leading to degradation of environment and discussed simple measures to be taken to minimize them. **Dr. Sanjay P. Govindwar**, Dept. of Biochemistry, Shivaji University, Kolhapur, discussed various microorganisms that could be used to degrade dyes from textile effluents to make them safer for disposal. **Dr. Anjana K. Vala**, Dept. of Life Sciences, Bhavnagar University, Bhavnagar, Gujarat, gave an insight on marine –derived fungi as potential candidates for bioremediation. **Dr. Prashant K.**

**Dhakephalkar**, Microbial Sciences Division, Agharkar Research Institute, Pune, introduced the audience to the modern molecular biological techniques and metagenomics to search for microorganisms capable of biodegradation even if they are not cultivable.

Oral paper presentation was done by five delegates, while poster presentation was done by five delegates. They represented isolation of different types of organisms capable of degrading selected pollutants and/or methods of degradation.



**Keynote Address**

**Environmental Sustainability and Our Responsibility**

**Sharad P. Kale**

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World population has grown from about 100 crores in year 1800 to about 750 crores in year 2014. This increase has caused tremendous stress on natural resources of Mother Earth. Basic needs like air, water, shelter, clothes and food have gone up by 7.5 times in a small time span of 200 years but peripheral needs have grown astronomically. It appears that physical comforts offered by developments in Science and Technology have somewhere made human being insensitive towards the need of Mother Earth. Increasing dump yards in both rural and urban areas are turning healthy atmosphere into a poisonous one. Many luxury items have become need of common households. Time has come to take a stalk of situation and identify our priorities and responsibilities. This would help us in orienting ourselves towards Nature and Mother Earth.



**Invited Guest Lecture**

**Evaluation of Microbial Potential for the Treatment of Textile Industry Effluent to Reuse Waste Water**

**Dr. Sanjay P. Govindwar**

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Bioremediation involves the use of rhizospheric microorganisms for the removal of pollutants which is an emerging technology for the cleanup of contaminated sites and degradation of textile industrial effluent. Dyes, which are primary constituents of the waste from the textile industry effluents, constitute a group of recalcitrant compounds, many of which are known to have toxic and carcinogenic effects. The study of the mechanisms adopted by the microorganism in the removal of textile dyes and standardized parameters will help in broadening the horizons of bioremediation technologies.

Rapid industrialization and urbanization have resulted in large amount of wastes into the environment causing major pollution problem. Among many pollutants, textile industry effluents are the major source of environmental pollution. Synthetic dyes are widely used in the textile, leather, pharmaceutical, cosmetic, and food industries. However, at least 10-15% of the dyes used in textile processing are released into wastewater leading to alters pH, increases BOD, COD and reduction of sunlight penetration, which in turn decreases photosynthetic activity and deteriorates the water quality, lowering the gas solubility which causes acute toxic effects on aquatic flora and fauna. There is necessity to treat to this effluent prior to discharge into the environment.

Existing physicochemical methods viz., chemical oxidation, reverse osmosis, coagulation, flocculation, filtration, adsorption, photo degradation and membrane processes are effective for color removal but these methods are not suitable due to high cost, low efficiency and inapplicability to a wide variety of dyes. Also they use more energy and chemicals than biological processes and may cause secondary pollution problems in the form of sludge. Several emerging technologies such as electrochemical destruction, advanced oxidation and sorption have potential for decolorization but these approaches involve complicated procedures or are not feasible economically.

The effectiveness of microbial decolorization depends on the adaptability and the activity of selected microorganisms and structure of dye itself. However, the presence of azo, nitro, and sulfo groups make dyes more resistant to microbial degradation and their residues accumulate in biota. Several numerous attempts have been to develop biological process for treatment of textile dyes and effluent including enzyme from fungi and bacteria. Recently trend is shifting towards use of mixed microbial culture as compared to individual strains. Thus the treatment systems composed of mixed microbial populations possess higher degree of biodegradation and mineralization due to synergistic metabolic activities of microbial community and offers considerable advantages over the use of pure cultures in the degradation of dyes and textile dyestuff.

**Invited Guest Lecture**

**Marine-derived Fungi: Potential Candidates for Bioremediation**

**Anjana K. Vala**

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Increased industrialization and urbanization have led to increased level of pollutants. It is imperative to reduce concentration of toxic compounds in the effluent to meet ever increasing legislative standards. While in most of the cases physico-chemical treatments of wastes suffer from one or the other limitation, bioremediation is a promising alternative. Among microbes, unique traits of fungi viz. their greater growth capacity, reach by virtue of mycelial branching, ability to produce a number of enzymes and metal accumulation potential, etc make fungi well suited for bioremediation processes. Marine-derived fungi are even better candidates for such purposes due to their ability to grow under extreme conditions such as high salinity and pH which may aid in the treatment of industrial effluent. Role of marine-derived fungi in general, and those screened along Gujarat coast in particular, for removal of some pollutants are discussed. Based on the findings, marine-derived fungi are envisaged as potential bioremediation candidates.

**Acknowledgements:** Thanks are due to the Department of Science and Technology, Government of India, New Delhi for financial support under Women Scientists' Scheme. Prof. Bharti P. Dave, Head, Department of Life Sciences, Maharaja Krishnakumarsinhji Bhavnagar University is gratefully acknowledged for encouragement and support.

**Invited Guest Lecture**

**Genomics for Cleansing Environment: Employing Molecular Tools to Bioremediation**

**Prashant K. Dhakephalkar**

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Bioremediation is a cost effective and yet efficient method to restore contaminated environments. However, limited understanding of the factors affecting microbial growth and metabolism in contaminated sites often limits its application in field. This scenario, however, is rapidly changing with advent of new and sophisticated techniques. Researchers now have the ability to cultivate, isolate, identify and characterize the microorganisms that play an important/ critical role in microbial remediation of contaminated sites. This can be easily achieved with the help of combination of genome-based experimental and modeling techniques. Further, next generation sequencing techniques offer the possibility for similar studies on uncultivated microbes or microbial populations. Combining PCR based DNA fingerprinting data with Metagenomics and NGS data one can identify the useful microorganisms and predict their pathways, substrate profile, end products of metabolism, enzymes involved, their properties/ affinity and efficiency, etc. Such in depth understanding will surely transform bioremediation from a largely empirical practice into a science and eventually to techno-commercially feasible implementation in the field.

## **Oral Presentations**

### **Removal of Lead from Waste Water Effluent by Using Agricultural Waste (Fruit Peel) as Bioadsorbent**

**Neha D. Sawant, Dr. Lolly Jain**

K.J. Somaiya College of Science and Commerce, University of Mumbai

#### **Abstract**

One of the greatest problems that the world is facing today is that of environmental pollution, increasing with every passing year and causing grave and irreparable damage to earth. Water pollutants like lead compounds are toxic to health and have made marine life no longer hospitable. This research focuses on development of technology which not only removes heavy metal but also recovers and recycles it. This study attempts to use agricultural waste i.e. Orange and sweet lime peel as Bioadsorbent instead of activated charcoal which is widely used in industry. Owing to its high cost technical preparation and occupational hazard of activated charcoal, it is needed to be replaced with adsorbent having similar characteristics. In current study fruit peel showed 90.47 % while activated charcoal showed 57.14 % adsorption. In earlier study, the orange and sweet lime based Bio adsorbent was prepared by easy and environment friendly process. Along with characterization of Bio adsorbent it was evaluated for adsorption and desorption capacity. The SEM (backscattered) and EDX analysis showed that the bio adsorbent is capable of adsorption and has potential binding sites. The FTIR analysis showed carboxylic acid, alkane and amine group playing major role in adsorption. By using Atomic absorption spectrometer (AAS) the optimal conditions for bio adsorption were found at pH 12, particle size  $<75\mu$  while 0.1N HNO<sub>3</sub> as best eluent. The Hence orange and sweet lime based bio adsorbent is found to be more efficient than activated charcoal and should be analyzed further on large scale.

**Keywords:** Bio adsorption, Orange and Sweet lime peel, Lead removal, Desorption

## **Oral Presentations**

### **Isolation and Characterization of Cellulolytic Bacteria from Soil**

**Usha Singh, Sheron Gonzales, Sangeeta Shetty, and Praia Sundararajan**

Department of Life Science and Biochemistry, St. Xavier's College (Autonomous), Mumbai

#### **Abstract**

Bioconversion of plant biomass into biofuels, bulk chemicals and animal feed-stock is being studied as a means of alleviating food and energy shortages. The objective of this study was to screen for novel cellulolytic bacteria and improve the production of cellulases by optimizing the cultivation conditions. Towards this end, work was initiated to isolate bacteria with high cellulolytic activity, from sources such as soil. Two different soil samples were plated on CMC-agar plates and the cellulose-degrading bacteria were detected by the Congo red staining method. Out of total 154 isolates, 12 were found to be cellulase-positive from the two soil samples. The positive isolates could grow at a pH range of 5.0 to 11. The enzymes produced by these were assayed qualitatively from pH 5 to 11 using the supernatants and the pellets of the bacterial cultures, separately. The cellulases produced by these were extracellular and constitutive. Biochemical and morphological tests were also performed on the isolates. All the 12 cellulase-positive isolates were found to be Gram-positive bacilli. Sugar utilization and biochemical tests were performed in an attempt to characterize the isolates.

Three of the 12 isolates could have a potential application in industry for biofuel production, as they can grow at pH 11.0 at 50°C.

**Oral Presentations**

**Primary Screening of Xylanolytic Bacteria from Marine Mangroves**

**Zamanat S.H. Syed**

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Thane-401104

**Abstract:**

Xylanases are enzymes which degrade linear polysaccharide beta-1,4-xylan. The enzyme has applications in effluent treatment, ecofriendly bleaching of paper pulp, textile industry and food industry. Most of these applications demand stability of the enzyme under harsh environmental conditions. The present study was focused on isolation of xylanolytic bacteria capable of tolerating high salt concentration from marine mangroves as it has been suggested that the enzymes derived from such bacteria may also tolerate unfavourable environmental conditions. Enrichment and isolation of xylanolytic bacteria from marine mangroves *Avicennia*, *Acanthus*, *Sonneratia* and *Rhizophora* was done using Han's modified medium containing 0.4% xylan. Twenty nine isolates capable of using xylan as the carbon source in presence of 7% or 15% NaCl were obtained. Quantitative analysis of xylanase produced by these salt tolerant bacteria in liquid medium revealed that only seven of the twenty nine cultures produced exo-xylanase with detectable activity in the liquid medium. These cultures were preserved for further characterization.

**Keywords:** Xylanase, beta-1,4-xylan, marine mangroves, xylanolytic salt tolerant bacteria, exo-xylanase

## **Oral Presentations**

### **Spirulina Species as a Candidate for Bioremediation and Its Synthesis of Nanoparticles**

**Vaity Tejaswee and Padalia Unnati**

Dept. of Microbiology, K.J. Somaiya College Of Science and Commerce, Vidyavihar,  
Mumbai

#### **Abstract:**

Heavy metals are highly toxic to living cells and causes soil and water pollution. Their incremental accumulation in the food chain magnifies the problem. Hence it is imperative to eliminate these heavy metals from the environment. Techniques like ion-exchange and precipitation are expensive and not effective in removal of heavy metals from environment. Spirulina a filamentous, undifferentiated, non-toxigenic Cynobacteria (Blue-Green Microalgae) deserve significance for its bioremedial activity. Hence an attempt was made to use Spirulina spp. to biologically removal lead from industrial effluent. This biomass offers a high surface area to volume ratio which consequently renders a larger area for binding of metal ions. Optimisation of biomass production of Spirulina culture was carried out in the laboratory. Dry biomass of Spirulina spp was examined for its efficiency to remove lead from lead polluted textile effluent waste water. Lead contaminated sample was analysed for initial lead content by Atomic Absorption Spectroscopy. After biosorption with Spirulina spp., lead concentration was found to be reduced considerably. Addition of Spirulina spp biomass to aqueous AgNO<sub>3</sub> solution led to the appearance of brown colour in solutions, indicating the formation of silver nanoparticles. SEM image of Spirulina spp revealed the presence of stabilised silver nanoparticles.



### **Oral Presentations**

#### **Microbial degradation of Azo Dyes by organisms isolated from a polluted source**

Braggs C., Barnes N.M., Achary N., Bence A.M., Chikte A., Talekar A., Amonkar V.  
Dept of Microbiology, St. Xavier's College (Autonomous), Mumbai, Maharashtra

#### **Abstract:**

Stability, color fastness and resistance to degradation, makes azo dyes, one of the most commonly and widely used dyes in the textile industry. But the recalcitrant properties of azo dyes, that make them suitable for the textile industry, make their removal from effluents highly difficult. The run-offs from these industries thus pose a threat to the environment due to the well documented toxic effects of these dyes. The degradation of azo dyes by microbial processes provides a favourable solution to reducing the levels of these dyes in industrial effluents.

This study focused on isolating an azo dye degrader from a polluted soil source and studying the dye degradation by this organism. Organisms degrading a chosen azo dye were isolated and one isolate which showed the highest rate of degradation was selected for further study. Effects of various parameters such as pH, anaerobiosis, high salt concentrations and the presence of a heavy metal on dye degradation were analyzed.

Thus the study succeeded in isolating an efficient azo dye degrader and optimized conditions for the dye degradation process during in situ effluent treatment.

**Key words:** Azo dye, Effluent treatment, Dye degradation

### **Poster Presentations**

## **Isolation of a Biosurfactant Producing Organism from Various Niches**

**Nilima. P. Tidar, Deepika Shinde**

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### **Abstract**

Oil pollution has been one of the most important environmental problems. Being water insoluble, oil shows low and slow biodegradability. Surfactants increase the aqueous solubility and consequently degradation of hydrocarbon. However chemical surfactants are relatively toxic, less biodegradable, and show limited efficiency. On the whole, biosurfactants, are specific in action, biodegradable, less toxic and show widespread applicability. The present study deals to isolate a biosurfactant producer and assess its role in oil degradation.

17 isolates were obtained on enriching garage and railway track contaminated soil sample in Bushnell and Haas medium amended with 1% oil. Isolate GC12 was selected as it gave 30mm of oil displacement and 45.71% of emulsification index using diesel. 16SrRNA analysis showed GC12 has 97% homology with *Gamma Proteobacter*. Optimization studies for biosurfactant production, showed GC12 gave total yield of 0.26 gms/100ml using 1% fructose as carbon and ammonium nitrate as nitrogen source at pH 7.5 at RT and. Characterization of bio surfactant by infrared, protein and carbohydrate analysis showed that bio surfactant is of carbohydrate- protein-lipid complex. Bioremediation studies conducted showed reduction in COD levels, which indicates, the bio surfactant released by the isolate could emulsify hydrocarbons which could be degraded by organisms.

**Key words:** Bio surfactant, Bioremediation, Proteobacteria

**Poster Presentations**

**Production and Optimization of Keratinase for Degradation of Feathers**

**Solomon Nally and Padania Unnasty**

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**Abstract:**

Poultry industry faces a major challenge of disposing feathers which constitutes around 7% of the total weight of a chicken. Keratin, an insoluble protein, is the chief constituent of the feather. Keratinases are enzymes that can hydrolyze native and denatured keratin. Hence the study was undertaken to isolate and characterize organisms producing keratinase. Selection of a suitable microorganism plays a vital role in obtaining an increased yield. The investigation also included optimization of the conditions for production of keratinase with respect to time of incubation, effect of aeration, effect of nutrients, pH, and temperature. The study was extended to study effect of inhibitors, metal ions, surfactants, and solvents for optimization of keratinase activity. Raw feather samples were processed for enrichment of keratinase producers followed by its selective isolation and identification. Three bacterial species obtained were screened for its proteolytic and keratinolytic activity. Study was extended to evaluate the effect of Inhibitors, metal ions, surfactants and solvents for optimisation of keratinase activity. The findings revealed that the consortium of three bacterial isolates obtained exhibited enhanced feather degradation compared to the individual isolate and suggests its application in treatment of poultry effluents.

**Key words:** keratinase, feathers, poultry, enzyme optimisation,

## Poster Presentations

### **Microbial Biomass Accumulation: A Problem Related To Bioremediation**

**Neha Agrawal**

Amity Institute of Microbial Technology, Amity University Rajasthan, Jaipur.

#### **Abstract:**

Increase in pollutants has now become a global environmental issue. The cost, labour effective choice to halt this process is bioremediation through microbial functions. Polluted environments often contain many different types of toxic substances. Bioremediation uses living things to break down or remove or neutralize toxins and harmful substances from a contaminated site. Plants, mushrooms, and microorganisms can be combined in many different ways to regenerate healthy, thriving life in our environment. The microbial detoxification and degradation will continue to remain an effective biotechnological approach to clean up the sites contaminated with a variety of chemical pollutants. **These microorganisms are used to breakdown the pollutants into simple compounds which may be toxic or non-toxic. These products can then be used by plants and animals to carry out their daily functions.** The microorganisms grow in enormous amount in polluted environment. **However, not all microorganisms are able to breakdown contaminants, many are able to breakdown them at least partially. Many pollutants are absorbed by the microbes. This leads to the production of huge amount of biomass by microorganisms growing at the site of contamination.** Generated biomass may be toxic to the environment because of absorption of pollutants. Biomass if dump in soil then it may be the cause of pollution due to leaching out of many harmful metals and toxic materials back to the ground. Biomass burning emits many products of incomplete combustion like small particles, CO, NO<sub>2</sub>, Formaldehyde, Acrolein, Benzene, Toluene, Styrene, 1,3-Butadiene, Polyaromatic hydrocarbons. Sometime produced biomass cannot be utilized again. Thus there is a growing need to overcome this problem of biomass production. The possible solution of this problem is use of an autolytic enzyme which lyse the microbial cells after bioremediation.

## **Poster Presentations**

### **An Environment-Friendly Alternative for Extraction of Coconut Fibres**

**Soniya Shetty, R.H. Balasubramanya**

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#### **Abstract:**

Coconut fibres are one of the strongest natural fibres and an eco-friendly option to synthetic fibres for many applications. They are lignocellulosic fibres containing upto 45% lignin, which is responsible for their stiffness and brown colour. Traditionally, fibres are extracted from husks by immersing them in lakes, ponds, rivers or seawater for nine to eleven months. The retted fibres thus extracted are whiter, softer and of superior quality as compared to fibres extracted in a defibering machine. However, in this process, natural phenolic substances are released leading to extensive water pollution thus affecting the aquatic life.

An anaerobic closed tank retting process for softening of mechanically extracted fibres has been developed in the present work. Enriched microbial consortium was used for delignification and biosoftening of these fibres. The fibres were subjected to anaerobic retting for different periods of time from two to ten weeks and quality of the fibres was assessed. The fibres were analyzed using standard methods for physicochemical characteristics such as cellulose, pectin and lignin contents, breaking load, extensibility and tenacity. Scanning electron microscopy revealed an improvement in the surface topography of the fibres. Lignin content was analysed by FTIR. An improvement in the softness and brightness of the fibres was achieved without considerable decrease in the tenacity. Thus, a tank retting process is an environmentally friendly and faster alternative to the traditional method.

**Keywords:** Lignocellosic fibres, retting, water pollution, anaerobic treatment, biosoftening

## **Poster Presentations**

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### **Isolation, Identification and Characterization of p, p'-DDT Degrading Bacteria from Soil**

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#### **ABSTRACT**

DDT (dichlorodiphenyltrichloroethane), one of the organochlorine pesticides was widely used in agriculture and healthcare. Though its usage is banned in most of the countries, DDT residues cause varying negative effects through bioaccumulation and bioamagnification. Biodegradation is an potential method to detoxify the recalcitrant compounds and this study is an investigation to isolate and characterize the p, p'-DDT degrading bacteria from DDT contaminated soil. An p, p'-DDT [1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane] degrading bacterium was isolated and identified by 16S rRNA studies. The role of temperature, pH and DDT concentration in the degrading ability of the isolate has also been investigated. Based on the analysis of the phenotype, biochemical characteristics and 16S rRNA, the strain was identified to belong to the bacterial genera *Bacillus* and was named as *Bacillus* strain GSS. The isolate had an optimum pH of 7.0 at 35°C and was able to degrade DDT at a wide range of concentrations with complete degradation of the DDT (10 mg L<sup>-1</sup>) and 89.3% of 15 mg L<sup>-1</sup> in 120 h, whereas 100% degradation of 5 mg L<sup>-1</sup> concentration was observed within 48 h. Significant degradation was observed at 72 h and 96 h for 15 and 20 mg L<sup>-1</sup>, respectively. At the end of 120 h, 73% of 20 mg L<sup>-1</sup> and 34% of 25 mg L<sup>-1</sup> was recorded by the isolate *Bacillus* strain GSS.

**Key words:** *Bacillus*, DDT, biodegradation, 16S rRNA

**Study Of Seasonal Variations in Pollen dispersal and Pollen Allergy**

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**Department of Botany,**

**Royal College of Arts, Science and Commerce,**

**Mira Road**

**ABSTRACT:**

Air-borne allergens cause the most problems for people with allergies. Pollen allergy is one of the most common chronic disease in worldwide. The goals of this research project are to provide a better understanding of the cause of allergy, to improve methods for diagnosing and treating allergy reactions and eventually to prevent allergies.

Author observed and studied seasonal nature of pollen allergy, people's seasonal symptoms. And successfully correlated with plants' pollination period which is more or less the same every year.

As dispersal rate depends on relative length of night and day, a pollen count is a measure of how much pollen is in the air (i.e. concentration) and it differs during the difference of the day span. Information can be useful for patients as well as doctors. Author studied pollen dispersal in different months of the year.

**METHODOLOGY:** Three sites were selected for the present investigation namely dumping ground in Chincholi Bunder Road –Malad –West (Site I) and Gorai (Site II), dumping ground near Deonar Slaughter house (Site III). Trapping of air-borne fungal spores, pollen grains was carried out within 1.1/2 km from these sites. Two methods were employed for trapping of pollen grain

(A) Gravity slide method and

(B) The culture Petri-plate method (Ref 3 Indian Aerobiological Society 1980)

(A) The Gravity Slide Method- Glycerin jelly coated slides were placed at a height of about 2 meters. After exposure, the slides were placed horizontally inside the boxes and brought to laboratory. A coverslip (18 X 18 mm) was put on each slide with one drop of fresh molten jelly. Edges of coverslip were sealed with DPX. These exposed slides were regularly observed under high power. A constant quadrat area of 3.24 cm<sup>2</sup> was thoroughly combed for air spore trapping. The number of pollen grains, fungal spores and other bio-particles were counted and recorded. For the proper identification of pollen grains caught at sites reference slides were prepared by taking actual pollen grain from the plants which were flowering in

various seasons (Ref 8 Tilak ST 1989). Also pollen identification was done with the help of standard reference books. This identification was mainly based on size, shape and type of pollen the type and distribution of apertures and ornamentation of exine. Finally comparative studies were made with the reference slides and published illustrations.

(B) Culture Petri Plate method- Petri dishes of 10 cm diameter containing about 12-15 ml Rose Bengal Streptomycin Agar (RBS) were exposed to atmosphere at all sites for minutes at 2 meters above ground level. Exposures were done on throughout the year at each site.

### **TOTAL AVERAGE ANNUAL SPORE COUNT AND PERCENTAGE CONTRIBUTION**

Sites	I		II		III	
	Total Count	Percentage %	Total Count	Percentage %	Total Count	Percentage %
Pollen	2,678	9.31	116	8.85	1,972	6.35
Fungal Spores	21,191	73.67	71,735	74.15	23,348	75.15
Other Spores	4,895	17.02	4,090	17.10	5,747	18.50
Intal Air-flora Captured in slides	28,765	100	23,919	100	31,069	100



**AVERAGE METEOROLOGICAL DATA OF MUMBAI FOR THE PERIOD**

Season	Month	Mean Temperature c	Relative Humidity	Total Rainfall Mm	Maximum Wind Velocity
Monsoon	June	28.8	79	338.4	61
	July	27.8	86.4	1219.6	66
	August	26.9	85.02	642	59
	September	27.7	82.0	210.02	38
	October	30.9	69.0	72	33
Winter	November	27.7	70		90
	December	25.8	62		31
	January	28.3	61.6		35
	February	30.0	62.4		39
Spring	March	30.1	65.8		33
Summer	April	32.5	72.6		49
	May	30.8	75	02.1	43

**OBSERVATION:**

Pollen Types: Pollen types had a percentage contribution of only 8.16% to total air spores in this investigation

Weed Pollen- Weed pollen outnumbered the other pollen types with an annual percentage at 53.32% to total air borne pollen grains. It comprised mainly of Parthenium, Amaranthus, Ricinus, Portulaca and Lantana. Other important weed pollen types represented were Cyperus, Datura, Typha, Tridax and Urena.

1) **Parthenium**- These are sphaeroidal-ambisphaeroidal pollen about 19µm in diameter with angular aperture (Ref 5 Nair PKK) 36.20% among weed pollen occupying the top position. These pollens were recorded throughout this year around dumping sites; with 1.38%, 1.4% and 1.815 at three sites respectively. These weeds are used as packaging material for vegetables may be one of the reasons of its abundant appearance in the atmosphere. Tilak et al (1981) recorded its presence in the indoor environment of the hospital ward at Aurangabad.

2) **Amaranth**- These pollen grains are Sphaeroidal oblong, 20-32 µm pantaporate exine considerably thicker than pantaporate endine (Ref 5 Nair PKK). These pollen grains were trapped during months of January-April and September –December. They contributed 0.42%, 2.9%, 0.3% at sites I II and III respectively to the total air spora and an average of 23.7% of

total weed pollen at all sites.  
Amaranth-Chenopod ranked after Parthenium

3)**Ricinus**-Ricinus pollen trapped were 21% of the weed pollen and formed about 0.6% of total air spora at three sites. The allergenicity of this pollen has been reported by many researchers. Prasad and had (1984) observed intradermal reactions when tested on 24% asthmatic patients at Aligarh. Singh & Singh (1985), Saoji and Kimmatkar (1985) also recorded positive allergenic reactions to this pollen (**Ref 7 Singh, B.P and Gangal 2001**).

4)**Cyperus**-Cyperus pollen trapped were 2.8% of the weed pollen These pollens were observed mostly during months of January – May and August –December in the atmosphere at all sites in present studies. Their percentage to total air spores was 0.17% ,0.22% and 0.4% at the sited I , II,III respectively. The allergenicity of this pollen was also recorded by Singh and Singh from Manipur. Datta Adholiya (1998) reported Cyperus pollen from the atmosphere of Gwalior (**Ref 7 Singh, B.P and Gangal 2001**).

5)**Typha** –Pollen grains are spheroidal , 21-32  $\mu\text{m}$  in diameter, monoporate with 4  $\mu\text{m}$  diameter pore , exine 1.5  $\mu\text{m}$  thick with reticulate surface .Typha pollen contributed 5.37% of total weed pollen and their occurrence was seen throughout the year except during the heavy monsoon period. Typha pollen at sites I, II & III recorded 0.28%, 0.31% and 0.3% respectively .This pollen has been reported from Delhi Atmosphere by sing and babu (1982) .Mahadik et al (1998) carried out tests on allergenic patients. They showed positive reactions and concluded that Typha could be an important pollen allergen responsible for nasobronchial allergies in Mumbai (**Ref 7 Singh, B.P and Gangal 2001**)

**Other Weeds**-Pollen grains of number of other weeds like Abutilon, Malachra, Urena, Dahiria, Portulaca, Sida, Tridax, Scoparia, Phyllanthus niruri , Cleome etc. were also trapped during this investigation. Their occurrence was according to their flowering season. These pollen contributed 10.93% of total weed pollen and recorded 0.38%, 0.32% and 0.39% respectively at site I, II and III to the total air spores.  
1) Acacia 2) Cassia 3) Azadirachta 4) Peltophorum 5) Polyalthia 6) Peltophorum 7) Pongamia 8) Carica 9) Cocos 10) Moringa 11) Pithecollobium 12) Thespesia 13) Lantana 14) Scrophulariaceae Etc tree pollens were recorded. Among these very common are moringa cocos and cassia variety and its occurrence is seeing throughout year in atmosphere.

As per the sites of study were concerned no cultivated cereal pollen were reported. The highest peak of the grass pollen concentration in the month of Septmember and lowest in the month of February was reported. Grass pollen has been widely known as an important allergenic pollen type.

**CONCLUSION**-Asthma is a major cause of illness and hospitalizations among the children and others. Each season tiny pollen grains are release from the trees and weeds and grasses. These grains ride on current of air although pollen should react to fertilize plant, Instead it

enters human nose, throat and trigger a type of seasonal allergy Many of thing like food, medicine, dust animals that cause allergies can be avoided to a great extent There is no easy way to avoid airborne pollen-allergy. Many types mentioned above can be considered to be the cause of respiratory allergic diseases & reactions like asthma ,allergic rhinitis cough ,itching ,watering of eyes ,body rash are seeing in patients.The data does obtain from this study could be of great help to allergologists treating patients for above proble

#### **REFERENCES:**

- 1)Cunningham, D.D. 1873. Microscopic examination of air.Govt.Printer,Calcutta.
- 2)Edmonds,R.L. & Bennighoof,W.S. 1973.Aerobiology and its Modern application.Report No.3.  
**IBP Aeriobiology Programme**
- 3)Indian Aerobiological Society,1980 .Experimental Methods in Aerobiology.
- 4)Jean Emberlin,1998. Aerobiology and recent environmentalChanges.Proc.6<sup>th</sup>International Congress on Aerobiology 14-17.
- 5)Nair, P.K.K, 1970. Pollen Morphology of Angiosperms, Vikas Publishers, Lucknow.
- 6)Singh,A.B.,1985. Importance of Aerobiology to allergy Treatment centers,Atmospheric Biopollution
- 7)Singh,B.P and Gangal S.V,2001 Defined allergen extracts; Need for efficient diagnosis of  
**Allergy and immunotherapy.Indi J.Allergy Asthma Immunol.**
- 8)Tilak,S.T.,1989 Air-Borne pollen and fungal spores **Vaijayanti Prakashan,Aurangabad.**



## **Medical Tourism in India---A SWOT Analysis**

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### **Abstract**

Medical tourism, alternatively called health tourism and wellness tourism, is a term that has risen from the rapid growth of an industry where people from all around the world are travelling to other countries to obtain medical, dental, and surgical care while at the same time touring, vacationing, and fully experiencing the attractions of the countries that they are visiting. It is a silent revolution that has been sweeping the healthcare landscape of India for almost a decade. With countries like India, Mexico, Singapore, Brazil, Argentina, Greece, Costa Rica, Dominican Republic, Peru, Hungary, Israel, Jordan, Lithuania, Malaysia, South Africa, Thailand and the Philippines actively promoting it, its future is sure to be bright. The domestic medical industry in India is trying all out to grab its pie from the evolving global health bazaar.

Key Words

### **Introduction**

Medical tourism is an idea with which a greatly lucrative potential is attached. Medical tourists are generally residents of the industrialized nations of the world and primarily come from The United States, Canada, Great Britain, Western Europe, Australia, and The Middle East. But more and more, people from many other countries of the world are seeking out places where they can both enjoy a vacation and obtain medical treatment at a reasonable price. It is forecasted that medical tourism will fetch India \$2.3 billion by 2012. If not many things go wrong, it will become a major driver of the Indian economy along with information technology, biotechnology, and technology enabled consumer services. With the

international media constantly telecasting scenes of white people getting knees replaced, hips resurfaced, and dental works done here by the West-trained doctors at throw-away prices, that too in the ambience of a five star resort, the demand from the nationals of Western Europe and the US for medical treatment in India is on an ever-increase. Now, companies that help arrange such travel are eyeing a far bigger market: U.S. and western European employers who want to save money on their health care costs.

Rising healthcare costs along with increasing numbers of uninsured consumers are making insurers, employers and consumers in developed economies to consider medical services in foreign countries, which have much lower costs, yet can provide comparable quality of care.

The state of health care of the destination countries can affect its medical tourism industry in two ways. First, medical tourists assess a potential destination based on its track record in providing a healthy environment to visitors . Hence, highly publicized accidents, injuries and health-related issues in a country can adversely affect the perception of medical tourists, which in turn negatively impact the tourism demand in the destination country. Second, a number of governments in developing countries have sought to develop medical tourism to boost their tourism revenues (Lee, 2009).

### **Medical tourism in India**

Medical tourism is a growing trend in Asia. India has been a front runner in this industry that is rapidly expanding the same sector in order to capitalize on its growing opportunities. Several factors come into play when one thinks about the growth of medical tourism. From the perspective of the destination country, government support is by far one of the strongest factors, but one cannot ignore other factors such as infrastructure, competence of medical professionals, the business acumen, and the entrepreneurial drive of the middlemen who facilitate the process, and the political stability of the destination countries. This paper looks at the medical tourism industry in India through a SWOT analysis. The purpose of the paper is to analyze the existing and emerging trends in the country and to shed light on some of the issues faced by them.

## A SWOT ANALYSIS

### SWOT Analysis of Medical Tourism

<b>Strength</b>	<b>Weaknesses</b>
<ul style="list-style-type: none"> <li>• Low cost</li> <li>• Short wait time</li> <li>• Accredited and U.S.-affiliated facilities</li> <li>• Medical technology</li> <li>• Specialized treatments and oriental medicine</li> <li>• English language</li> </ul>	<ul style="list-style-type: none"> <li>• Low accountability</li> <li>• Poor infrastructure</li> <li>• Internal price disparity</li> </ul>
<b>Opportunities</b>	<b>Threats</b>
<ul style="list-style-type: none"> <li>• High growth potential</li> <li>• Government support</li> <li>• Strategic partnerships</li> <li>• Opportunities for health professionals</li> <li>• Preventative treatments</li> <li>• Multinational companies</li> <li>• Stable foreign exchange</li> </ul>	<ul style="list-style-type: none"> <li>• Medical and travel risks</li> <li>• Internal resource constraint</li> <li>• Increased competition</li> <li>• Dependence on developed countries</li> <li>• Economic downturn</li> <li>• Regional markets</li> </ul>

### Explanation

#### Strengths

##### 1. Affordable medical cost

As far as India is concerned, there are several inherent factors that lead to its success in the medical tourism industry. Among the six popular treatments demanded by medical tourists, India is mostly lower priced than the United States, and this is one of the main reasons why it is considered as one of the prime destinations for medical tourism. The costs of popular medical procedures sought by medical tourists such as gastric bypass and joint replacements in India it is 3 to 4 times lower than the cost of the same procedures in developed countries such as the United States , whereas for more expensive procedure such as CABG, the cost differential between the U.S. and India range from 2-4 times lower.

##### 2. Short waiting periods

Typical waiting periods for medical procedures performed in advanced economies can range from four to six months in the United States, and twelve to fourteen months in the United Kingdom. Medical tourists from developed economies can avoid long waiting times by participating in medical tourism.

### 3. Medical affiliations

Some hospitals in destination countries may be affiliated with well-reputed Western hospitals with internationally recognized names. The rapid development of affiliations with foreign hospitals and foreign medical education programs contribute to the quality of medical professionals available in Asian hospitals. Harvard Medical International has collaboration hospitals in more than thirty countries, and the Cleveland Clinic operates hospitals in Austria and Canada (Cohen, 2010). All these should strengthen the destination countries in offering their medical tourism services, especially to consumers from western countries who desire a quality of care comparable to that of their home countries. Specialized treatments and Oriental medicine in India is among the world's leading centers in biotechnology especially in stem cell research (Demicco and Cetron 2006).

### 4. English language competency

India was under the British rule for many years, and this has contributed to the English language competency of its people. The competency in the English language is an important advantage when it comes to the marketability of their medical professionals and their supporting staff as well the communication skills of medical tourism facilitators who are responsible for arranging and planning the trips for English-speaking consumers. South Korea is globally recognized as one of the four "industrialized countries" (NICS) or "Asian Tigers". As medical tourism becomes rapidly globalized, it will pay to promote business in popular languages other than English.

### **Weaknesses**

The strengths that were discussed in the previous section automatically become weaknesses for countries that are poor or incompetent in the respective areas. However, we also look at some independent systemic weaknesses inherent to the Asian medical tourism industry.



### 1.Lack of accountability

In western countries much emphasis is placed on the value of human life and its protection. There are penalties and methods for recourse for the wrongful death and/or injury to a patient receiving medical treatment. The legal system is relatively clear and transparent. That allows for the rule of law and demands accountability. A major drawback in several Asian countries, is that there is little accountability for medical procedures performed in these countries and especially when things go wrong during treatment. There are few sound legal systems protecting patient rights and the few that exist are poorly implemented. In general, good mechanisms to manage complaints from patients virtually do not exist. For instance, India is not known to have well established malpractice laws

### 2. Poor infrastructure

Infrastructure is another problem. For instance, in some areas in India, foreign patients may have to change flights three or four times to reach the destination of their choice. The public transport system and the roadways are often not up to western standards. The infrastructure problems are not limited to transportation. It is difficult to gauge the quality of some hospitals based on pictures available in the Internet. Not all medical procedures are done at the premier hospitals.

### 3.Internal price disparity

This can be a source of strength or weakness depending on which country one belongs to. Such unique supply-demand distinctions exist and they are difficult to capture in the overall medical tourism model for each nation.

## **Opportunities**

### 1. High growth potential

The gross domestic products (GDPs) for India was \$4.46 trillion in 2011, and its respective GDP growth was 7.8% from 2010 to 2011 (Central Intelligence Agency, 2012). In 2009, the healthcare spending constituted 4.2% of country's GDP for India (WHO, 2012). In India, the

government contribution to public health expenditure was only 30%, the remaining 70% were private expenditures (WHO, 2012). The Asian medical tourism industry has been growing with a double digit compound annual growth rate (CAGR) and it is expected to reach \$8.5 billion by 2013 (Renub Research, 2009). It was estimated that 150,000 medical tourists arrived in India in 2004 with an expected growth of 30% each year (CII and Mckinsey & Company, 2002).

## 2. Government support

Some countries view inbound medical tourism from the West as a solid opportunity for economic development, as such. Increasingly, governments are positioning themselves to play key roles in developing the medical tourism industry. In India, the rapid deregulation of the industry and the passing of favorable tax laws to encourage entrepreneurship have boosted the medical tourism industry. The Indian government has provided the medical tourism industry with tax concessions, lower import duties, and an increased rate of depreciation (from 25% to 40%) for life-saving medical equipment, and prime land is provided at subsidized rates (Sengupta, 2008).

## 3. Strategic partnerships

There are potential partnerships that can be initiated and formed by various key players of the medical tourism industry. For instance, medical tourists are usually accompanied by family members or loved ones who would need accommodation while visiting the destination countries. Many of the destination hospitals can form strategic partnerships with international hotel chains and airlines to accommodate the needs of medical tourists' companions and families. It is said that trips for follow-up care to India are relatively inexpensive since Air India subsidize them with frequent flyer miles (Demicco and Cetron, 2006). Opportunities for foreign health Professionals The opportunity is not limited to just the nations from which medical tourists are originated. The healthcare professionals from destination nations can certainly benefit from a higher pay and better working environments in hospitals that cater to medical tourists. Due to the specialized nature of health care, demand tends to exceed supply. High population density countries such as India tend to supply abundant doctors and nurses globally and many of them may welcome the opportunity to work in their native countries for

higher pay. This is made possible by the higher profit margins earned from medical tourism.

#### 4. Preventive health focus

Preventive health checkups and alternative treatments such as specialized herbal medicines, medicinal massages are areas that can be developed under medical tourism. Not everyone travels specifically to a country for the main purpose of treatment, so another opportunity is to target “diasporas” (or emigrants of their former native countries) who often visit their native countries for vacation. Another target group would be the “expatriates” who work for western MNCs stationed in destination countries. Procedures such as dental checkups and cleanings, general physical checkups, eye examinations, are something they can avail themselves during their visits. This represents a largely unexplored area of the medical tourism industry that both countries can tap into.

#### 5. Growth of multinational companies

The inflow of multinationals and private funds into the destination countries will boost the medical tourism industry. In fact, many Western-based multinational companies can afford to have their human resource departments compare the costs of health care across nations and perform a cost-benefit analysis of allowing their employees to receive treatments in countries in which their companies are based.

#### 6. Stable foreign exchange rates

The macroeconomic environment, such as the development of GDP growth and the steady foreign exchange rate in these Asian countries will benefit the growth of medical tourism. As India develops at a rapid pace in light of globalization, and as long as they maintain favorable currency exchange rates and relatively lower costs of health care, the opportunities will abound. Regional markets There is also a growing prosperity within Asian countries. Thus, economically less advantaged nations in Asia can target advanced economies within Asia to develop their medical tourism markets.

### **Threats**

#### 1. Medical and travel risks

Risks include the accessibility of follow-up care and travel risk. Follow-up care, usually postoperative treatment, is critical to the continued health of a treated patient. The risk may be abated somewhat if patients are given more options for post-op care from their home countries. Travel risk includes risk of infection and exposure to other diseases. International flights may expose some patients to new germs and bacteria which may increase the possibility of infection to certain diseases. Other examples are localized epidemics such as the SARS outbreak in Asia and swine flu in Mexico. Not only are these potential health risks, they are risks to the business. An outbreak could potentially bring tourism in that region to a halt.

### 2. Internal resource constraint

It appears that the private burden of healthcare costs and its related-resource constraints are two primary issues faced by the Indian health care system (Vijaya, 2010). This shortage of health professional in India was exacerbated by the fact that the majority of the Indian doctors worked in the private sector, but only about 10.4% were hired in the public health sector (Central Bureau of Health Intelligence, 2010, p.161 While medical tourism may reverse the external brain drain of health professionals, it may worsen the internal brain drain by luring health professional from rural public hospitals to urban medical centers, eventually limiting the local access to health professionals and facilities.

### 3. Increased competition

As competition increases and saturation occurs, the lack of investment and product or service differentiation by the government and the entrepreneurs may become potential problems. Due to similarities in the final product, success often is only achieved by those nations who offer some sort of a macro-level differentiation such as promoting better infrastructure and vacation locations, supportive government policies, and a greater number of well reputed hospitals and physicians. These advantages need to be properly marketed; the absence of such marketing would cause some countries to lose out in the wake of extreme competition. Even though India is considered by some to be a front runner in the medical tourism industry in Asia, it is faced with tough competition from other Asian countries such as Thailand, Singapore, Malaysia, and to some extent South Korea.

#### 4. Dependency on developed nations

Another potential threat is the dependency on the western countries. The medical tourism industry stems from the high cost of health care in the western countries. The U.S. health care system has a relatively high cost structure associated with it. Furthermore, the U.S. health insurance policies are complicated and elective procedures are not covered under many public and private medical programs.

#### 5. Effect of the global economy

Medical tourism is also affected by the general economic downturn. Often, medical tourism for elective and cosmetic procedures, which represents a sizable chunk of the industry, is still considered a discretionary spending item for most people. The current unfavorable global economic climate that began in 2007 will pose a sizeable short term threat to the medical tourism industry. 21

### **CONCLUSION**

Medical tourism is not without its challenges, considering that the industry is relatively new. Hospitals in developing countries which target foreign patients should seek to meet or exceed Western standards and expectations if they are to compete. The SWOT analysis makes certain points clear. It shows that while there are several advantages, most of the industry hinges on the cost saving for the insurance companies and the employer groups. Furthermore, the main issues revolve around a lack of accountability and poorer quality and infrastructure. We find that several opportunities exist in the areas of developing new markets -- particularly the offering of non-emergency, preventive and alternative care to expatriates who take a vacation in their home countries. The human resource departments of the multinational companies located in Asian countries can certainly negotiate and work with their insurance companies to develop cost saving policies by including certain cost-effective foreign treatments in their plans. These opportunities however need to be juxtaposed with the threats that the industry faces. As the SWOT analysis has revealed, INDIA has not reached its full potential in medical tourism.

## REFERENCES

Renub Research Report (2009). Asia medical tourism analysis 2008 – 2013. Available at <http://www.reportlinker.com/p0149565-summary/Asia-Medical-Tourism-Analysis-.html> . Retrieved June 1, 2012.

Centers for Medicare & Medicaid Services. (2012). National health expenditures 2010 highlights. Available at [www.cms.gov/NationalHealthExpendData/downloads/highlights.pdf](http://www.cms.gov/NationalHealthExpendData/downloads/highlights.pdf). Retrieved May 18, 2012.

Central Bureau of Health Intelligence (CBHI) (2010). National health profile of India 2010. Section 5: Human resources in health sector. Pp. 155-166. <http://cbhidghs.nic.in/writereaddata/mainlinkFile/Human%20Resources%20in%20Health%20Sector%202010.pdf>. Retrieved May 29, 2012. 23 Central Intelligence Agency (2012).

The World Factbook. Available at <https://www.cia.gov/library/publications/the-world-factbook/geos/>, Retrieved May 18, 2012. Chandra, R. (2002).

Trade in health services. Bulletin of the World Health Organization: the International Journal of Public Health. 80(2), 158-163.

Chinai R. & Goswami, R. (2007). Medical visas mark growth of Indian medical tourism.

Bulletin of the World Health Organization. 85(3), 164-165.

CII and Mckinsey & Company (2002). Healthcare in India: The road ahead. New Delhi: CII and Mckinsey & Company. Cohen, I. G. (2010).

Human Resource Planning. 30(2), 8-10. Mattoo, A., & Rathindran, R. (July, 2005).

Does health insurance impede trade in health care services? World Bank Policy Research Working Paper 3667. Mudur, G. (2000).

Indian doctors not accountable, says consumer report. British Medical Journal. 321, 588. OECD (2011).

Health at a Glance 2011: The globalization of healthcare: Can medical tourism reduce healthcare costs? June 26. Vequist, G. David, & Valdez, Erika (2008).

Medical tourism economic report: South Korea, Medical Tourism Association Magazine. Issue 6, August, 38-39. Vijaya, R. M. (2010).

## **NATIONAL LEVEL WORKSHOP**

**On**

### **STRUCTURE SOLVING BY POWDER X RAY DIFFRACTION**

A Two-day National Level Workshop was organized on 'Structure Solving by Powder X-ray Diffraction (SSBPXD-15), by Department of Physics, Royal College of Arts, Commerce & Science on 27<sup>th</sup> & 28<sup>th</sup> of November, 2015. The main focus of this workshop was on imparting training to the participant about analyzing the x-ray diffraction data. On first day theoretical background on x-ray diffraction and crystallography was developed and on second day comprehensive practical session was taken to train the participants for the application of various software for structure determination. There were 24 participants for the workshop largely research scholars from various institutes from Mumbai & outside Mumbai and faculty members from colleges around Mumbai.

#### **Objective of Workshop**

1. Introducing the principle technique of material characterization of crystalline using powder X-ray diffraction
2. Structure solution of unknown phases at ambient conditions using Le-Bail and Rietveld refinement methods
3. Training Academician and research scholars by means of practical exercises of X-ray powder diffraction data analysis on computer using GSAS software.

#### **1. Important Sessions**

##### **Inaugural session**

The inauguration function started with a prayer which is one of the traditions of our college. Following this, a gracious welcome speech was delivered by Prof. Maleka Bootwala (Vice-Principal & HOD) of physics department. She briefly introduced the theme of workshop and mission, vision & activities of Royal College of Arts, Science & Commerce.



She also encouraged the audience to make the best use of sessions to be delivered by the eminent speakers invited from premier research institutes, BARC & RRCAT. The workshop was inaugurated by our Founder and Director Prof. A. E. Lakadawala and other members of Royal College by lighting a lamp.

**Day -1 (27<sup>th</sup> November, 2015)**

**(Session -1, 10 : 30 AM – 11 : 45 AM)**

Dr. Nandini Garg, Scientific Officer (G) at Bhabha Atomic Research Centre (BARC, Mumbai) delivered a lecture on "Basic crystallography and fundamentals of x-ray powder diffraction". The resource person emphasized more on basic aspects of crystallography and theoretical aspects of x-ray diffraction.

**(Session -2, 11 : 45 AM – 1 : 00 PM)**

Dr. Shreyashkar Dev Singh, Scientific Officer (F) at Raja Ramanna Centre For Advanced Technology (RRCAT), Indore delivered an interesting lecture on "High resolution X-ray diffraction from epitaxial thin films". The speaker spoke on basics of high resolution X-ray diffraction & basics of Epitaxy.

**(Session -3, 2 : 00 PM – 3 : 30 PM)**

Dr. K. K. Pandey, Scientific Officer (F) at Bhabha Atomic Research Centre (BARC, Mumbai) delivered an interesting lecture on "Powder diffraction and its analysis". The speaker mainly talked about powder diffraction technique and discussed briefly about the Rietveld refinement method,

**(Session -4, 3 : 30 PM – 4 : 30 AM)**

In this session Dr. Shreyashkar Dev Singh, spoke about few interesting examples to demonstrate the applications of high resolution x-ray diffraction technique from epitaxial layer. The later part of his lecture was an interactive session. As the many of the participants were research scholars they could find solution to problems faced in their research.

**Day 2 (28<sup>th</sup> November, 2015)**

**(Lab Session 10 : 00 AM – 4 : 00 PM)**

Second day of the workshop was lab session scheduled from 10.00 am to 4:00 pm on lab sessions. This session began with data conversion methods. A two-dimensional x-ray diffraction data taken on detectors like Image plate converted to one-dimensional using FIT2D software. Then the indexing of diffraction peaks was carried out using CRYSFIRE software. Then with the help of CHECKCELL software best space group was identified. Now with this starting model Le-Bail refinement and Rietveld refinement was demonstrated using GSAS software.

The workshop was closed with a vote of thanks by Prof. Maleka Bootwala.

## **2. Workshop Outcomes**

1. This workshop helped participants to learn basic theoretical concept underlying X-ray diffraction and crystallography.
2. The participant learnt theoretical background behind powder diffraction data analysis.
3. In the practical sessions they have learnt how to carryout data conversion from 2D image to 1D pattern.
4. Participants have gain hands on experience on indexing of X-ray diffraction data using various software and then simulate the obtained structure using POWDERCELL software
5. Using GSAS software the participants learnt to carryout Le-Bail and Rietveld refinement



## **National Conference on**

### **“Vision 2050: Balancing Developmental Needs with Ecological Issues”**

A one day National Conference on “Vision 2050: Balancing Developmental Needs with Ecological issues” was organized by the faculties of Arts and Commerce, Royal College of Arts, Science and Commerce, Mira Road, Thane, Maharashtra, on 20<sup>th</sup> December, 2016. The objectives of this conference were to explore and discuss new and emerging challenges that development on the path of sustainability would entail in various realms of human life. The conference envisaged the coming together of experts from myriad realms leading to the convergence of ideas, thoughts, questions and debates on balancing developmental needs with ecological issues.

Dr. SC Bhanu, the **keynote speaker**, spoke emphatically on the issue of ‘Climate Change and Societal Issues’. The whole issue of climate change and its consequences we are/ will be encountering are an outcome of our own handiwork rather than natural dynamics. The same, he said, was underlined in the International Panel for Climate Change, 2013.

He said that, the recent years have recorded the highest level of Carbon Dioxide emissions, i.e., 400 parts per million, contributed to by sectors such as transportation, communication, power stations, industries and agriculture. He dwelt also on the harmful impact of green house gases, global warming and rising level of ocean water on our lives, bio diversity and ecosystem.

Indiscriminate consumption of energy sources is only compounding the problem. Continuing urbanization is increasing the pressure on infrastructure which in turn will increase the pressure on natural resources. All these may cascade into risks of flooding, drought, heightened migration and threat to human settlement.

Hence, it is imperative that man, who is the driver and victim of climate change, acts as an agent for redressing the ill effects of climate change by redirecting the developmental trajectories. He reiterated that there is an urgent need to spur behavioral change which could be accelerated by a mix of instruments such incentives, regulations, and public benefits in a coherent and coordinated way.

Dr. K. Rangnathan, chaired the **first technical session** on Financial Planning Towards sustainability formerly with TMC Business School Singapore and Syndicate Bank, Bangalore. He emphasized on the anthropological influences which plays a crucial role in climate change and deliberated on the significance of Vision 2050.

He stated that the world population now is estimated as 7.5 billion or 750 crores. Today people need an income either from employment or business to buy potable water, food 3 times a day, decent house to reside, clothing and modern necessities like mobile phones, internet etc. A constant strife between poverty and greed is spoiling the welfare of the people.

He described that policy makers are constantly faced with the challenge to provide employment to millions of people joining the workforce every day and to create opportunities and facilities for new business start-ups.

He said that communism has failed to address these problems because by nature man is selfish and his generosity surfaces only when his needs are met first. Alternatively uncontrolled capitalism is also dangerous, therefore regulatory measures are adopted. However enforcing regulations become difficult with the Greed of human beings, which gives rise to corruption. This increases the cost of goods and services ultimately.

Population on the rise amidst limited supply results in inflation. This makes living difficult even for a person with a steady income. When the young population has no such income, social evils like crimes become more prevalent. The remedy lies in providing education, skills and training to the growing population.

Inherently, the term '*crisis*' is composed of two characters. One represents *danger* and the other represents *opportunity*.

*He justified that Green Revolution pioneered by Norman Borlaug, an effort to solve food crisis saved billions of people from starvation. However the Genetically Modified food crops faced lot of opposition. This led to the emergence of a new discipline bio-technology. The increased production of food grains, wheat, rice and soya bean crops etc have significantly increased the carbon levels in the atmosphere in the last 50 years. The countries uniting to mitigate the ill effects are promising in the midst of crisis. In 1987, member nations of UN, signed the Montreal protocol, to address the problems of depletion of the Ozone layer in the atmosphere. Now 30 years after, the ozone hole has shrunk and is showing signs of healing.*

*Agriculture depends upon water and people need water for drinking, pointing to the problem of water paucity to be dealt with.*

*He emphasized that water scarcity can be addressed through technology. The rivers linkage plan, mooted by Bharat Ratna Sir. Visvesvarayya an eminent engineer, when implemented may solve both unemployment problem as well as the water problem of Indian states.*

*He also specified that the renewable energy studies are also receiving considerable impetus. Electric cars have already become a reality. These cars reduce carbon emissions on the roads and reduce reliance on fossil fuels. Solar Energy has already lighted several villages and is getting attention more and more now.*

With regard to housing the millions, in countries like India, where a large working population is in unorganized sector, government initiatives, corporate social responsibility (CSR) projects and active help of NGOs can help in housing the poor. But the real issue is corruption, which needs elimination for such initiatives to become successful.

He concluded that the policy of universal happiness is required for a person to live in peace and happiness. Islands of happiness cannot exist for long with oceans of poverty. When this realization percolates, societies will become happier. One can resolve to be a *part of the solution* the world is facing; *it's up to each individual to be the change.*

The **second technical session** on Education, Poverty Alleviation and NGOs [Non-Governmental Organizations] was presided by Dr. Narayan. B. Iyer, [CEO & Coordinator of Indian Development Foundation - IDF, Mumbai]. He affirmed that vision 2050 - sustainable development, inherently demands co-operative effort from mankind. A single entity alone cannot shoulder the responsibility of sustainable development. The onus is on everyone to contribute effectively toward sustainability. He further stated that mitigation of multiple deprivation – food, nutrition, health, education and non-food - would facilitate the emancipation of every individual. This will refine the quality of life of the disadvantaged, thereby promote sustainability.

He believed that NGOs have a pivotal role to play in the achievement of sustainable development. He substantiated his point by sharing IDFs vision, programmes and accomplishments. IDF was conceived 45 years ago, with a vision of providing basic health, education, and empowerment to every citizen. In health, it works for the elimination of

leprosy, tuberculosis, HIV-AIDS, and Cancer. India had 4 million leprosy cases in 1981. Through focused effort this prevalence rate has drastically declined to less than 100 thousand cases, (2005). Through 192 Bal-Gurukuls (after-school programs), basic education is provided to the neglected in the urban as well as rural regions. With the objective of facilitating development, they carry out awareness programmes on water conservation and waste prevention. They have adopted infrastructure projects such as sanitation, water, electricity, and mobility for primary and slum schools.

He asserted, the key to nation building lies in developing leaders. He stated that India is one of the youngest nations. As per the Indian demographics profile, 2016, the median age of Indians was recorded as 27.

He emphasized that India, a young nation with an aspiration to acquire sustainable development amidst manifold poverty, has the potential to attain sustainability through collective effort. This necessitates concerted effort and collaboration among its citizens to overcome various challenges to attain the goal.

In the light of vision 2050, Dr. Jayaraman (Nuclear Scientist, formerly with BARC) in his **valedictory session**, explicated the various impediments in achieving sustainable development. He stated “The preoccupation of the human mind for the cares of his family and his obsession for the here and now leaves no scope for the concerns of this world and its tomorrow.”

Quoting from the ‘Technology Vision 2035’ document (3<sup>rd</sup> Jan, 2016, the Indian Science Congress), he posited that by 2035 life expectancy is expected to reach 80 years, MMR will be 15/100,000 and the total health expenditure is predicted to be 5.7% GDP. Furthermore, he postulated that the constant conflict between individual versus collective prerogatives challenge the accomplishment of sustainable development. He identified seven grand challenges to sustainable development namely: (poverty, development, sustainable development, resource nationalism, terrorism, nuclear power, and conflict free stability).

He expounded the intrinsic challenge in defining poverty as no one definition of poverty has been universally accepted, however, ‘Welfare level below a reasonable minimum’ is the common idea found in all the definitions of poverty. Highlighting the

ambiguity around the description of 'poverty line'; he stated, as of Oct 2015, the globally accepted description of poverty line is the ability to live on \$ 1.90 a day (150/- per day). As per this parameter India is an abode to over one-third of poor people in the world. He clarified that living below poverty line is not the only predictor of poverty. Poverty of food, education, nutrition, non-food poverty and multiple deprivation are all dimensions of poverty. All these dimensions together choke development of an individual and the country. He reasoned that there are no scientific solutions to poverty.

He asserted that quality of life expectancy, opportunity to education and expression of knowledge and competence and standard of living are the three dimensions of human development index. He was of the view that any growth in the absence of development is perceived abnormal. Such a growth has a ceiling beyond which it acts as a catalyst of destruction. Amid finite resources and infinite desires; every year 150 acres of rainforest are cut down, 1/3 of the Earth's land is converted to farm fields. And, yet 1 billion suffer from chronic hunger, farmers are unable to cultivate crops culminating in unequal distribution of basic amenities. This irrational pattern of production and consumption of resources is a glaring reality of unsustainability in every endeavor toward progress.

He seized our focus on resource nationalism, nuclear power and terrorism – inescapable obstacles in the fulfillment of sustainable development. Middle East's monopoly over oil and China's monopoly over rare earth is just a hint of the potential threat 'resource nationalism' holds in hampering sustainability. The turmoil because of middle East wars is an unpleasant indication of the pervasive impact 'resource nationalism' has on sustainable development. Additionally, terrorism and nuclear power jeopardizes the scope of sustainable development. He contended that today, in the race for nuclear power, India is galloping to compete against super nations. He also stressed, India is a victim of ethno-nationalist, religious, left wing, and nacro-terrorism. He resolved that in such a scenario the avenue for conflict free stability seems grim.

A magnificent vision amidst such gigantic challenges demand callous human race to radically alter their attitude and approach towards production and consumption. He reinforced the thought that business cannot be carried out as usual to achieve vision 2050. He



emphasized that meeting existing needs without compromising the utility of future generations in doing so is an imperative step towards sustainable development.

The conference accomplished this purpose of compelling the minds to ponder on the vast opportunities and challenges in achieving sustainable development.

**Examining the Relationship Environmental Attitudes and Ecological Behavior: A Preliminary Investigation**

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**ABSTRACT**

Theory of Reasoned Action (TRA; also known as “Theory of Planned Behavior”; TPB) highlights the intervening role of behavioral intentions in attitude-behavior association. In the field of environmental psychology, Kaiser and colleagues (1999a) formulated a model along similar lines. The current study, inspired by these prior research studies, aims to examine the relationship between three dimensions of environmental attitudes (environmental knowledge, environmental values, and ecological behavior intention) and ecological behaviors. Data were collected from 32 college students, who completed the following questionnaires: Environmental Attitudes Scales (Kaiser et al., 1999a; see also Kaiser et al., 1999b) and Ecological Behavior Scale (Kaiser, 1998; Kaiser et al., 1999b). Pearson Product Moment Correlation was used to examine the relationship between these variables. The emerging findings have been elucidated using relevant scholarly literature.

**KEY WORDS:**

Environmental attitudes, ecological behaviors, college students, theory of reasoned action.

## **INTRODUCTION (OVERVIEW)**

A detailed report published in 2009 by American Psychological Association Task Force on the Interface between Psychology and Global Climate Change recognized global climate change (also popularly known as “global warming”) as undoubtedly one of the pressing concerns of the new millennium, which is likely to foster unfavorable consequences such as heightened stress and mental health concerns, heat-related violence, intergroup conflict, and widening socioeconomic disparities. Their report highlighted that environmental psychology can play an important role in addressing global climate change and promoting sustainable development (see also Gifford, 2007). The current study delves into the relationship between pro-environmental attitudes and ecological behaviors.

## **RESEARCH METHODOLOGY**

### **Sample Description**

Data were collected from 32 undergraduate students between the ages of 18 and 25 years (Mean= 20 years). The sample comprised of 9 males (28.1%) and 22 females (68.8%), and 1 respondent did not indicate his/her gender. With respect to religious affiliation, 20 respondents were Hindus (62.5%), 4 were Muslims (12.5%), 3 each were Christians and Jains (9.4%), and 1 was Parsi (3.1%); the religious identity of one participant was unknown. With respect to annual family income, 5 (15.6%) fell in the category of “INR 2, 00,000 or below”, 7 each fell in the category of “INR 2, 00,001-5, 00,000” and “INR 8, 00,001-12, 00,000”, 4 in the category of “INR 5, 00,001-8, 00,000” and 6 in the category of “Above INR 12, 00, 000”; 3 respondents not divulge their annual family income.

### **Measures**

*Demographic Sheet* asked respondents about details pertaining to age, gender, religion, and annual family income.

*Environmental Attitudes.* Kaiser and colleagues’ (1999a; see also Kaiser et al., 1999b) scale was used to measure environmental attitudes, which were broadly categorized into three dimensions, namely, EK, EV, and EBI. Kaiser et al. (1999a, 1999b) found the scale to

demonstrate adequate internal consistency values of .84, .73, and .85 for EK, EV, and EBI scales, respectively. Subjects are asked to indicate their level of agreement on each of the items on a 5-point Likert rating scale. Higher scores on each dimension are indicative of higher levels of that particular dimension. In the current study, the Cronbach's alpha for EK, EV, and EBI scale was found to be .827, .579, and .754, respectively.

*Ecological Behavior.* Kaiser's (1998; see also Kaiser et al., 1999b) 38-item *General Ecological Behavior* scale was adapted and used to assess ecological behavior. The measure includes 8 items on prosocial behavior and 30 items on ecological behavior. Subjects are expected to respond to each of these items by either indicating a 'Yes' or a 'No'. The scale was found to demonstrate reliability and internal consistency coefficients of .71 and .76, respectively. In the current study, the Cronbach's alpha for ecological behavior scale was found to .461.

### **Procedure**

The data was collected online. Prior to data collection, respondents were presented with a page that included information about relevant ethical issues, and their consent was sought subsequently. They were then presented with the questionnaire items and were asked to respond to each of them. After the data collection was over, they were thanked for their participation.

### **Statistical Analysis**

Descriptive statistics, such as mean and standard deviation for calculated for each of the variables investigated in the current study. The relationships between each of these variables were examined using Pearson Product Moment Correlation.

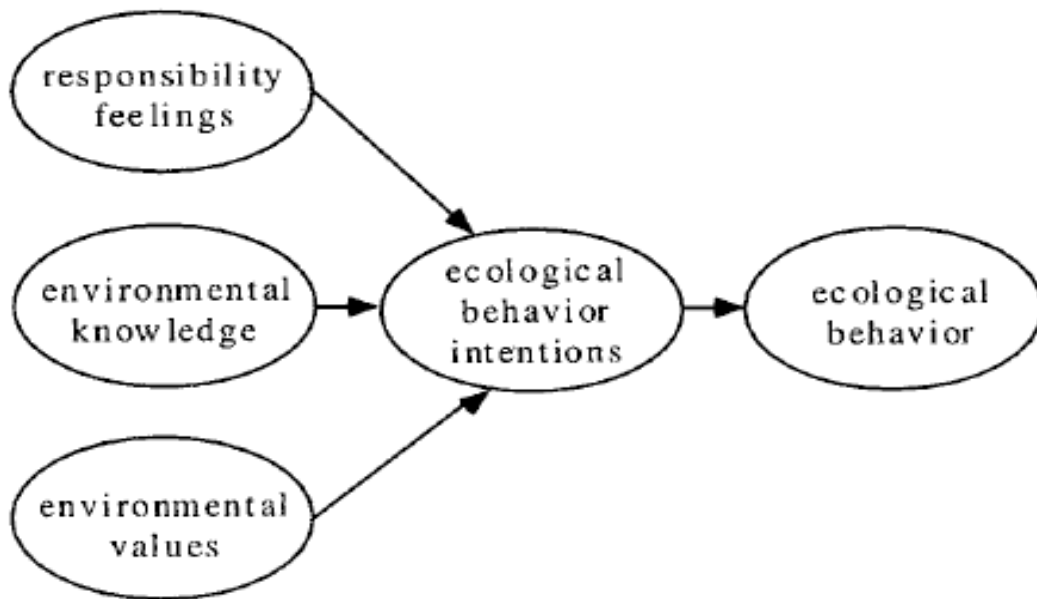
### **LITERATURE REVIEW**

The attitude-behavior link was elucidated in the theory of reasoned action (TRA; an extended version of the theory is known as theory of planned behavior, TPB) developed by Azjen and Fishbein (1980; Azjen, 1991). The theory proposes that behavioral intentions act as an important mediator, which influences the attitude-behavior relationship. In addition to attitudinal component, subjective norms and perceived behavioral control have also been

found to influence intentions to engage in certain behaviors. In the area of environmental psychology, research has delved into the relationship between environmental attitudes/ecological behavioral intentions and ecological behavior (e.g., Hamid & Cheng, 1995; Hines et al., 1986/1987; Kaiser, Ranney, Hartig & Bowler, 1999a; Kaiser, Wolfing & Fuhrer, 1999b). In line with the proposed model (see Figure 1), Kaiser et al.'s (1999a) research found evidence for the TRA/ TPB model, such that responsibility feelings (RF), environmental knowledge (EK), and environmental values (EV) as impacting ecological behavior intentions (EBI), which in turn, influenced actual ecological behavior. Based on the aforementioned literature review, the current study rests on the following hypotheses:

*Environmental attitudes will be related to ecological behavior such that higher scores on EK, EV, and EBI will be associated with higher scores on ecological behavior (EB).*

*Figure 1: (Source: Kaiser et al., 1999a)*



## ANALYSIS

Table 1 pertains to descriptive statistics, namely, mean and standard deviation for each of the variables under investigation.

Table 2 demonstrates the intercorrelations between various variables investigated in the current study. In the current study, it was found that EK was found to demonstrate a

significant positive association with EV ( $r=.60, p<.01$ ), EBI ( $r=.392, p<.05$ ), and EB ( $r=.489, p<.01$ ). Additionally, EV was found to demonstrate a significant positive correlation with EBI ( $r=.387, p<.05$ ). No other intercorrelations were found to be statistically significant, although in the expected direction.

**Table 1. Descriptive Statistics: Mean and Standard Deviation**

Variable	Mean	Standard Deviation
EK	39.60	5.84
EV	27.52	3.56
EBI	36.72	6.14
EB	20.59	3.79

**Table2. Overall Correlations between Perceived Stress, Coping Strategies, Mental Wellbeing, and Perceived Health**

	EK	EV	EBI
EV	.60**		
EBI	.392*	.387*	
EB	.489**	.09	.181

\* $p<.05$ , \*\*  $p<.01$

## INFERENCES

The significant relationship between EK and EV with EBI lends credence to the theoretical premises of the TRA/ TRP model (Ajzen & Fishbein, 1980; Ajzen, 1991), which indicates the salience of attitudes in influencing behavioral intentions; it also lends credence partially to Kaiser et al.'s (1999a) model of environmental attitudes-ecological behavior intention

linkages. The remaining non-significant correlations obtained in the current study can be accounted for the limitations of sample size and method of collecting data.

### **APPLICABILITY**

The findings obtained in the current study have crucial implications for promoting sustainable ecological development by changing environmental attitudes.

### **FUTURE RESEARCH SCOPE**

Future research can use probability sampling methods to see if the proposed hypothesis receive empirical support. Additionally, prospective research can look into the role demographic and psychological variables (e.g., Locus of Control), whose role has been highlighted in prior research studies (e.g., Hines et al., 1986/1987) in influencing environment-friendly behaviors. Structural equation modeling (SEM) techniques can be adopted to examine the pathways between variables of interest.

### **CONCLUSION**

From the current study, it can be concluded that environmental attitudes have been closely linked to intentions to engage in environment-friendly behaviors, but not actual behaviors.

### **REFERENCES**

- American Psychological Association Task Force on the Interface between Psychology and Global Climate Change (APA; 2009). *Psychology and global climate Change: Addressing a multi-faceted phenomenon and set of challenges*. Washington, DC: Author. Retrieved from <http://www.apa.org/science/about/publications/climate-change.aspx>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior: Attitudes, intentions, and perceived behavioral control*. Englewood Cliffs, NJ: Prentice Hall

- Gifford, R. (2007). Environmental psychology and sustainable development: Expansion, maturation, and challenges. *Journal of Social Issues*, 63(1), 199-212.
- Hamid, P. N., & Cheng, S.-T. (1995). Predicting antipollution behavior: The role of molar behavioral intentions, past behavior, and locus of control. *Environment and Behavior*, 27(5), 679-697.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/87). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education*, 18, 1-8.
- Kaiser, F. G. (1998). A general measure of ecological behavior. *Journal of Applied Social Psychology*, 28, 395-422.
- Kaiser, F. G., Ranney, M., Hartig, T., & Bowler, P. A. (1999a). Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *European Psychologist*, 4, 59-74.
- Kaiser, F. G., Wolfing, S., & Fuhrer, U. (1999b). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology*, 19, 1-19.



## ECO-FRIENDLY ROUTE FOR THE SYNTHESIS OF AZODYES

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### **Abstract:**

A simple, efficient and green method has been devised for the synthesis of azodyes. A variety of diazonium salts were prepared by reacting various substituted aromatic amines with nitrous acid produced in situ (diazotization reaction). The salts were then azo coupled with several organic compounds containing active methylene groups to form azo dyes. These were then confirmed by obtaining sharp melting points of representative samples that matched with standards. The structures of the products were also confirmed by spectral and elemental analysis.

**Keywords:** Aromatic primary amines, SiO<sub>2</sub>, Green chemistry, Active methylene group.

### **INTRODUCTION:**

Decomposition product of azo dye effluents are considered to be important for agricultural chemicals. Logically, we focused our attention on use of SiO<sub>2</sub> as a green acid catalyst. Recently, we reported that SiO<sub>2</sub> as a heterogeneous green Catalyst efficiently catalyzes the organic reactions<sup>1-4</sup>. To our satisfaction we found that the use of stoichiometric amount of

SiO<sub>2</sub> resulted in quantitative yield of the corresponding azodyes in ice cold condition<sup>5-6</sup>. However, no result was obtained when condensation is carried without employing catalyst<sup>7-8</sup>.

## EXPERIMENTAL

Melting points of all synthesized compounds were determined in open capillary tubes. The purity of the compounds was monitored by thin layer chromatography on silica gel coated aluminum plates (Merck) as adsorbent and UV light as visualizing agent. <sup>1</sup>H NMR spectra were recorded on Varian 500 MHz NMR spectrophotometer using CDCl<sub>3</sub>/DMSO-d<sub>6</sub> as solvent and TMS as an internal standard (chemical shifts in δ ppm). C, H, N estimation was recorded on Carlo Erba 1108 (CHN) Elemental Analyzer

### General Procedure:

#### Synthesis of azodyes from compounds containing active methylene group.

##### Conventional method:

To an ice-cold solution of aromatic primary amine (2.46g, 0.02mole), concentrated Hydrochloric acid (8ml) and water (11ml), a cold aqueous solution of sodium nitrite (1.40g) was added in portions under ice-cold condition. The diazonium salt so formed was then filtered into an already cooled (0°C) solution containing sodium acetate (0.196mole, 16g) and ethyl acetoacetate (2.46g, 0.02mole)/Acetyl acetone (2.0g, 0.02mole) in ethanol (50ml), the solution was then stirred vigorously. Separated solid was washed with water and recrystallised from ethanol to obtained **(5) and (6)**.

##### Green method:

To an ice-cold solution of aromatic primary amine (2.46gm, 0.02mole), Silica gel (catalytic amount) and water (11ml), a cold aqueous solution of sodium nitrite (1.40gm) was added in portions under ice-cold condition. The diazonium salt so formed was then filtered into an

already cooled (0°C) solution containing sodium acetate (0.196mole, 16gm) and ethyl acetoacetate (2.46gm, 0.02mole) Acetyl acetone (2 g, 0.02mole) in ethanol (50ml), the solution was then stirred vigorously. Separated solid was washed with water and recrystallised from ethanol to obtained **(5) and (6)**

*3-phenylazopentane-2,4-dione(5a)*

IR (cm<sup>-1</sup>):1695(C=O)

<sup>1</sup>H NMR(δ ppm):2.05(6H,s,2xCH<sub>3</sub>), 3.1 (1H, s, CH), 7.2-7.3 (5H,m,Ar- H),

*3-(4-Chlorophenylazo)pentane-2,4-dione(5b).*

IR (cm<sup>-1</sup>):1695(C=O), 1750(C=O), 1110(C-O),

<sup>1</sup>H NMR(δ ppm):2.12(6H, s, 2xCH<sub>3</sub>), 3.1 (1H, s, CH), 7.2-7.3 (4H,m,Ar- H)

*2-phenylazo-3-oxoethyl butanoate(6a)*

IR (cm<sup>-1</sup>):1690(C=O), 1750(C=O), 1110(C-O),

<sup>1</sup>H NMR(δ ppm):1.35(3H, t, CH<sub>3</sub>), 2.15(3H, s, CH<sub>3</sub>), 3.1 (1H,s, CH), 4.1(2H, q, CH<sub>2</sub>), 7.2-7.3 (5H,m,Ar- H)

*2-(4-Chlorophenylazo)-3-oxoethylbutanoate(6b)*

IR (cm<sup>-1</sup>):1690(C=O), 1750(C=O), 1110(C-O)

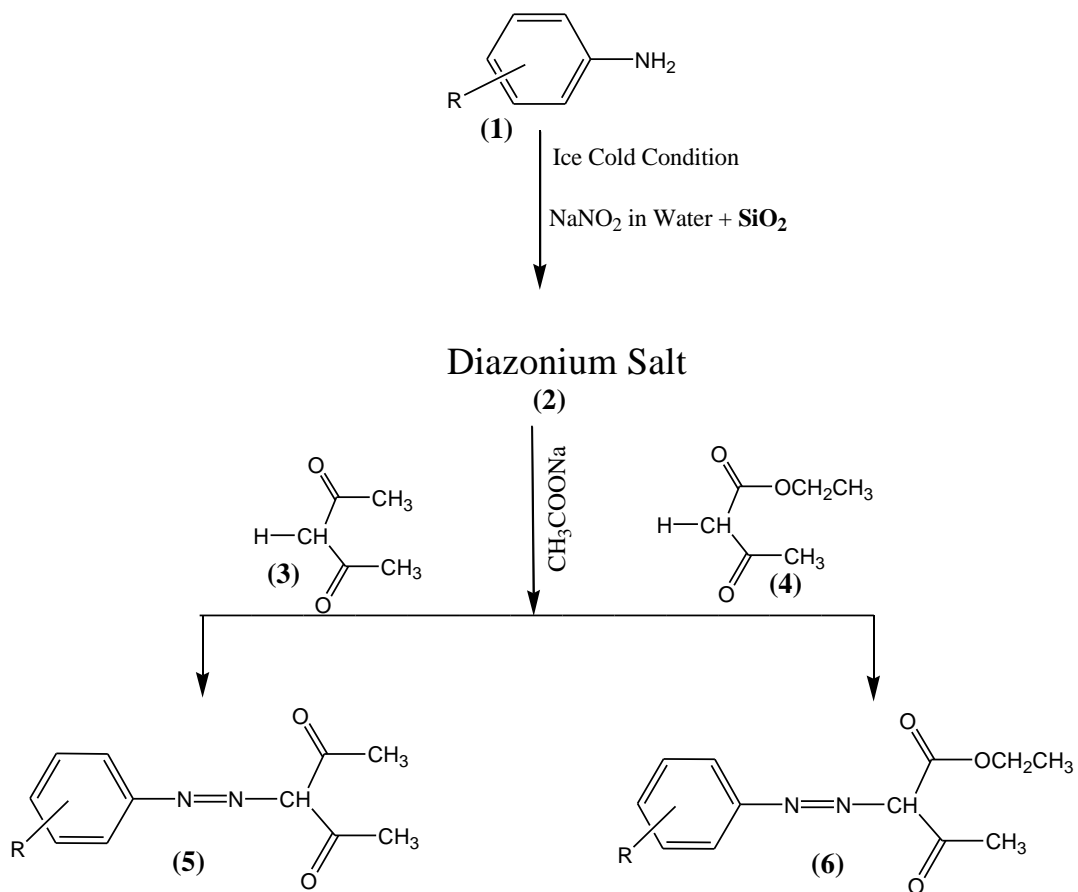
<sup>1</sup>H NMR(δ ppm):, 1.35(3H, t, CH<sub>3</sub>), 2.15(3H, s, CH<sub>3</sub>), 3.3 (1H,s, CH), 4.2(2H, q, CH<sub>2</sub>), 7.2-7.4 (4H,m,Ar- H)

TABLE I : Characterization data of compounds **5 (Acetyl acetone derivative)** and **6 (Ethyl acetoacetate derivative)**

Compounds	R	Mol. Formula	m.p. °C	Yield %		Colour
				C*	G*	
<b>5a</b>	H	C <sub>11</sub> H <sub>13</sub> N <sub>2</sub> O <sub>2</sub>	58-59	58	60	Golden Yellw
<b>5b</b>	4-Cl	C <sub>11</sub> H <sub>12</sub> N <sub>2</sub> O <sub>2</sub> Cl	170-174	64	59	Light Yellow
<b>5c</b>	2-NO <sub>2</sub>	C <sub>11</sub> H <sub>12</sub> N <sub>3</sub> O <sub>4</sub>	130-132	77	70	Yellow
<b>5d</b>	3-NO <sub>2</sub>	C <sub>11</sub> H <sub>12</sub> N <sub>3</sub> O <sub>4</sub>	114-116	71	67	Dark Yellow
<b>5e</b>	4-NO <sub>2</sub>	C <sub>11</sub> H <sub>12</sub> N <sub>3</sub> O <sub>4</sub>	122-123	79	85	Orange
<b>6a</b>	H	C <sub>12</sub> H <sub>15</sub> N <sub>2</sub> O <sub>3</sub>	68-69	61	69	Yellow
<b>6b</b>	4-Cl	C <sub>12</sub> H <sub>14</sub> N <sub>2</sub> O <sub>3</sub> Cl	156-158	60	71	Light Green
<b>6c</b>	2-NO <sub>2</sub>	C <sub>12</sub> H <sub>14</sub> N <sub>3</sub> O <sub>5</sub>	120-123	74	67	Pale Yellow
<b>6d</b>	3-NO <sub>2</sub>	C <sub>12</sub> H <sub>14</sub> N <sub>3</sub> O <sub>5</sub>	102-104	66	78	Light Orange
<b>6e</b>	4-NO <sub>2</sub>	C <sub>12</sub> H <sub>14</sub> N <sub>3</sub> O <sub>5</sub>	138-141	70	82	Yellowish-orange

C\*=*Conventional Method*      G\*=*Green Method*

**REACTION SCHEME**



## **RESULTS AND DISCUSSION**

Catalytic amount of SiO<sub>2</sub> in water acts as a highly effective acid catalyst for an organic reaction. The reaction complete within short time-frames of minutes (Monitored by TLC) with good to excellent yield. The present methodology, thus, offers an efficient and environmentally safe protocol for diazotization of aromatic primary amines using a readily available acid catalyst. The products were characterized by comparison of their TLC, IR spectra, <sup>1</sup>H NMR spectra and melting point.

The generality of the methods was verified by using variety of amino compound using different functionalities like, -NO<sub>2</sub>, -Cl, -Br etc. and each and every case these functionalities remained intact under the reaction condition. The present catalyst successfully diazotize amino group as evidence from the experimental results. It is earnestly hope that this new approach to diazotisation of aromatic primary amine will be found useful to the organic chemist at large scale.

## **CONCLUSIONS**

A number of azodyes were prepared in good yield. High yields were obtained, and the reaction conditions employed were less hazardous compared to the previous reported literatures. Hence this method will be of great importance in the synthesis of pyrazoles and will open opportunities among researchers for further study of such compounds.

## **ACKNOWLEDGEMENT:**

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**References:**

1. S. Kumar, Turk. J. Chem., 35, **2011**, 99-108
2. Chimichi S, Boccalini M, Hasan G, Tetrahedron, 62, **2006**, 90-95.
3. E.V.Pimerova, E.V. Voronina, *Pharm. Chem. J.*, 35, **2001**, 18-20.
4. S.L. Janus; A.Z. Magdif ; B.P. Erik; N.Claus; *Chem.*, 130, **1999**, 1167-1174.
5. H.J. Park, K.Lee, S.Park, B. Ahn, J.C.Lee, H.Y. Cho, K.I. Lee. *Bioorg. Med. Chem. Lett.*, 15, **2005**, 3307-3312.
6. Vijay V. Dabholkar, Omprakash G. Yadav, Navnath B. Shinde, Mustaqeem Mohammed A. ,*J. Chem. & Cheml. Sci.* Vol.5 (9), **2015**, 522-526
7. I. Yildirim, N. Ozdemir, Y.Akçamur, M. Dinçer, O.Andaç, *Acta Cryst.*, E61, **2005**, 256-258.
8. D.M. Bailey, P.E. Hansen, A.G. Hlavac, E.R. Baizman, J.Pearl, A.F. Defelice, M.E Feigenson, *J. Med. Chem.*, 28, **1985**, 256-260

“CHEMICAL INVESTIGATION OF EFFLUENT FROM  
CHEMISTRY LABORATORIES OF ROYAL COLLEGE, MIRA ROAD  
AND SUBSEQUENT STUDIES OF REMEDIATION TECHNIQUES”

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**ABSTRACT:**

The college chemistry laboratories generate effluents daily as a result of experiments performed by students who are pursuing chemistry related courses. The effluent generated during these practical exercises are disposed of into the sinks without any treatment. This effluent can alter the physical, chemical, and biological nature of receiving water body. The objective of the research study was to determine the quality of effluents from chemistry laboratories of Royal College and to assess whether the effluents meet the guidelines set up by Maharashtra Pollution Control Board. Effluents were collected when undergraduate students were performing chemical kinetics, Organic qualitative analysis, inorganic qualitative and physical chemistry experiments in laboratory.

Effluents were treated with corn cob, charcoal, stored in earthen pot and aerated. pH, electrical conductivity, chemical oxygen demand (COD), dissolved oxygen, total hardness, Total suspended solid (TSS) and Total dissolved solid (TDS) of effluent were measured before and after treatment.

The results showed that in all the effluent sample total hardness, chloride, TDS and DO level were within the permissible range. The storage of effluent in earthen pot has found to be most effective treatment to decrease COD value. Combine use of activated charcoal and clay pot for effluent treatment was found to be most effective to increase pH from highly acidic range towards neutral value. Treatment with corn cob and bubbling of air were not



successful. Based on results it was suggested that chemistry laboratory of college must have common pit for pretreatment of effluent. The natural easily available low cost adsorbent can be use in pit for decolonization of effluent and adsorption of ions. Highly acidic effluent must be neutralized before pouring in sink. Experiments which generates highly colourful acidic effluent having residue and bad odour can be given as demonstration experiment.

Key words: pH , TSS , TDS, DO , COD

### **INTRODUCTION :**

Effluent is discharge into environment with enhanced concentration of nutrient, sediment and toxic substances may have a serious negative impact on the quality and life forms of the receiving water body when discharge untreated . Water pollution by effluent has become a question of considerable public and scientific concern in the light of evidence of their extreme toxicity to human health and to biological ecosystems.

The laboratories of the Department of Chemistry at Royal College, generate laboratory effluents daily as a result of their general course of activities. The laboratory effluents contain many different types of chemicals resulting from the experiments designed for the undergraduate students. These laboratory effluents are discarded through the college drain system without any pre-treatment contributing to environmental pollution. Therefore, paying attention to laboratory waste management strategies has become an important aspect in order to reduce pollution. This research project is an attempt to identify experiments causing maximum extent of contamination, to research different kinds of wastewater treatment technologies, which would help to reduce the chemical emissions from effluents.

### **RESEARCH METHODOLOGY :**

#### **Study Area**

Royal College of Arts, Science and Commerce is located at Mira Road, District Thane. **Mira Road** is a town in [Maharashtra, India](#), part of the [Mumbai Metropolitan Region](#). Located to the north of [Mumbai](#), it is governed by the [Mira-BhayandarMunicipal Corporation](#) (MBMC). Royal College is affiliated to University of Mumbai and offers undergraduate courses in Arts, Science, Commerce and Management Studies.

#### Collection of effluent :

Effluents were collected when FY , SY & TYBSc students were performing following experiments in laboratory.

Effluent No.	Title of Experiment	No. of students Performed expt.	Vol. of effluent collected
1	Organic Qualitative Analysis	18	11 lit
2	Organic Qualitative Analysis	17	10 lit
3	Organic Qualitative Analysis	17	11 lit
4.	To determine acidity of water and to prepare tris (acetyl acetonato) iron III by Green chemistry principles	26	12 lit
5.	Chemical Kinetics - $K_2S_2O_8$ & KI	15	12 lit
6.	Conductometry- $K_a$ of acetic acid and chloroacetic acid, Potentiometry – HCl vs NaOH titration using quinhydrone	26	5.5 lit
7.	Organic Qualitative Analysis	18	08 lit
8.	Oxidation of Benzaldehyde	26	05 lit.
9.	Organic Qualitative Analysis	14	04 lit
10.	Organic Qualitative Analysis	14	12 lit.
11.	Colorimetry – $KMnO_4$	06	2 lit
12.	Kinetics - $K_2S_2O_8$ & KI (SYBSc)	05	2.5 lit
13.	Conductometry & pH metry (HCl vs NaOH)	04	1 lit
14.	Kinetics - $K_2S_2O_8$ & KI (TYBSc)	18	6 lit

15.	Inorganic Qualitative Analysis (SYBSc)	16	6 lit
16	Colorimetry : Fe – Salicylic acid	15	3 lit

For analysis, one liter of each effluent after through mixing separated and stored in labeled glass bottles.

**Methods used for effluent treatment:**

- 1) Treatment with corn cob: 10g dried corn cob was added in 100ml of effluent and kept overnight and then physicochemical parameters of filtrate were measured.
- 2) Bubbling of air/oxygen: Air was bubbled for 5 minutes through 200 ml effluent.
- 3) Treatment with charcoal : 1g activated charcoal was added in 100ml of effluent in a conical flask and kept overnight. After filtration through whatmann filter paper -42 , analysis was done.
- 4) Storage in earthen pot :100 ml effluent was kept in earthen pot overnight.
- 5) Treatment with charcoal and clay pot :1g activated charcoal was added in earthen pot containing 100ml of effluent and kept overnight. Physicochemical parameters were measured after filtration through Whatmann filter paper 42.

**ANALYSIS :**

Physico- chemical analyses of the following parameters before & after treatment were done.

**pH:**

pH of all the sample was measured using digital pH meter EQ 610. The pH electrode was calibrated using buffers of pH 4.0and 9.2. The electrode was immersed into the effluent sample and reading was recorded.

**1) Electrical Conductance (EC)**

Conductance measurements are a rapid and practical parameter of the variation of dissolved

nutrients and micro-nutrients contents of water samples. EC was determined for each of the effluent using conductivitymeter EQ660 with cell having cell constant  $1.0 \text{ cm}^{-1}$ .

## 2) Chemical Oxygen Demand (COD) :

COD determines the oxygen requirement for complete oxidation of bio-degradable and non-bio-degradable matter. The organic matter gets oxidized completely by  $\text{K}_2\text{Cr}_2\text{O}_7$  in presence of  $\text{H}_2\text{SO}_4$  to produce  $\text{CO}_2$  and  $\text{H}_2\text{O}$ . The unconsumed  $\text{K}_2\text{Cr}_2\text{O}_7$  titrated with standardized Ferrous Ammonium Sulphate (FAS) solution. The dichromate consumed gives the oxygen required for oxidation.

Calculation:

$$COD (\text{mg /lit}) = \frac{(A - B) \times N \times 8 \times 1000}{\text{sample volume}}$$

Where, A = Volume of FAS in ml used for blank,

B = Volume of FAS in ml used for sample, N = Normality of FAS.

## 4) Total Suspended Solids (TSS)

Suspended solids are the portion of total solids retained by filter. 100 ml well mixed sample is filtered through a weighed standard filter paper (whatmann filter paper 41) and the residue retained on the filter paper is dried to a constant weight at  $103^\circ\text{C}$  to  $105^\circ\text{C}$ . The increase in weight of the filter paper represents the total suspended solids.

$$\text{Total Suspended solids (mg/Lit)} = \frac{(A - B) \times 1000 \times 1000}{\text{Sample volume in ml}}$$

Calculation:

where, A= Final weight of filter paper      B= Initial weight of filter paper

## 5) Total Dissolved Solids (TDS)

Dissolved solids consist mainly of inorganic salts and small amount of organic matter. A well mixed sample is filtered through a standard filter paper (Whatmann filter paper no.41) and the filtrate (10ml) is evaporated to dryness in a pre-weighed dish and dried to constant weight at 180<sup>0</sup>C, the increase in dish weight represent the total dissolved solids.

$$\text{Total Dissolved Solids (mg/Lit)} = \frac{(A - B) \times 1000 \times 1000}{\text{Sample volume in ml}}$$

Calculation:

		Parameter	Result
Where, A= Final gms, B= dish in gms		pH	1.57
		Chemical Oxygen Demand	916 mg/lit
		Total Suspended Solids (TSS)	1,240 mg/lit

weight of dish in  
Initial weight of

6) **Total Hardness & Chloride Testing** : Total hardness testing was done for samples before and after treatment by using HiMedia's testing kit.

7) **Dissolved Oxygen (DO)** : Dissolved oxygen (DO) is the amount of oxygen that is present in water. It is measured in mg/L. DO was measured in samples of effluent before and after treatment by Winkler's Iodometric method.

### RESULT AND DISCUSSION :

Effluent samples 1 to 10 were send to laboratory of BEC chemicals, Roha , Maharashtra.

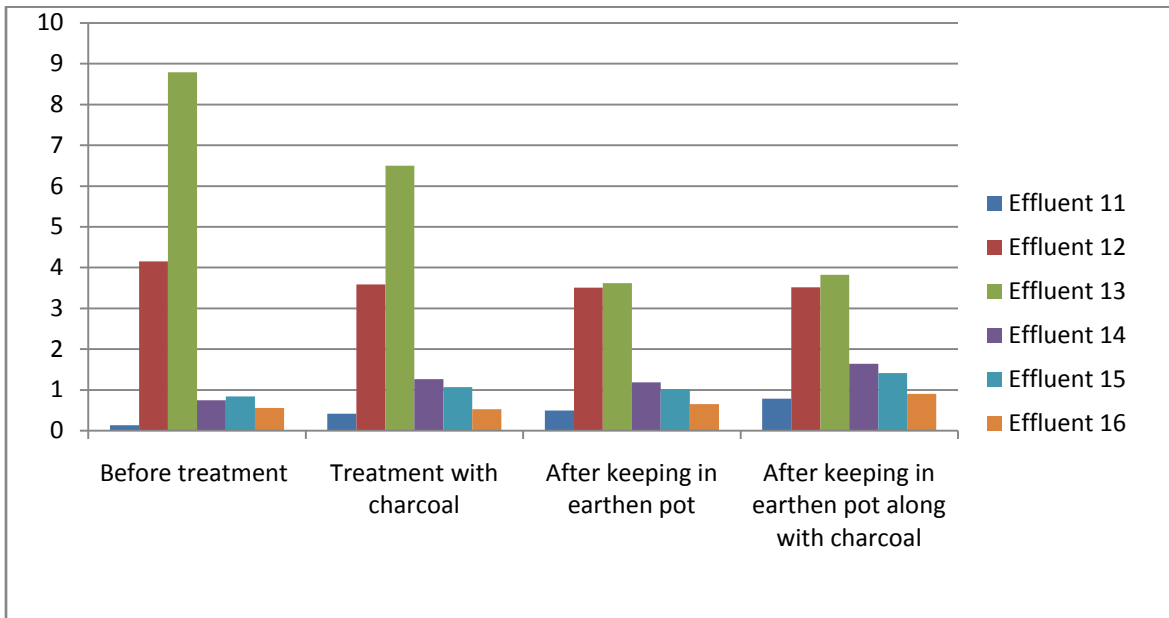
The results of untreated composite sample prepared by taking 10 ml of each effluent is given in Table 1 below:

Total Dissolved Solids (TDS)	2,130 mg/lit
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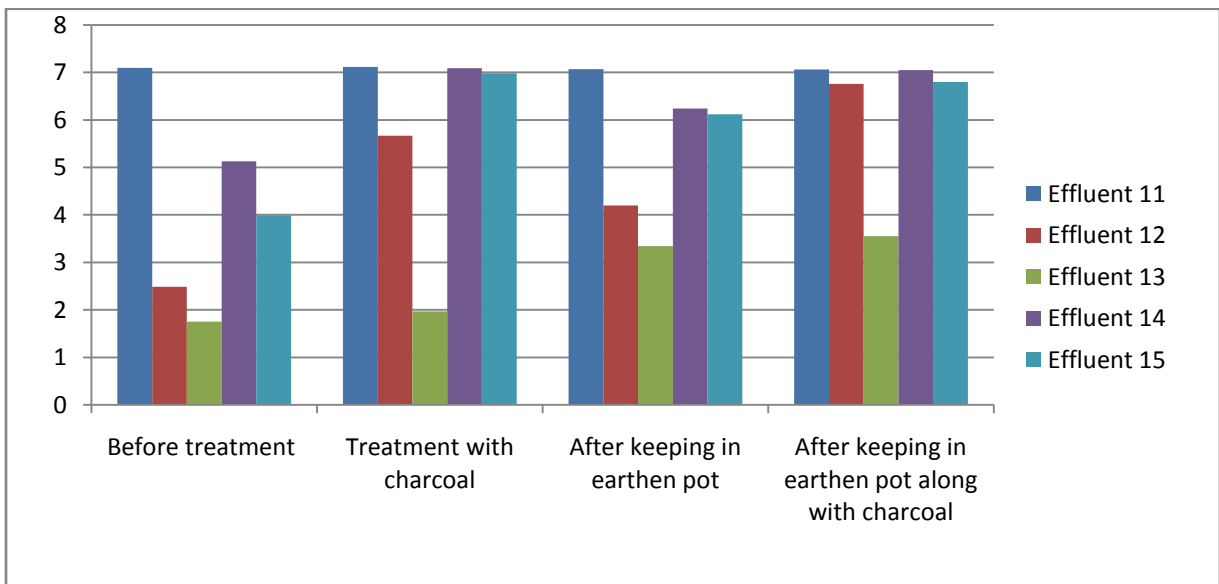
pH , conductance , DO were measured before and after treatment for effluent samples 1 to 10 in Royal college laboratory . Composite sample was also prepared by mixing 50 ml of each effluent. The analytical results are shown in Table 2 below .

Effluent No.	Conductance (mS)		pH		Dissolved Oxygen (mg/L)		
	Before treatment	After Bubbling air	Before treatment	After Bubbling air	Before treatment	After Bubbling air	After treatment with corn cob
1	3.91	4.43	17.08	1.92	17.08	20.41	17.5
2	9.45	11.42	56.25	1.49	56.25	-	-
3	2.95	3.28	20.41	2.07	20.41	17.9	-
4	4.06	4.09	21.66	8.70	21.66	20.83	27.9
5	1.03	1.13	20.42	2.73	20.42	31.6	18.75
6	6.07	7.01	16.66	2.08	16.66	39.5	22.5
7	8.81	10.8	64.58	1.37	64.58	15	31.25
8	35.5	53.7	32.91	0.72	32.91	5.41	-
9	2.74	3.23	18.75	1.94	18.75	15.8	17.5
10	2.04	3.90	18.75	1.83	18.75	15.8	11.66
Average	7.66	10.29	28.75	2.49	28.75	20.25	21.01
Composite	-	-	30.61	-	30.61	33.88	31.020

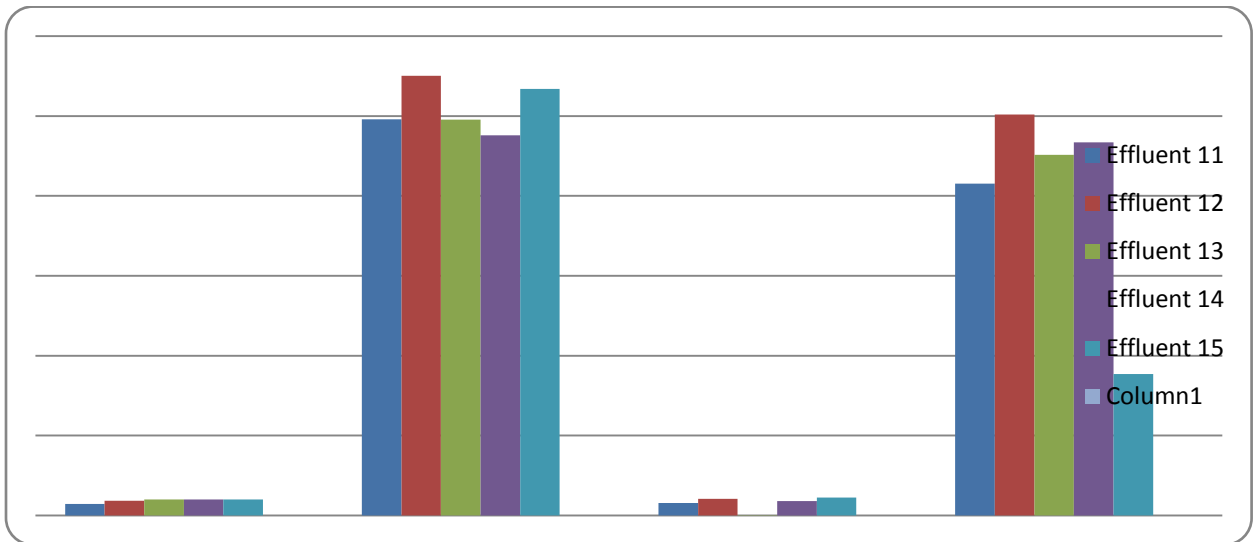
As treatment given to effluents of sample 1 to 10 was not found to be effective fresh effluents were collected and 100 ml of each effluent was treated with **activated charcoal**, stored in **earthen pot** and **stored in earthen pot in presence of activated charcoal**. Composite sample was also prepared by adding 40 ml of each effluent and 100 ml of each effluent was given similar treatment. Physico – chemical parameters studied is given in below tables.



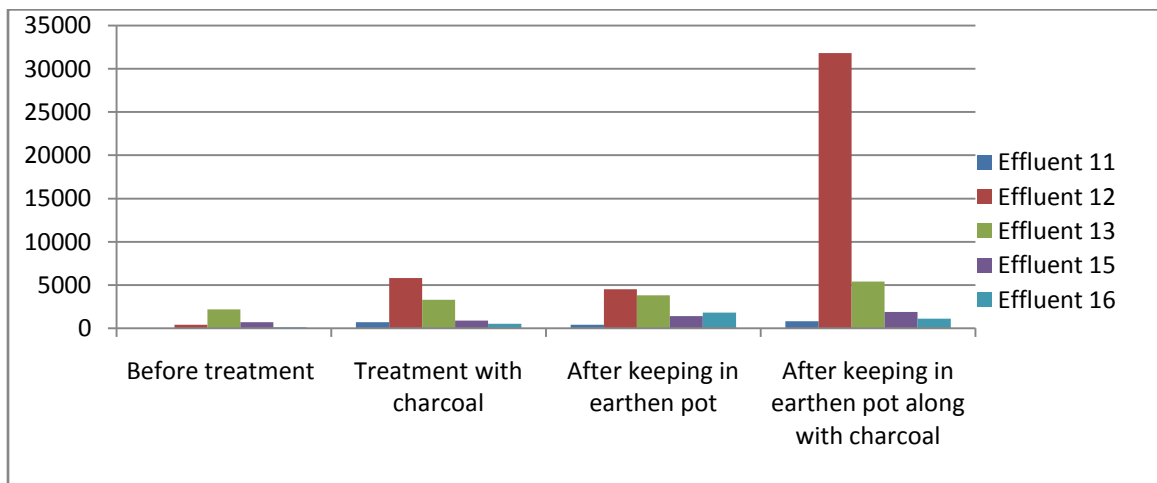
**Fig 1 :Variation of conductance (mS) in treated and untreated**



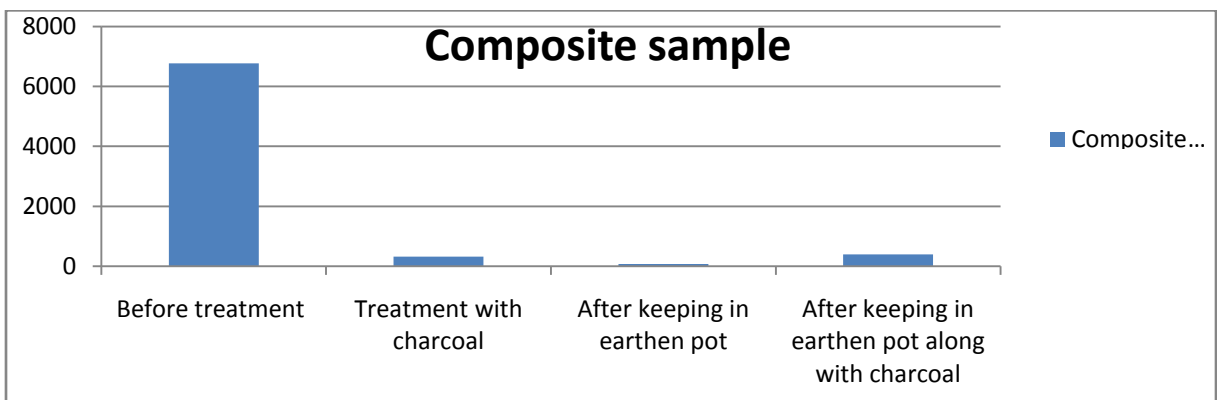
**Fig:2 Variation of pH in treated and untreated effluent**



**Fig :3 Variation of Total Suspended Solids ( mg/L)in treated and untreated**



**Fig :4 Variation of Total Dissolved Solids ( mg/L)in treated and untreated**





**Fig:5 Variation of COD in treated and**

The CPCB ( Central Pollution Control Board ) has developed National Standards for Effluent under the statutory powers of the Water (Prevention and Control of Pollution) Act, 1947. These standards have been approved and notified by the government of India, Union ministry of environment and forests (MoEF), under section 25 of the Environment (Protection) Act, 1986. Effluent standards for disposing effluent on land (irrigation, water recharge), in water bodies and in public sewers for measured parameters are listed in Table 5.

**Table 3 :** Disposal Standards of CPCB for Disposal of Waste Water

Parameter	Tolerance limits for		
	On land for irrigation Indian Standards: 3307 (1974)	Into inland surface waters Indian Standards: 2490 (1974)	Into public sewers Indian Standards: 3306 (1974)
pH	5.5 - 9.0	5.5 - 9.0	5.5 - 9.0
COD	-	250	-
Suspended solids	200	100	600
Total dissolved solids (inorganic)	2100	2100	2100
Chlorides	600	1000	1000

**pH :**

Effluent 4 shows the highly alkaline pH and all other effluents were highly acidic. High pH induces the formation of trihalomethanes which are toxic. pH below 6.5 starts corrosion in pipes , thereby releasing toxic metals such as Zn , Pb, Cd and Cu etc<sup>1</sup>. Water with a pH outside the normal range may cause a nutritional imbalance or may contain a toxic ion which can adversely affect the growth and development of aquatic life<sup>2</sup>. As pH affects the unit

processes in water treatment that contribute to the removal of harmful organisms, it could be argued that pH has an indirect effect on health<sup>3</sup>.

The average pH values of untreated effluents (sample 11 – 15 ) was 4.09 which has increased to 5.76 after treating with activated charcoal and found to be 5.39 when kept in earthen pot. The value of pH 6.24 falls in acceptable range ( 5.5 - 9.0) when both the treatments were given together.

### **Electrical Conductance :**

According to WHO, the acceptable EC is 1 mScm<sup>-1</sup> to 2 mScm<sup>-1</sup>.

Waters having conductivity more than 20 mScm<sup>-1</sup> have not been found suitable for irrigation<sup>1</sup>. There is report that a high positive correlation exists between electrical conductance and chloride concentration<sup>4</sup> and similarly a high positive correlation between electrical conductance and total dissolved solids of water<sup>5</sup>. The present observations are also in support of these reports. The higher conductivity alters the chelating properties of water bodies and creates an imbalance of free metal availability for flora and fauna<sup>6</sup>.

All the samples except effluent 5 show high EC value. The higher value of treated effluent might be due to the increase in ions because of bubbling of air and addition of corn cob.

Result shows interaction with activated charcoal (EC = 6.50 mScm<sup>-1</sup>) is not very effective.

Storage in earthen pot (EC = 3.62 mScm<sup>-1</sup>) is highly effective, may be due to high adsorption of ions on earthen pot.

### **Dissolved Oxygen:**

Average DO levels in effluent before and after treatment found to remain same. According to WHO, the permissible DO level in water is **8 mg/L**. DO values of all the effluents were within acceptable limit.

**Total Suspended Solids ( mg/L) :**

TSS gives a measure of the turbidity of the water. High TSS can block light from reaching submerged vegetation. As the amount of light passing through the water is reduced, photosynthesis slows down. Reduced rates of photosynthesis causes less dissolved oxygen to be released into the water by plants. Thus high concentrations of suspended solids can cause many problems for stream health and aquatic life.

According to CPCB acceptable value of TSS in public sewers is 600 mg/L. The composite sample of effluent 1 to 10 showed high TSS value (1,240 mg/L) . The TSS value observed in present study are in the range of permissible limit. TSS value increases when samples were treated with activated charcoal but decreases after keeping in earthen pot.

**Total Dissolved Solids ( mg/L) :**

Total dissolved solids (TDS) is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro granular suspended form. According to CPCB the permissible limit of TDS for public sewer water is 2100 mg/L. The observation shows that the TDS is within the permissible range before any treatment. Treatment with charcoal and earthen pot increases TDS values of all the effluent samples.

**Chemical Oxygen Demand ( mg/L) :**

The COD test measures the oxygen demand of biodegradable pollutants plus the oxygen demand of non-biodegradable oxidisable pollutants. COD is a water quality measure used not only to measure the amount of biologically active substances such as bacteria but also biologically inactive organic matter in water. The COD of composite sample of effluent 1-10 was found to be 2130 mg/L which is beyond the CPCB permissible limits for industrial effluent discharges (250mg/L) .

The present study shows that the COD value of untreated composite sample of effluent 11-15 was very high (6772.8mg/L) and it was minimum (79.68mg/L) after keeping overnight in earthen pot.

#### **Total hardness :**

Principle cation imparting hardness is calcium and magnesium. The water containing excess hardness is not desirable for potable water as it forms scales on water heater and utensils when used for cooking and consume more soap during washing of clothes. The total hardness value of untreated composite sample was found to be 25 mg/l and it is within the desirable limits. Treatment of water with activated charcoal or earthen pot increases the hardness of water.

#### **Chloride :**

Chlorides are highly soluble with most of the naturally occurring cations. It is harmless upto 1500 mg/L but produces a salty taste at 250-500mg/L. The chloride content of all the effluent samples were within desirable limit before and after the treatments.

#### **CONCLUSION**

It is evident from the study that in all the effluent sample total hardness, chloride, TDS and DO level were within the permissible range. Treatment with corn cob and bubbling of air did not change the measured parameters of effluent. The higher levels of COD in effluent samples clearly indicate that the chemicals discharged by lab activities are high oxygen demanding materials, which causes depletion of dissolved oxygen in water. The storage of effluent in earthen pot has found to be most effective treatment to decrease COD value . The present study also shows that high conductance value of some of the effluent had decreased drastically after overnight storage in clay pot.

Combine use of activated charcoal and clay pot for effluent treatment was found to be most effective to increase pH from highly acidic range towards neutral value. For effluent of semi-micro qualitative inorganic analysis, activated charcoal alone is effective to increase pH from acidic to neutral value. Also activated charcoal was found to be highly effective decolorizing agent for all the effluents.

The study reveals that the laboratory effluent can alter the physical, chemical and biological nature of receiving water body. Therefore laboratory waste management strategies has become essential. The college laboratory water must be collected through all drain pipe into a common pit for pretreatment of effluent. Clay, charcoal, zeolites or natural easily available low cost adsorbent can be use in pit for decolonization of effluent and adsorption of ions. Use of clay and charcoal will decrease the conductance and COD level and also it will help in increasing pH of acidic effluent. Experiments such as kinetics ( $K_2S_2O_8$  & KI) which generates highly colourful acidic effluent having residue and bad odour can be given as demonstration experiment. Experiments such as titration of HCl vs NaOH by pH or Conductometry, verification of Ostwald's dilution law, oxidation of benzaldehyde which generates highly acidic effluent must be neutralized with excess water or using some other method before pouring in sink.

Further research can be done to design effective and low cost pit for pre treatment of college laboratory liquid waste and also to investigate methods for disposal of solid waste generated in the pit.

**Acknowledgment:**

The author is thankful to University of Mumbai for funding the project, Principal Prof. A.E. Lakdawala and Dr. Chitra of Department of Chemistry, Royal College for encouragement and guidance. I also thank to Mr. P.B. Girase of BEC Chemicals, Roha , Maharashtra for effluent analysis , Prof. Sadguna Dhantal & non teaching staff of Department of chemistry, Royal College for their support.

**References :**

1. Chemical and Biological Method for Water Pollution Studies R.K Trivedy, P. K. Goel , department of Environmental Pollution , Y. C. College of Science, karad , 8 (1984)
2. Bolawa O.E. and Gbenle G.O., Analysis of industrial impact on physiochemical parameters and heavy metal concentrations in waters of river Majidun, Molatori and Ibeshe around Ikorodu in Lagos, Nigeria, Journal of Environmental Science and Water Resources,1(2), 34–38 (2012)
3. Aramini J.M., McLean M., Wilson J., Holt J., Copes R., Allen B. and Sears W., Drinking water Quality and Health Care Utilization for Gastrointestinal Illness in Greater Vancouver, Environmental and Workplace Health Reports and Publications, (2009)
4. Regumathan P., Beauman W.H. and Kreusch E.G., Efficiency of point of use treatment devices, J. Am. Water Works Assoc., 75 (1), 42 (1983)
5. Aydin A., The Microbiological and Physico-Chemical Quality of Ground water in West in West Threce, Turkey, Polish J Environ. Stud., 16 (3), 377- 383 (2007)
6. Akan J.C., Abdulrahman F.I., Dimari G.A. and Ogugbuaja V.O., Physiological determination of pollutants in wastewater and vegetables samples along the Jakara

wastewater channel in Kano metropolis, Kano state, Nigeria, European Journal of Scientific research, 23(1) 122-133 (2008)

7. Subin M.P. , Husna A.H. , An Assessment on the Impact of Waste Discharge on Water Quality of Priyar River Lets in Certain Selected Sites in the Northern Part of Ernakulum District in Kerala, India, International Research Journal of Environment Sciences, Vol. 2(6),76-84, June (2013)
8. Ram S. Lokhande, Pravin U. Singare, Deepali S. Pimple , Study on Physico-Chemical Parameters of Waste Water Effluents from Taloja Industrial Area of Mumbai, India. International Journal of Ecosystem 2011; 1(1): 1-9DOI: 10.5923/j.ije.20110101.01

**RESEARCH PROJECTS PUBLICATIONS AND PRESENTATIONS OF FACULTY  
MEMBERS 2014-15**

**FUNDED RESEARCH PROJECTS**

<b>Name</b>	<b>Agency</b>	<b>Topic</b>	<b>Amount</b>
Aqeela Sattar (Chemistry)	University of Mumbai	Chemical Investigation of Effluent From Chemistry Laboratories of Royal College, Mira Road & Subsequent Studies of Remediation Techniques.	25000/-

**Publications**

<b>Faculty</b>	<b>Title of Paper Publication</b>
Ravishri Mishra	Higher Education in India: Transition from Socialism to Capitalism, European Scientific Journal, Aug-2014 /special/Edition, ISSN:1857-7881
Ravishri Mishra	Digitalized Cities and Sustainability, Shodhatiya Research Journal, June – Nov 2014, Vol 1 issue 2
Vibha Bhagat	Synthesis of some novel ligands of benzimidazole derivative, Indian Journal of Applied Research, Vol.4, Issue 8, 44-45, ISSN 224955( Impact factor 0.8215)
Vilasini Gaode (Microbiology)	Study of heavy metal tolerance of Halophilic bacteria Sanskodhana, Vol 1-2014, ISBN 978-81-929897-0-9
Zamanat Syed (Microbiology)	Isolation and identification of Halophilic/ Halotolerant organisms having the potential to produce Xylanase Sanskodhana, Vol 1-2014, ISBN 978-81-929897-0-9
Farhaan Makba (Microbiology)	Study of Microflora on the lid surface of Canned Beverages Sanskodhana, Vol 1-2014, ISBN 978-81-929897-0-9
Ravishri Mishra (Sociology)	Digitalized Cities and Sustainability Shodhatiya Research Journal, June – Nov 2014, Vol 1 issue 2 Inclusive Growth
Dr.Sanchita Datta	Gender inequalities in the field of education. Quest in Education , ISSN 0048-6434.
	Engaging Employees in the Corporate Social Responsibilities Thakur College Conference Proceedings with ISBN978-93-83072-64-4.
	Women in Indian Media with special reference to Cinema Shodhaditya Vol 2 Issue 2 with ISSN2347-8403



Dr..Sanchita Datta	Industrialisation and slum development. Thakur College Conference Proceedings with ISBN-978-1-312-86802-1.
	Issues and Implications of FDI in the Indian retail. Sanshodhana Vol 1-2014 ISBN978-81-929897-0-9.
Prof. Renu Khandelwal	Catalyzation of Women Entrepreneurs Shodhaditya Research Journal Vol 1 Issue 1 with ISSN2347-8403
	Issues of Urbanisation and its impact on Real Estate Chapter in the book titled Real Estate Development In India, published by Top Publication ,ISBN no. 81-89217-07-0
Prof. Mazhar Thakur	Employment Trends in B.P.O sector LalaLajpat Rai College Magazine, ISSN no.978-93-82159-52-0
	The New Trend in Advertising Marketing Centum Magazine, June 2014 , ISSN 2231-1475
Dr. Chitralekha Amin	Qualitative and Quantitaive Assessment of Commercial Samples of Abharak and TrivangaBhasma. Sanshodhana, Vol 1-2014, ISBN 978-81- 929897-0-9
Dr. Juliet Miranda	Effect of Fertilisers on the Cation Exchange Capacity of Farming Soils of Vasai Region, Sanshodhana, Vol 1-2014, ISBN 978-81-929897-0-9

### Paper Presentations

Faculty	Title of Paper Presented	Conference	Venue and Date
Zamanat Syed (Microbiology)	Primary screening of Xylanolytic bacteria from marine mangroves	National Conference	9 <sup>th</sup> August 2014  Royal College, Mira Road
Farhaan Makba (Microbiology)	Study of Micro- flora on the lid surface of canned beverages	National Conference	14 <sup>th</sup> , 15 <sup>th</sup> January 2015  Smt.C.H.M. College, Ulhasnagar
Farhaan Makba (Microbiology)	Winogradsky Column (Poster)	Regional Seminar	21 <sup>st</sup> , 22 <sup>nd</sup> January 2015  Konark Group and K.C. College
Vilasini Gaode (Microbiology)	Biosorption of Nickel (Poster)	Regional Seminar	21 <sup>st</sup> , 22 <sup>nd</sup> January 2015  Konark Group and K.C. College
Ravishri Mishra (Sociology)	Digitalized Cities and Sustainability	International Conference	Aditya College of Management
	Inclusive Growth	International Conference	Thakur College

Dr. Sanchita Datta (Commerce)	Industrialisation and slum development	International Conference	29 <sup>th</sup> January 2015 Thakur College
	Engaging Employees in CSR	International Conference	5 <sup>th</sup> December 2014 Thakur College
	Women in Media: Special reference to Cinema	International Conference	22 <sup>nd</sup> August 2014 Aditya Institute of Management
Renu Khandelwal (Commerce)	Catalyzation of Women Entrepreneurs: An ICT Base	International Conference	22 <sup>nd</sup> August 2014 Aditya Institute of Management
Komal W. (Mathematics)	Maximizing information diffusion in online social networks in "INFOSPARX"	National Conference	SIES (Nerul) college of Arts, Science and Commerce in association with Life Long Learning and Extension, University of Mumbai.
Momina Sirguroh (Political Science)	ICT and Sustainability	International Conference	Aditya College of Management
Dr. Chitralekha Amin (Chemistry)	Hazardous waste management in Mira Bhayender Region, Solutions and Concerns	National level UGC Sponsored conference	Elphinstone College on 21 <sup>st</sup> January 2015
Gunwanti Negi (Chemistry)	Women and ICT	State Level Seminar	Bandodkar College , Thane 7 <sup>th</sup> March 2015

### Books published

Dr. Jyotsna Haran	Books: Regional Planning and economic Development, 1987, EssEss publication, New Delhi, ISBN 978-81-920276-9-2
	Books: Managerial Economics, 2012, Garima Publications, ISBN 978-81-920276-9-2
Ravishri Mishra &	Chapter on Main Currents of Feminist thought ( NOTES), M.A( Sem 4)

Momina Sirguroh	SNDT University.
Ravishri Mishra	A Chapter published in the book "Swami Vivekananda: The Man and his message, ISBN 978-93-82835-19-6, Axis books Pvt Ltd

**RESEARCH PROJECTS PUBLICATIONS AND PRESENTATIONS OF FACULTY MEMBERS 2015-16**

**FUNDED RESEARCH PROJECTS**

<b>Name</b>	<b>Agency</b>	<b>Topic</b>	<b>Amount</b>
Zamanat Syed	UGC (Minor Research)	Isolation of Xylanolytic microorganisms from marine environment and optimization of xylanase production	3,55,000/-
Farhaan Makba	UGC (Minor Research)	Study of Diversity of Bacteria in Marshes of Mira-Bhayanderareawith Special reference to Production of Lipase.	2,60,000/-
Dr. Vinod Panchal	UGC (Minor Reseach)	Pressure induced band gap modifications and structural phase transition of $ABO_4$ type compounds.	2,45,000/-
Dr. Chitralkha Amin	University of Mumbai	Chemical Analysis and migration of epichlorohydrin and possible contaminants from tea bag infusion	25,000/-

Komal Wategaonkar	University of Mumbai	Approximation solution of fuzzy Fredholm Integral equation.	25,000/-
Dr. Poonam Kelkar	University of Mumbai	Phytoremediation of Dyes in effluent and determination of eco friendly nature of dye accumulated plants	30,000/-
Vinetta Rodriques	University of Mumbai	Biodiversity of Mangroves from Dahisar Khadi, Borivili (West)	20,000/-

**PUBLICATIONS AND PRESENTATIONS 2015-16**

<b>Faculty</b>	<b>Title of Paper Publication</b>
Gunwanti Negi	Graphite coated barium (II) selective membrane electrode based on dibenzo24-crown-8, International Journal of Research in Engineering and Applied Sciences, Volume 5, Issue 12 (December 2015)  Pg. No. 85-92, Impact Factor-5.98
Dr. Mustaqeem Mohammed	Synthesis of Novel Pyrazole Derivatives of Chalcones, International Journal of Chemistry and chemical science, Volume 5, Issue 07 (July 2015)  Pg. No. 351-356, Impact factor-2.89
Dr. Mustaqeem Mohammed	Synthesis of Pyrazole Derivatives containing azo dye moiety, Der Pharma Chemica, (International), Volume 5, Issue 09 (July 2015)  Pg. No. 95-99, 4.32, Impact factor-4.32
Nazia Kausar	Developing Multi Query form for F-score result, International Journal of Engineering Development and Research, ISSN:2321-9939

**CONFERENCE PROCEEDINGS 2015-16**

<b>FACULTY</b>	<b>TITLE OF PAPER</b>	<b>JOURNAL</b>	<b>ISSN NO/Impact Factor (If any)</b>
Dr. Sanchita Datta	Popular marketing strategies followed globally	Conference proceedings of “Global Business Scenario” organized by B.K Shroff College	1ISBN 978-81-927102-2-8
Dr. Sanchita Datta	Chalk and Duster and more	Conference proceedings of Trends in Higher Education Scaling New Heights in Education	ISSN 2231-1475 (Im
Renu	A study of green tea	An International Journal of	ISSN: 2394-

Khandelwal	consumption in Mumbai	Commerce, Economics and Management	4560
Renu Khandelwal	Rural Women entrepreneur, Issues and Concern	Management Guru International Journal of Management Research	ISSN2319-2429
Ganesh Tondlekar	Cost of Capital	Proceedings of One day National Seminar on Emerging Trends in Finance, Management, Accounting, Auditing and reporting in India	ISSN 2319-2429
Farhan Makba	Bacterial Diversity in Mangrove soil of Bhayander Creek and detection of Sulphur reducing bacteria	Proceedings of UGC sponsored National Seminar on wetlands	ISBN NO:978-81-925005-3-9
Parveen Shaikh	Problems of the elderly people in India, An overview	Proceedings of National seminar on Geriatric concerns in India- Past, Present and future organized by Jhunjhunwala College	ISBN: 978-81-925489-8-2
Momina Sirguroh	Leisure time activity for elderly people	Proceedings of National seminar on Geriatric concerns in India- Past, Present and future organized by Jhunjhunwala College	ISBN: 97881-925489-8-2
Ravishri Mishra	The culture of out migration among muslims and its impact on the left behind elderly in Mira BhayanderNagarpalika An empirical analysis	Proceedings of International conference Bhavishya 2016 organised by Thakur College	ISBN:978-81-925489-8-2
Ravishri Mishra	Inequalities in higher education in India, Scenarion and Solution	Proceedings of National seminar onBhartiya Shikshanani BadalteVastan organized by LJMJ MahilaCollegee	ISSN:2231-1475

**PAPER PRESENTATIONS**

<b>Faculty</b>	<b>Title of Paper</b>	<b>Theme of Conference</b>	<b>Date</b>	<b>Organiser And Venue</b>
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Gunwanti Negi	Optimisation of membrane composition of a graphite coated barium (II) selective electrode based on dibenzo24-crown-8	International Conference on New Horizons in Synthetic and Materials Chemistry	26 -28 <sup>th</sup> Nov 2015	Mumbai University, Kalina
Dr.Chitralkha Amin	Environmental Risk Assessment and Associated Disease burden in Vasai Region	International Conference on climate change and sustainability	21-23 <sup>rd</sup> December 2015	Thakur College In association with University of Mumbai, and Edith Cowan University, Australia
Aqeela A. S. Qureshi	A study of Chemical Composition & Antioxidant Properties of Nigella Sativa & Trigonellaf oenum GraecumL .seeds	International Conference on New Horizons in Synthetic and Materials Chemistry	26 -28 <sup>th</sup> Nov 2015	Department of Chemistry, University of Mumbai
Dr. Mustaqeem Mohammed	Heteroannulation of substituted Thiocarbohydrazide	Lifestyle and management	08-09 <sup>th</sup> May 2016	International Young Science Association, Mother Theresa Post Graduate Institute of Health Science, Puducherry
Renu Khandelwal	Rural Women entrepreneur and role of technology	National level seminar on Emerging Trends and innovation in research in commerce, science technology, humanities and	25 <sup>th</sup> April 2016	IQAC Cell of Nagrik Shikshan Sanstha's College of Commerce and Economics, Mumbai

		social sciences		
<b>Faculty</b>	<b>Title of Paper</b>	<b>Theme of Conference</b>	<b>Date</b>	<b>Organiser And Venue</b>
Farhan Makba	Bacterial Diversity in Mangrove soil of Bhayander Creek and detection of Sulphur reducing bacteria	Wetlands- Present Status, Ecology and Conservation	12 <sup>th</sup> August 2015	M.D.College
Farhan Makba	Preservation of vegetables by fermentation	Research Meet at Konark Memorial Awards	15 <sup>th</sup> January 2016	Konark Group and Wilson College
Rugma N	Application of Graph theory in determination of ambulance stations in Mira Road	Recent Trends in Mathematics and statistics	5 <sup>th</sup> September 2016	M.D.College
Tabassum Khan	Pravasi Sahitya		8 <sup>th</sup> and 9 <sup>th</sup> January 2016	Guru Nanak College



**RESEARCH PROJECTS PUBLICATIONS AND PRESENTATIONS OF FACULTY MEMBERS 2016-17**

**FUNDED RESEARCH PROJECTS**

<b>Name</b>	<b>Agency</b>	<b>Topic</b>	<b>Amount</b>
Delphine Pereira	University of Mumbai	Biodiversity of Mangrove associated Macrobenthos of Kandarpada- Dahisar mangrove park.	25000/-
Dr. Juliet Miranda Dr. Mustaqueem Mohammed	University of Mumbai	Synthesis of Heterocycles using Novel Green Catalysts”.	30000/-
Dr. Vibha Bhagat	University of Mumbai	To evaluate presence of lysine and adipic acid from hydrolysis and degradation products of waste paper by soil micro flora as renewable green source of commodity chemicals	30000/-
Ritika Lala	University of Mumbai	Generation of Online Quiz and Question Papers using Shuffling Algorithm	35,000/-
AnushkaPadhye	University of Mumbai	Comparative Analysis of various techniques of steganography	20,000/-

**Paper Publications**

<b>Faculty</b>	<b>Title of Paper Publication</b>
Sanchita Datta	Indian Retail Management, Shodhadya, 42-45, ISSN-2347-8403
Sanchita Datta	Impact of Brand Awareness on Consumer Loyalty of Soap, Online International Interdisciplinary Research Journal. Vol. VI Nov. 2016, 76-

	82,ISSN-2249-9598
Sanchita Datta	Medical tourism in India, A swot analysis, Sanshodhana-2, In press,ISBN978-81-929897-1-6
Tabassum Khan	Ekisivi Sadi ki kahani mein badalte sambandh, Hindi Sahitya : Samvednake Dharatal,130-135 ,
Mustaqeem Mohammed, J.M.Miranda	Heteroannulation of substituted thiocarbohydrazide,HeterocyclicLetters,Volume 6, Issue 03 (July 2016),Pg. No. 351-356,ISSN-2231-3087

### Paper Presentations

Faculty	Title of Paper	Theme of Conference	State/ National/ University Level	Date	Organiser And Venue
Renu.Khandelwal	Role of technology in Developing Women Entrepreneurs in Unorganised Sector	“Vision India: Prospects and challenges”.	National level	26/04/17	A.E.Kalsekar Degree college Mumbra, Thane
Dr. Jyotsna Haran	Status of Health Insurance in India: Its opportunities and Challenges	Vibrant India: Renaissance	National	4/3/17	Thakur College of Science and Commerce, Kandivali
Dr. Jyotsna Haran	Students Perspective on Boundary less Education System	Organization Sans Boundaries	International	18/02/17	Aditya Institute of Management, Borivali
MominaSirguroh	Sanitation and Development: A study on the role	Culture and Nation Building:	National	3 & 4, Dec 2016	Mahatma Gandhi Kashi

	of sanitation in Nation Building	Challenges and Solutions			Vidyapith, Varansi
Momina Sirguroh	Changing Lifestyle of Tribals of Mirambhayaner City : An Ethnographic Approach	The Tribes of India: Habitat and Survival	International Interdisciplinary	7 & 8 Feb, 2017	K.M. Agrawal College of Arts, Commerce & Science
Tabassum Khan	Samkaleen Kahani Mein Bhasha Shaili	Samkaleen Kahani Sahitya	National	30/7/16	Smt. Indira Mahadev Behere Arts College
Ravishri Mishra	Hygiene Status & Practices of Tribal in Dahisar T Manor Village, Palghar District.	The Tribes of India: Habitat and Survival	International Inter-disciplinary	7 & 8 Feb, 2017	K.M. Agrawal College of Arts, Commerce & Science
<b>Faculty</b>	<b>Title of Paper</b>	<b>Theme of Conference</b>	<b>State/ National/ University Level</b>	<b>Date</b>	<b>Organiser And Venue</b>
Ravishri Mishra	Gender & Health: Empowering adolescent Girls through Sanitation	Culture and Nation Building: Challenges and Solutions	National	3 & 4, Dec 2016	Mahatma Gandhi Kashi Vidyapith, Varansi
Delphine Pereira	“Biodiversity status of mangroves of Dahisar mangrove park, Dahisar(west) Khadi, Mumbai, India.”	Contemporary issues in Economics, Commerce Humanities, Social sciences, Engineering, Technology and	International Conference	28 <sup>th</sup> Jan 2017	La-Shimmer Resort, Bhayandar Mumbai. (Organised by Abhinav college and INNAAR)

		Management			
Dr. SanchitaDatta	Online Purchase Bridging the divide in Rural India	Recent Trends in Digital Empowerme nt in Emerging Economies.	National Conference	8 <sup>th</sup> Dec. 2016	Ghanshyamd as Saraf College
Dr. SanchitaDatta	Smart Cities through Industrial Corridors	Sustainable Development : Impact on Trade, Commerce, Economies and Science	National Conference	19 <sup>th</sup> Nov. 2016	Maharashtra College
Dr. SanchitaDatta	India a survivor in the world geo- politics	Visio2050: balancing Development al needs with Ecological Issues	National Conference	20 <sup>th</sup> Dec. 2016	Royal College
Prof.VilasiniGaode	Effect of Garlic Juice on in-vitro Dental <a href="#">Biofilm</a>	Research Meet The Sajjan Gupta – Konark Memorial Awards	National	18 January 2017	VES College
<b>Faculty</b>	<b>Title of Paper</b>	<b>Theme of Conference</b>	<b>State/ National/ University Level</b>	<b>Date</b>	<b>Organiser And Venue</b>
Vilasini Gaode	Decolourization of Acid Blue Dye by Bacterial Isolates from Local Effluent	Research Meet The Sajjan Gupta – Konark Memorial Awards	National	18 January 2017	VES College
Vilasini Gaode	Biodegradation of	Research	National	18	VES College

	Engine Oil by Bacterial Isolates from Oil-polluted Waters	Meet The Sajjan Gupta – Konark Memorial Awards		January 2017	
Vilasini Gaode	Heavy Metal Tolerance of Moderately Halophilic Bacteria from Wetlands of Western Thane	Frontiers in Applied Biological and Chemical Sciences	National Symposium	10, 11 Feb' 2017	Smt. CHM College
Zamanat Syed	Primary Screening of Xylanolytic Bacteria from Marine Environment and Characterization of xylanase from <i>Gracilibacillus</i> spp.	19 th DFF (Dr Dhala's felicitation fund) Research Project Presentation	Regional	27th Aug.'16	Bhavan's College
Farhaan Makba	Comparative Study of Antibacterial Activity of Honey and Antibiotics.	Research Meet The Sajjan Gupta – Konark Memorial Awards	National	18 January 2017	VES College
Farhaan Makba	Preservation of Vegetables by Fermentation	International Virtual Congress	International	5/8/2016 to 10/8/2016	International Science Community Association
<b>Faculty</b>	<b>Title of Paper</b>	<b>Theme of Conference</b>	<b>State/ National/ University Level</b>	<b>Date</b>	<b>Organiser And Venue</b>
Dr. Mustaqeem	Ecofriendly route for the synthesis	Balancing Development	National	19/12/2016	One Day National

Mohammed	of azo dyes	need with ecological issue			Conference-Vision 2050: Balancing Development need with ecological issue at Royal College, Mira Road.
Dr. Mustaqeem Mohammed	Ecofriendly synthesis of Biginelli Products	Global Research : Value, impact and outcomes	International	05 -10th Aug 2016	3rd IVC
Dr.Chitralkha Amin	Physico chemical characterization and heavy metal content of ayurvedic bhasmas	National symposium on frontiers in applied biological and chemical sciences	National	10 <sup>th</sup> and 11th Feb 2017	CHM College Ulhasnagar
Dr. Juliet Miranda	Ecofriendly route for the synthesis of azo dyes	Balancing Development need with ecological issue	National	19/12/2016	One Day National Conference-Vision 2050: Balancing Development need with ecological issue at Royal College, Mira Road.

<b>Faculty</b>	<b>Title of Paper</b>	<b>Theme of Conference</b>	<b>State/ National/ University Level</b>	<b>Date</b>	<b>Organiser And Venue</b>
Aqeela A. S. Qureshi	GC-MS analysis of <i>Nigella sativa</i> & <i>Trigonella foenum-graecum</i> L. seed extract and study of Antibacterial effect	Global Research : Value, impact and outcomes	International	5 <sup>th</sup> -10 <sup>th</sup> August 2016	<b>3<sup>rd</sup> International Virtual Congress (IVC-2016)</b>
Aqeela A. S. Qureshi	“Chemical investigation of effluent from Chemistry laboratories of Royal college, Mira road & subsequent studies of remediation techniques”	Balancing Development need with ecological issue	National	19/12/2016	One Day National Conference- Vision 2050: Balancing Development need with ecological issue at Royal College, Mira Road.

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