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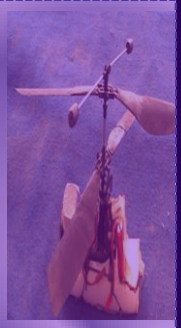

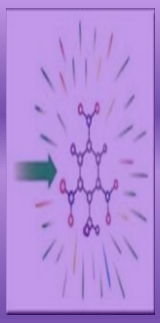

Chandrasekhar Venkata Raman
(1888-1970)

Research Committee

VPM's B.N. Bandodkar College of Science

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JB.N.Bandodkar College of Science

Editor's Message ……

The research committee is glad to present fifth volume in the form of e- issue of multidisciplinary fitness journal - **JBNB** (Journal of B.N. Bandodkar College). This volume is inaugurated on the occasion of *Science Day* by the hands of Dr. B.M.Bhanage from ICT. The primary focus of journal is to inculcate various dimensions of science for the betterment of mankind. This volume covers popular article on the first Indian Nobel prize winner C.V. Raman, about a voyage that gives opportunity to observe wonderful blue opalescence of the Mediterranean Sea. Also the other article is about smart city, Theory of Relativity and 360 analyses of volunteers.

Efforts of all the authors for their immense contribution on the dyes isolated from effluents, bacterial inhibition, oil extraction, algae and cryptology etc. The purpose of the e-journal is to develop constructive decision making, for development of good citizenship and be a part of smart India in their subjects to understand the current status of the research in various fields.

'*In the history of science, we often find that the study of some natural phenomenon has been the starting point in the development of a new branch of knowledge*."

Dr. (Mrs.) M.K.Pejaver

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

J

B.N.Bandodkar College of Science

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JBNB -16

MICROORGANISMS FROM INDUSTRIAL EFFLUENT: POTENTIAL DECOLOURIZERS OF BISMARCK BROWN Y

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ABSTRACT:

Azo dyes are a major part of synthetic dyes used in textiles, leather industries, cosmetics, food industry and many more. Some examples of these dyes are Methyl orange, Methyl red, Congo red and Bismarck brown Y. Bismarck brown Y dye was used in the current study which is known to cause health hazards in animals. Bacteria that were able to decolourize the above dye were isolated from effluent sample collected near Ulhas river, Ulhasnagar. Higher concentrations of dye were used for enrichment of these organisms and their efficiency of decolourization was checked by colorimetric analysis.

Keywords: Bismarck Brown Y, Decolourization, Bacteria, Effluent and Luria Bertani broth (LB).

INTRODUCTION:

A dye may be defined as an organic compound containing both chromophore and auxochrome groups linked to benzene rings (A. J. Salle). A chromophore group imparts to the compound the property of color (A. J. Salle).

Dyes have a wide range of industrial applications. They are used in textile industry, paper industry, leather industry, food industry, medical field, cosmetics, etc. Hence in the industries that produce dyes and also in the industries which use dyes, the effluent or the waste product generated consists of large amount of waste dyes. If such effluents are released into the rivers untreated, they can cause hazardous effects on the environment especially the aquatic environment and ultimately on human health. Chemical treatment of such effluents may be costly and may require energy; the use of bacteria in degradation of such effluents is not only financially beneficial but also environment friendly.

Microbial degradation and decolorization of azo dyes has gained more attention recently because of eco-friendly and inexpensive nature (Sudha *et.al.*, 2014). Based on the available literature, the microbial decolorization of azo dyes is more effective under combined aerobic

and anaerobic conditions (Sudha *et.al.*, 2014).

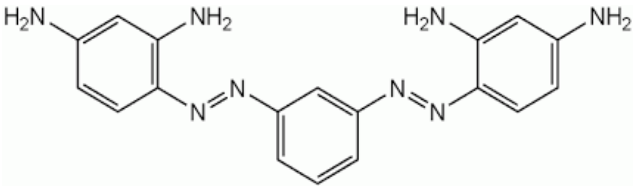

Figure 1: Structure of Bismarck Brown Y

Figure 2: Powdered Bismarck Brown Y

MATERIALS AND METHODS:

***Dyes and Media*:**

The sample was collected from the site where industrial effluent was released in the Ulhas River, Ulhasnagar. The dye used in the current study was Bismarck Brown Y obtained from Loba Chemie, Mumbai. Different concentrations - 10 ppm, 25 ppm, 50 ppm, 100 ppm, 150 ppm, 200 ppm, 250 ppm, 300 ppm, 400 ppm, 500 ppm, 750 ppm, 1000 ppm, 1200 ppm, 1500 ppm, 1750 ppm and 2000 ppm of dye were prepared in Luria Bertani media which was obtained from Himedia.

***Enrichment of dye decolourizing bacteria*:**

0.5 ml of sample was inoculated in the flask containing 10 ppm concentration of dye. This flask was incubated for 24 hrs at 37°C. Dense growth of organisms along with heavy decolourization was observed. 0.1ml sample from this flask was transferred to the subsequent flasks of higher concentrations which were further incubated at 37°C at 24 hrs.

Isolation of dye decolourizing bacteria:

Sterile agar plates of the said media were prepared in which the selected concentration of dye was incorporated. The concentrations of the dye selected for isolation were 500 ppm, 1000ppm, 2000ppm, 3000 ppm and 3500 ppm. Gram nature of isolated colonies was determined.

***Decolourization efficiency*:**

The efficiency of decolourization using one of the two isolated colonies was determined colorimetrically. The peak λ_{max} of the selected dye was found out. Absorbance of media with different selected concentrations was checked without inoculation. The selected colony was suspended in saline to prepare suspension of O.D. 0.1 at 530 nm. 0.5 ml of this suspension was added to media with selected higher concentrations (1250 ppm, 1500 ppm, 1750 ppm and 2000 ppm) and were incubated at 37°C for 24 hours. After 24 hours of incubation 10 ml of

sample was taken from the flask which was transferred into the centrifugation tube aseptically. The tubes were then centrifuged at 7500 rpm for 2 minutes. The supernatant was collected and was checked for absorbance at 470 nm. Sterile Luria Bertani broth was set as blank.

Formula:

The efficiency of decolourization by the selected bacteria was checked by using the following formula (Sneha *et. al.*)-

$$\% \text{ decolourization} = \frac{[A_0] - [A_t]}{[A_t]} \times 100$$

Where, A_0= Initial absorbance

A_t= Absorbance after incubation

RESULTS AND DISCUSSIONS:

Decolourization:

It was observed that the sample culture was able to decolourize the selected dye in all the prepared concentrations. The extent of decolourization was found to decrease with increase in the concentration of the dye. However complete decolourization of the dye was not observed in any of the flasks. The peak λ_{max} of the solutions was found to be 470 nm. Hence the initial and final absorbances of the selected higher concentrations were found out at 470 nm. Their % decolourization was calculated with the help of the formula mentioned above and the values obtained are listed in table 2.

Isolation of the dye decolourizing bacteria:

On isolation two organisms were found to be decolourizing the selected dye. Out of the two, the bacteria showing most abundant growth was used to check its decolourizing efficiency on the selected dye. Their colony characteristics are listed in table 1.

Colony Characteristics	**Colony 1**	**Colony 2**
Size	Pinpoint	Large
Shape	Punctiform	Circular
Elevation	Flat	Flat
Colour	Dirty white	Dirty white
Opacity	Opaque	Opaque
Margin	Entire	Entire
Consistency	Butyrous	Butyrous
Gram nature	Negative	Positive
Morphology	Coccobacilli	Bacilli

Table 1: Colony Characteristics of Isolates.

Concentration of the dye (ppm)	**%**
1250	50 %
1500	48.88%
1750	9.448%
2000	5.63%

Table 2: Percentage decolourization by the bacteria.

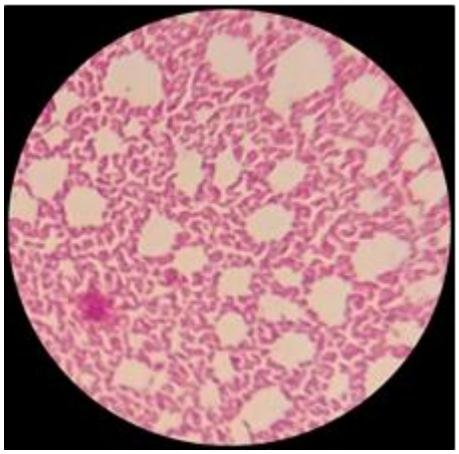

Figure 3: Colony 1

Figure 4: Colony 2

CONCLUSION:

There were many references found for photocatalytic degradation of Bismarck Brown Y. Microbial degradation may prove to be comparatively cheap and it can be used at an industrial scale as well. This technique being cost effective may have future prospects of bioremediation.

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J BNB -16

METHYLENE BLUE AS AN ALTERNATIVE HILL REAGENT: A PRELIMINARY STUDY

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ABSTRACT:

Hill reaction is an in vitro reaction which involves photoreduction of an artificial electron acceptor(Hill reagent) by water. 2,6-Dichlorophenol-indolphenol (DCPIP), a redox dye is the most commonly used electron acceptor. The present study involves the use of Methylene blue as a cheap alternative for DCPIP. A substantial reduction in colour of Methylene blue was observed gradually in a span of one hour indicating it to be a potent Hill Reagent.

Keywords: Hill reagent, Methylene blue, DCPIP, Chloroplast, Photoreduction

INTRODUCTION:

Robert Hill (1930s) showed that if isolated thylakoids are combined with a redox dye that shows different color in oxidized and reduced forms, electron flow (during photosynthetic electron transport) could be measured directly with a spectrophotometer. The process of photophosphorylation in vivo involves acceptance of electron released from water by NADP. Hill studied this photosynthetic electron transport in vitro using isolated chloroplasts and a redox dye as artificial electron acceptor instead of NADP. The dye that he used was **DCPIP (2,6-dichlorophenol-indolphenol)**. When DCPIP accepts electrons, it changes from a blue to a colorless state and the change can be monitored spectrophotometrically at 620 nm. This *in vitro* photosynthetic electron transport process from water to DCPIP is called the **Hill reaction** and DCPIP that accepts electrons from the photosynthetic electron transport pathway is called as Hill Reagent.

DCPIP(oxidized) + 2e- —> DCPIP(reduced)

Blue **Colorless**

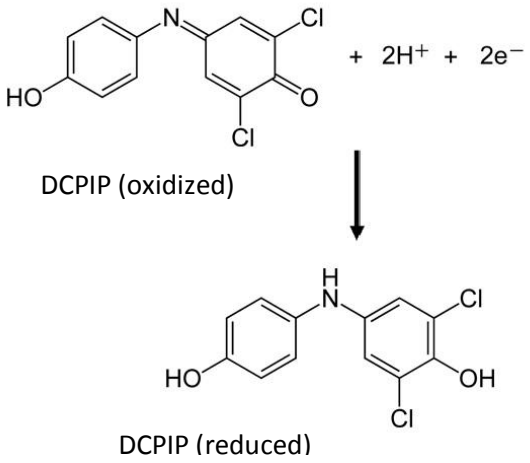

Fig.1 Reduction reaction of DCPIP

Thus, the rate at which electron transport occurs in the Hill reaction can be measured

spectrophotometrically (at 620 nm) by following the change in absorbance of DCPIP as it accepts electrons from the electron transport chain. After each exposure period, the absorbance of the DCPIP will be measured. The absorbance values can then be plotted versus time to determine the rate of DCPIP reduction.

DCPIP is a very expensive chemical. Hence, in the present study Methylene blue is used as a cheap alternative for DCPIP. Methylene blue, like DCPIP, is blue in oxidized form and colourless (leucomethylene blue) in reduced form (Fig.2)

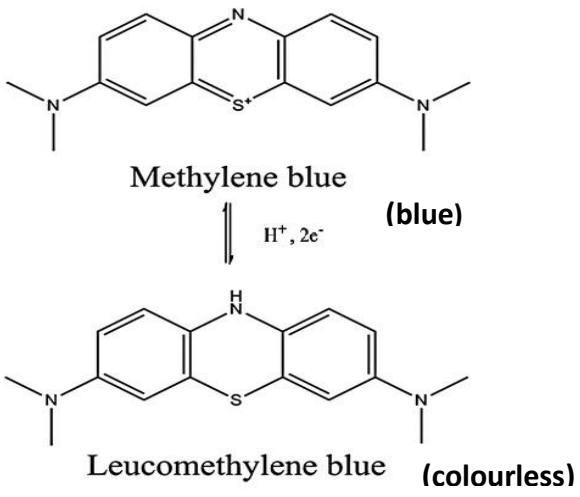

Fig.2 Reduction reaction of methylene blue

MATERIALS AND METHODS:

Extraction of Chloroplast:

Chloroplasts from spinach leaves were isolated in the following manner: 5g of fresh spinach leaves (without petiole and mid-vein) were ground in a chilled mortar with 25ml 0.5 M ice-cold sucrose buffer .The homogenate was filtered through muslin cloth in chilled centrifuge tubes. The tubes were subjected to centrifugation for 10 minutes at 1,000 rpm. The supernatant obtained was further centrifuged at 1000 rpm for 12 minutes. The pellet was resuspended in 10 ml 0.5M sucrose buffer. This was used as the chloroplast source. The source was always kept in ice bath.

Preparation of reaction mixture and measurement of Methylene blue reduction:

The reaction mixture used in the study was as follows:
1ml chloroplast source + 1 ml Methylene blue (0.001%) + 4 ml 0.5M sucrose buffer.
The reaction mixture was exposed to sunlight for 60 minutes. Methylene blue reduction was measured colorimetrically at an interval of 10 minutes at 620 nm.
One set of reaction mixture was kept unexposed to sunlight for control studies.

RESULT AND DISCUSSION :

On exposure to sunlight the reaction mixture showed gradual reduction in a span of an hour (Table 1). Methylene blue the blue in color has reduced in leuco. The color of spinach is green and its extraction in buffer produced chloroplast through the reaction in relation to time showed decrease the hill reaction (table 1).
Colorimetric estimation of dyes gives idea of chrome group which is responsible for the color to the dyes having industrial application.

Time (minutes)	Absorbance at 620 nm
0	0.46
10	0.43
20	0.40
30	0.39
40	0.36
50	0.33
60	0.31

Table 1: Colorimetric estimation of Methylene blue reduction

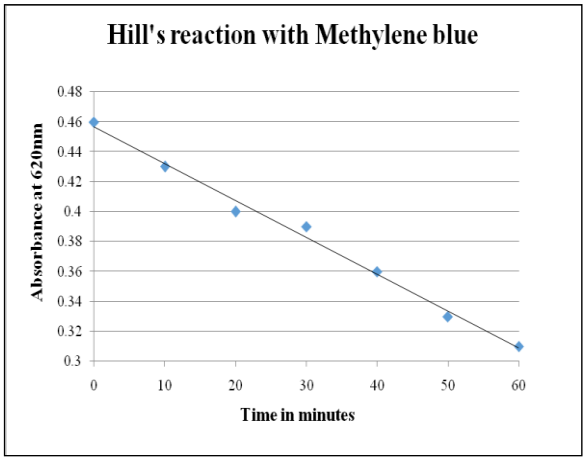

Figure 3: Graph of Methylene blue reduction

CONCLUSION:

Methylene blue showed gradual but substantial reduction in a span of one hour. Thus it can be used as a cheap alternative over DCPIP. This was a preliminary study to confirm the use of Methylene blue as a hill reagent; though it is less efficient than DCPIP its use in laboratory demonstration of Hill reaction can prove to be cost-effective.

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JBNB -16

AVIFAUNAL DIVERSITY IN AND AROUND VIDYA PRASARAK MANDAL CAMPUS, THANE, MAHARASHTRA, INDIA.

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Abstract: Avifaunal diversity is an indicator of health of the ecosystem of an area. They perform important functions in the ecosystem like pollination of flowers, dispersal of seeds and occupy important position in the food chain. Monitoring bird population provides information about ecological status of an area. Bird diversity Vidya Prasarak Mandal's "Jnanadweep" was assessed using line transects and point count method. Total 38 species from 11 different orders were observed with domination of Passerines (46%) over non Passerines (54%). Feeding habits showed dominance of carnivory which can be attributed to creek and mangroves present besides the campus providing good prey base. Area shows good diversity considering the location and the human disturbances but there is scope to plant more indigenous trees in order to increase nesting potential of the campus.

Keywords: Jnanadweepa, Avifauna, Migratory species, Resident Species.

INTRODUCTION:

Aves are one of the most diversified classes of vertebrates that inhabit almost all habitats on the planet. They are found in tropics, desserts, oceans, mountains and even Polar Regions. Their bright colours, displays, nests, songs and calls make them one of the most favorite creatures of mankind.

Along with the recreational enjoyment, they play an important role in maintaining ecological balance of the ecosystem and provide a broad array ecosystem services. Birds represent various trophic levels from primary consumers to the apex predator in the food chain. They are also responsible for reproduction of many plant species either by acting as a pollinator or seed dispersers.

Today, anthropogenic disturbances leading to climate change and habitat loss are considered as main reasons for decrease in the bird population and species diversity (Case study, Bird Life International, 2008). Many species are already extinct and many more are on the verge of extinction. IUCN Red List of endangered birds has already recognized 1226 bird species as threatened globally and India with 88 threatened bird

species is ranked at seventh position (BirdLife International 2010). Owing to this, it is essential to study avifaunal diversity at local level to assess the extent of environmental changes for sustainable development (Furness and Greenwood, 1993; Newton, 1995; Ali, 1996; Daniels, 2005; Chamberlain et al., 2007; Rotenberry and Wiens, 2009). Changes in the population and species composition of local birds help to speculate ecological and environmental cues to climate change and habitat status. Also study of avifaunal diversity is an essential ecological tool which acts as an important indicator to evaluate different habitats both qualitatively and quantitatively (Bilgrami, 1995).This study reveals avifaunal diversity and its status in and around VPM Campus, Thane, Maharashtra.

Study area:

The study was undertaken in June 2014 to January 2016 the Vidya Prasarak Mandal's "Jnandweepa" campus, (19.189586 N 72.981101 E), Thane, Maharashtra. The city encompasses variety of habitats such as Sanjay Gandhi National Park, Yeoor and Parsik hills, Thane creek with mangrove vegetation and numerous lakes. The diversity of habitats is thus also reflected in the flora and fauna observed in the city. The peculiarity of this location is, it surrounded by Thane creek with dense mangroves species like *Avicennia marina* on one side and highly crowded city area on the other side. The 13.5 acres of campus has got many trees, most of which are indigenous, well maintained gardens with variety of flowering plants and open areas covered with different grass species thus attracts different kinds of bird species to the campus.

"Jnandweepa" or VPM campus is located in the heart of the Thane city at an average elevation of 7 m MSL. The

MATERIALS AND METHOD:

The study was carried out using line and point count survey method. The garden pathway known as "Jnanpath" (Knowledge Path) of around 750 m which runs along the campus periphery was trailed to carry out avifaunal sampling. The birds were recorded using direct sampling method during the survey, along with activity such as feeding,

Nesting etc. The nesting behavior of different species was also noted along with plant species.

Identification of birds was confirmed using fields guides such as "Birds of Indian Subcontinent" (2013) by Grimmet R., Inskipp C. 2nd edition. Photographs were captured where ever possible. Opportunistic sightings and observations were also collected during the survey period and were considered for analysis.

Further, birds were categorized as (classification suggested by Ali, 2012): **R** – Resident (Indigenous birds) and **WM** – Winter Migratory and **MM** – Monsoon Migratory.

RESULTS AND DISCUSSION:

Total 38 species of birds from 11 different orders were observed during the survey period (Table 1). The area is dominated by Passerines (47%) over other 10 orders of non Passerines which together contributed to remaining 54% of the diversity.

Table: 1: Checklist of Bird Species

S. N	Birds	Scientific Name	Feeding type	Status
I	Accipitriformes			
1	Black kite	*Milvus migrans*	C	R
2	Brahmniey kite	*Haliastur Indus*	C	R
II	Charadriiformes			
3	Red wattled lapwing	*Vanellus indicus*	C	R
4	Wood sandpiper	*Actitis hypoleucos*	C	WM
5	Brown headed Gull	*Chroicocephalus brunnicephalus*	C	WM
6	Little stint	*Calidris minuta*	C	WM
III	Ciconiformes			
7	Cattle egret	*Bubulcus ibis*	C	R
8	Pond Heron	*Ardeola grayii*	C	R
9	Western reef egret	*Egretta gularis*	C	R
10	Little egret	*Egretta garzetta*	C	R
IV	Columbiformes			
11	Blue rock pigeon	*Columba livia*	G	R
12	Spotted dove	*Spotted dove*	G	R
V	Cuculiformes			
13	Asian Koel	*Eudynamys scolopaceus*	F,I	R

14	Southern cocoul	*Centropus sinensis*	C,I	R
VI	Coraciiformes			
15	White throated Kingfisher	*Halcyon smyrnensis*	C	R
16	Green beeeater	*Merops orientalis*	I	R
VII	Gruiformes			
17	White breasted Waterhen	*Amaurornis phoenicurus*	I	R
VIII	Passeriformes			R
18	House sparrow	*Passer domesticus*	O	R
19	House crow	*Corvus splendens*	O	R
20	Jungle crow	*Corvus macrorhynchos*	O	R
21	Common Myna	*Acridotheres tristis*	O	R
22	White throated fantail	*Rhipidura albicollis*	I	R
23	Common Tailor bird	*Orthotomus sutorius*	I	R
24	Purple sunbird	*Cinnyris asiaticus*	N	R
25	Black drongo	*Dicrurus macrocercus*	I,N	R
26	Red vented bulbul	*Pycnonotus cafer*	O	R
27	Scaly breasted munia	*Lonchura punctulata*	O	R
28	Purple rumped sunbird	*Leptocoma zeylonica*	N	R
29	Ashy prinia	*Prinia socialis*	I	R
30	White cheecked bulbul	*Pycnonotus leucotis*	O	R
31	Red Whiskered bulbul	*Pycnonotus jocosus*	O	R
32	Indian Golden Oriole	*Oriolus kundoo*	F,N	R
33	Oriental Magpie robin	*Copsychus saularis*	I	R
34	Long tailed Shrike	*Lanius schach*	I,F	R
35	Tickell's Blue flycatcher	*Cyornis tickelliae*	I	R
IX	Piciformes			
36	Coppersmith barbet	*Megalaima haemacephala*	F	R
X	Psittaciformes			
37	Rose ringed parakeet	*Psittacula krameri*	F	R
XI	Suliformes			
38	Little cormorant	*Microcarbo niger*	C	R

(C: Carnivorous, F: Frugivorous, I: Insectivorous, O: Omnivorous, N: Nectarivorous, G: Grainivorous); (R: Resident, M: Migratory)

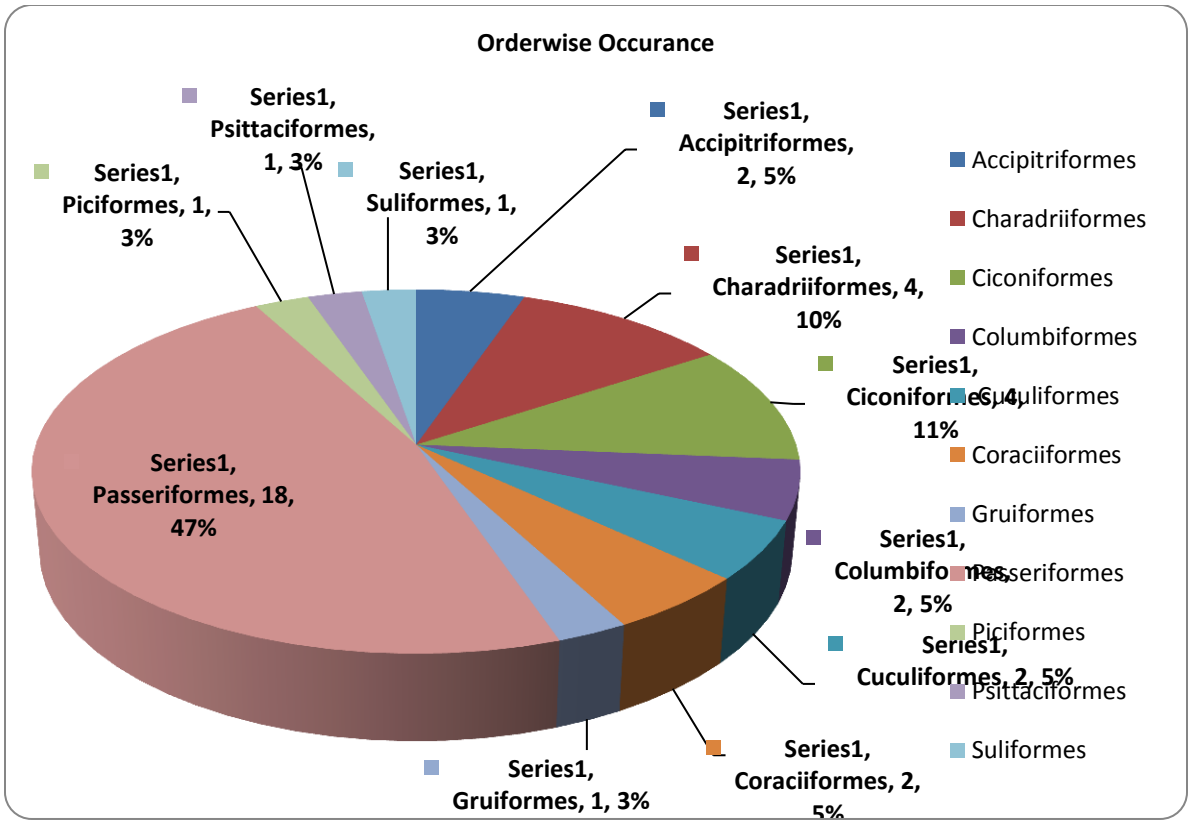


Fig: 1: Orderwise Occurance of Species

The passerines contributed 18 species while non passerines comprised of 20 species from orders; Accipitriformes 2 spp.(5%), Charadriformes 4 spp. 10%), Ciconiformes 4 spp. (10%), Columbiformes 2 spp. (5%), Cuculiformes 2 spp.(5%), Coraciiformes 1 spp. (2.83%), Cuculiformes 2 spp. (5.71%), Gruiformes 1 spp. (3%), Piciformes 1 spp.(3%), Psittaciformes 1 spp. (3%) and Suliformes 1 spp. (3%) (Fig: 1). The dominance of the passerines at the study site can be attributed to diversity in plant habits such as trees, shrubs and herbs.

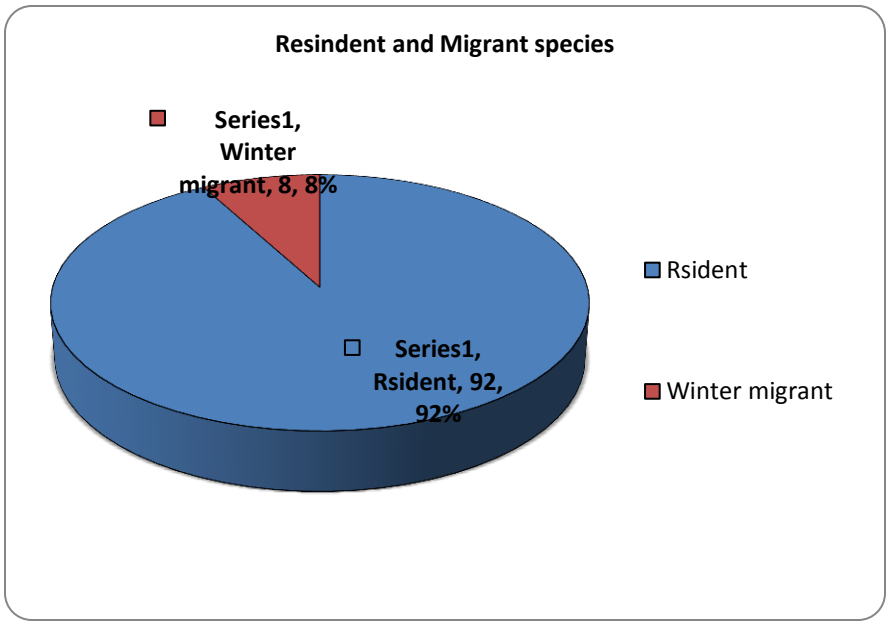


Fig.2: Resident and Migrant Species

Migration:

Mumbai and Thane region is an annual hub for migratory birds which visit to the mudflats and creeks in every winter. There are around 150 migratory bird species which are recorded in Mumbai and thane region. As our study was only restricted to VPM campus we could only observe few migratory species which were in the vicinity of the college campus. Out of total birds, migratory avifauna contributed about 8% while remaining 92% by resident species. More extensive surveys are necessary in order to have conclusive results.

Feeding behavior:

In the present study, highest proportion of feeding habit was found to be Carnivory it means that most of the bird species (34%) were carnivorous, followed by Insectivorous and Omnivorous species (24% and 21% respectively). Frugivorous, Nectarivorous and Grainivorous species contributing 11%, 5% and 5% to the total feeding diversity of the area respectively (Fig.2).

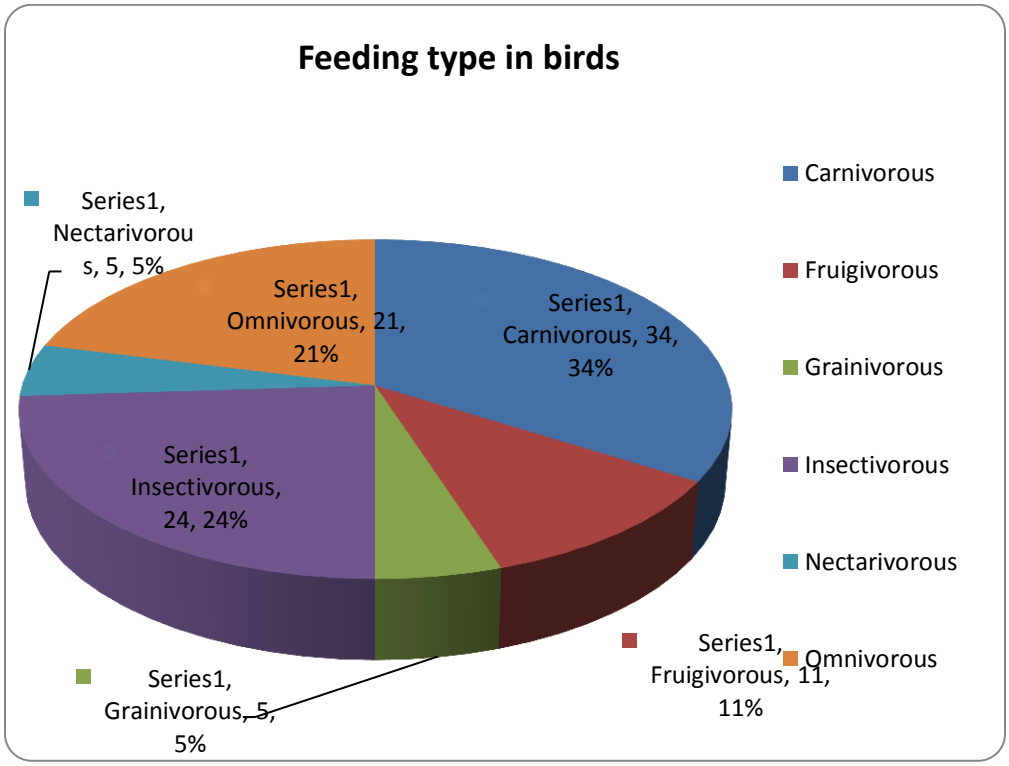


Fig: 3: Feeding Type

Out of 38 species of birds found in the campus, 13 are carnivores of which 9 species are aquatic species found in Thane creek.

Feeding conditions and structure of land surface are two main factors that determine the distribution of number of birds (Tryjanowski, 2005). The presence of Thane creek in the vicinity of the campus could be the reason for the abundance of carnivorous species, which might be providing them with a rich prey base such as rodents, invertebrates etc. College Canteen, human settlements in the vicinity and grass patches in the study area supports good population of insects, lizards and rodents which might be attracting other carnivorous and insectivorous species like Kites, Kingfisher, Magpie robin, prinias and drongos.

Fruit plant species like Custard apple, Mango, False Ashoka etc. could be the reason for presence of frugivorous species like Oriole, Coppersmith barbet, Parakeet and Koel. Also, nectivorous species like Sunbirds, drongos have been seen feeding on nectar of flowering species like *Bauhinia spp.*, *Bombax ceiba* etc.

The area also provides nesting sites for variety of bird species. Species like *Terminalia cattapa, Suru, Tamarindus indicus, Prosopis/Acacia, Cana indica* have been observed with the nests of various birds like Crows, Magpie robin, Oriole, Coppersmith barbets, Tailor bird bulbuls etc.

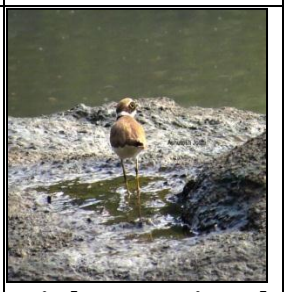
The diversity of ecosystems reflects in the diversity of flora and fauna. Studies by Singh U. and Ambavane P. (2013) is a work done on similar a heterogeneous habitat near *Thakurli* village, shows 86 bird species consisting mangroves farmlands and trees. This heterogeneity provides birds with their microniches. Another study by Khushwaha S. and Kulkarni N. (2013) shows presence of 135 species at Betawde which is again mixed area with diverse ecosystem like farmland, Scrubland, Wetland, forest etc. But both these areas have much larger spatial expanse as well as lesser anthropogenic disturbance compared to our study area which is 13.5 acre land in midst of a metropolitan city. The place might also be an important and secured stop for many passing birds species. Thus, it serves as an Urban Island, which is of immense importance for the local movement of birds and other species.

To conclude, the area shows fairly good diversity of avifauna considering the location and the human disturbance in the study site.

Wood sandpiper

Tickell's Blue Flycacther

Brown headed Gull



Little ringed plover

The no. of species resident or nesting in the campus is relatively less thus plantation of indigenous tree species should be promoted which can serve with potential niches for nesting for different species. Native fruiting and flowering plant species can also be introduced in the campus so that more and more Nectivorous and Fruigivorous birds can be attracted to the area.

Acknowledgement:

Authors are thankful to Vidya Prasarak Mandal, Thane for developing such diverse ecologically rich campus and for the

infrastructural facilities that were provided for the study.

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JBNB -16

SCREENING OF MICROALGAL POPULATION OF TWO LAKES IN THANE CITY

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Abstract:

Algae ; a plant-like organism that are usually photosynthetic and aquatic in nature but do not have true roots, stems, leaves, vascular tissue. The microalgae are used for food and biofilters to pollutants from waste water, in cosmetic and pharmaceutical products and it is also good source for biofuel production because of their high oil content and rapid biomass production. Algal toxins are just as diverse as the organisms that produce them. The toxins are typically grouped by their main mode of action, such as hepatotoxins, dermatotoxins. In the current study, water samples from Siddheshwar and Hariyali Lake were screened for microalgae and their future use.

Keywords: Microalgae, Lakes, Thane, Siddheshwar, Hariyali

Introduction:

Algae are one of the major components of ecosystem of all the lakes. There are different types of algae such as macroalgae and microalgae. Algae are photosynthetic organisms and they are ultimate source of both cellular carbon and chemical energy for other organisms. Therefore, they often called as Primary Producer.

Microalgae are microscopic unicellular organisms capable to convert solar energy to chemical energy via photosynthesis, for such as *Spirulina*, *Spirogyra*, *Volvox*, *Euglena*, *Chlorella* etc.

They contain numerous bioactive compounds that can be harnessed for commercial use. The potential of microalgal photosynthesis for the production of valuable compounds or for energetic use is widely recognized due to their

more efficient utilization of sunlight energy as compared with higher plants. Microalgae can be used to produce a wide range of metabolites such as proteins, lipids, carbohydrates, carotenoids or vitamins for health, food and feed additives, cosmetics and for energy production. (Ivaylo Sirakov et al 2015)

Nowadays, there are numerous commercial applications of microalgae such as microalgae can be used to enhance the nutritional value of food and animal feed owing to their chemical composition; they play a crucial role in aquaculture and they can be incorporated into cosmetics. Microalgae have three fundamental attributes that can be converted into technical and commercial advantages. They are genetically a very diverse group of organisms with a wide range of physiological and biochemical characteristics. In recent years, microalgae apart from being used as single-cell proteins, they are projected as living-cell factories for the production of bio-fuels and various beneficial bio-chemicals used in food, aquaculture, poultry and pharmaceutical industries due to presence of different useful compounds.

Materials and methods:

Sample collection:

Algal water samples were collected from 'Siddheshwar Lake' located at Mahadev Gopal Patil road, Thane west, between the slum areas near eastern express highway and 'Hariyali Lake', Daulat Nagar, Thane East. A liter of each sample was collected in sterile container.

Identification:

Both the water sample was observed under low power (10X) and high power (40X) in compound microscope.

Results and Discussion:

Algal cells which were collected from Siddheshwar Lake accumulated at the top of the container [Figure 1 (a)] while algal cells from

Hariyali Lake sedimented at the bottom of container [Figure 1 (b)].

Figure 1 (a)

Figure 1 (b)

The diverse species of microalgae observed in water samples of Siddheshwar Lake and Hariyali Lake are shown in figure 2 and 3 respectively.

Conclusion:

Varieties of algae were observed from water samples of Siddheshwar Lake and Hariyali Lake. The important algal species can be further enriched using media like Guilard Media, F/2 Medium, Algal Culture Broth, TMRL Media (Tung Kang Marine Research Lab).

These species could be further subjected to processing for environmental and mankind's benefit.

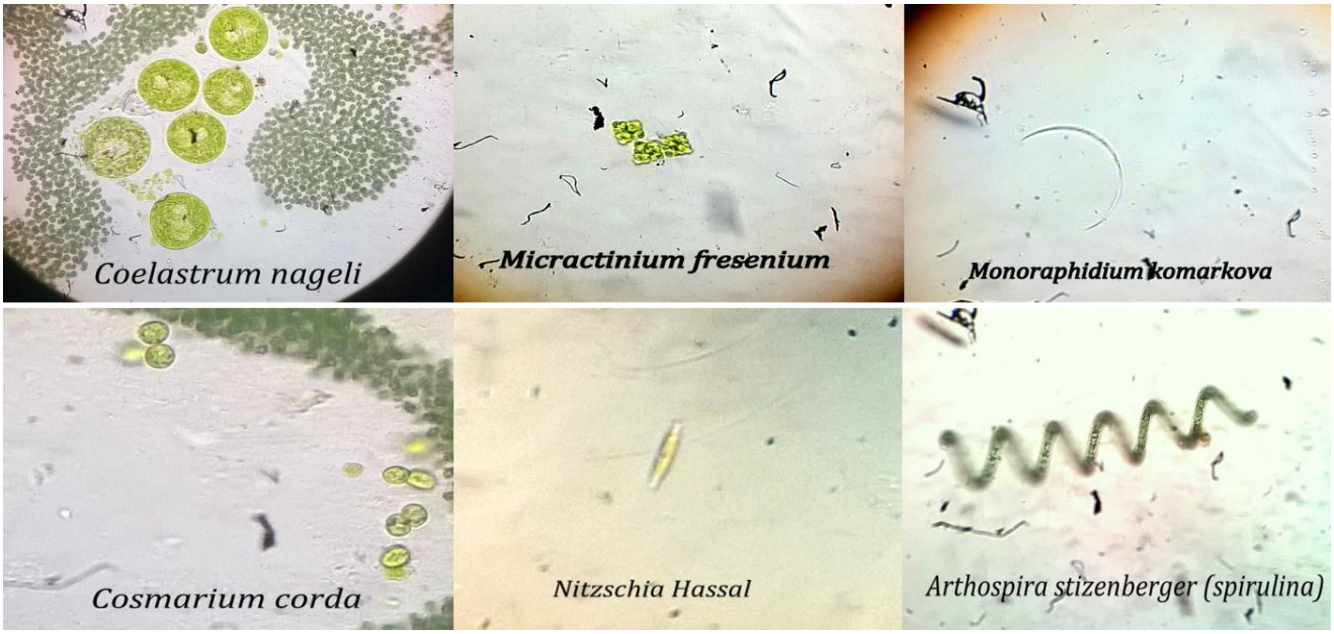
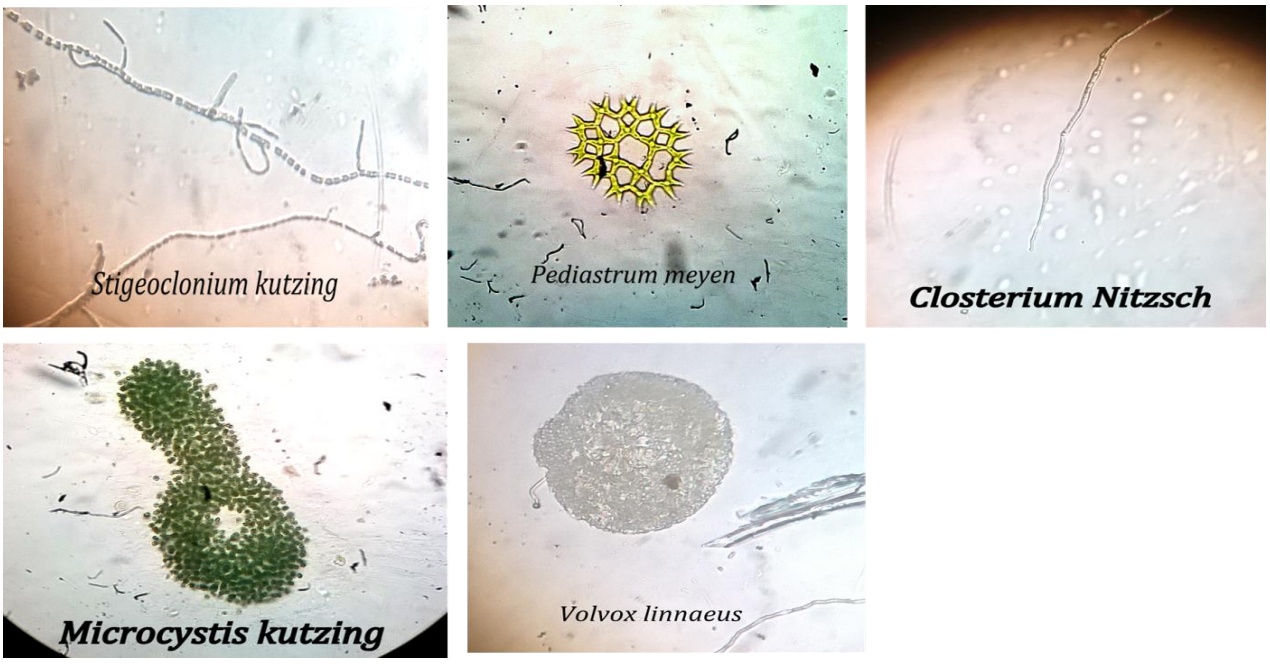


Figure 2 Microalgal populations from Siddheshwar Lake (as observed under 40 x magnification).



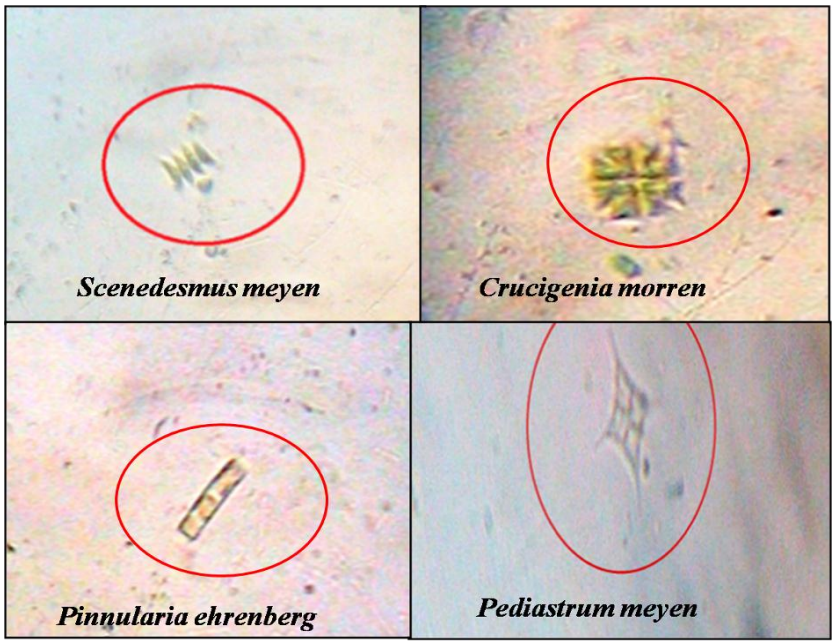


Figure 3 Microalgal population from Hariyali lake (as observed under 40x magnification).

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JBNB -16

COMPARATIVE STUDY OF NUTRITIVE VALUE, PHENOLICS AND ANTIOXIDANT ACTIVITY THREE VARIETIES OF *CAPSICUM ANNUM*.

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ABSTRACT:

In the present study, Capsicum *annuum* L. var. frutescence; *Capsicum annuum* var. Glabriusculum; and *Capsicum annuum* var. Bell pepper were investigated for their total bioactive compounds and the antioxidant activity. By Iodine titrimetric method, vitamin C contents in all varieties of chilies were found between 4-8mg/5gm of fresh weight chilly. Maximum vitamin C was found in bell pepper at the intermediate stage of yellow colour. The fruits of Capsicums were extracted with organic solvents for estimation of total phenolic contents, total carbohydrate, protein contents and antioxidant activity. The antioxidant activities were analyzed using FRAP scavenging assay. Green Bell pepper showed the highest amount of antioxidants, 10 to 18 gm/100gm and the total Phenolic content of 1.567gm/100gm was recorded. These all chili varieties may be used as direct vegetable or as salad. *Capsicum annum* cultivars bell pepper can be used as valuable flavor with functional properties for foods for their high content of bioactive compounds.

Keywords: *Capsicum annuum*, antioxidants, primary and secondary metabolites, nutrition.

INTRODUCTION:

Bell peppers (*Capsicum annuum*) are part of the Solanaceae family. They are grown throughout the world and Pepper fruits (*Capsicum annuum* L.) are important vegetables and are also used as spices.

Peppers are good source of vitamins C and E as well as provitamin A and carotenoid compounds with well-known antioxidant properties. Hot cultivars are rich in

capsaicinoids, alkaloids with pharmacological properties giving the specific taste to pepper fruit. There are flavonoids and phenolic compounds in cultivars and presence of derivatives of cinnamic acid and flavonoids have also been found in pepper fruits. Phenolic compounds are an important group of secondary metabolites, which are synthesized by plants as a result of plant adaptation to biotic and abiotic stress conditions (infection, wounding, water stress, cold stress, high visible light). Ascorbic acid is a required human nutrient and functions primarily as an antioxidant in biological systems, preventing common degenerative processes. Testing of ascorbic acid derivatives on cancer cells showed ascorbic acid esters to have promising anticancer activity. Ascorbic acid found in most fruits and vegetables also provides protection against heart disease, high cholesterol, high blood pressure and cancer. In recent years; phenolic compounds have attracted the interest of researchers because they show great potential of being powerful antioxidants that can protect the human body from free radicals, the formation of which is associated with the normal natural metabolism of aerobic cells. It prominently shows the presence of some phytochemicals such as capsaicin, capsaicinoid. Capsaicin is a thermogenic agent, which increases metabolic activity. This, in turn, helps to burn calories and fats. Many popular "fat-burning" supplements in the market contain capsaicin. Their high bioactive compounds content and importance as dietary antioxidants has increased interest in *Capsicum* fruit. Thus, the primary objective of this study was to determine the concentration of each nutritive component such as phenolics, vitamin C, carbohydrates, protein content, and antioxidant activity in 3 capsicum fruit cultivars *viz.*, red, yellow and green pepper.

MATERIALS AND METHODS:

Sample extraction:

Sample extracts were obtained by solvent extraction method. A ground sample 5 gm of

each varieties of *C. annuum* was homogenized with 5ml of each solvent *viz.*, Ethanol, Methanol, Chloroform and Distilled water. The extracts were filtered through muslin cloth, air dried and then the powdered extracts were stored till further use.

Total Phenolic content:

The total phenolic content was measured colorimetrically following the procedure outlined by Ranajit Kumar Shaha et al (2013).

Determination of Carbohydrate Content:

Presence of carbohydrates was determined qualitatively with the help of Molisch Test. DNSA (Dinitrosalicylic acid) method, which is a simple and characteristic method for detection of reducing sugar was used here.

Determination of ascorbic acid content:

Iodometric titration method was used to determine the vitamin C content of the sample extracts as outlined by Dereje Alemu Bekele et al (2015).

Determination of Protein Content:

Proteins can be determined qualitatively and quantitatively. Qualitative determination was accomplished by Folin-Lowry method. For quantitative detection Biuret's reagent and standard protein solution of BSA Bovine Serum Albumin (10µg/ml) was used.

Determination of ferric reducing antioxidant potential (FRAP) Antioxidant capacity:

The ferric reducing power of the chili extracts was determined by using potassium ferricyanide-ferric chloride method (Oyaizu, 1986) and outlined by Ranajit Kumar Shaha et al (2013).

RESULTS AND DISCUSSIONS:

Phenolic content:

Large amount of phenolics 1.9 gm /100 gm were found in methanolic extract of green capsicum. But relative to green capsicum the red capsicum showed maximum phenolics in all the extracts ranging from 1.5 to 1.7gm/100gm except in chloroform extract which showed 0.56 gm/100gm. While in

yellow and green capsicum ethanolic, methanolic, D/W extracts showed phenolics ranging between 0.7 to 1.5 gm /100gm and for chloroform extracts it was found less, ranging in between 0.5- 0.8 gm / 100 gm of capsicum. (Table 1 and figure1). Thus, for phenolic assay chloroform was not found to be a preferable solvent as it gave less content.

Carbohydrate content:

On an average the Red and Yellow capsicum gave highest content of carbohydrates ranging from 6.5-22gm/100 gm in all the extracts. While the highest carbohydrate content was found to be 23gm/100gm in methanolic extract of Green capsicum. Green capsicum as compared to other two cultivars showed less carbohydrate content ranging from 2.3 to 5.4gm /100gm. (Table 1 and Figure 2). For carbohydrate content D/W and methanolic extracts were found to be significant.

Ascorbic acid content:

Peppers have the highest ascorbic acid content of the vegetables e.g. consumption of 100 g fresh weight of peppers provides 100% - 200% of the recommended dietary allowance of ascorbic acid. Peppers are good source of Vitamin C, E and pro-vitamins. According to which the highest ascorbic acid content was obtained in the Ethanolic and Chloroform extracts of green capsicum in the range of 7.04-7.52 mg/5 gm. Red and yellow bell pepper showed ascorbic acid content ranging between 3.4-6.16 mg/5 gm in all the four extracts. Comparing with other two fruit cultivars Green capsicum showed presence of higher Ascorbic acid content ranging from 4.4mg to 7.52 mg/5 gm in all the four extracts. (Table 1 and figure 3).

Protein content:

Proteins were qualitatively determined by Folin-Lowry method. Chloroform extract of red bell pepper and methanolic extracts of green bell pepper showed the recognizable blue coloration at higher amount.

Quantitative estimation of proteins was done by using Biuret Test. The methanolic extract of Green bell pepper showed the

maximum amount of protein 18.6gm/100gm of capsicum. The phenolics were also detected in high amount in methanolic extract of green capsicum so it illustrates that phenolic content and protein content have a relation. (Table 1 and figure 4).

Antioxidant capacity of peppers by Ferric Reducing Action Potential:

Capsicum has various organic compounds which comprises of phenols, polyphenols, carotenoids, etc. These compounds are anti-oxidant in nature. Antioxidants are powerful nutrients that protect the healthy cells of the body from the negative effects of free radical compounds that result from a variety of causes such as normal metabolic reactions in the body, cigarette smoke, pollution and sun exposure.

Methanolic extract of Green bell pepper was detected with the highest anti-oxidant capacity. By comparing the absorbance of all the three varities, the green capsicum showed highest absorbance values at 700 nm. Those were viz. Ethanolic extract -0.18, methanolic extract-0.28, chloroform extract-0.20 and Distilled water extract-0.13. (Table 1 and figure 5).

Name of extract (0.2mg/ml)	Phenolic content	Carbohydrate content	Ascorbic acid content	Protein Content	Antioxidant capacity
	(gm/100 gm of capsicum)	(gm/100 gm of capsicum)	(mg/5 gm of capsicum)	(gm/100 gm of capsicum)	Absorbance at 700 nm
ETHANOL (RED)	1.56	17.8	5.28	7.56	0.16
METHANOL (RED)	1.02	6.15	4.40	5.92	0.06
CHLOROFORM(RED)	0.52	4.11	3.52	2.46	0.11
D/W (RED)	1.78	13.72	1.76	10.29	0.08
ETHANOL (YELLOW)	0.87	9.40	3.52	5.71	0.14
METHANOL (YELLOW)	1.08	4.75	6.16	9.51	0.18
CHLOROFORM(YELLOW)	0.89	8.91	5.28	7.48	0.10
D/W (YELLOW)	1.08	12.38	4.40	12.38	0.09
ETHANOL (GREEN)	0.47	2.94	7.04	6.72	0.18
METHANOL (GREEN)	1.99	23.12	1.76	18.20	0.28
CHLOROFORM(GREEN)	0.76	5.41	7.52	7.65	0.20
D/W (GREEN)	0.99	5.21	3.52	13.26	0.13

Table 1: Bioactive compounds and antioxidant capacity of extracts of 3 *Capsicum* varieties in 4 different solvents.

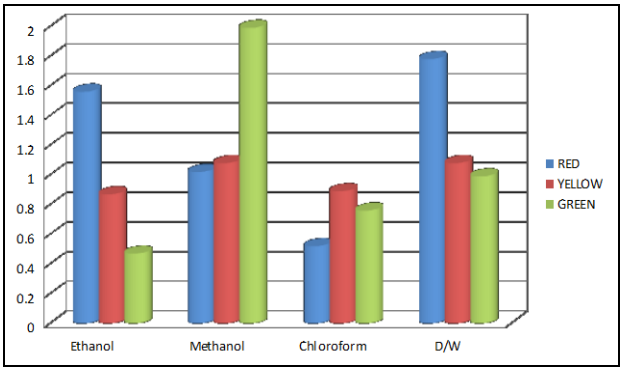

Figure1 Comparative graph showing phenolic contents of
extracts of 3 *Capsicum* varieties in 4 different solvents

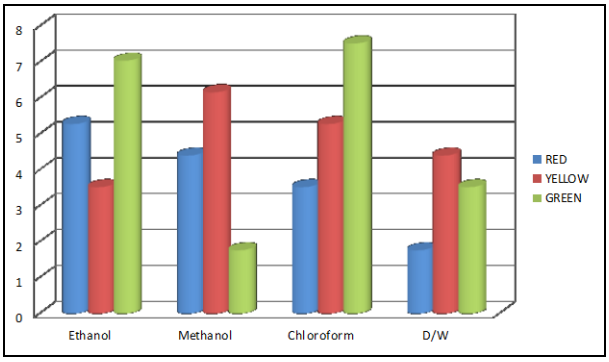

Figure3 Comparative graph showing ascorbic acid contents of extracts of 3 *Capsicum* varieties in 4 different solvents.

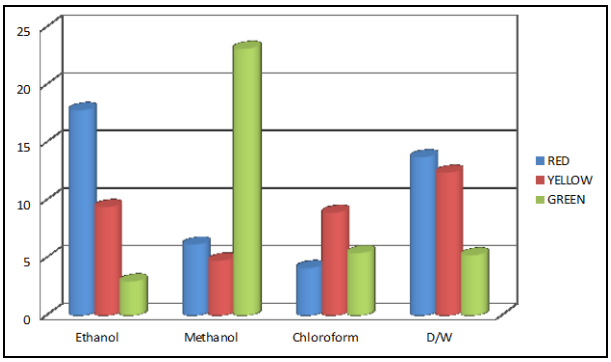

Figure 2 Comparative graph showing carbohydrate contentsof extracts of 3 *Capsicum* varieties in 4 different solvents.

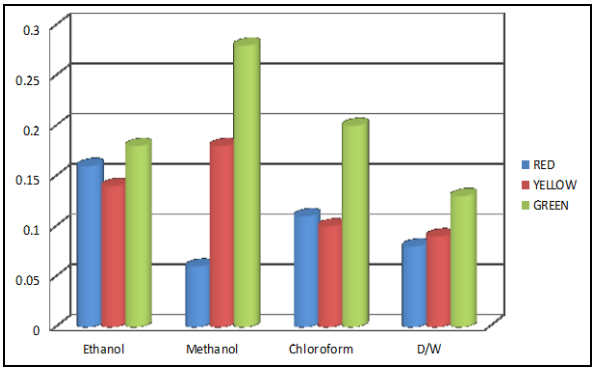

Figure 4 Comparative graph showing protein contents of extracts of 3 *Capsicum* varieties in 4 different solvents

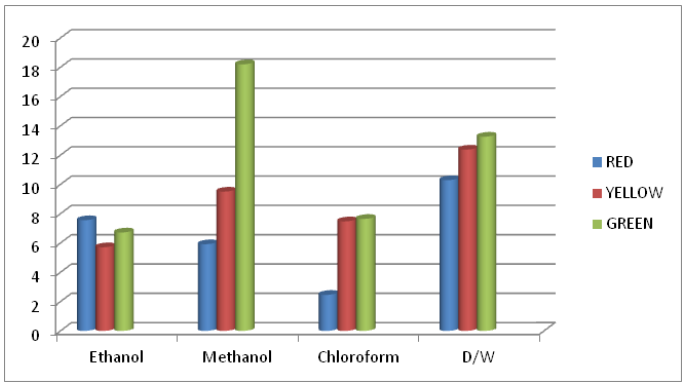

Figure 5 Comparative graph showing antioxidant activities of extracts of 3 *Capsicum* varieties in 4 different solvents

CONCLUSION:

The present study investigated the contents of bioactive compounds and the antioxidant activities of three different varieties of peppers. All three varieties viz. var. bell pepper and var. gedabriusculum and var. frutescence of pepper fruits showed great antioxidant capacity, total phenols, and ascorbic acid content. Bell pepper among all the tested types of chili pepper was found to be good source of dietary antioxidants. The results have highlighted the significance of the use of bell peppers as a food ingredient as well as for direct use.

In conclusion, the different compositions of bioactive compounds in these fruits indicate the importance of each variety. Further attempts will be made to isolate and identify the compounds that may have contributed to the high antioxidant activities in *C. annuum* samples.

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Note

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JBNB -16

MICROSCOPIC STUDY OF EDIBLE FLOWERS

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Nivedita Singh and Anita S.Goswami-Giri*,

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Abstract:

The present study focused on ancient era women used sunflower, rose and champak for their skin beautification and also as a colorant in food preparation. The change in colour and characterises of flower due sensitization were studied. The study may support to extract the food colour as per desired material.

Keyword: Colour ; Bacterial growth; edible and nonedible

INTRODUCTION:

Dyes are one of the useful stuffs used for various purposes in our daily life. They are commercially produced on a large extent. Some may be toxic or some may be in-toxic [Kirkus 2012]. It is necessary to make worthy practice of natural resources instead of chemicals which are toxic and hazardous to health. Sunflower, rose and champak are ornamental point of view utilized for some economic purpose. The sunflower contains a yellow dye and also petals are used in salad. Rose petals used for syrups, cookies, oils/anti-inflammatory, and beautification [Jonathan pereira (1854]. Champak flowers are insect repellent and extract is used for eradicating lice [H.B.Singh et al 2003]. The study focuses on the microscopic analysis of ancient ruralised flowers used for their beautification and in foodstuff.

MATERIAL AND METHOD:

Rose, Sunflower, Champak flowers were collected from local market of Thane Maharashtra, India.

METHOD:

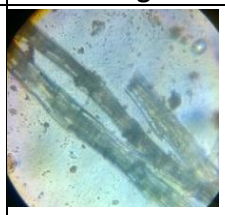
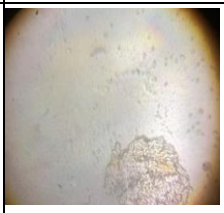
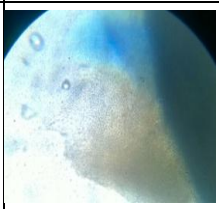
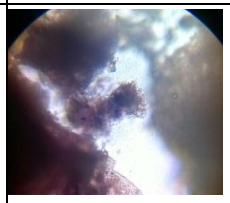
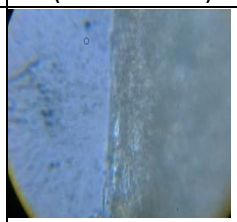
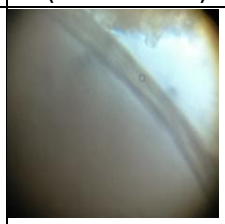
The selected flowers were air dried, crushed into small pieces and were boiled separately. After boiling and filtration, each flower sample was divided into 3 parts and each part was kept under the Sunlight, Normal and Dark conditions without boiling of respective sample is acts as control. The respective samples after drying completely, was observed under the microscope (100X Zoom).

RESULT AND DISCUSSION:

In the ancient era flowers were used for the beautification purpose by the women and

also used as sweeteners and colorant. Hence the difference between the structures of the flower sample was observed in different condition. The food/sweet was consumed after day required preservative nevertheless the rural women not aware of it. To ensure the thermophilic bacterial growth was present in the sample may have the stereotypic effect on the skin (under study). The blue colours were observed from the sunflower by boiling for an hour in water. After drying, it in normal day light, sunlight and in dark gets the yellow flowers material converted into brown in colour. The dried material of sunflower observed under microscope bluish in colour in day light and sunlight dried material while yellowish tinge and shading of morning glory was observed in material explored dark light.

Table Microscopic analysis of aqua boiled flowers, dried in sunlight, daylight and in dark conditions.

Flower	Normal /day light	Sunlight	Dark
Sunflower	 blue extract (weedy aroma)	 opeque extract	 pinkish extract fresh aroma
Rose	 Brownish extract (fresh aroma)	 pinkextract (fresh aroma)	 pink extract with silver tinge
Champak	 faint turbid (weedy aroma)	 turbid extract (Fresh aroma)	 colorless extract (fresh aroma)

However, the dye produced auxiliary sun and scarcer water the sunflower has the blue dye. Change in colour was observed under the microscopic study and naked eye as well when aqua condition was used for the dilution (Table).

The amorphous nature of champak and crystals of roses showed attractive colour in both condition but in dark, all flowers procured darkest bright in colour.

The changes in colour of Rose from red to cream in sunlight and orange to bluish black in day light to violet in dark were observed. Champak procured under microscopic study showed that bluish white (bright white) in normal light, buff colour in sunlight and pink colour in dark. Due to these characteristics ancient women may using these flowers as a ornamental, beautification and also in fruits.

CONCLUSION:

Smaller the particles, more accurate are the possible colour. Hence the dried flowers were boiled to retain its pigment. Sunflowers rose are edible flowers but the champak is nonedible flowers hence need more invention in thermophilic bacterial decomposition of chemicals observed by researcher. The note definitely helps in the food industries to observe the effect of environment on edibles and nonedible flowers that are acts as scent.

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FRUIT JUICES FROM LOCAL VENDOR: A RISK FACTOR FOR INFECTIONS

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Abstract:

Fruit juices are well recognized for their nutritive value, minerals and vitamin content. As fruit juices are commonly sold at crowded public places, their quality is an important factor to be considered for public health**.** Due to unhygienic conditions juices have shown to have a source of bacteria such as *Escherichia coli, Salmonella spp, Shigella spp, Staphylococcus aureus, Listeria spp, Vibrio spp, Enterobacter spp, Citrobacter spp, Klebsiella spp, Pseudomonas, etc.hanece in the present* study focused on juices of Mango, Apple, Pineapple and Sugarcane from local vendors near VPM's B.N. Bandodkar College, Thane for their microbiological analysis and report their potability standards.

Keywords: Fruit juices, Vendor, Potability, MPN, Pathogen

INTRODUCTION:

Fruit juices are the common drinks sold mostly at all public places and roadside shops. However, many of hazardous human infections have been found to be due to high consumption of contaminated fruit juices. The contamination of fruit juices causes ill effects on public health by various risk factors which include use of contaminated water, unclean utensils, dressing with ice, preservation without refrigeration and unhygienic preparation conditions (Poonam U. Sharma, 2013) .These contaminated fruit juices contain variety of organisms such as *Eshcherichia coli, Salmonella spp, Shigella spp (*Poonam U. Sharma, 2013)

Staphylococcus aureus, Listeria spp, Vibrio spp, Enterobacter spp, Citrobacter spp etc.

As per WHO standards provided for drinking water, there should be <1 colony of any organism in the sample. However contamination of fruit juices with fecal coliforms is often observed. These coliforms may cause dangerous infections like Ascariasis, Cholera, Diarrhea, Hepatitis, Malaria, Polio, Times, Typhoid, etc. Thus, the transmission of certain human diseases through fruit juices becomes a serious problem.

Thane city is located near a metropolitan city Mumbai and it constitutes about 147 km^2 of land with a population of approximately 1.263 million. The city has colleges, schools, shopping complexes and many market areas that remain crowded and thus serve a good place for business to local fruit juice venders. The demand for fruit juices increases during summer season. During monsoon, there are high chances of contamination as the water used may not be boiled to remove pathogenic organisms.

MATERIALS AND METHODS:

Ten different fruit juice samples were collected in the month of December, 2015, from the area around VPM's B. N. Bandodkar College, Thane. Naturally acidic fruits do not favor bacterial growth. Owing to this fact, the current study was carried out on juices of Pineapple, Mango and Green Apple served locally. High concentration of sugar is also unfavorable for bacterial growth and hence sugarcane juice sample was analyzed for coliform contamination. The samples were collected from the three major local vendors where the sale of the fruit juices was high. All samples were collected in sterile autoclaved tubes and were analyzed within half an hour or preserved at 4°C for further analysis.

MPN Test for Fruit Juices:

Presumptive test:

1:10 diluted sample was inoculated in lactose broth tubes with Andrade's indicator and inverted Durham's tubes. The Double strength (DS) lactose broth had 2% lactose concentration and Single strength (SS) lactose broth had 1%. A total of 15 tubes with inverted Durham's tube in broth were

arranged in a stand (5 DS + 10 SS). 5 tubes containing DS broth were inoculated with 10 ml of the diluted sample. 5 tubes of SS broth were inoculated with 1 ml while rest 5 tubes of SS broth were inoculated with 0.1 ml of sample. All tubes were incubated at 37^0C for 24 hours. The results were analyzed for MPN count.

Confirmed test:

A positive tube of single strength tube inoculated with 0.1 ml of sample was selected for further analysis in BGLB broth with inverted Durham's tubes, to confirm gas production after 24 hours incubation.

Completed test

A loopful of BGLB tube was then isolated on Eosine Methylene Blue (EMB) agar plate for detection of coliforms. Also a loopful of it was analyzed for IMViC test. The colonies isolated were studied for their Gram nature and Colony characteristics.

IMVIC Test (Indole, Methyl Red, Voges-Proskaurer, Citrate) Test:

Indole test : This test was performed using Kovac's reagent to detect the production of tryptophanase enzyme by organism.

Methyl red-Voges Proskauer test:

The glucose phosphate broth was inoculated with positive BGLB broth to check the glucose fermentation by organism. Addition of methyl red and alpha-naphthol along with 40% KOH helped in identification of positive and negative results.

Citrate test:

Simmon's citrate slants were streaked with a loopful of suspension from positive BGLB broth to check the ability of an organism to degrade citrate that was added as sole source of carbon.

RESULT AND CONCLUSION:

All the recorded findings have been tabulated below. There was bacterial contamination seen in all the samples collected and they were found to be unfit for human consumption. Unhygienic fruit juices can be an important source of gastrointestinal tract infections which may prove to be fatal under severe conditions. Hence, increased awareness among would reduce risk of these infections.

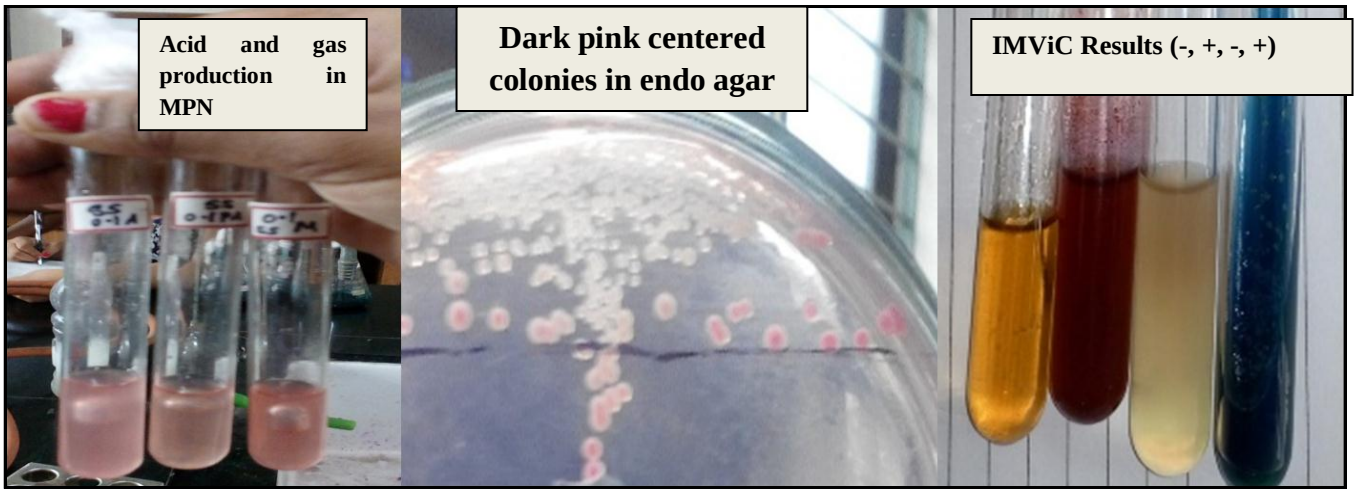

Table No. 1: MPN Results

Sr No.	Shop No.	Sample	Double Strength					Single Strength					Single Strength						MPN/ 100 ml
			10 ml					1 ml					0.1 ml						
1.	Shop No. 1	M	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	18000
2.	Shop No. 1	GA	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
3.	Shop No. 1	PA	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
4.	Shop No. 2	M	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
5.	Shop No. 2	GA	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
6.	Shop No. 2	PA	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
7.	Shop No. 3	M	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
8.	Shop No. 3	GA	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	
9.	Shop No. 3	PA	AG	AG	A	AG	AG	A	AG	AG	AG	AG	AG	AG	AG	AG	AG	4-4-5	3500
10.	Shop No. 4	SC	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	AG	5-5-5	18000

Key:- M- Mango, PA- Pineapple, SC- Sugarcane, GA- Green apple, A – Acid production, AG – Acid gas production

Table No. 2: BGLB Results

Sr No.	Shop	Sample Name	Result
1.	Shop No. 1	M	AG
2.		GA	AG
3.		PA	AG
4.	Shop No. 2	M	AG
5.		GA	AG
6.		PA	AG
7.	Shop No. 3	M	AG
8.		GA	AG
9.		PA	AG
10.	Shop No. 4	SC	AG

Key:- M- Mango, PA- Pineapple, SC- Sugarcane GA- Green apple, A – Acid production, AG – Acid gas production

Table No. 3: IMViC Results

S N.	Shop	Sample Name	I	M	Vi	C	Possible organisms
1.	1	M	-	+	-	+	*Citrobacter freundii Salmonella spp.*
2.	1	GA	+	+	-	+	*Citrobacter koseri*
3.	1	PA	-	+	-	+	*Citrobacter freundii Salmonella* spp.
4.	2	M	-	+	-	+	*Citrobacter freundii Salmonella spp.*
5.	2	GA	-	+	-	+	*Citrobacter freundii Salmonella spp.*
6.	2	PA	-	+	-	+	*Citrobacter freundii Salmonella spp.*
7.	3	M	-	-	-	+	*Pseudomonas spp*
8.	3	GA	+	+	-	+	*Citrobacter koseri*
9.	3	PA	-	+	-	+	*Citrobacter freundii Salmonella spp.*
10.	4	SC	+	+	-	+	*Proteus spp*
11.	Positive Control		+	+	-	-	*Escherichia coli*

Key: M- Mango, GA- Green apple, PA- Pineapple, SC- Sugarcane, I- Indole, M- methyl red, Vi- Voges-Proskaurer test, C- Citrate + : Positive test, - : Negative test

Table No. 4: Colony Characteristics: Endo Agar Plate

Shop No.	Sample Name	Colony Characteristics							
		Size	Shape	Color	Opacity	Margin	Elevation	Consistency	Gram nature
1	PA	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Coccobacilli
	M	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Coccobacilli
	GA	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Cocci
2	PA	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Cocci
	M	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Coccobacilli
	GA	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Cocci
3	PA	Pinpoint	Circular	Light pink	Opaque	Entire	Raised	Butyrous	Gram Negative Cocci

				with dark pink center					
	M	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative rod
	GA	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Cocci
4	SC	Pinpoint	Circular	Light pink with dark pink center	Opaque	Entire	Raised	Butyrous	Gram Negative Coccobacilli

Key:- M- Mango, GA- Green apple, PA- Pineapple, SC- Sugarcane

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NSS as an elective subject and skill development with vocational education training for 360^0 Development of volunteers.

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ABSTRACT

The ideological orientation of the NSS is inspired by the ideals of Mahatma Gandhi. Very appropriately, the motto of NSS is "NOT ME, BUT YOU". NSS acts as a bridge between the higher educational institutions and the society, by exposing students to social realities. Voluntary and participatory in nature, the NSS sensitizes students in the socio-political, economic and environmental context of peoples' lives and engages them to play a role in bettering their condition. Although 'volunteerism' is the foundation of NSS, some initiatives have been taken to incentivise NSS to encourage students to take it up. The good work done by NSS volunteers is rewarded in the form of certificates, awards, weightage in admission in higher level courses, etc. NSS was launched in the year 1969 in 27 Universities involving about 40,000 volunteers with the primary objective of developing the personality and character of the student youth through voluntary community service. Today, NSS has about 34.89 lacs volunteers on its rolls spread over 365 Universities, 18,625 Colleges / Technical Institutions and 27,069 Senior Secondary Schools. However, this is only a small fraction of the student population in country and a lot more work needs to be done. NSS provides a wide range of opportunities to the students to study the problems of society through practical experience and to understand ways of addressing them by introducing NSS as an elective subject & skill development with vocational education training at undergraduate level for 360^0 Development of volunteers.

Key Words: NSS, elective subject, 360^0 development

INTRODUCTION

The post-independence era was marked by an urge for introducing social service for students, both as a measure of educational reform and as a means to improve the quality of educated manpower.

The University Grants Commission headed by Dr. Radhakrishnan recommended introduction of National service in the academic institutions on a voluntary basis with a view to developing healthy contacts between the students and teachers on the one hand and establishing a constructive linkage between the campus and the community on the other hand. The idea was again considered by the Central Advisory Board of Education (CABE) at its meeting held in January, 1950. After examining the various aspects of the matter and in the light of experience of other countries in this field, the Board recommended that students should devote some time to manual work on a

voluntary basis and that the teachers should also associate with them in such work. In the draft, First Five Year Plan adopted by the Government of India in 1952, the need for social and labour service for students for one year was further stressed. Consequent upon this, labour and social service camps, campus work projects, village apprenticeship scheme etc., were put into operation by various educational institutions.

In 1958, the then Prime Minister Pandit Jawaharlal Nehru in his letter to the Chief Ministers mooted the idea of having social service as a prerequisite for graduation. He further directed the Ministry of Education to formulate a suitable scheme for introduction of national service into the academic institutions. In 1959, a draft outline of the scheme was placed before the Education Minister's Conference. The Conference was unanimous about the urgent need for trying out a workable scheme for national service. In view of the fact that education as it was imparted in schools and colleges, left something to be desired and it was necessary to supplement it with programmes which would arouse interest the social and economic reconstruction of the country. It was viewed that if the objectives of the scheme were to be realized, it was essential to integrate social service with the educational process as early as possible. The Conference suggested the appointment of a committee to work out details of the proposed pilot project. In pursuance of these recommendations, a National Service Committee was appointed under the Chairmanship of Dr. C.D. Deshmuklh on August 28, 1959 to make concrete suggestions in this direction. The committee recommended that national service for a period of nine months to a year may be made compulsory for all students completing high school education and intending to enrol themselves in a college or a university. The scheme was to include some military training, social service, manual labour and general education. The recommendations of the committee could not be accepted because of its financial implications and difficulties in implementation.

In 1960, at the instance of the Government of India, Prof. K.G. Saiyidain studied national service by students implemented in several countries of the world and submitted his report under the title

"National Service for the Youth" to the Government with a number of recommendations as to what could be done in India to develop a feasible scheme of social service by students. It was also recommended that social service camps should be open to students as well as non-students within the prescribed age group for better inter-relationship. The Education Commission headed by Dr. D.S. Kothari (1964-66) recommended that students at all stages of education should be associated with some form of social service. This was taken into account by the State Education Minister during their conference in April 1967 and they recommended that at the university stage, students could be permitted to join the National Cadet Corps (NCC) which was already in existence on a voluntary basis and an alternative to this could be offered to them in the form of a new programme called the National Service Scheme (NSS). Promising sportsmen, however, should be exempted from both and allowed to join another scheme called the National Sports Organisation (NSO), in view of the need to give priority to the development of sports and athletics. The Vice Chancellors' Conference in September, 1969 welcomed this recommendation and suggested that a special committee of Vice Chancellors could be set up to examine this question in detail. In the statement of national policy on education of the Government of India, it was laid down that work experience and national service should be an integral part of education.

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The cardinal principle of the programme is that it is organised by the students themselves and both students and teachers through their combined participation in social service, get a sense of involvement in the tasks of national development. Besides, the students, particularly, obtain work experience which might help them to find avenues of self-employment or employment in any organisation at the end of their university career.

National Service Scheme (NSS) is a flagship programme of the Ministry of Youth Affairs & Sports, Government of India, with prime objective of community development and nation building. In this context, it has been widely recommended a comprehensive proposal relating to the need for awarding Credits under NSS for which NSS may be considered as Elective Subject for university/college education. In addition, this will also be an attempt to standardizing the usages of teaching of NSS as a nation building activity nationwide.

The enhancement potential of NSS is quite often forgotten in many institutions find themselves preoccupied with the machinery of the academic teaching. The Institute is uniquely positioned in the education sector to support use of NSS for enhancement purposes. The NSS has much strength, particularly in helping us to understand more about student experience at undergraduate level, but also has some limitations in this regard. The research paper provides a brief overview and suggests the strategies and decisions to be taken at various levels by stakeholders for over all development of NSS volunteers. This paper outlines the areas in which the NSS can be a useful in 360^0 development of volunteers. We can facilitate the institute for enhancing students learning and teaching experience by introducing NSS as an elective subject &

skill development with vocational education training at under graduate level.

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- Understand the community in which they work.
- Understand themselves in relation to their community.
- Identify the needs and problems of the community and involve them in Problem-solving
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- Utilise their knowledge in finding practical solutions to individual and community problems
- Develop competence required for group living and sharing of responsibilities
- Gain Skills in mobilising community participation
- Acquire leadership qualities and democratic attitudes
- Develop capacity to meet emergencies and natural disasters and
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NSS volunteer undertake various activities in campus, adopted villages and slums for community service. Duration of this service is 120 hours i.e. 20 hours for college level activities, 20 hours for University level activities and 80 hours for community service. In regular NSS programmes students undertake various activities in the college campuses, adopted villages, cities and slums during weekends. Adoption of a village or an area is a meaningful programme in NSS.

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The nature of activities taken up under NSS continues to evolve in response to the needs of the community.

An illustrative list of some of the activities undertaken under NSS is as follows:

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Health, Family Welfare and Nutrition: immunisation, blood donation, health education, AIDS awareness, etc.

Environment Conservation: plantation of trees and their preservation/ upkeep, cleaning and maintenance of streets, drains etc,

Social Service Programmes: Work in hospitals, institutions for disabled persons, orphanages, old-age homes, women welfare institutions, etc.

Programmes for improving Status of Women: awareness generation reg. women's rights, imparting skill training to women wherever possible.

Production-oriented Programmes: educating people about improved agricultural practices, guidance in animal resource development, etc.

Relief and Rehabilitation during Natural Calamities: working with local authorities in rescue and relief operations.

Role of academicians at various strata.

Each NSS unit in an institution is led by a teacher designated as "Programme Officer (PO)", who plays a pivotal role as an educator, organiser, coordinator and administrator for the NSS unit under him. At the University Level, there is a NSS Cell and a designated Programme Coordinator (PC) to coordinate the NSS activities in respect of all NSS units in the University and its affiliated colleges. Similarly, in respect of Senior Secondary Schools, NSS Cell is located in the Directorate of Senior Secondary Education. At State level, there is a State NSS Cell headed by a State Liaison Officer (SLO). At National Level, there is a NSS Programme Advisory Cell, which functions through 15 Regional Centres. In addition, there are Advisory Committees at National, State, University and Institution level, comprising of official and non-official members, to provide necessary guidance to the NSS activities.

Incentivising NSS

NSS as an 'Elective Subject':

The Ministry has been pursuing the matter for introduction of NSS as an Elective Subject (with credits), on the pattern of NCC. In fact, in the last CABE Meeting organized by Ministry of HRD on 10.10.2013, it was decided that the UGC and AICTE would explore to introduce NSS as an elective subject (with credits), from next Academic Session. UGC has constituted a Committee to examine the curriculum proposed by the Ministry for NSS as an elective subject. The members may express their views on the subject.

Skill Training for NSS Volunteers:

Ministry of Youth Affairs and Sports (MoYAS) and TISS has signed an MoU to

implement a Pilot Project in 10 Universities to enhance the employable skill base of about 50,500 NSS volunteers in Universities, over a 3-year period. Under the Project, the volunteers shall acquire some basic foundation skills and will have option to undergo one of the specialised skill development modules on offer. This will enable them to secure a Certificate / Diploma in a Vocational Course while, at the same time, pursing their normal Degree course. The implementation of the Project has started. About 3,000 volunteers have been enrolled so far. The members may like to express their views of the subject.

Opportunities to NSS volunteers:

NSS provides a wide range of opportunities to the students to study the problems of society through practical experience and to understand ways of addressing them. NSS acts as a bridge between the higher educational institutions and the society, by exposing students to social realities. Voluntary and participatory in nature, the NSS sensitizes students in the socio-political, economic and environmental context of peoples' lives and engages them to play a role in bettering their condition. Although 'volunteerism' is the foundation of NSS, some initiatives have been taken to incentivise NSS to encourage students to take it up. The good work done by NSS volunteers is rewarded in the form of certificates, awards, weightage in admission in higher level courses, etc.

DISCUSSION:

Proposed Expansion

NSS programme have expanded both quantitatively and qualitatively over the years. A review committee was set up by the Government of India in August, 1984. One of the important recommendations of the committee was that the programme of NSS had great potential and, therefore, should continue and expand. The committee also recommended a 10 percent rate of growth of coverage of students under NSS in each year. This recommendation of the committee has been accepted by the government and by the end of IX Plan; the target of covering 20.00 lakh students under the programme is to be achieved.

Recently, the scheme has been extended to form an open unit, involving ex-NSS volunteers, and persons having an aptitude for social work. As the role of NSS

has been appreciated and recognized in the New Education Policy, the State Governments are requested to increase the coverage. For this purpose, the State Governments are expected to make necessary provisions in their budget in order to be able to meet the expenditure on 10 percent increase in the number of NSS volunteers every year.

Special emphasis in National Policy on Education, 1986 (Revised 1992).

The National Policy on Education 1986, with modification undertaken in 1992 envisages that opportunities will be provided for the youth to involve themselves in national and social development through educational institutions and outside agencies. Students will be required to participate in one or the other existing schemes, namely, the National Service Scheme, National Cadet Corps. The National Service Volunteer Scheme will also be strengthened. "Academic credit for extension work could be considered and in certain areas directly related to extension activities like social work and rural development" (National Policy on Education – Recommendation para 8.22). "We strongly reiterate para 8.22 of NPE. Adequate facilities should be provided to ensure that all students participate in one or the other existing schemes, particularly National Service Scheme (NSS) and National Cadet Corps (NCC)" Para 13.4 Central Advisory Board of Education Committee on Policy – January, 1992. In pursuance of the above recommendations the programme of Action 1992 on National Policy on Education provides that special incentives be evolved to encourage teachers' interest and participation, quite apart from incentives to encourage and sustain participation of students and youth in these programmes. Possible incentives may include the following: -

(a) Recognition of the outstanding contribution of teachers to NSS as an extension work under the third dimension of the university system as equivalent to research work.

(b) Special incentives for teachers for outstanding contributions under NSS.

(c) Special incentives for students with outstanding records under NCC, NSS etc.

At the time of their admission to college and university and also for promotion within colleges and universities. (Para No.20.3.3

Programme of Action 1992 on National Policy on Education by Government of India, Ministry of Human Resource Development). From the above, it is evident that special emphasis has been given to NSS in National Policy on Education in which it has been proposed that every student would be expected to participate either in NSS or NCC. It is now realized that the scheme is useful for the personality development of the students, particularly in the context of the present campus situation in our country where the opportunities to students for personality development and other activities are scarce. There is thus a need for the Centre and the State Governments to work towards a situation where all the students in universities, colleges and +2 levels can have such opportunities through the NSS and NCC as envisaged in National Policy on Education.

The past experience of National Service Scheme is quite heartening. It has provided diversified opportunities to students in schools/colleges and universities to develop their personality through community service.

The requirement to promote and develop quality, capability and diversity in our workforce is vital. It is therefore not surprising that "Technical and Vocational Education and Training" (TVET) is today one of the top priorities on agendas in the universe. TVET is aimed at matching the huge supply of manpower that could potentially be trained on the one hand; and huge skill gaps in various sectors on the other.

Current initiatives, few training programs, etc. do not justify the status & potential of NSS as nation builders. This calls for a need to develop an extensive approach towards nation building with inputs from staff, students and alumni.

In prevalent circumstances where national boundaries no longer limit economic pursuit, the availability of skilled manpower would attract more capital into the country. This would create wealth for all to share and create demand for more skilled manpower with emphasis on **characteristics such as:**

1. Mind state
2. Mind control
3. Fear and stress control
4. Confidence building
5. Skill building
6. Image building

7. Effective community skills
8. Body language
9. Mannerism
10. Channelize positive thoughts
11. Developing positive attitude
12. Developing good habits
13. Time management
14. Rational thinkers
15. Decision making
16. Leadership development
17. Team building
18. Power of enrolment
19. Relationship building
20. Law of attraction
21. Public speaking
22. Public etiquettes
23. Goal setting
24. Social responsibilities

360^0 Development

CONCLUSION:

Following are the Objectives of introducing NSS as an elective subject for 360^0 developments of NSS volunteers.

S : Society

O: Opportunities

C: Concern

I : Innovation

A: Association

L: Leadership

Thus NSS provides a wide range of opportunities to the students to study the problems of society through practical experience and to understand ways of addressing them by introducing NSS as an elective subject & skill development with vocational education training at undergraduate level for 360^0 Development of volunteers.

ACKNOWLEDGEMENT: Greatly acknowledge to the NSS unit of B.N.Bandodkar College of Science Thane MS India.

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Skill Training for NSS Volunteers:

Ministry of Youth Affairs and Sports (MoYAS) and TISS has signed an MoU to implement a Pilot Project in 10 Universities to enhance the employable skill base of about

50,500 NSS volunteers in Universities, over a 3-year period. Under the Project, the volunteers shall acquire some basic foundation skills and will have option to undergo one of the specialised skill development modules on offer. This will enable them to secure a Certificate / Diploma in a Vocational Course while, at the same time, pursing their normal Degree course. The implementation of the Project has started. About 3,000 volunteers have been enrolled so far. The members may like to express their views of the subject.

Opportunities to NSS volunteers:

NSS provides a wide range of opportunities to the students to study the problems of society through practical experience and to understand ways of addressing them. NSS acts as a bridge between the higher educational institutions and the society, by exposing students to social realities. Voluntary and participatory in nature, the NSS sensitizes students in the socio-political, economic and environmental context of peoples' lives and engages them to play a role in bettering their condition. Although 'volunteerism' is the foundation of NSS, some initiatives have been taken to incentivise NSS to encourage students to take it up. The good work done by NSS volunteers is rewarded in the form of certificates, awards, weightage in admission in higher level courses, etc.

DISCUSSION:

Proposed Expansion

NSS programme have expanded both quantitatively and qualitatively over the years. A review committee was set up by the Government of India in August, 1984. One of the important recommendations of the committee was that the programme of NSS had great potential and, therefore, should continue and expand. The committee also recommended a 10 percent rate of growth of coverage of students under NSS in each year. This recommendation of the committee has been accepted by the government and by the end of IX Plan; the target of covering 20.00 lakh students under the programme is to be achieved.

Recently, the scheme has been extended to form an open unit, involving ex-NSS volunteers, and persons having an aptitude for social work. As the role of NSS has been appreciated and recognized in the New Education Policy, the State

Governments are requested to increase the coverage. For this purpose, the State Governments are expected to make necessary provisions in their budget in order to be able to meet the expenditure on 10 percent increase in the number of NSS volunteers every year.

Special emphasis in National Policy on Education, 1986 (Revised 1992).

The National Policy on Education 1986, with modification undertaken in 1992 envisages that opportunities will be provided for the youth to involve themselves in national and social development through educational institutions and outside agencies. Students will be required to participate in one or the other existing schemes, namely, the National Service Scheme, National Cadet Corps. The National Service Volunteer Scheme will also be strengthened. "Academic credit for extension work could be considered and in certain areas directly related to extension activities like social work and rural development" (National Policy on Education – Recommendation para 8.22). "We strongly reiterate para 8.22 of NPE. Adequate facilities should be provided to ensure that all students participate in one or the other existing schemes, particularly National Service Scheme (NSS) and National Cadet Corps (NCC)" Para 13.4 Central Advisory Board of Education Committee on Policy – January, 1992. In pursuance of the above recommendations the programme of Action 1992 on National Policy on Education provides that special incentives be evolved to encourage teachers' interest and participation, quite apart from incentives to encourage and sustain participation of students and youth in these programmes. Possible incentives may include the following: -

(a) Recognition of the outstanding contribution of teachers to NSS as an extension work under the third dimension of the university system as equivalent to research work.

(b) Special incentives for teachers for outstanding contributions under NSS.

(c) Special incentives for students with outstanding records under NCC, NSS etc.

At the time of their admission to college and university and also for promotion within colleges and universities. (Para No.20.3.3 Programme of Action 1992 on National Policy on Education by Government of India,

Ministry of Human Resource Development). From the above, it is evident that special emphasis has been given to NSS in National Policy on Education in which it has been proposed that every student would be expected to participate either in NSS or NCC. It is now realized that the scheme is useful for the personality development of the students, particularly in the context of the present campus situation in our country where the opportunities to students for personality development and other activities are scarce. There is thus a need for the Centre and the State Governments to work towards a situation where all the students in universities, colleges and +2 levels can have such opportunities through the NSS and NCC as envisaged in National Policy on Education.

The past experience of National Service Scheme is quite heartening. It has provided diversified opportunities to students in schools/colleges and universities to develop their personality through community service.

The requirement to promote and develop quality, capability and diversity in our workforce is vital. It is therefore not surprising that "Technical and Vocational Education and Training" (TVET) is today one of the top priorities on agendas in the universe. TVET is aimed at matching the huge supply of manpower that could potentially be trained on the one hand; and huge skill gaps in various sectors on the other.

Current initiatives, few training programs, etc. do not justify the status & potential of NSS as nation builders. This calls for a need to develop an extensive approach towards nation building with inputs from staff, students and alumni.

In prevalent circumstances where national boundaries no longer limit economic pursuit, the availability of skilled manpower would attract more capital into the country. This would create wealth for all to share and create demand for more skilled manpower with emphasis on **characteristics such as:**

1. Mind state
2. Mind control
3. Fear and stress control
4. Confidence building
5. Skill building
6. Image building
7. Effective community skills
8. Body language

9. Mannerism
10. Channelize positive thoughts
11. Developing positive attitude
12. Developing good habits
13. Time management
14. Rational thinkers
15. Decision making
16. Leadership development
17. Team building
18. Power of enrolment
19. Relationship building
20. Law of attraction
21. Public speaking
22. Public etiquettes
23. Goal setting
24. Social responsibilities

360^0 Development

CONCLUSION:

Following are the Objectives of introducing NSS as an elective subject for 360^0 developments of NSS volunteers.

S : Society
O: Opportunities
C: Concern
I : Innovation
A: Association
L: Leadership

Thus NSS provides a wide range of opportunities to the students to study the problems of society through practical experience and to understand ways of addressing them by introducing NSS as an elective subject & skill development with vocational education training at undergraduate level for 360^0 Development of volunteers.

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PHYSICO-CHEMICAL CHARACTERISTICS OF DIFFERENT LAKES IN AND AROUND THANE CITY

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ABSTRACT:

Thane city is popularly adorned with the title of City Of Lakes. There are total 36 lakes. The present study was conducted in April 2015 to analyse the quality of 4 different lakes of Thane city. Water samples were collected from the lakes and were subjected to physico-chemical analysis to measure parameters such as pH, color, alkalinity, hardness, TSS, TDS, Dissolved oxygen, COD, nitrates. Siddheshwar lake showed highest values for all the parameters tested and the quality of water was found to be poor.

Keywords: Lakes, Physico-chemical, Water quality, Thane

INTRODUCTION:

Much of the current concern with regards to environmental quality is focused on water because of its importance in maintaining the human health and health of the ecosystem (Mahananda et al, 2010). Water is indispensible for life. Fresh water availability is the most important criteria for the survival of life on earth (Meera D. et al, 2015). Rivers, lakes, ponds, wetlands and groundwater form important fresh water bodies on earth. Though these habitats occupy a relatively small portion of the earth surface as compared to marine and terrestrial habitats, their importance to man is far greater than their areas (A.C.Patel, et al 2013). Fresh water is a finite resource, essential for agriculture, industry and even human existence, without fresh water of adequate quantity and quality, sustainable development will not be possible (N. Kumar et al, 1997).

Thane city, the city of lakes, has 36 lakes as per record of TMC. Ironically, this city is observing serious water-cuts to meet the increased demand of water that has arisen due

to population growth, increased building constructions and urbanization. As lakes contain stagnant water, they have more population of micro-organisms and hence may not prove as a direct source of potable water. But even if they can be used for other non-potable purposes it will prove to be of immense importance. TMC has taken up the conservation of many lakes in the city which have been developed for recreational purposes. But still lot many remain in bad state. Many of these lakes are surrounded by residential areas and are exposed to diverse anthropogenic activities.

The present study involves analysis of physico-chemical parameters of 4 lakes in Thane city viz., Siddhweswar, Kachrali, Bramhala, Mhatre. This is a preliminary study to assess the existing quality of water in these lakes.

MATERIALS & METHODS:

All the samples were collected in the month of April in 2015 and they were tested within two hours of collection. Various physico-chemical characteristics of the samples were tested as per the APHA guidelines. pH of the samples were determined using Universal indicator.

RESULTS & DISCUSSION:

All the samples collected were colourless, turbid in appearance except that the sample collected from Siddheshwar was dark green in colour.

pH: pH values were in the range 8 – 8.5 when tested with the help of universal indicator, that indicated alkaline conditions.

TDS & TSS: These terms refer to the solid matter dissolved and suspended in the water. High range of TDS indicates the decreased potability of water quality. The acceptable limit for TDS is 500mg/L which was crossed by water samples from Siddheshwar, while Kachrali showed least TDS. This was comparatively lesser than the value obtained in March 2014 by Rathod et al. On the same ground, TSS obtained was highest for Siddheshwar Lake.

Total Hardness: Precipitates of calcium and magnesium salts in water makes it hard. Maximum hardness was seen in Mhatre Lake which was 66 mg/L.

Alkalinity: All water samples were alkaline. Siddheshwar water sample showed maximum alkalinity owing to its highest photosynthetic rate. This was due to the algal bloom in the lake.

DO: Dissolved oxygen helps to estimate the demand for oxygen. Lowest DO was observed in Siddheshwar Lake while it was highest for Mhatre Lake. All the findings are summarized in table 1 below.

Name of the Lake	pH	TSS	TDS	Alkalinity	DO	COD	N_2	Hardness
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Siddheshwar	8-8.5	1000	1000	1350	40	206.4	375	20
Kacharali	8-8.5	200	50	250	135	128	30	24
Brahmala	8-8.5	50	100	325	120	120	16	32
Mhatre	8-8.5	200	100	175	150	72	16	66

Table 1: Physico-Chemical Analysis of Water Samples Collected From Different Lakes

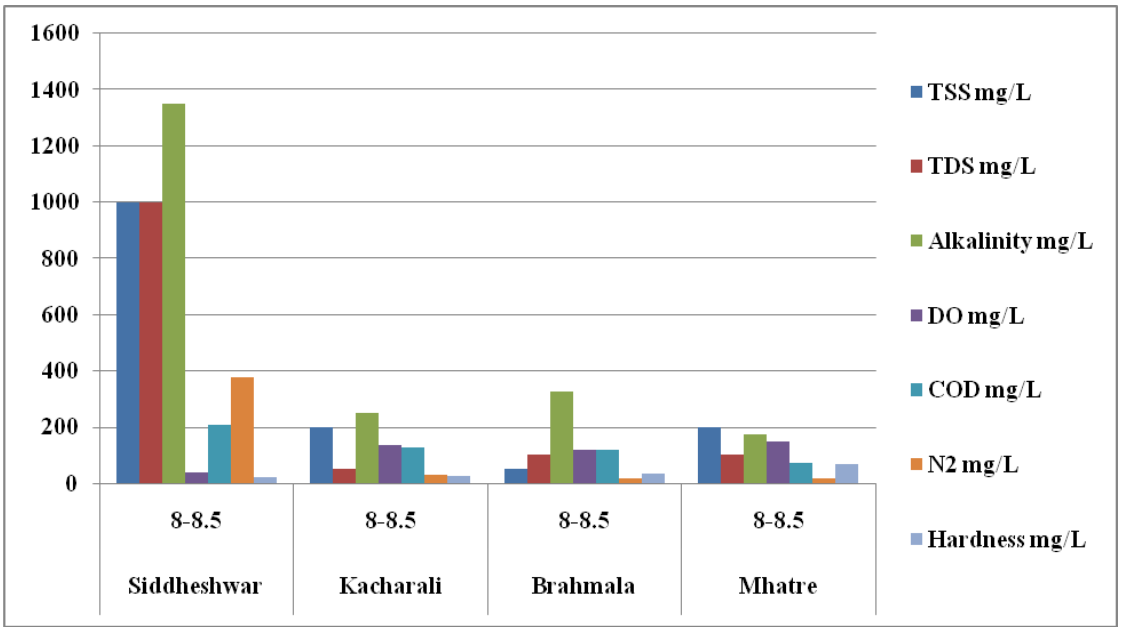

Figure 1 Comparative Analysis of Physico-Chemical Analysis of Water Samples Collected From Different Lakes.

COD: Chemical oxygen demand of the water samples is an indicator of level of pollution and it ranged between 70-210 mg/L. Highest COD value was shown by Siddheshwar water sample.

Nitrogen: The nitrogen content was maximum in Siddheshwar Lake. High nitrogen content was in accordance with the fact of high algal growth in the lake.

The above values were compared to the values obtained in the reports submitted by *Rathod et al* in May 2014. Siddheshwar lake has shown noticeable deterioration in the water quality while Kacharali and Brahmala Lake water quality seem to have improved.

CONCLUSION:

Siddheshwar Lake was found to be most deteriorated in quality among four lakes tested. Most of the parameters of the other lakes were well in limits. Owing to the large area (3 hectares) of Siddheshwar Lake, it has great potential to be developed for recreational purpose. Hence, it should be taken up for conservation. To comment on the potability of the water samples collected, they need to be subjected to further analysis for heavy metals and microbial population.

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Preliminary phytochemical evaluation of *Cissampelos pareira* L.

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Abstract:

Nature has bestowed upon us a profusion of medicinal plants which play a crucial role in our health care. Even today, plants and plant extracts continue to be an essential part of human health care system and modern medicines mostly have their origins in plants. Therefore, it is necessary to explore such plants and investigate their phytochemical and pharmacological properties. *Cissampelos pareira* L. is a medicinally valuable plant belonging to family Menispermaceae. The present study was to analyze the phytochemical constituents of leaf extracts in five different solvents of *Cissampelos pareira* L including universal solvent. Alkaloids, carbohydrates, fats and fixed oils, glycosides, phenols, flavanoids, steroids, tannins, saponins, etc. are present *Cissampelos pareira* L. indicates contain medicinally important.

Key words: *Cissampelos pareira* L., Preliminary phytochemical

INTRODUCTION:

Plant derived drug has gained a good reputation both in traditional and modern medicine (Das *et al*., 2007). Phytochemicals from natural sources are simpler and are much accepted in the development of new 'Rasayana' drugs from plants. Biologically active compounds from natural source have gained good status in treating several ailments not only in humans but also in animals. Detailed research on the chemistry and pharmacology of remedial products of plant origin are much essential and this may ultimately lead to the innovation of medicine that can be used in the treatment of several hazardous diseases (Samy *et al*., 2008). Most of the medicinal plants from tribal origin with ethnopharmacological and ethnobotanical interest lack preclinical

scientific validations (Baker and Alvi, 2004).

Various parts of the plants like roots, leaves, bark, exudates etc. are used as per medicinal properties. Herbal remedies can work without many of the unpleasant side effects of modern medicines (Perumal and Gopala, 2007).

Cissampelos pareira L. is a perennial climbing herbs/shrub. It belongs to the family Manispermaceae. *Cissampelos pareira* is very widespread and locally common (Anonymous, 1988).

The genus *Cissampelos* has thirty to forty species, distributed in the tropical and subtropical world. The plant is found in orchards, hedges, park and gardens with moist soils, either creeping or twining around other plants.

It is common on the hilly tracts along water courses. *Cissampelos pareira* is mostly collected from the wild. It can be propagated from root cutting. In ethno-medicinal practices the roots of *Cissampelos pareira* (Patha) are used in the treatment of various ailments related to urinary problems and skin infections, and in tumor inhibitor activity, antibacterial, antimalarial, diuretic activity, anticonvulsant activity etc. (Jhuma *et al*., 2012 a).

Cissampelos pareira is widely employed in herbal medicine today as a diuretic and as a tonic, as well as to reduce fever and relieve pain. It is often employed for menstrual cramps, difficult menstruation, excessive bleeding and uterine hemorrhages, fibroid tumors, pre- and postnatal pain, colic, constipation, poor digestion, and dyspepsia (Mukerji and Bhandari, 1959).In ayurvedic system of medicine; the leaves are used in the treatment of indolent ulcers and diarrhea. The leaves are eaten as potherb, and are reported to be cooling. Crushed leaves are boiled with rice and given as a tonic for heart complaints and fresh juice is applied for eye-diseases (Kirtikar and Basu, 1933).

It has a long history of use in muscle inflammation, snakebite, rheumatism, diarrhea, dysentery, and menstrual problems (Mokkhasmit, 1971). Therefore

the present study aims to assess the phyto-constituents present in different leaf extracts of *Cissampelos pareira* L.

MATERIALS AND METHODS:

Collection of Plant material: The plant material of *Cissampelos pareira* L. were collected, dried, powdered and stored in air tight containers separately.

Authentication of the plant (S.H. – 1533) was done at Blatter Herbarium, St. Xevier's College, Mumbai and the specimen vouvher was deposited there.

Extract preparation

Cissampelos pareira L. plant powders (500 mg) were extracted separately in 100 ml of five different solvents (petroleum ether, toluene, chloroform, methanol and water) overnight.

The contents were filtered through Whatman filter paper No. 1. Filtrates were evaporated on boiling water bath until dry. The extracts were reconstituted in same solvent and then stored in refrigerator for further use.

Preliminary phytochemical screening

Qualitative chemical examination of the dried leaf powder of *Cissampelos pareira* L. revealed the presence or absence of various plant constituents in different chemical extracts. The observations were recorded in + (present) or – (absent). The tests were performed according to Khandelwal (1998) and Kokate (2007).

RESULTS AND DISCUSSION:

The preliminary phytochemical studies showed the presence of various components.

The phytochemicals detected in extracts were alkaloids, carbohydrates, fats and fixed oils, glycosides, phenols, flavanoids, steroids, tannins and saponins (Table 1).

Petroleum ether extract of *Cissampelos pareira* L. showed presence of alkaloids, carbohydrates, fats and fixed oils and flavonoids. Toluene extract of *Cissampelos pareira* L. showed presence of fats and fixed oils. Chloroform extract of *Cissampelos pareira* L. showed presence of alkaloids. Methanol extract of *Cissampelos pareira* L.

showed presence of alkaloids, carbohydrates, glycosides, phenols, flavonoids, steroids, tannins and saponins. Aqueous extract of *Cissampelos pareira* L. showed presence of alkaloids, carbohydrates, glycosides, phenols, flavonoids, steroids, tannins and saponins.

The results confirmed the presence of constituents which are known to exhibit medicinal as well as physiological activities.

Screening of phytochemicals present in any plant is very important because the phytochemicals are the major factors in identification of plant drugs. It is also important to study pharmacological characters as it helps to determine the medicinal uses of plant. The alkaloids contained in plants are used in medicine as anaesthetic agents (Tshibangu *et al*., 2003). Flavonoids have been referred to as nature's biological response modifiers, because of their inherent ability to modify the body's reaction to allergies. They showed anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activities (Aiyelaaghe and Osamudiamen, 2000). Glyscosides, flavonoids, tannins and alkaloids have hypoglycemic activities (Ouiet, 1980). Steroids showed analgesic properties. Saponin is used as detergents and in intracellular histochemical staining. It is also used to allow anti-body access in intracellular proteins. In medicines it is used in hypercholesterolemia, hyperglycemia, antioxidant, anticancer, antifungal, anti-inflammatory etc. (Tiwari *et al*., 2003).

The result obtained in this study thus suggest that the identified phytochemical compounds may be the bioactive constituents responsible for the efficacy of the leaves of the plant studied and the presence of some of these compounds have also been confirmed to have antimicrobial activity. Hence it could be inferred that the plant extract could be a source for the industrial manufacture of drugs useful in the chemotherapy of some microbial infection (Talalay, 2001).

CONCLUSION:

Herbal plants used in traditional medicine contain a wide range of bioactive compounds that was used since the dawn of

civilization to maintain health and to treat diseases. Amongst them the substances having medicinal value have been extensively used for treating various diseases. Herbs being easily available to human beings have been explored to the maximum for their medicinal properties. Preliminary phytochemical of *Cissampelos pareira* L. showed that in methanol and aqueous extract presence of alkaloids, carbohydrates, glycosides, phenols, flavonoids, steroids, tannins and saponins were present. The present investigations may help the researchers in pharmacognostic evaluation of the plant. The results of the study could be useful for the identification and preparation of a monograph of the plants.

Table 1 Preliminary phytochemical analysis of *Cissampelos pareira* L.

Sr. no	Test	PE	T	Ch	M	Aq
1	**Acid compounds**	-	-	-	-	-
2	**Aleurone grains**					
	Picric acid	-	-	-	-	-
	Iodine solution	-	-	-	-	-
3	**Alkaloids**					
	Mayer's rgt	-	-	+	+	+
	Dragondoff' rgt	+	-	+	+	+
	Wagner's rgt	-	-	+	+	+
4	**Anthraquinone**	-	-	-	-	-
5	**Amino acids**	-	-	-	-	-
6	**Proteins**					
	Heat	-	-	-	-	-
	TCA	-	-	-	-	-
7	**Carbohydrates**	+	-	-	+	+

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8	**Starch**	-	-	-	-	-
9	**Fats and fixed oils**	+	+	-	-	-
10	**Glycosides**	-	-	-	+	+
11	**Mucilage**	-	-	-	-	-
12	**Phenols**	-	-	-	+	+
13	**Flavonoids**					
	NaOH	-	-	-	+	+
	Lead acetate	+	-	-	+	+
14	**Steroids**	-	-	-	+	+
15	**Tannins**					
	Lead acetate	-	-	-	+	+
	$FeCl_3$	-	-	-	+	+
16	**Saponins**	-	-	-	+	+
17	**Essential oils**	-	-	-	-	-
18	**Resins**					
	$FeCl_3$	-	-	-	-	-
	Turbidity test	-	-	-	-	-

Values are mean of three determinants
+ = Present; - = Absent
PE: Petroleum ether; T: Toluene; Ch: Chloroform; M: Methanol; Aq: Aqueous

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APPLICATIONS OF MOVING BED BIOFILM REACTOR SYSTEM: AN OVERVIEW

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Abstract:

Present study deals with gathering information on Moving Bed Biofilm Reactor (MBBR) Technology and its applications. Moving Bed technology presents several operational advantages, compared to other conventional biological treatments. Different applications of this technology for Municipal sewage treatment and wide range of Industrial effluent treatment were studied. In conclusion, the results indicate that MBBR with polyethylene media as Biofilm carrier may possess great potential to be used for Organic removal, i.e. COD & BOD removal and Nutrient removal for both Municipal waste water and Industrial wastewater. This study can be helpful to check possibility that the moving bed Biofilm process may be used as an ideal and efficient option for Upgradation of existing treatment plants.

Keywords: Moving bed Biofilm Reactor (MBBR), Nutrient removal, sewage treatment, Industrial effluent treatment

INTRODUCTION:

Water pollution or degradation of water quality is due to ingress of chemical and biological materials (waste) in water body. Discharge of untreated sewage is one of the most important causes of pollution of surface and ground water in India. Biological processes based upon suspended biomass (i.e., Activated sludge processes-ASP) are effective for organic carbon and nutrient removal in municipal wastewater plants.

But with ASP there are problems of sludge settle ability and it needs large volume reactors and settling tanks and biomass

recycling whereas Biofilm processes have proved to be reliable for organic carbon and nutrients removal and has overcome some of the problems of activated sludge processes. There are already many different Biofilm systems in use, such as trickling filters, Rotating Biological Contactors (RBCs), fixed media submerged bio-filters, granular media bio-filters, fluidized bed reactors, etc. They all have advantages and disadvantages. Two technologies are commonly used for biological treatment of sewage: activated sludge and trickling filters. A moving bed biological reactor (MBBR) is a combination of these two technologies. (Borkar et al, 2013). The biomass in the MBBR exists in two forms: suspended flocks and a biofilm attached to carriers. It can be operated at high organic loads and it is less sensitive to hydraulic overloading.

Moving Bed Bioreactors (MBBR) biologically treat wastewater by circulating moving media in aerobic as well as anaerobic activated sludge environments. MBBR systems are an ideal treatment solution for high-strength wastewater or in applications requiring a compact physical footprint. Upgrading existing treatment plants into MBBR systems can greatly enhance biological nitrogen removal (BNR) – expanding treatment capacity and improving effluent quality with no additional footprint expansion.

Literature record showed that MBBR review studies done till now mainly proved efficiency of MBBR in organic removal and nutrient removal. Like Ødegaard and Rusten (1995) gathered data from various small full-scale wastewater treatment plants and the Moving Bed Biofilm Reactor systems started to develop. They found that MBBR systems are used as stand-alone treatment solutions for organic matter removal. Gulhane et al, (2013) concluded that MBBR technology is becoming increasingly popular and widely used in the world for treating different kinds of effluents and under different conditions and further added that this study may be helpful to check possibility that the moving bed biofilm process can used as an ideal and efficient option for the total nutrient removal from municipal wastewater.

The present study was done to draw attention of the researchers and designers on current research trends and recent applications of MBBR. Thus the study compiled data on efficiency of MBBR in treatment of various industrial effluents like Pulp & paper, Pharmaceutical, chemical degradation treatment, Upgradation of existing treatment plants, petrochemical effluents etc. along with organic removal and total nutrient removal in municipal waste water or synthetically prepared sewage.

Kermani et al, (2009) investigated nutrient removal from synthetic wastewater by a lab-scale moving bed biofilm process; he also studied kinetic analysis of the process with regard to phosphorus and nitrogen removal with different mathematical models. He concluded that under optimum conditions, almost complete nitrification with an average ammonium removal efficiency of 99.72% occurred in the aerobic reactor. Under optimum conditions, the average total nitrogen and phosphorus removal efficiencies were 80.9% and 95.8%, respectively. According to kinetic model evaluation by Kermani et al, the Stover-Kincannon model gave high correlation coefficients for phosphorus and nitrogen removal, which were 0.9862 and 0.986, respectively.

Fig 1: Applications of MBBR

Table2: Characteristics of bio-carriers.

Material	Polypropylene, plastic, ceramic,
Shape	Corrugated cylinder, chips, hollow, curved
Density	0.90 to 0.95 g /cm3
Dimensions	10×15 mm
Specific surface	260 – 500 m2/m3

SN	Source	Application	Model studied	Type of Effluent
1	Kermani et al ,2009	Biological Phosphorus and Nitrogen Removal	Lab scale	Synthetic Waste Water
2	Shu-hai et al, 2008	Two-stage MBBR at Low Temperature	Pilot scale	Municipal waste water
3	Lei et al, 2007	Study Of Startup And Treatment Effect With Low-Strength Wastewater	Pilot scale	Low-Strength Wastewater
4	Chunyan et al, 2005	Comparison of petrochemical wastewater by MBBR and ASP	Full scale plant	Petrochemical Wastewater
5	Ahmadi et al,2011	Upgradation of Existing Waste water treatment plant by MBBR	Full scale plant	Waste Water From Commercial Complex
6	K.Vaidhegi	Treatment Of Bagasse Based Pulp And Paper Industry Effluent	Lab scale	Pulp And Paper Mill Effluent
7	Marques et al, 2008	Study Of Attached Biomass Growth And Substrate Utilization Rate	Lab scale	Synthetic Wastewater
8	Borkar et al 2013	Literature review on MBBR	Review	
9	Rezende et al , 2012	Comparison of COD & Toxicity removal during ASP & MBBR treatment of Kraft Pulp Mill effluent	Lab scale	Pulp mill effluent
10	Sandeep joshi,2012	Results of the Indo-European Project NaWaTech- "Natural Water Systems and Treatment Technologies to cope with Water Shortages in Urbanised Areas in India"	Review	Sewage/Municipal WW
11	Zhou et al,2012	Domestic Waste water Treatment & Mechanism of Denitrification in Anaerobic MBBR Reactor	Lab scale	Domestic wastewater
12	Esmaeilirad et al,2015	Kinetics of Ethylene Glycol Biodegradation in a Sequencing Moving Bed Biofilm Reactor	Lab scale	waste water containing ethylene glyco
13	Wei et al,2008	Application of MBBR to dyeing effluent treatment	Lab scale	dyeing effluent
14	Xing et al,2013	Treatment of antibiotic fermentation-based pharmaceutical wastewater using anaerobic and aerobic moving bed biofilm reactors	Lab scale	Pharmaceutical waste water

Table 1: Applications of MBBR for treatment of various types of effluents

Lei et al, (2007) had setup a pilot-scale experiment on startup and treatment effect of MBBR process in small towns. Results of his experiments indicated that MBBR could accomplish startup at low or medium temperature and main indexes such as COD, NH_3-N, TN of effluent meet the requirement of discharge standard of pollutants for municipal wastewater treatment plant at low strength influent with 3.4h HRT of the reactor. He concluded that MBBR process has good efficiency for NH_3-N & TN (Total Nitrogen) treatment and has vast prospect in application of Municipal Waste Treatment.

Chunyan1 et al, (2005) evaluated the performance of Moving Bed Biofilm Reactor (MBBR) in treating petrochemical wastewater. Study comprised of the competitive experiment between MBBR and activated sludge process (ASP), based on factors such as HRT, organic loading rate and air flow. He concluded that MBBR boasts advantages over activated sludge process (ASP) in terms of the impact of organic loading.Ahmadi et al, (2011) studied Upgradation of Existing Waste water treatment plant by MBBR on Full scale model analysis. Report states that MBBR process can be successfully employed for upgrading an overloaded Activated Sludge Waste Water Treatment Plant to produce high quality treated effluent. **K.Vaidhegi, (2013)** shown using Lab scale model aimed at Treatment of Bagasse Based Pulp and Paper Industry Effluent and concluded that the moving bed biofilm reactor was found to be an ideal and efficient option for removal of organic components from the wastewater of pulp and paper industry. Marques et al, (2008) deliberated attached biomass growth and substrate utilization rate in a moving bed biofilm reactor using synthetic wastewater, Lab scale model studies shown that moving bed biofilm reactors tolerate around 2 times the volumetric organic loads experienced by the other modalities of activated sludge reactor processes. Borkar et al, (2013) proved that MBBR systems offer an increased specific surface in the reactor for the growth of the biomass, achieving significant reductions in the biological reactor volume and can be used as an ideal and efficient option for the total nutrient

removal from municipal wastewater. Rezende et al, (2012) gave a comparative account of COD & Toxicity removal during ASP & MBBR treatment of Kraft Pulp Mill effluent, As per analysis reports the MBBR presented higher removal efficiency than the Activated Sludge system & greater Solids retention under stress condition.

In the results of the Indo-European Project NaWaTech- "Natural Water Systems and Treatment Technologies to cope with Water Shortages in Urbanised Areas in India", Sandip Joshi (2012), stated that MBBR process under various commercial names is being used for sewage treatment in India for the flows ranging from 10 m^3/d to 8 MLD, especially for newly developing townships in the urban, semi-urban or rural-urban areas. These systems are found useful in reducing the space footprint of conventional ASP based STPs. Adaptation of MBBR is reported to reduce solids load in secondary sedimentation tank. Zhou et al, (2012) studied Mechanism of Denitrification in Anaerobic MBBR Reactor using domestic waste water, Lab scale studies made observation that NH3-N reduction in way of nitrification-denitrification was achieved at HRT of 8 hrs. Esmaeilirad et al, (2015) conducted laboratory scale studies to evaluate the phenol removal efficiency by means of a moving bed biofilm reactor, the process proved to be flexible, reliable, and easy-to-operate with no clogging problems.

Wei et al, (2008) investigated applications of MBBR to dyeing effluent treatment. The results of lab scale studies have shown that under conditions of effluent COD 300-600 mg/L, aeration rate 0.55 m3/h and HRT 1.5d,the removal of COD and color reached 85% and 90% respectively, and effluents reached primary grade discharge standard after treatment by MBBR. Xing et al, (2013) carried out lab scale experiments aimed at Treatment of antibiotic fermentation – based pharmaceutical wastewater using anaerobic and aerobic moving bed biofilm reactors. The experimental results indicated that 26.6% of chemical oxygen demand (COD) was removed, and 931.75 mg/L of volatile fatty acids (VFAs) were produced under the optimum conditions of the anaerobic MBBR at an influent pH of 6.5, hydraulic retention time (HRT) of 12 hr and organic loading

rate (OLR) of 13 kg COD/ (m^3·d) for the hydrolysis/acidification process. In addition, 91.0% of COD was removed at 1.5 m^3/h of aeration rate with the aerobic MBBR.

Expected outcome:

"Save water" has become Global slogan nowadays and efficient and effective recycling or reuse of waste water is one way of supplementing available water supplies. For the purpose MBBR technology which is proved to be more efficient than ASP as well as several other biological treatment processes can be useful in treating different kinds of effluents under different conditions and generating high quality treated effluent available for recycling and reuse. This study may be helpful to check possibility that the moving bed biofilm process can be used as an ideal and efficient option for treating various industrial effluents and for nutrient removal from municipal wastewater.

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Study of Mandelbrot Set and Fractal Theory

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Abstract: The aim of this paper is to study Mandelbrot set and its applications as a part of fractals. A brief overview of the geometry of Mandelbrot set with geometric representation of the set using MATLAB software give more knowledge of fractural theory.

Keywords: Mandelbrot set, Iteration, Fractal, MATLAB.

INTRODUCTION

Many objects in the nature can be created by applying the concept of classical geometry like lines, circles, conic sections, polygons, spheres, quadratic surface and so on. There are various objects of nature which cannot be modeled by applying Euclidean geometry, hence there is need to deal with such complicated and irregular object which can only be constructed by fractal geometry. To generate such complicated object iteration process is required which is called iterated function system. As mathematical equations fractals are usually nowhere differentiable which illustrates that it cannot be measured in traditional ways. The term fractal was first coined by mathematician Benoit Mandelbrot in 1975.Mandelbrot based it on the Latin word "fractus " that means broken or fractured .[Braner, B, 1989].

The Mandelbrot set is the most beautiful and remarkable discovery in the entire history of mathematics and it was discovered as recently as 1980s. At the basis of the discovery of the Mandelbrot set was decades before, in Paris in 1917. Gaston Julia , published papers connected with complex numbers, now known as Julia sets.

Development of Mandelbrot Set

In this paper we consider the family of complex rational maps of the form

$F_\lambda = Z^n + \lambda/Z$

where , the parameter λ belongs to set of complex numbers and $n \geq 2$. We will primarily consider the case where $|\lambda|$ is small, so these maps may be regarded as singular permutations of the well understood map $Z \rightarrow Z^n$. The map F_λ has critical points at $c_\lambda = (\lambda/n)^{1/(n+1)}$.

We call these points the free critical points. The point at ∞ is also a critical point of order n-1. Hence we have an immediate basin of ∞ which we denote by B_λ . There is a neighbourhood of 0 that is then mapped to B_λ .We call this set the trap door and denote it by T_λ . [Elenbogen, B, 1989 et al].

In a complex plane Mandelbrot set is the set of values of C for which the orbit of 0 under

iteration of the complex quadratic polynomial $Z_{n+1}= Z_n^2 + C$ remain bounded. [Ewing, J. H 1992 et al].

"The" Mandelbrot set is the set obtained from the quadratic recurrence equation $Z_{n+1} = Z_n^2 + C$

with $z_0 = C$, where points C in the complex plane for which the orbit of z_n does not tend to infinity are in the set. Setting z_0 equal to any point in the is not a periodic point gives the same result. The Mandelbrot set was originally called a μ molecule by Mandelbrot. J. Hubbard and A. Douady proved that the Mandelbrot set is connected.[Douday, A 1986; Peitgen, H.O, 1988 et al]

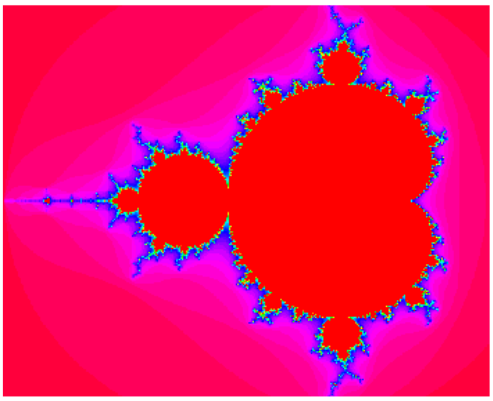
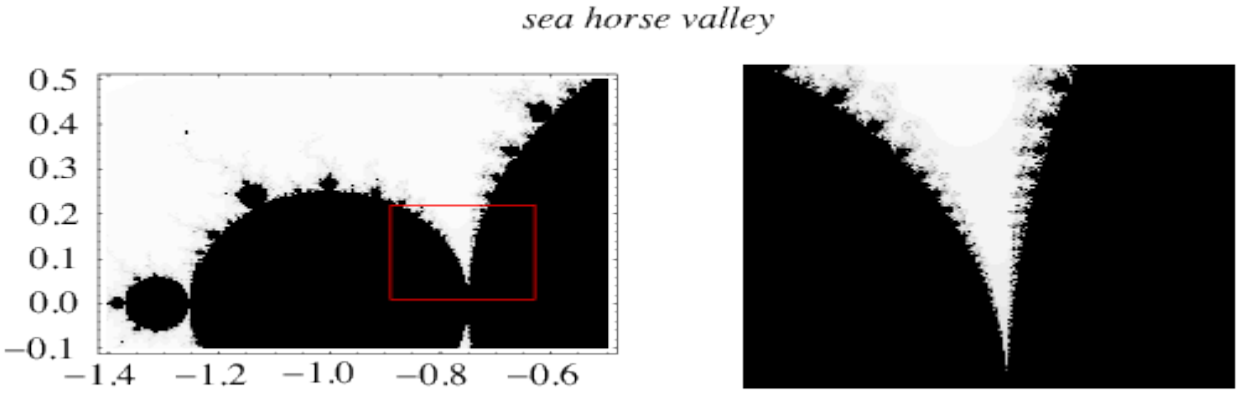


Figure 1:Mandelbrot set

A plot of the Mandelbrot set is shown above in which values of C in the complex plane are colored according to the number of steps required to reach $r_{max} = 2$. The kidney bean-shaped portion of the Mandelbrot set turns out to be bordered by a cardiod with equations

$$4x=2\cos t - \cos(2t)$$

$$4y=2\sin t - \sin(2t)$$



The adjoining portion is a circle with center at (-1, 0)and radius 1/4.

Figure 2.1: Sea Horse Valley

The region of the Mandelbrot set centered around $-0.75 + 0.1\,i$ is sometimes known as the sea horse valley because the spiral shapes appearing in it resemble sea horse tails .

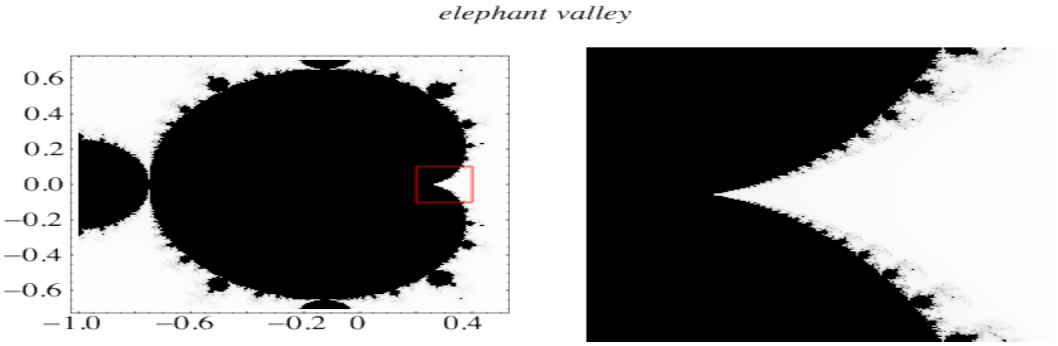


Figure 2.2 : Elephant Valley

Similarly, the portion of the Mandelbrot set centered around $0.3 + 0\,i$ with size approximately $0.1 + 0.1\,i$ is known as elephant valley.[Devaney R 1999].

Suppose the initial value of Z_0 =0, if this function iterates again and again with a large value of Z_n the number C may or may not be the part of Mandelbrot set. The function with C=1 gives the sequence 0, 1, 2, 5, 26,…,, which tends to infinity. As this sequence is unbounded, hence C with value 1 is not an element of the Mandelbrot set. If the value of C is -1 this function after few iteration gives the sequence 0,-1,0,-1,0,.., which is bounded, in this case C belongs to the Mandelbrot set.[Lei, T. 2000]

Different images of Mandelbrot set

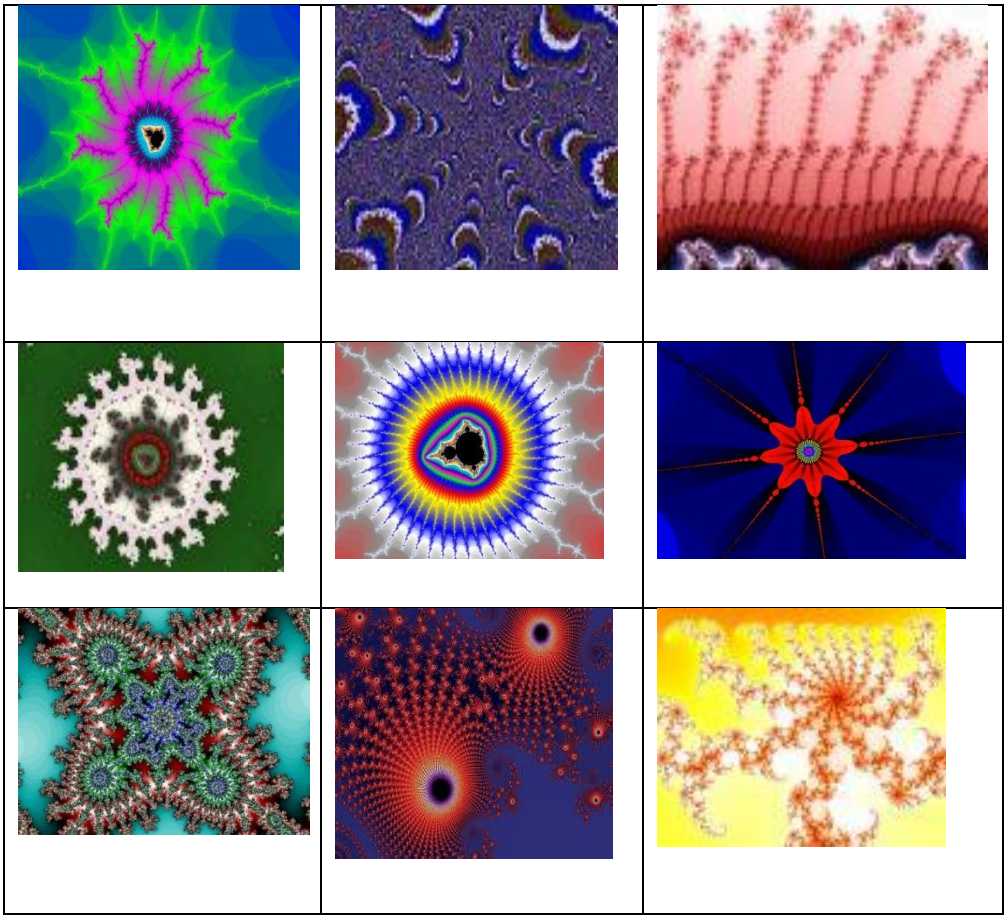


Figure 3: Different images of Mandelbrot set.

Applications Many fields from breast cancer to geology and botany are reaping the benefits of Mandelbrot work with fractals. Currently, fractal geometry is being studied for effective use by Richard Voss, a physicist at the IVM T.J. Watson Research Center to help doctors diagnose breast cancer from mammograms. [Gleick J, Chaos 1988].

1. Another application occurs in geology by examining the self-similarity of mountain ranges and coastlines.
2. Fractal self-similarity is also modeled in botany because the angle between the main branches of a tree and its trunk remain constant in each species.

3. The film industry has been making use of computer-generated fractals to create real-life alien landscapes. Michael Crichton, author of Jurassic Park, explained why a park of dinosaurs would not work through fractal geometry.
4. Other areas of application include irregular structures of clouds and galaxies, weather patterns, turbulence in fluid flow, stock market fluctuations, disturbances in heart rhythms, and even used for dating in Chinese art. Many uses have been found for fractals in many different occupations.

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CONCLUSIONS

Mandelbrot set and its construction analysis along with different images of Mandelbrot set obtained by performing different iterations and its applications in Fractals and various fields are studied.

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Popular Article

RAMAN EFFECT

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Abstract: Science day celebrated on the account of C.V. Raman, employed monochromatic light from a mercury arc using suitable Filters which penetrated transparent materials and was allowed to fall on a spectrograph to record its spectrum. He detected some new lines in the spectrum which were later called 'Raman Lines'. These lines considered very significant in analyzing the molecular structure of chemical compounds. These discovery made him the first Asian and first non-white to receive any Nobel Prize in science.

CHANDRASEKHARA VENKATA RAMAN

One of the most prominent Indian scientists, C.V. Raman, was the first Indian person to win the Nobel Prize in Physics for his illustrious 1930 discovery, now commonly known as the "Raman Effect". It is immensely surprising that Raman used equipment worth merely Rs.200 to make this discovery. The Raman Effect is now examined with the help of equipment worth almost millions of rupees.

After 86 year of discovery, Raman Effect is major technique in molecular spectroscopy and principal method of nondestructive chemical analysis for both organic and inorganic compounds.

Chandrasekhara Venkata Raman was born at Tiruchirapalli in Tamil Nadu on 7th November 1888. Father of C.V.Raman was a professor of physics and mathematics and his mother came from a family of Sanskrit scholars, Raman exhibited a precocious nature at an early age. He received a B.A. degree from Presidency College in Madras at the age of 16, placing first in his class and receiving a gold medal in physics.

While studying for his M.A. degree, he published his first research paper in *Philosophical Magazine* at the age of 18. It was the first research paper ever published from Presidency College.

Because of poor health, he was unable to go to England for further education. With nothing else available in India, in 1907 he passed the Financial Civil Service exam, married, and was posted to Calcutta as assistant accountant general.

Shortly after arriving in Calcutta, Raman began after-hours research at the Indian Association for the Cultivation of Science (IACS). In the first 10 years, working almost alone, he published 27

research papers and led the way for the IACS to become recognized as a vibrant research institute. Much of this early work was on the theory of vibrations as it related to musical instruments. After brief postings in Rangoon and Nagpur, he returned to Calcutta, took up residence next door to the IACS, and constructed a door that led directly into the institute, giving him access at any time. He received research prizes in 1912 and 1913 while he was still a full-time civil servant. He also increased the IACS reputation with his extensive lectures in popular science, holding the audience spellbound with his booming voice, lively demonstrations, superb diction and rich humor.

At the age of 29 he resigned from his lucrative civil service job when Sir Ashutosh Mukherjee, vice-chancellor, Calcutta University, offered him the **Palit Chair Professorship**. He continued to lecture even though it was not required, and he used the IACS as the research arm of the university. By the time of his first visit to England in 1921, his reputation in physics was well known. Three years later he was elected a Fellow of the Royal Society — only the fourth Indian so honored. That same year he toured the United States, spending four months at the California Institute of Technology through the invitation of Nobel Laureate Robert Millikan.

CONTRIBUTIONS AND ACHIEVEMENTS

C.V. Raman made his first trip to London in 1921, where his reputation in the study of optics and especially acoustics was already known to the English physicists J. J. Thomson and Lord Rutherford, who gave him a warm reception. Raman's specialty had been the study of the vibrations and sounds of stringed instruments such as the violin, the Indian veena and tambura, and two uniquely Indian percussion instruments, the tabla and the mridangam.

But it was the return trip from London to Bombay that would change forever the direction of Raman's future. During the fifteen-day voyage, his restless and probing mind became fascinated with the deep blue color of the Mediterranean. As the story goes, during the voyage, Raman would often sit on the ship's deck and gaze at the azure of the Mediterranean Sea. Eventually, and perhaps inevitably, given his interest in the study of light, Raman began to wonder where the sea got its colour from.

The prevailing notion at the time was that the blue of the sea was a reflection of the sky. As for the sky's colour, physicist Lord Rayleigh had won a Nobel Prize in 1904 for proposing that it was due to minute particles in the air scattering the blue wavelength from the sun's white rays, while absorbing all other wavelengths of colour. But Raman had a hunch that the sea's hue was more than just a reflection of the sky. Unable to accept Lord Rayleigh's explanation that the color of the sea was just a reflection of the color of the sky, Raman proceeded to outline his thoughts on the matter while still at sea and sent a letter to the editors of the journal *Nature* when the ship docked in Bombay.

Using a Nicol prism, he eliminated some of the light from the sky that the sea reflected. This made the water's colour grow even more intense. "The hue of the water is of such fullness and saturation that the bluest sky in comparison with it seems a dull grey," Raman wrote in an article in the journal Nature in 1921, describing his observations with the Nicol prism. Clearly, water was responsible for its own colour, rather than merely reflecting the skies.

Popular Article

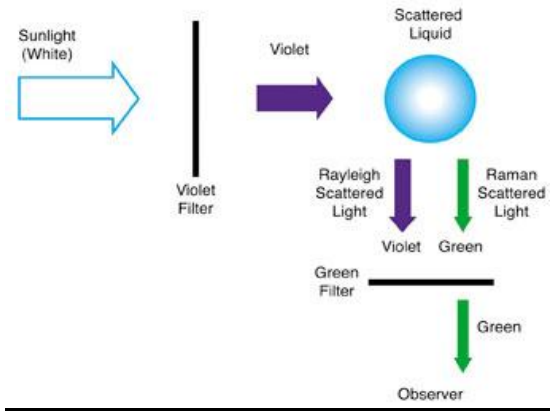
A short time later Raman was able to show conclusively that the color of the sea was the result of the scattering of sunlight by water molecules. Ironically, it was exactly the same argument that Rayleigh had invoked when explaining the color of the sky — the blue was the result of the scattering of sunlight by the molecules in the air.
Over the next seven years, Raman and his students—including physicist KS Krishnan(who later became the Director of the National Physical Laboratory, New Delhi)—shone light onto several transparent liquids, ranging from water to glycerin. Each time, they saw a faint glow: Blue in the case of water, green in the case of glycerin and so forth.

There is a captivating event that served as the inspiration for the discovery of the Raman Effect. Raman was busy doing some work on a December evening in 1927, when his student, K.S. Krishnan, gave him the news that Professor Compton had won the Nobel Prize on scattering of X-rays. This led Raman to have some thoughts. He commented that if the Compton Effect is applicable for X-rays, it must also be true for light. He carried out some experiments to establish his opinion.

Raman employed monochromatic light from a mercury arc using suitable Filters which penetrated transparent materials and was allowed to fall on a spectrograph to record its spectrum. During this, Raman detected some new lines in the spectrum which were later called 'Raman Lines'. Finally, on February 28, 1928, celebrated as Indian Science Day, Raman described to a group of scientists in Bangalore the phenomenon that would win him India's first Nobel for Physics. He was the first Asian and first non-white to receive any Nobel Prize in science. Before him Rabindranath Tagore (also Indian) had received the Nobel Prize for Literature in 1913.

The 'Raman Effect' is considered very significant in analyzing the molecular structure of chemical compounds. After a decade of its discovery, the structure of about 2000 compounds had been studied. Thanks to the invention of the laser, the 'Raman Effect' has proved to be a very useful tool for scientists.

Raman Effect



The Raman Effect is a very weak effect; only one in a million of the scattered light particles, or photons, actually exhibit the change in wavelength. This explains, in part, why the effect was not discovered earlier. In all of the early light-scattering studies, the excitation source was sunlight, which Raman has described as being plentiful in Calcutta, but it still lacked the desired intensity. The acquisition in 1927 by the IACS of a seven-inch (18 cm) refracting telescope enabled Raman to condense the sunlight and create a more powerful light source for his studies. By early 1928, mercury arc lamps were commercially available, and he switched to this even more intense light source.

Popular Article

Raman knew that visual and qualitative observations alone would not be sufficient information. He methodically set out to measure the exact wavelengths of the incident and Raman scattering by replacing the observer with a pocket spectroscope. He ultimately replaced it with a quartz spectrograph with which he could photograph the spectrum of the scattered light and measure its wavelength. These quantitative results were first published in the Indian Journal of Physics on March 31, 1928.

In the first seven years after its discovery, the Raman Effect was the subject of more than 700 papers in the scientific literature, mostly by physicists who were using the technique to study the vibration and rotation of molecules and relating those phenomena to the molecular structure. Then, as noted by Raman biographer G. Venkataraman, there was a decline in interest, as "the first bloom of novelty had worn off and physicists were satisfied that they understood the origin of the effect." At the same time, chemists became interested in the Raman Effect as an analytical tool. In James Hibben's words, "The Raman Effect became the adopted child of chemistry."

The unique spectrum of Raman scattered light for any particular substance served as a "fingerprint" that could be used for qualitative analysis, even in a mixture of materials. Further, the intensity of the spectral lines was related to the amount of the substance. Raman spectroscopy could be applied not only to liquids but also to gases and solids. And unlike many other analytical methods, it could be applied easily to the analysis of aqueous solutions. It was a ubiquitous technique, giving information on what and how much was present in a plethora of samples.

Later Life and Death

After discovering the Raman Effect in 1928, he was knighted by the British government in India and received the Nobel Prize in physics in 1930. Three years later, Raman left Calcutta for Bangalore, where he served as head of the Indian Institute of Science. There he continued his work on the Raman Effect and became interested in the structure of crystals, especially diamond. In 1934 he founded the Indian Academy of Science and began the publication of its *Proceedings*.

In 1948 he became director of the newly constructed Raman Research Institute, where he remained continually active, delivering his last lecture just two weeks before his death which was caused by a strong heart attack on November 21, 1970.His research interests changed in later years when he primarily investigated the perception of color.

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INFLUENCE OF DILUTE MEDIA ON CULTRABILITY OF BACTERIAL FLORA OF THANE CREEK WATER

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ABSTRACT

Bacterial diversity in natural habitats remains uncultured, unexplored that has been evidences of bacteria growth only in dilute nutrient media and form microscopic colonies. Therefore, present study involved comparison of flora of highly polluted Thane creek water on dilute media and normal media. Dilute nutrient agar containing the creek water and normal nutrient agar were used to compare the bacterial flora of the sample. An enormous transformation of flora was observed dilute nutrient agar media. Absence of micro colonies in normal nutrient agar represents that novel bacteria may present in the creek water sample.

Keywords- dilute media, novel bacteria, creek water.

INTRODUCTION:

The microbial world is the largest unexplored reservoir of biodiversity on the Earth. Out of three primary phylogenetic domains – Archaea (archaebacteria), Bacteria (eubacteria) and Eukarya (eukaryotes), bacterial domain is the least understood in terms of its diversity, physiologies and ecological panorama (Woese et al., 1990). Although 55 divisions (deep evolutionary lineages) of Bacteria and 13 divisions of Archaea have been described (Rappe et al., 2003), much diversity remains unexplored. The expansion of validly described species reflects the incompleteness of our current knowledge of microbial diversity.

Researchers have long known that traditional methods for culturing bacteria are effective at identifying only a fraction of the bacteria in a given sample. Higher numbers (by several orders of magnitude) of bacteria have been observed in various environmental samples by direct microscopic counting than by the plating procedures. The term "The great plate count anomaly" was coined by Staley and Konopka in 1985 (Staley and Konopka, 1985) to describe this phenomenon. One explanation for the "great plate count anomaly" is that many of the microbial species that dominate in natural settings are not adapted for growth in media containing high concentrations of complex organic carbon. Many microorganisms may need oligotrophic or other fastidious conditions to be successfully cultured. There are many examples of microbial strains that are common in nature, but can only be cultivated by specialized techniques (Wirsen et al, 2002).

The simple explanation for why these bacteria are not growing in the laboratory is that microbiologists are failing to replicate essential aspects of their environment. This is not for lack of trying or cleverness; when it is not clear what facet of the environment is not being properly replicated (nutrients, pH, osmotic conditions, temperature, or many more), attempting to vary all of these conditions at once results in a multidimensional matrix of possibilities that cannot be exhaustively addressed with reasonable time and effort. Various approaches like modification of growth media, modifications of growth conditions, directed cultivation attempts and cultivation of

microbial communities have been used to isolate different microbes from their natural habitat (Pham and Kim, 2012). Use of dilute media containing portion of the environment is one such approach.

The present study aimed at analysis of bacterial diversity of the polluted Thane creek water on dilute media containing creek water and normal nutrient media.

MATERIALS AND METHODS :

Sample collection: Sample collection was done at the Thane Creek. The water sample was collected in sterile containers and stored at 4^0C till analysis.

Media preparation: Two types of media were used in this study to analyze the bacterial flora.

Sterile Nutrient Agar media (HiMedia) was prepared according to standard protocol

Dilute media containing portion of the environment: 1:100 diluted Nutrient agar containing 20% creek water was prepared.

Composition of dilute media: 0.013 gm Nutrient broth powder was dissolved in 80ml Distilled water to which 20ml Creek water and 3gm agar agar powder were added.

Sample dilution: The creek water was serially diluted using tenfold dilution. Dilutions up to 10^5 were used for isolation by T- streak method. Neat creek water sample, as well as the diluted samples were used for streaking. The plates were incubated at room temperature for 72 hours.

RESULTS AND DISCUSSION:

High concentrations of nutrients used in conventional cultivation attempts may inhibit a large number of microorganisms, as many natural microbial communities flourish in oligotrophic conditions. Indeed, reports have indicated that the use of low concentrations of nutrients has increased microbial recovery (Aslam et al., 2010; Staley and Konopka, 1985). Simulation of natural environment has been another approach to culture the previously uncultured bacteria (Stewart, 2012).

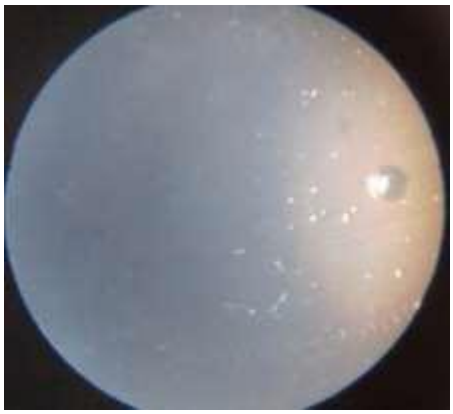
Inclusion of creek water in the medium is expected to provide nutrients and/ or signalling molecules and help culture the uncultured microorganisms. Both these approaches have been used in our study to isolate probable novel bacteria in the sample.

Bacteria isolated on the two media showed vast difference in colony characteristics. Some bacteria were slow growers; some showed pigment production while some showed difference in their colony appearance on prolonged incubation.

Importantly, the appearance of colonies growing on dilute media was completely different from the ones growing on normal nutrient media plate. Dilute media simulating the creek water environment showed the presence of micro colonies which were totally absent on normal media. Most of the difficult-to-culture bacteria have been known to produce very small (0.1–0.5 mm diameter) colonies, which can be observed and picked with the use of a dissecting microscope only (Dedysh, 2011). The same phenomenon has been reported for several rarely cultured groups of soil bacteria, which were most abundant among the mini-colonies that developed after >12weeks of incubation (Davis et al., 2011). Watwe et al. (2000) also have reported presence of such ‘micro colonies’ in isolation of novel bacteria from soil, water and plant surfaces. Thus, these micro colonies may represent probable novel groups of bacteria, a finding that needs to be confirmed by molecular identification of the cultures.

Thus, the use of dilute media simulating the creek water environment seems to help culture some novel bacteria, which needs to be confirmed by molecular analysis of the isolate.

Image of micro colonies on minimal media plates (observed under100x)1.



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JBNB -16

Antimicrobial property of *Piper betle* Leaf against *Candida albicans*

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Abstract

The leaves of *Piper betle* have long been in use in the Indian local system of medicine for its antioxidant and antimicrobial properties. In the present work, the antimicrobial activity of ethanol extract of Piper *Betle* leaves was evaluated against *Candida albicans*. Crude ethanol extract of *Piper Betle* leaves showed strong antimicrobial activity against the tested pathogenic strain. This was done using Disc diffusion method, which showed decline in the growth of the tested strain. *Candida albicans* is the causative agent of candidiasis. Candidiasis is a fungal infection due to any type of *Candida*. When it affects the mouth, it is commonly called thrush. Signs and symptoms include white patches on the tongue or other areas of the mouth and throat Other symptoms may include soreness and problems swallowing. When it affects the vagina, it is commonly called a yeast infection. The results also indicate that scientific studies carried out commonly use herbs having traditional claims of effectiveness might warrant fruitful results.

Keywords: Antimicrobial activity, Piper betel leaf, phytochemical, pathogenic isolates

INTRODUCTION:

The leaves of *Piper betle* are widely used as a post meal mouth freshener with various condiments such as areca nut (kattha), cloves, cardamom, candied rose and fennel for chewing purpose. The crop is extensively grown in India, Srilanka, Malaysia, Thailand, Taiwan and other south Asian countries. In Indian folkloric medicine, *Piper betle* leaf is popular as an antiseptic and is commonly applied on wounds and lesions for its healing effects. Fresh juice of Piper betel leaf is also used in many ayurvedic preparations. *Piper*

Betle leaves have long being studied for their diverse pharmacological actions.

From other scientific studies and researches, decline in the growth of ethanol extract treated bacterial strain was observed using disc diffusion method, MIC, and time kill kinetics. Also, the phytochemical analysis of *Piper betle* leaf extract revealed the presence of important bioactive components like phenolic compounds, antioxidants, flavanoids, carbohydrate, proteins.

In the present work, the antimicrobial activity of ethanol extract of *Piper Betle* leaves was evaluated against *Candida albicans. Candida albicans* is a fungus that grows both as unicellular and filamentous cells and a causal agent of opportunistic oral and genital infections in humans. It is a commensal and a constituent of the normal gut flora comprising microorganisms that live in the human mouth and gastro intestinal tract.

Crude ethanol extract showed strong antimicrobial activity against the tested pathogenic strain.

The main objective of this study includes the investigating the efficacy of the same as an antimicrobial agent on the pathogenic species of *Candida albicans.*

MATERIALS AND METHODS:

Plant materials

Fresh *Piper Betle* leaves were collected from Thane. The leaves were shade dried and crushed into fine powder with electric blender. The powder was sealed in a plastic can and was stored for further uses.

Preparation of ethanol extract

Dried and powdered *Piper Betle* leaves (10g) were Soxhlet extracted with 100ml of ethanol for about 6 hrs. The crude extract extracted in solvent was removed from the Soxhlet and was concentrated to dryness at room temperature and at 37°C and stored until needed for the bioassays in refrigerator.

Microbial strain and inoculum preparation

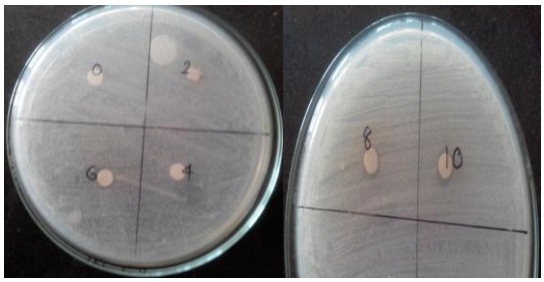
The microorganism used in this study was clinical isolate of *Candida albicans* obtained from Dr.Vaidya's laboratory, Thane. Active cultures were prepared by inoculating fresh nutrient broth medium with a loopfull of cells to get desirable cell counts for bioassays.

PROTOCOL

Disc diffusion method:

The antimicrobial activity of ethanol extract of *Piper Betle* was screened using disc diffusion technique. The agar plates

were prepared by pouring 15 ml of molten nutrient agar media into sterile petriplates. The plates were allowed to solidify and inoculum suspension was swabbed uniformly with sterile cotton swab and was allowed to stand for 15 minutes. The different dilutions of initial concentration of 10 mg/ml were loaded on autoclaved filter paper discs (6 mm diameter). The loaded disc was placed on the surface of medium and the compound was allowed to diffuse for 5 minutes and the plates were incubated at 37°C for 24 hrs. At the end of incubation, inhibition zones formed around the disc were measured.



RESULTS AND DISCUSSION:

The analysis of *Piper Betle* leaf revealed the presence of biologically active components .From other scientific studies it was observed that the presence of antioxidants improved the antimicrobial activity of this medicinal plant. The antimicrobial effect was seen for a fungal species *Candida albicans*. Since this is one of the most opportunistic oral pathogen. The antimicrobial properties were studied using disc diffusion test.

Strain	Dilution concentrations (mg/ml)					
	0	2	4	6	8	10
Candida albicans(zone of inhibition in mm)	-	-	-	4	6	7

Key: (-) = zone of inhibition was not observed

The disc diffusion method gave inhibition of *Candida albicans* at 6mg/ml.

CONCLUSION:

Candida albicans is the most commonly implicated organism in oral Candidiasis, fungal infection on mucous membrane of mouth. The relative efficiency of the bactericidal activity by *Piper Betle* leaf ethanol extract on specific opportunistic oral pathogens suggest the possibility of a more specific, cost effective and potentially harmless antimicrobial agent. Concentration of *Piper Betle* leaf extract should be increased for more efficient results.

ACKNOWLEDGEMENT

We gratefully acknowledge Dr. Vaidya's laboratory, Thane for providing the opportunistic fungal species of *Candida albicans* for carrying out the project.

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JBNB -16

USE OF ELLIPTIC CURVES IN DISCRETE LOGARITHM PROBLEMS: AN OVERVIEW

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Abstract:

Numerous cryptosystem often involves the use of algebraic groups. Elliptic curves are widely used to form elliptic curve groups. Elliptic curve cryptosystem requires less storage, less memory and less bandwidth as compare to other cryptography system. The use of Elliptic curves in cryptography has been increasing rapidly especially when it comes to the wireless devices such as smart cards and cell phones.Security of cryptosystem is based on difficulty of solving discrete logarithm problem. This paper contains different methods of solving discrete logarithm problems using elliptic curves and its comparison.

Keywords: Elliptic curve, discrete logarithm problem.

INTRODUCTION:

The invention of computer and the internet have made communication a lot easier. Today, the significant information is sharing immediately with within a miniature worldwide, which made to look after the communication to prevent from dangerous. In order to keep the information secure, cryptography plays a major role. Use of elliptic curves in cryptography is recently introduced, just three decades back. Public key cryptosystem consist of encryption schemes, where the difficulty of finding the decryption key without the knowledge of the encryption key, is based on the mathematical problem which is believed to be impossible to solve in a reasonable time. This way the encryption key can be made public and this solves the problem of exchanging keys in the traditional secret key cryptosystems.

One such difficult mathematical problem is the discrete logarithm problem for abelian groups. The discrete logarithm problem is to find a number k, such that

$$kg = h$$

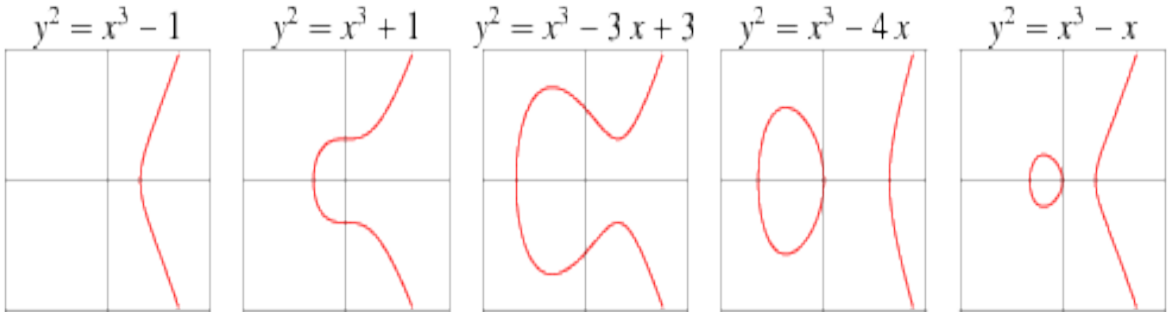
for some elements g, h in the group[*Neil,2006*] or general groups, there

exist algorithms that solve a DLP, like the Baby-step Giant-step algorithm and the pollard rho algorithm, which have exponential running time and are therefore not considered to be fast [*Neil,2006*]. However, for the multiplicative group, there is a method that solves a DLP in sub exponential time, namely Index Calculus. As a consequence, this kind of groups can only be used if their cardinality is enormous. That is where elliptic curves come into play. These are non-singular projective cubic curves over algebraically closed fields. It is possible to define discrete logarithm problems on them, so elliptic curves can be used to define public key cryptosystems.

Public key cryptosystem based on elliptic curve groups, also known as elliptic curve cryptosystems are safe comparatively. Until now, there are no known algorithms that solve a random DLP on a random elliptic curve group in polynomial or subexponential time [*Joseph,2010*]. Therefore, the group size can be kept relatively small, and this makes elliptic curve cryptosystems especially useful for small communication devices.

Definition of elliptic curve

An equation of the form $y^2 = x^3 + ax^2 + bx + c$ is called an elliptic curve. Some of the examples of elliptic curves are as follows:



Group Law on elliptic curve

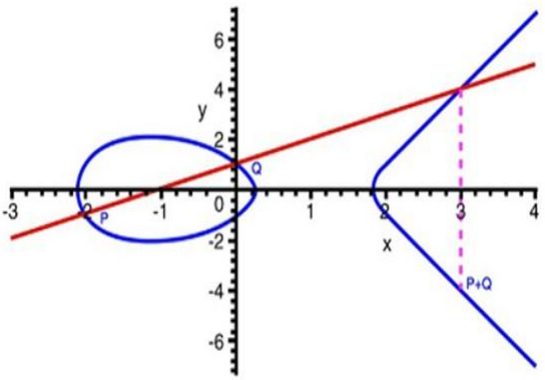
Let E :$y^2 = x^3 + ax^2 + bx + c$ represents elliptic curve over field IR. Let P, Q be the point on the elliptic curve. Draw line through the points P and Q and find the third intersection point "-R". Draw the vertical line through the point "-R". Since the curve is symmetric about x- axis we just take point R and reflect it above x-axis. The corresponding point "R" represents addition of two points P and Q. Set of all points on elliptic curve along with the point at infinity, which is actually an identity element form a group with

binary operation addition as defined below.

Thus if P = (x_1, y_1) and Q = (x_2, y_2) then P + Q = R = (x_3, y_3) is given by

$X_3 = [(y_2 - y_1)/(x_2 - x_1)]^2 - x_1 - x_2$.and $y_3 = -y_1 + [(y_2 - y_1)/(x_2 - x_1)](x_1 - x_3)$

If the points P and Q are same i.e. if the line through the point P meet the curve at



Discrete logarithm problem:

Let

E $y^2 = x^3 + ax^2 + bx + c$ represents elliptic curve over finite field. Let P, Q be points on elliptic curve. The problem is to find an integer k such that Q = KP. [*Neil 2006*]

Example:

Consider an elliptic curve given by the equation $y^2 = x^3 + 9x + 17 \pmod{23}$.

Let Q = (4, 5) and P = (16, 5), Elliptic curve discrete logarithm problem is to find an integer k such that kP = Q.

point "-R" as shown in the figure below then in that case addition is taken as P+P = R.

If P = (x_1, y_1) and Q = (x_2, y_2) and $x_1 = -x_2$ then P + Q = P + (-P) is defined to be an identity element, which is point at infinity. [*M.T.Wankhede-2012*]

The integer k can be found by repeated point doubling till we get Q.

Since P = (16, 5), 2P = (20, 20), 3P = (14, 14), 4P =(19, 20), 6P = (7, 3), 7P = (8, 7),

9P = (4, 5) = Q. Hence k = 9.

The above method of attacking DLP is simple brute force; try all possible values of k until one work. This is impractical when the answer k can be an integer of several hundred digits which is a typical size used in cryptography. [*M.T.Wan 2012]*

The earliest methods introduced to compute discrete logarithms are generic i.e. they assume no special knowledge about the underlying group and consider group operation as black boxes. The fact that the discrete logarithms can be computed using exhaustive search is self – evident. But it is outperformed by the introduction of Baby-step Giant-step, initially introduced by Shanks in 1971 for computation of class numbers in quadratic fields. Subsequently in 1978, Pollard Rho method is introduced. [*Adrian 2012*]

Subexponential Index Calculus algorithms have been developed for a variety of discrete logarithm problem. The one notable exception, where in general we still do not have algorithms better than those for the generic problem, is for elliptic curve discrete logarithms.

Most of the recent progress in discrete logarithm algorithm has come from the developments in the Index Calculus method through exploitation of algebraic properties of finite fields. Unfortunately, this approach is in general not applicable to elliptic curve discrete logarithms. For elliptic curves, there exist some direct discrete logarithm algorithms that work for specific classes of curves and some indirect approaches that transfer the problem to finite fields or to higher genus curves.[*Amie 2005*]

The Baby-step Giant-step algorithm

Let G be an abelian group and let g be an element of order n and h be an element in <g>. The discrete log problem is to find k such that h = k.gLet $m = \sqrt{n}$. We execute the following steps:

1. Make a list $L_1 = \{0, g, 2g, \ldots\ldots mg\}$If h∈ L_1, we are done, otherwise go to next step.
2. Make a list $L_2 = \{h, h - mg, h - 2mg, \ldots\ldots h - m^2 g\}$ If $0 \in L_2$, we are done, otherwise go to next step.
3. Determine x ∈ $L_1 \cap L_2$.
4. $x = ig = h - jmg$ for some $0 \leq i, j \leq m$, hence $h = (i + jm)g$

Thus the value of k is (i + jm).

The baby –step giant- step algorithm solves DLP significantly faster but still it takes exponential running time. Another disadvantage is that the algorithm requires a lot of memory, since two lists of size $\sqrt{n}$ need to be stored.[*Ismail2012*]

Pollard rho algorithm

Another algorithm for solving DLP is the Pollard rho algorithm. It is slightly faster than baby-step giant-step method and it needs much less storage.

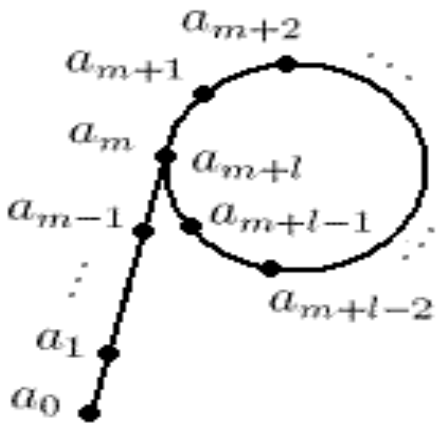
Pollard rho method is a low memory algorithm that finds a discrete logarithm by finding a collision in the map

(a,b) → aP + bQ where a, b ϵ Z.

Finding a collision usually reveals the discrete logarithm k of Q to the base

P: if aP+bQ = a'P+ b'Q and b ≠b'(mod l) then k = (a – a')/(b – b') (mod l).

A generic way to find this collision is to iterate this function. Define maps a and b from <P> to Z and compute a_{i+1} = f(a_i)= a(a_i)P + b(a_i)Q, starting from some initial combination a_0= a_0P + b_0Q. If any of a_i and a_j collide then also a_{i+1} = a_{j+1}, a_{i+2}=a_{j+2}, etc. This means that the sequence enters a cycle. This can be detected efficiently using Floyd's cycle-finding method. [*Ismail 2012*].



CONCLUSION:

Finally the difference between Baby-step Giant-step method and Pollard Rho method is pointed out. The BSGS method is deterministic, which means that it is guaranteed to finish within the predicted time. On the other hand, Pollard Rho method is probabilistic, which means that there is a high probability that they will finish within the predicted time.

The best known algorithm to solve the discrete logarithm problem can be categorized into two: collision search algorithm and index calculus algorithm. They differ in the kind of objects on which they can be applied and also in their computing time. A collision search algorithm works for a finite group, while index calculus method requires certain properties of the group for it to be successful. Because of its requirement for special properties of group, the index calculus method cannot be used to attack any discrete logarithm problem using elliptic curve. For the elliptic curve discrete logarithm problem, the fastest known algorithm currently available is the pollard rho algorithm.

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Popular Article

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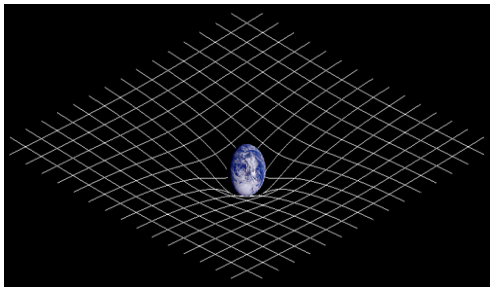
JBNB -16

100 Years of General Relativity

-Nitin Dubey

On 4 November 1915 Einstein wrote to his elder son Hans Albert Einstein, "In the last days I completed one of the finest papers of my life; when you are older I'll tell you about it". He referred to the first out of four papers Einstein wrote in November 1915 where he finally developed his General Theory of Relativity.



The General Theory of Relativity provides the law of gravitation and its relation to the other forces of nature. From Newton we knew about the "strength" of gravity, but his theory did not tell us how gravity pulls on things. Einstein's General Theory of Relativity was a game-changer. In the general theory of relativity the doctrine of space and time no longer figures as a fundamental independent of the rest of physics. The geometrical behavior of bodies and the motion of clocks rather depend on gravitational fields, which in their turn are produced by matter.

With the general theory of relativity, in which Einstein managed to reconcile relativity and gravitation, he had to discard the traditional physics worldview, which saw space as merely a stage on which the events of the world unfold. Instead, space-time is a dynamic entity, which is distorted by any matter that is contained in it, and which in turn tells that matter how to move and evolve. This interaction between spacetime and matter is described by Einstein's geometric, relativistic theory of gravity.

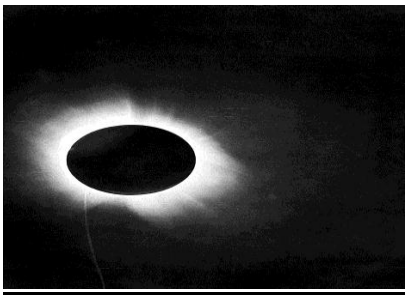
The consequences of that theory are spectacular. For instance, general relativity predicts that even light is deflected by gravity - a prediction that has been confirmed by numerous astronomical observations. In addition, it predicts exotic phenomena like gravitational waves and black holes,

To obtain this result he spent ten years (from 1905 to 1915) completely dedicated to obtain a more "general" application of what he

developed with the special theory of relativity. He noticed that for the purpose of describing nature the choice of the state of motion of an arbitrary coordinate system should have no restrictions.

In 1907, he had what he defined as "the happiest thought of his life", a milestone that paved the way for the development of his theory. He imagined a man falling from the roof of a house and he thought that man would not feel his own weight; he would feel weightless. He realized that there is a link between gravity and motion and after working out this idea for the next eight years, Einstein concluded that space is like a stretchy sheet of fabric that warps when objects are on it. Bigger objects like the Sun warp space more than objects like the Earth. This is also true for time: clocks run slower in a strong gravitational field than they do in empty space.

Confirmation of the theory



One of Eddington's photographs of the 1919 solar eclipse experiment, presented in his 1920 paper announcing its success

The scientific community received the theory with skepticism and its complexity did not help either. It needed to be confronted with experiments.

Albert Einstein proposed three tests of general relativity, subsequently called **the classical tests of general relativity**, in 1916:

1. the perihelion precession of Mercury's orbit
2. the deflection of light by the Sun
3. the gravitational redshift of light

The first observation of light deflection was performed by noting the change in position of stars as they passed near the Sun on the celestial sphere. The observations were performed in May 1919 by Arthur Eddington and his collaborators during a total solar eclipse, so that

the stars near the Sun (at that time in the constellation Taurus) could be observed. Observations were made simultaneously in the cities of Sobral, Ceará, Brazil and in São Tomé and Príncipe on the west coast of Africa. The result was considered spectacular news and made the front page of most major newspapers. It made Einstein and his theory of general relativity world-famous. When asked by his assistant what his reaction would have been if general relativity had not been confirmed by Eddington and Dyson in 1919, Einstein famously made the quip: "Then I would feel sorry for the dear Lord. The theory is correct anyway."

The early accuracy, however, was poor. The results were argued by some to have been plagued by systematic error and possibly confirmation bias, although modern reanalysis of the dataset suggests that Eddington's analysis was accurate. The measurement was repeated by a team from the Lick Observatory in the 1922 eclipse, with results that agreed with the 1919 results and has been repeated several times since, most notably in 1953 by Yerkes Observatory astronomers and in 1973 by a team from the University of Texas. Considerable uncertainty remained in these measurements for almost fifty years, until observations started being made at radio frequencies. It was not until the 1960s that it was definitively accepted that the amount of deflection was the full value predicted by general relativity, and not half that number. The Einstein ring is an example of the deflection of light from distant galaxies by more nearby objects.

Application of General Relativity

GPS (Global Positioning System):

Built at a cost of over $10 billion mainly for military navigation, GPS has rapidly transformed itself into a thriving commercial industry. The system is based on an array of 24 satellites orbiting the earth, each carrying a precise atomic clock. Using a hand-held GPS receiver which detects radio emissions from any of the satellites which happen to be overhead, users of even moderately priced devices can determine latitude, longitude and altitude to an accuracy which can currently reach 15 meters, and local time to 50 billionths of a second. Apart from the obvious military uses, GPS is finding applications in airplane navigation, oil exploration, wilderness recreation, bridge

construction, sailing, and interstate trucking, to name just a few.

But in a relativistic world, things are not simple. The satellite clocks are moving at 14,000 km/hr in orbits that circle the Earth twice per day, much faster than clocks on the surface of the Earth, and Einstein's theory of special relativity says that rapidly moving clocks tick more slowly, by about seven microseconds (millionths of a second) per day.

Also, the orbiting clocks are 20,000 km above the Earth, and experience gravity that is four times weaker than that on the ground. The atomic clocks on the GPS satellites run faster than clocks on Earth's surface, because they are located farther from the Earth's gravitational field and thus experience less gravitational time dilation. Einstein's general relativity theory says that gravity curves space and time, resulting in a tendency for the orbiting clocks to tick slightly faster, by about 45 microseconds per day. The net result is that time on a GPS satellite clock advances faster than a clock on the ground by about 38 microseconds per day.

To determine its location, the GPS receiver uses the time at which each signal from a satellite was emitted, as determined by the on-board atomic clock and encoded into the signal, together the with speed of light, to calculate the distance between itself and the satellites it communicated with. The orbit of each satellite is known accurately. Given enough satellites, it is a simple problem in Euclidean geometry to compute the receiver's precise location, both in space and time. To achieve a navigation accuracy of 15 meters, time throughout the GPS system must be known to an accuracy of 50 nanoseconds, which simply corresponds to the time required for light to travel 15 meters.

But at 38 microseconds per day, the relativistic offset in the rates of the satellite clocks is so large that, if left uncompensated, it would cause navigational errors that accumulate faster than 10 km per day! GPS accounts for relativity by electronically adjusting the rates of the satellite clocks, and by building mathematical corrections into the computer chips which solve for the user's location. Without the proper application of relativity, GPS would fail in its navigational functions within about 2 minutes.

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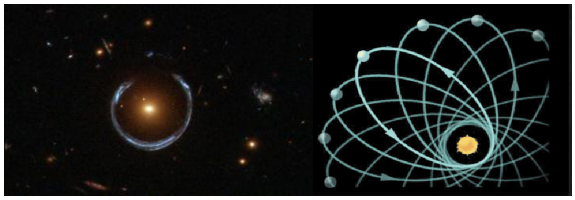
Gravitational Lensing:

One of the more interesting predictions by Newtonian physics and Einstein's General Theory of Relativity is that in the presence of matter, the path of a light ray can get bent. Only Einstein's theory gets it exactly right, however, because Newtonian physics fails to include the effect of the bending of space-time by a gravitational field. Newtonian gravitation theory assumes that space-time remains flat.

During the 1980's, astronomers have found a number of examples in which the image of a distant quasar is distorted by the gravitational field of some galaxy along our line of sight to the quasar. Such gravitational lensing leads to several peculiar kinds of image distortion depending on the exact geometry and distances between the quasar, the 'lensing galaxy', the shape of the lensing gravitational field, and the distance to the earth. For the Earth, quasar and lensing galaxy located exactly along the same line, and for a quasar with no resolvable structure, you get what is called an Einstein Ring. For any other geometry in which the lensing galaxy is not on the line between the Earth and quasar, you will get a set of multiple images of the quasar surrounding the image of the lensing galaxy. The number, shape and intensity of these images are determined by what opticians called 'caustics'.

There are no simple rules for determining how many images or arcs ought to form. The 'Einstein Ring' objects MG1131+0546 is a perfect ring with two spots. The 'Einstein Cross' objects G2237+0305, observed by the Hubble Space Telescope, is 4 images of a quasar and a 5th image in the center formed by the lensing galaxy itself. Giant arcs in the distant galaxy cluster Abell 370 are formed by lensing of galaxy images into portions of rings; and the 'Double Quasar' 0957+5614, is a pair of images of a distant quasar split by a foreground galaxy. The various geometries of quasar, galaxy and Earth control the intensity and locations of lens images.



LRG 3-757 was discovered in 2007 in data from the Sloan Digital Sky Survey (SDSS), the image shown above is a follow-up observation taken with the Hubble Space Telescope's Wide Field Camera 3.

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Perihelion precession of Mercury:

A long-standing problem in the study of the Solar System was that the orbit of Mercury did not behave as required by Newton's equations.

To understand what the problem is let me describe the way Mercury's orbit looks. As it orbits the Sun, this planet follows an ellipse...but only approximately: it is found that the point of closest approach of Mercury to the sun does not always occur at the same place but that it slowly moves around the sun. This rotation of the orbit is called a *precession*.

The precession of the orbit is not peculiar to Mercury, *all* the planetary orbits precess. In fact, Newton's theory predicts these effects, as being produced by the pull of the planets on one another. The question is whether Newton's predictions agree with the *amount* an orbit precesses; it is not enough to understand qualitatively what is the origin of an effect; such arguments must be backed by hard numbers to give them credence. The precession of the orbits of all planets *except* for Mercury's can, in fact, be understood using Newton's equations. But Mercury seemed to be an exception. Mercury deviates from the precession predicted from these Newtonian effects. This anomalous rate of precession of the perihelion of Mercury's orbit was first recognized in 1859 as a problem in celestial mechanics, by Urbain Le Verrier. His reanalysis of available timed observations of transits of Mercury over the Sun's disk from 1697 to 1848 showed that the actual rate of the precession disagreed from that predicted from Newton's theory by 38" (arc seconds) per tropical century (later re-estimated at 43"). Einstein showed that general relativity agrees closely with the observed amount of perihelion shift. This was a powerful factor motivating the adoption of general relativity.

Recent Discovery of Gravitational Waves:

One hundred years after Albert Einstein predicted the existence of gravitational waves, scientists have finally spotted these elusive ripples in space-time.

In a highly anticipated announcement, physicists with the Advanced Laser Interferometer Gravitational-Wave Observatory (LIGO) revealed on February 11, 2016 that their twin

detectors have heard the gravitational 'ringing' produced by the collision of two black holes about 400 mega parsecs (1.3 billion light-years) from Earth.

On September 14, 2015, at just before eleven in the morning, Central European Time, the waves reached Earth. Marco Drago, a thirty-two-year-old Italian postdoctoral student and a member of the LIGO Scientific Collaboration, was the first person to notice them. He was sitting in front of his computer at the Albert Einstein Institute, in Hannover, Germany, viewing the LIGO data remotely. The waves appeared on his screen as a compressed squiggle, but the most exquisite ears in the universe, attuned to vibrations of less than a trillionth of an inch, would have heard what astronomers call a chirp- a faint whooping from low to high. This morning, in a press conference in Washington, D.C., the LIGO team announced that the signal constitutes the first direct observation of gravitational waves.

Albert Einstein predicted the existence of gravitational waves in 1916 as part of the theory of general relativity. In Einstein's theory, space and time are aspects of a single measurable reality called space-time. Matter and energy are two expressions of a single material. We can think of space-time as a fabric; the presence of large amounts of mass or energy distorts space-time- in essence causing the fabric to "warp" - and we observe this warp as gravity. Freely falling objects- whether soccer balls, satellites, or beams of starlight-simply follow the most direct path in this curved space-time.

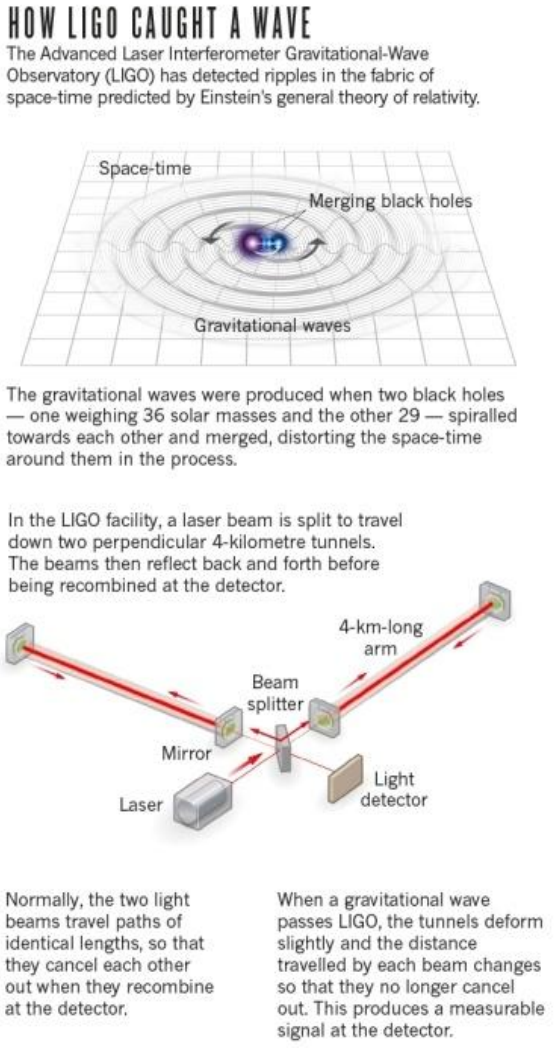
"Just as a boat sailing through the ocean produces waves in the water, moving masses like stars or black holes produce gravitational waves in the fabric of space-time. A more massive moving object will produce more powerful waves, and objects that move very quickly will produce more waves over a certain time period."

LIGO is part of a larger effort to explore one of the more elusive implications of Einstein's general theory of relativity. The theory, put simply, states that space and time curve in the presence of mass, and that this curvature produces the effect known as gravity. When two black holes orbit each other, they stretch and squeeze space-time like children running in circles on a trampoline, creating vibrations that travel to the very edge; these vibrations are gravitational waves. They pass through us all the time, from sources across the universe, but because gravity is so much weaker than the

other fundamental forces of nature-electromagnetism, for instance, or the interactions that bind an atom together-we never sense them. Einstein thought it highly unlikely that they would ever be detected. He twice declared them nonexistent, reversing and then re-reversing his own prediction. A skeptical contemporary noted that the waves seemed to "propagate at the speed of thought."

LIGO detected the ripples in space-time by using a device called a laser interferometer, in which the time it takes light to travel between suspended mirrors is measured with high precision using controlled laser light. Two mirrors hang far apart, forming one "arm" of the interferometer, and two more mirrors make a second arm perpendicular to the first. Viewed from above, the two arms form an L shape. Laser light enters the arms through a beam splitter located at the corner of the L, dividing the light between the arms. The light is allowed to bounce between the mirrors repeatedly before it returns to the beam splitter. If the two arms have identical lengths, then interference between the light beams returning to the beam splitter will direct all of the light back toward the laser. But if there is any difference between the lengths of the two arms, some light will travel to where it can be recorded by a photodetector.

The space-time ripples cause the distance measured by a light beam to change as the gravitational wave passes by, and the amount of light falling on the photodetector to vary. The photodetector then produces a signal defining how the light falling on it changes over time. The laser interferometer is like a microphone that converts gravitational waves into electrical signals. Three interferometers of this kind were built for LIGO- two near Richland, Washington, and the other near Baton Rouge. Louisiana. LIGO requires at least two widely separated detectors, operated in unison, to rule out false signals and confirm that a gravitational wave has passed through the earth.



What's next?

Even though general relative has passed every test and have helped scientist go well beyond what Newton dreamed, many scientists think is incomplete. This comes from the fact that scientists haven't found a way yet to reconcile gravity and quantum physics or that some scientists argue that phenomena such as dark matter could be actually failures of general relativity. This have led scientists to look for alternative explanations such as modifications of the General Relativity but no explanation has been good enough to circumvent these problems and many questions are still open.

It took more than two hundred years and many struggles until Einstein showed us how gravity and the Universe work. A hundred years later we celebrate worldwide this beautiful theory with the same excitement as Einstein wrote to his son Hans to tell him the good news.

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Books on General relativity for further readings:

- General Relativity by Robert M. Wald.
- Gravitation by Charles Misner, Kip Thorne, and John Wheeler.
- *Black holes and time warps: Einstein's outrageous legacy by* Kip S. Thorne.
- *Space, time, and gravity: the theory of the big bang and black holes by* Robert M. Wald.

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EXTRACTION AND PHYSICOCHEMICAL CHARACTERIZATION OF *MOMORDICA DIOCA* SEED OIL

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ABSTRACT:

Momordica dioica is very popular vegetable in India during monsoon /Shravan. It is specially used during fast since ancient times. Oil is extracted from various natural resources by various means. Vegetable oils are used as an ingredient or component in many manufactured products. *Momordica dioica* fruits are rainy vegetable and the hoary seeds are thrown due to their hard covers which remain uncooked. Hence physicochemical characterization of *momordica dioca* seed oil was measured for edibility.

Keywords: Green extraction of oil; *Cucurbitaceous;*

INTRODUCTION:

Indian agriculturalists from rural areas are working for improvement in different varieties of edible plant to satisfy alimentary supplements [Ali M.A.;,et al 2008]. Spine gourd [*Cucurbitaceous]*; popularly known as 'Kantola or kankro, kartoli, kantoli, kantola, kantroli, ban karola, or janglee karel Kantola Kakrol'. It is short in length and round in size, closely resembles to bitter gourd features but not in taste. Botanical name of spine gourd is "Momordica dioca" is a marvel vegetable with a diversified applications having enormous economic potentials; belongs to the family *Momordica dioica Roxb*. *Momordica dioca* is a perennial, dioecious climber hence designated in Cucurbitaceous. Momordica genus contains about 80 species. [L. K. Bharathi et.al; 2011, N. M. Raj, et.al 1993] According to the latest revision of Indian Momordica, there are six well

identified species of which four are dioecious and two are monoecious. Spine gourd is a warm season crop especially growth observed in the month of Shravan /August. This revolutionary plants popularity has been enriched due to its remedial and significant nutritional values. It is successfully cultivated in the plains, hillside of sub-tropical and tropical regions by pitching of mature seed before cooking. It is waste land creeper on thorny plant.

Versatility as foodstuff and therapeutic applications of its; fruits have diuretic , laxative , hepatoprotective, antivenomous, antihypertensive, anti-inflammatory, antiasthmatic, antipyretic, antileprosy, antidiabetic , and antidepressant properties but also its leaves have antihelminthic , aphrodisiac,antihemorroidal,hepatoprotective,antibronchitic,antipyretic, antiasthmatic and analgesic properties. Methanol and aqueous extract of fruits were analysed for its antioxidant activity. [Sattya Narayan Talukdar 2014] The extract exhibited the presence of phenolic compounds, flavonoids, sterol, alkaloids, amino acids etc.[C. S. Shreedhara et al 2006 ;B. Shrinivas, et.al;2008 , A. Jain etal ;2008] Worldwide, Citrus fruits and vegetables are widely used for oil extraction. Hence researchers also tried for its oil extraction nevertheless *Momordica dioica* seed oil was observed as an insecticide and established satisfactory level of natural insecticidal due to presence of alkaloid [D. Mishra, et.al.;2006]. Moreover, it been evaluated that seed oil's has potential as grain protectant against *Callosobruchus chinensis* upon the stored legume-pulse grain. Hence, present study focused on extraction and physicochemical characterization of *Momordica dioca* seed oil.

MATERIALS AND METHODS:

Copper acetate, acetic anhydride from S.D.fine chemicals, Conc. Sulphuric acid, chloroform, alcoholic KOH, 0.01 N HCl were used from Loba chemicals. Glass distilled water used throughout the experimental work.

Source material:

The kantola vegetable was purchased from local market. Washed well with distilled water and seeds were segregated from

kantola, washed and sun dried and powdered.

EXTRACTION OF OIL FROM SEEDS:

Green extraction of oil:

Green extraction of oil from dried kantola seeds powdered (10gm) was observed by soxhlet extractor using water. The process was continuously monitored from to 90' min to 180' min. for the fatty acid. Finally, the solvent was recovered by simple distillation and oil was allowed to cool, and weighed. The extracted oil sample was in well-sealed glass bottle and kept for analysis test.

Solvent extraction of oil:

The oil was extracted from powdered seed material (10gm) in a Soxhlet apparatus with light petroleum ether (40–60°C) for about 24 h and the solvent was removed in rotary vacuum evaporator. The crude oil thus obtained was purified in a column (neutral alumina in petroleum ether) using petroleum ether-diethylether (70:30) as the eluting solvent and the percentage of the oil content was computed.

Characterisation of kantola seeds oil:

Physical and chemical characteristics:

Specific gravity of the oil was determined at 25°C with the help of a pycnometer. The refractive index of the clear oil was estimated at 25°C using Abbe Refractometer. The characterisation of oil was done as per standard tests. Copper acetate test [Ranganna S.; 1986] was performed by using (100µl) of extracted oil from kantola seeds for the confirmation of presence of oilve oil. Cholesterol test was carried out by Liebermann – Burchard test. [Ranganna S.; 1986]

Chemical characteristics:

The saponification value was estimated by Williams's 1966 using phenolphthalein indicator. Protein estimated by Lowery method (1951) and carbohydrate by Ammar method (2013) that is major modification of widely used Phenol–Sulfuric Acid method.

Stability of kantola seed oil:

Extracted oil was kept at room temperature as well as in the freeze to measure its stability.

Separation of acylglycerols:

The oil was separated into mono-, di- and triacylglycerols by silica gel (60–120 mesh) column chromatography. The elution was monitored by TLC. The purity of the acylglycerol classes was confirmed by TLC using silica gel developed with n-hexanediethyl ether 80/20 (v/v) and visualisation with chromic-sulphuric acid at 180°C. The acylglycerol classes were identified by comparing Rf values 277 with standard references.

RESULT AND DISCUSSION:

After segregation of mature seeds from fruits of *Momordica dioica* , washed well to remove all unwanted material of pulp of fruits to get the accurate result of oil. Seed were dried, powered and extraction was done by green and solvent techniques (Figure 1A and B). The powdered seed if explored for two days in the air, change in colour from whitish brown to black was observed. It may be due to biochemical change in biomolecules/enzyme action due to oxidation of it that reflect the quality of oil while extraction.

Green extraction process showed that the oil is extracted from seed within two hours but its stability is very less as compared to solvent extraction method. Oil (100 µl) was explored for two days in the air within to check its fatty acid characteristic produced stickiness. Green extraction oil showed rancity very fast and elasticity bad odour and fungal development after 8 days as compare to solvent extracted oil. Hence oil was vacuum distillate to received aqua-free oil. The colour of oil in both methods observed yellow and aroma is same. (Figure 1 C).

Figure 1 **A**. Morphology of *Momordica dioica* , **B**. Dried seed , **C**. Extracted oil from *Momordica dioica seed* by Green method and solvent method.

Oil extracted from *Momordica dioica* was acidic, which was indicative of the presence of fatty acid in extracted oil. The yellowish colour indicates the vitamin A, giving the oil a medicinal value. The odour of the oil changes with days giving a

neutral smell. The most common techniques for lipid extraction from seeds in current use involve organic compounds in solvent or Soxhlet extraction. These flammable and toxic organic solvents cause adverse health and environmental effects. Due to the new emphasis on environmental protection and the development of green chemistry, such solvent use is to be avoided as much as possible.

Table 1 Physicochemical Characteristic kantola seed oil.

Description	Result
Yield Weight and Volume %	10 gm and 30%
Specific gravity 25°C	0.9146 ± 0.00345a
Refractive index at 25°C	1.4257 ± 0.00047a
Color	Yellowish
Smell	Oily
pH	4 o 5
Saponification value	8.4
Copper acetate Test	Olive oil present
Liebermann - Burchard Test	Absence of cholesterol
Total protein	6.2 %± 0.039
Total Carbohydrate	63% ± 2

Soxhlet extraction is recognized by the Association of Analytical Chemists (AOAC) as the standard method for crude fat analysis. Green extraction of oil is advantageous in terms of solvent exposure to environment and solvent used for extraction is also a natural source. Extracted oil when treated with copper acetate solution, the petroleum ether and oil was seen in upper layer and copper acetate solution was seen in down layer, which gives confirmation of presence of oilve oil. By Liebermann- Burchard Test there was no change in colour, which confirms that there is absence of cholesterol in oil. Saponification is an indicator of average molecular weight and, hence chain length. This value indicates the oil is good for soap making industries. The monitoring of oil by TLC was performed.

The total amount of oil was separated into mono-, di-, and triacylglycerol fractions by means of column chromatography. The triacylglycerols varied from 89.15 to 94.10% while diacylglycerols from 2.45 to 1.76% and monoacylglycerols from 2.33 to 2.06%.

CONCLUSION:

momordica dioca is waste land creeper its fruits is used as vegetable during winter

season and produced income to farmers . Its nutritious values produced luster to rural life. The paper explored it applicability of *Momordica dioica* seed oil. It is vital substitute for higher fatty acid content oil. While assessing the nutritional value of oil need to human digestibility because it's also content starch. Therefore, there is a need for studies on the digestibility and overall bioavailability of the nutrients contained in kantola seeds.

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EVALUATION OF ANTIBACTERIAL ACTIVITY OF INDIAN MEDICINAL PLANTS

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Abstract:

The development of bacterial resistance to presently available antibiotics has necessitated the search for new antibacterial agents. Medicinal plants are a rich source of bioactive molecules which possess antibacterial and antifungal activity. In the present study, aqueous leaf extract of six plants i.e Betel (*Piper betle*), Bryopyllum (*Bryophyllum pinnatum*), Lemongrass (*Cymbopogon citratus*), Hibiscus (*Hibiscus rosa-sinesis*), Rose (*Rosa rugosa*) and Ashoka *(Saraca asoca)* was screened for potential antibacterial activity against *Escherichia coli* and *Staphylococcus aureus*. The antibacterial activity of the extract was determined using disc diffusion technique. The aqueous extract of betel and rose showed maximum antibacterial activity against *Escherichia coli* (9mm) and *Staphylococcus aureus* (11mm) respectively. The active agents from the leaf extract leads in development of new drugs.

Keywords: Medicinal plants, Antibacterial, Aqueous extract, *Escherichia coli*, *Staphylococcus aureus*

INTRODUCTION :

The worldwide increase of multidrug resistance in both community and health-care associated bacterial infections has impaired the current antimicrobial therapy, warranting the search for other alternative (Bishnu Marasini et al., 2015). Multi-drug resistant organisms are bacteria that have become resistant to certain antibiotics such that they can no longer be used to control or kill them. Bacteria that can resist treatment with more than one antibiotic are multidrug-resistant organisms (MDROs). Multi-drug resistant organisms develop when antibiotics are taken longer than necessary or when broad spectrum antibiotics are consumed for a prolonged time (Mahesh B et al., 2008). *Staphylococcus aureus*, a common bacterial pathogen, began to show resistance against Penicillin in the 1940s and has gradually become resistant to other drugs like methicillin dicloxacillin, nafcillin, oxacillin, and the cephalosporins. This multidrug resistant strain of *S. aureus* is known as Methicillin-resistant *Staphylococcus aureus* (MRSA). In medical facilities, MRSA

causes life-threatening bloodstream infections, pneumonia and surgical site infections. It is the emergence of such life threatening MDROs which has urged us to discover new lead molecules in the process of drug development.

For ages nature has gifted us plenty of herbs and plants. These plants form the main source of traditional medicines used to help in relief from illness and are still widely used all over the world. Herbs are safe, less toxic, economical and a reliable key natural resource of drugs all over the world (Al-Daihan et al., 2012)

Since ancient time in Chinese medicine, Ayurveda, Arabic medicine and Unani, the usefulness of plant extracts for antimicrobial therapy and/or other diseases have been observed to be promising remedies. They are considered both preventive and therapeutic. If phytomedicines are proved to be safe and effective, into national health care system then it can be approved by World Health Organization Bishnu Marasini et al., 2015). An impressive number of modern drugs have been isolated or derived from natural source, based on their use in traditional medicine. The plants have been used traditionally for centuries and modern scientific studies have shown the existence of good correlation between the traditional or folkloric application of some of the plants further strengthens the search for pharmacological active components from plants (HO Egharevba et al., 2010).

Medicinal plants represent a rich source of antimicrobial agents. Different parts of medicinal plant are used as extract for raw drugs (Srivastava, J et al., 1996). Medicinal plants are believed to be important source of new chemical substances with potential therapeutic effect (Chandra M et al., 2013). The secondary metabolites of plants found to be source of various phytochemicals that could be directly used as intermediates for the production of new drugs. Natural medicines are proved to be more acceptable to the human body, when compared to modern synthetic drugs.

In the present study, aqueous extracts of Indian plants such as Betel (*Piper betle)*, Bryophyllum *(Bryophyllum pinnatum)*, Lemon grass (*Cymbopogon citrates*), Hibiscus (*Hibiscus rosa-sinensis)*, Rose (*Rosa rugosa)*, Ashoka (*Saraca asoca)* were used to determine their antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli* using disc diffusion method.

MATERIALS AND METHODS :

1. Collection of leaves

Fresh and healthy leaves of test plants i.e. Betel (*Piper betle*), Bryophyllum (*Bryophyllum pinnatum)*, Lemongrass (*Cymbopogon citratus*)**,** Hibiscus (*Hibiscus rosa-sinensis)***,*** Rose (*Rosa rugosa*), Ashoka *(Saraca asoca)* were collected locally.

2. Preparation of leaf extracts (10%)

The leaves were rinsed thoroughly with distilled water to remove all the dust, cut into small pieces and dried at room temperature. About 10 g of these finely incised leaves of each plant type were weighed separately and transferred into 250 mL beakers containing 100 mL distilled water and boiled for about 10 min. The extracts were then filtered by muslin cloth to remove particulate matter and to get clear solutions which were then refrigerated (4°C) in 250 mL Erlenmeyer flasks for further experiments.

3. Microbial cultures

24hrs old culture suspension of *Escherichia coli* and *Staphylococcus aureus* were used as test isolates.

4. Concentration of the extract

The extract was concentrated by drying it in oven at 50^{o}C for 1hr.

5. Determination of antibacterial activity

For determination of the antimicrobial activity of the leaf extracts, disc diffusion method was used. Sterile filter paper discs were soaked separately with of each of the extract and then excess of extract was drained. These discs were placed on sterile nutrient agar plate, previously swabbed with the test bacterial isolate i.e. *Escherichia coli* and *Staphylococcus aureus*. The plates were then incubated at 37^{o}C for 24hrs. Antibacterial activity was defined as the diameter (mm) of the clear inhibitory zone formed around the discs. The test was carried out in duplicates.

RESULTS AND DISCUSSION:

In the present study, aqueous extracts of Indian plants such as Betel (*Piper betle)*, Bryophyllum *(Bryophyllum pinnatum)*, Lemon grass (*Cymbopogon citrates*), Hibiscus (*Hibiscus rosa-sinensis)*, Rose (*Rosa rugosa)*, Ashoka (*Saraca asoca)* were prepared and their antimicrobial activity against the test organisms was determined. One representative each from the Gram negative (*Escherichia coli)* and Gram positive *(Staphylococcus aureus)* group was chosen as the test organism. Both the test organisms are common human pathogens. *S. aureus* is responsible for a variety of infections like boils, impetigo, food poisoning, cellulitis, and toxic shock syndrome.

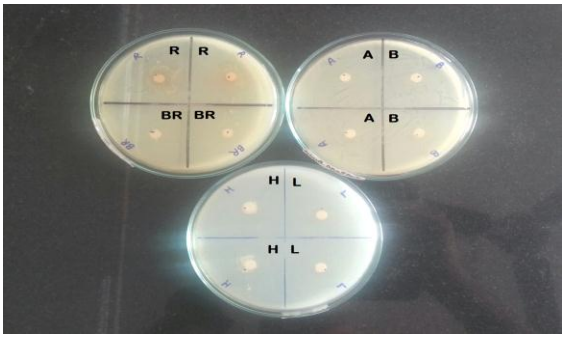
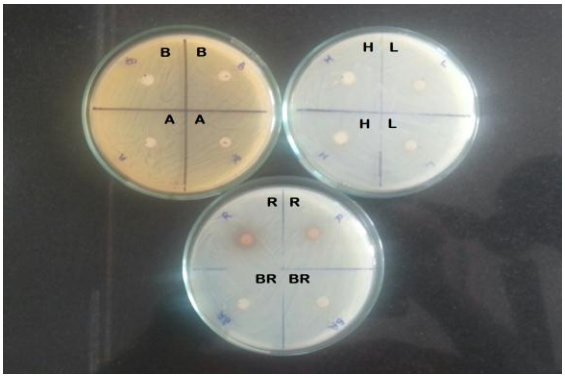


Figure1 Determination of anti-bacterial activity of aqueous leaf extract against *Escherichia coli*

Methicillin-resistant *Staphylococcus aureus*, known as MRSA, is a strain of *Staphylococcus aureus* that is resistant to the

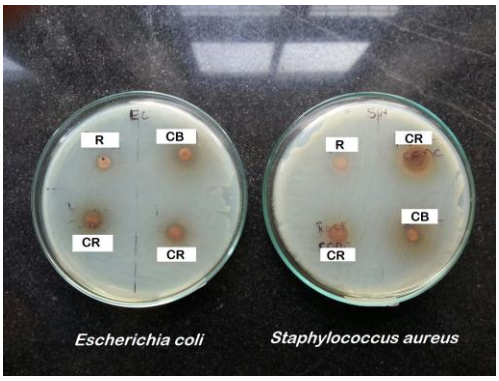
Table 1 Antimicrobial activity of aqueous extracts of plant leaves by disc diffusion assay.		
Plants	Diameter of zone of inhibition (mm)	
	S. aureus	E coli
Betel	6mm	6mm
Bryophyllum	-	-
Lemongrass	-	-
Hibiscus	-	-
Rose	8mm	6mm
Ashoka	-	-

antibiotic methicillin and other drugs in this class. *E. coli* is responsible for bacteremia, urinary tract infection (UTI), and traveler's diarrhea.



A.B - Betel; A - Ashoka; R - Rose; BR - Bryophyllum; H - Hibiscus; L - Lemon grass

Figure 2 Determination of anti-bacterial activity of aqueous leaf extract against *Staphylococcus aureus.*



B. R – Rose; CB - Concentrated Betel; CR - Concentrated rose

Figure 3: Determination and comparison of anti-bacterial activity of aqueous rose, concentrated betel, concentrated rose extract against *Staphylococcus aureus* and *Escherichia coli.*

The antibacterial activity of the extract was determined using disc diffusion method. In this method the extract impregnated disc is placed on to the agar plate which has been previously swabbed with the test culture. The disc absorbs moisture from the agar and the extract diffuses into the agar medium. As the distance from the disc increases, there is reduction in the concentration of the extract. Visible growth of bacteria occurs on the surface of the agar where the concentration of extract has fallen below its inhibitory level for the test strain. This zone of clearance (region where bacterial growth does not occur) is known as zone of inhibition

Table 2 Comparison of anti-bacterial activity of concentrated aqueous extracts of Rose and betel leaves by disc diffusion method.

Plants	Diameter of zone of inhibition (mm)	
	Staphylococcus aureus	*Escherichia coli*
Rose	5mm	6mm
Concentrated Rose	11mm	7mm
	9mm	7mm
Concentrated Betel	6mm	9mm

The zone of inhibition for rose extract against *Escherichia coli* and *Staphylococcus aureus* was 6mm and 8mm respectively. Since inhibitory effect was observed by rose leaf extract, it was concentrated and its antibacterial activity was determined again. And it was found that average zone of inhibition for concentrated rose extract against *Escherichia coli* and *Staphylococcus aureus* was 7mm and 10mm respectively. Hence, as the rose extract was concentrated, its antimicrobial activity was found to be increased. The zone of inhibition was observed to be higher in case of Gram negative bacteria (*Escherichia coli)* as compared to Gram positive bacteria (*Staphylococcus aureus*). Thus it can be concluded that concentrated rose extract was found more effective against Gram positive bacteria. Also in a previous study it was found that the average relative antimicrobial activity was higher with alcoholic extract as compare to aqueous extract of rose petals (Hirulkar N et al., 2010). The antibacterial activity of the Rose plant is mainly due to the presence of various phytochemicals like alkaloids, phenolic acids, flavonoids, tannins, and volatile oils which are more soluble in organic solvent (Rumana et al., 2014). In the initial part of the study very small zone of inhibition was observed for betel leaf extract and hence the extract was further concentrated and its antibacterial activity was checked. It was found that concentrated extract had a higher inhibitory effect on *Escherichia coli* (9mm) as compared to *Staphylococcus aureus* (6mm**).** Sivasankaridevi et al (2013) had obtained similar results where betel leaves had a less inhibitory effect on the Gram positive bacteria, *Staphylococcus aureus*. Various studies have shown that Gram positive bacteria are more susceptible towards plants extracts as compared to Gram negative bacteria. This may be due to fact that the cell wall in Gram positive bacteria is of a single layer, whereas the Gram negative cell wall is multilayered structure. Hence the passage of the active compound through the Gram negative cell wall may be inhibited. However, in the present study as well as in certain previous results the opposite was observed. This variation may due to the fact that microorganisms show variable sensitivity to chemical substances because of different resistance levels between strains.

No zone of inhibition was observed in case of hibiscus, Ashoka, lemon grass and Bryophyllum leaf extracts.

The result of this study is in accordance with the results reported by Kakarla et. al (2009) and K. Moore Neibel et al (2012), which states that the antimicrobial activity exhibited by lemongrass is due to the presence of citral, geraniol, and geranyl acetate, which are major constituents of lemongrass essential oils. Hence this substantiates the results of the present study, that the aqueous extract of lemongrass did not posses any antimicrobial activity (Mohd Irfan et al., 2010).

For the hibiscus leaf extract, similar results were obtained by Nair et al (2004). Neither aqueous nor methanolic extracts of hibiscus were able to inhibit any of the tested bacterial strains (Nair et al., 2004).

As mentioned previously, in the present study no zone of inhibition was observed for aqueous *Bryophyllum pinnatum* leaves. This may be due to the inability of the water to dissolve some of the bioactive components of this plant. In a previous study reported by Akinsulire et. al (2007), methanol extract was found to be most active. It showed marked antibacterial activities against *Staphylococcus aureus, Enterococcus faecalis, Bacillus subtilis* and *Pseudomonas aeruginosa*. The antimicrobial effect of methanol extract against these organisms may be due to the ability of the methanol to extract some of the active properties of these plants like phenolic compounds, saponin, bryophyllin and other secondary metabolites which are reported to be antimicrobial.

The leaves of Ashoka (*Saraca asoca)* are rich in alkaloids, flavonoids, glycosides, saponins, tannins and steroids. These phytochemicals probably confer antimicrobial activity to the leaf extracts (Sarojini et al., 2009). These components are soluble in alcoholic extract and hence in the present study no zone of inhibition was observed for aqueous extract of Ashoka leaves.

CONCLUSION :

Medicinal plants are the most important source for varieties of drugs because phytochemicals present in these plants are more precise, environment friendly, easily decomposable.

In the present study, focuses the use of only aqueous extract of plant leaves. Various phytochemicals like alkaloids, phenolic acids, flavonoids, tannins, and volatile oils, which impart antimicrobial activity to the plant extract, are more soluble organic solvent as compared to water. Hence evaluation of antibacterial activity of alcoholic extract of leaves of these plants should also be carried out in future.

However aqueous extracts of Rose and Betel leaves where shown to possess antibacterial activity. The active components from these

extracts should be isolated and subjected to further pharmacological evaluation.

Screening of various natural organic compounds and identifying active agents is the need of the hour. Thus the active agents from the leaf extract can be used as a lead in development of drugs against pathogens like *Pseudomonas spp.*, *MRSA*, *VRE*, etc, which possess serious a threat to the society.

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MATERIALS AND METHODS :

1. Collection of leaves

Fresh and healthy leaves of test plants i.e. Betel (*Piper betle*), Bryophyllum (*Bryophyllum pinnatum)*, Lemongrass (*Cymbopogon citratus*)**,** Hibiscus (*Hibiscus rosa-sinensis)***,*** Rose (*Rosa rugosa*), Ashoka *(Saraca asoca)* were collected locally.

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The leaves were rinsed thoroughly with distilled water to remove all the dust, cut into small pieces and dried at room temperature. About 10 g of these finely incised leaves of each plant type were weighed separately and transferred into 250 mL beakers containing 100 mL distilled water and boiled for about 10 min. The extracts were then filtered by muslin cloth to remove particulate matter and to get clear solutions which were then refrigerated (4°C) in 250 mL Erlenmeyer flasks for further experiments.

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The extract was concentrated by drying it in oven at 50^{o}C for 1hr.

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RESULTS AND DISCUSSION:

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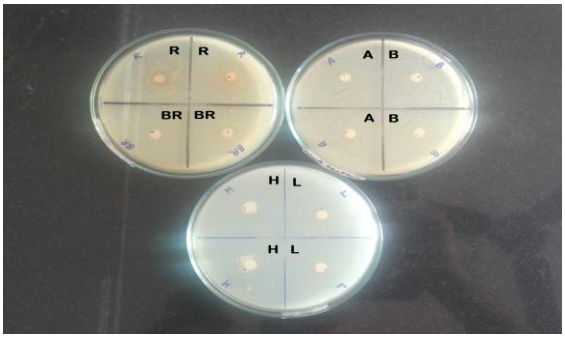

Figure1 Determination of anti-bacterial activity of aqueous leaf extract against *Escherichia coli*

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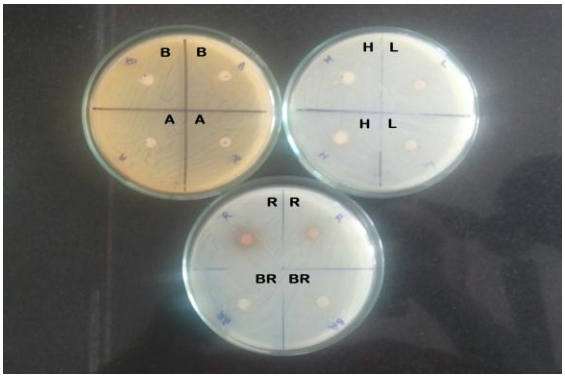
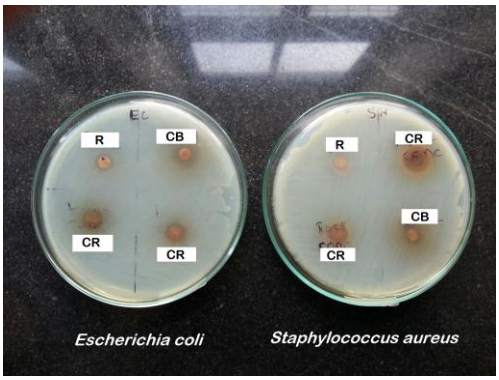


A.B - Betel; A - Ashoka; R - Rose; BR - Bryophyllum; H - Hibiscus; L - Lemon grass

Figure 2 Determination of anti-bacterial activity of aqueous leaf extract against *Staphylococcus aureus.*



B. R – Rose; CB - Concentrated Betel; CR - Concentrated rose

Figure 3: Determination and comparison of anti-bacterial activity of aqueous rose, concentrated betel, concentrated rose extract against *Staphylococcus aureus* and *Escherichia coli.*

The antibacterial activity of the extract was determined using disc diffusion method. In this method the extract impregnated disc is placed on to the agar plate which has been previously swabbed with the test culture. The disc absorbs moisture from the agar and the extract diffuses into the agar medium. As the distance from the disc increases, there is reduction in the concentration of the extract. Visible growth of bacteria occurs on the surface of the agar where the concentration of extract has fallen below its inhibitory level for the test strain. This zone of clearance (region where bacterial growth does not occur) is known as zone of inhibition

Table 2 Comparison of anti-bacterial activity of concentrated aqueous extracts of Rose and betel leaves by disc diffusion method.

Plants	Diameter of zone of inhibition (mm)	
	Staphylococcus aureus	*Escherichia coli*
Rose	5mm	6mm
Concentrated Rose	11mm	7mm
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The zone of inhibition for rose extract against *Escherichia coli* and *Staphylococcus aureus* was 6mm and 8mm respectively. Since inhibitory effect was observed by rose leaf extract, it was concentrated and its antibacterial activity was determined again. And it was found that average zone of inhibition for concentrated rose extract against *Escherichia coli* and *Staphylococcus aureus* was 7mm and 10mm respectively. Hence, as the rose extract was concentrated, its antimicrobial activity was found to be increased. The zone of inhibition was observed to be higher in case of Gram negative bacteria (*Escherichia coli)* as compared to Gram positive bacteria (*Staphylococcus aureus*). Thus it can be concluded that concentrated rose extract was found more effective against Gram positive bacteria. Also in a previous study it was found that the average relative antimicrobial activity was higher with alcoholic extract as compare to aqueous extract of rose petals (Hirulkar N et al., 2010). The antibacterial activity of the Rose plant is mainly due to the presence of various phytochemicals like alkaloids, phenolic acids, flavonoids, tannins, and volatile oils which are more soluble in organic solvent (Rumana et al., 2014). In the initial part of the study very small zone of inhibition was observed for betel leaf extract and hence the extract was further concentrated and its antibacterial activity was checked. It was found that concentrated extract had a higher inhibitory effect on *Escherichia coli* (9mm) as compared to *Staphylococcus aureus* (6mm**).** Sivasankaridevi et al (2013) had obtained similar results where betel leaves had a less inhibitory effect on the Gram positive bacteria, *Staphylococcus aureus*. Various studies have shown that Gram positive bacteria are more susceptible towards plants extracts as compared to Gram negative bacteria. This may be due to fact that the cell wall in Gram positive bacteria is of a single layer, whereas the Gram negative cell wall is multilayered structure. Hence the passage of the active compound through the Gram negative cell wall may be inhibited. However, in the present study as well as in certain previous results the opposite was observed. This variation may due to the fact that microorganisms show variable sensitivity to chemical substances because of different resistance levels between strains.

No zone of inhibition was observed in case of hibiscus, Ashoka, lemon grass and Bryophyllum leaf extracts.

The result of this study is in accordance with the results reported by Kakarla et. al (2009) and K. Moore Neibel et al (2012), which states that the antimicrobial activity exhibited by lemongrass is due to the presence of citral, geraniol, and geranyl acetate, which are major constituents of lemongrass essential oils. Hence this substantiates the results of the present study, that the aqueous extract of lemongrass did not posses any antimicrobial activity (Mohd Irfan et al., 2010).

For the hibiscus leaf extract, similar results were obtained by Nair et al (2004). Neither aqueous nor methanolic extracts of hibiscus were able to inhibit any of the tested bacterial strains (Nair et al., 2004).

As mentioned previously, in the present study no zone of inhibition was observed for aqueous *Bryophyllum pinnatum* leaves. This may be due to the inability of the water to dissolve some of the bioactive components of this plant. In a previous study reported by Akinsulire et. al (2007), methanol extract was found to be most active. It showed marked antibacterial activities against *Staphylococcus aureus, Enterococcus faecalis, Bacillus subtilis* and *Pseudomonas aeruginosa*. The antimicrobial effect of methanol extract against these organisms may be due to the ability of the methanol to extract some of the active properties of these plants like phenolic compounds, saponin, bryophyllin and other secondary metabolites which are reported to be antimicrobial.

The leaves of Ashoka (*Saraca asoca)* are rich in alkaloids, flavonoids, glycosides, saponins, tannins and steroids. These phytochemicals probably confer antimicrobial activity to the leaf extracts (Sarojini et al., 2009). These components are soluble in alcoholic extract and hence in the present study no zone of inhibition was observed for aqueous extract of Ashoka leaves.

CONCLUSION :

Medicinal plants are the most important source for varieties of drugs because phytochemicals present in these plants are more precise, environment friendly, easily decomposable.

In the present study, focuses the use of only aqueous extract of plant leaves. Various phytochemicals like alkaloids, phenolic acids, flavonoids, tannins, and volatile oils, which impart antimicrobial activity to the plant extract, are more soluble organic solvent as compared to water. Hence evaluation of antibacterial activity of alcoholic extract of leaves of these plants should also be carried out in future.

However aqueous extracts of Rose and Betel leaves where shown to possess antibacterial activity. The active components from these

extracts should be isolated and subjected to further pharmacological evaluation.

Screening of various natural organic compounds and identifying active agents is the need of the hour. Thus the active agents from the leaf extract can be used as a lead in development of drugs against pathogens like *Pseudomonas spp.*, *MRSA*, *VRE*, etc, which possess serious a threat to the society.

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ISOLATION OF CHROMIUM TOLERANT MICROORGANISMS FROM THANE CREEK

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ABSTRACT

The advent of industrialization has led to pollution of the environment with toxic heavy metals like Chromium, Lead, Arsenic, Mercury, etc. Cr(VI) is recognized to be highly toxic, carcinogenic, mutagenic and teratogenic for mammals including humans. Hexavalent chromium is the used in industrial processes, including manufacturing of metallic alloys, leather tanning, metal processing, ceramics, wood preservations and electronics. The current study focuses on isolating chromium tolerant organisms, for their use in bioremediation. The sample was collected from Thane Creek and was inoculated in Luria Bertani (LB) broth of increasing concentration to check the tolerance of the organisms to chromium. LB agar plates containing chromium were used for their isolation and further the organisms were subjected to macro and microscopic identification.

Keywords: Chromium(VI), Industrial wastes, Luria Bertani(LB), Thane creek, Microorganisms.

INTRODUCTION:

Chromium (Cr) is a hard steel grey compound which commonly exist as trivalent chromium Cr(III) and hexavalent chromium Cr(VI). Cr(VI) is a toxic form of chromium, approximately 10 to 100 times more toxic than Cr(III) [Katz and Salem]. Chromium (VI) is one of the most hazardous pollutants released from industries like textile dyeing, chemicals and pigment production, wood preservation, tanning and electroplating. Chromium compounds can lead to mutation and cancer, and inhibit enzymes and nucleic acid synthesis [Chaturvedi M. K.]. It is also teratogenic for mammals including humans [Asmatullah and Shakoori]. Various chemical methods are available for removal of chromium in from industrial effluent but they often fail to meet the environmental regulations [Muthukumaran K. *et al*., Agarwal. A *et.al*]. Many bacterial species surviving in presence of chromium in contaminated sites are found to be highly resistant to chromium. These are considered important for removal of chromium [Pinon-Castillo et.al., Pal A et. al]. The interactions of bacteria and plants with Chromium and its compounds have been studied extensively [Cervantes. Et.al.,

2001]. More than 170,000 tons of Cr wastes are discharged into the environment annually as a consequence of industrial and manufacturing activities [Gadd *et al*.].

Microbial tolerance to hexavalent chromium has practical importance because it can serve as a basis for selecting organism that can be used to detoxify chromium in the environment [Ganguli *et al*.]. A variety of chromate-resistant bacterial isolates has been reported, and the mechanisms of resistance to this ion may be encoded either by plasmids or by chromosomal genes. A number of chromium tolerant microorganisms have been reported including *Pseudomonas spp*., is *Desulfovibrio spp., Enterobacter spp., Escherichia coli, Bacillus spp*. and several other bacterial isolates [Cervantes "2007", Michel , Camargo F.A.O. , Kamaludeen , Mondaca , M.K. Chaturvedi *et al*., Shen and Wang 1993, Wang *et.al*].

MATERIALS AND METHODS:

Sample Collection:

Thane Creek was selected as the site for sample collection as effluents of various tannery industries as known to be discharged in it. The water samples were collected in sterile containers and immediately transported to the laboratory for further analysis.

Inoculation and enrichment:

0.5 ml of collected sample was inoculated in 40ml Luria Bertani (LB) Broth of different $K_2Cr_2O_7$ concentrations as a source of chromium. The sample was subjected to increasing concentrations viz. 200ppm, 400ppm, 600ppm, 800ppm and 1000ppm. The flasks were incubated at 37°C for 48 hours. The flask with highest concentration which showed growth of organisms was further used for enrichment in higher concentrations.

Isolation and microscopic identification of organisms:

The enriched organisms were isolated on Luria Bertani agar medium containing chromium with the highest concentration. The plates were incubated at 37°C for 48 hours. The different isolated colonies obtained were selected and preserved. Colony characteristics and gram nature of the bacterial isolates were studied.

RESULT AND DISCUSSION:

Chromium tolerance:

The inoculated sample showed growth upto 600ppm concentration of $K_2Cr_2O_7$ after 48 hours of incubation. Growth of organisms was observed in concentrations upto 1000ppm when the sample from 600ppm was inoculated for enrichment.

Isolation of organisms:

Two bacterial colonies from enriched broth of concentration 800 ppm were isolated on plate with same concentration. A cottony

growth was observed up to concentration 1000ppm. Colony characteristics and Gram nature of the bacterial isolates were studied which are mentioned in table 1:

	Colony 1	Colony 2
Size	Large	Pin point
Shape	Irregular	Circular
Colour	Dirty white	Colourless
Opacity	Translucent	Translucent
Margin	Entire	Entire
Elevation	Elevated	Flat
Gram nature and Morphology	Gram negative Coccobacilli	Gram positive Cocci

Table 1: Colony characteristics.

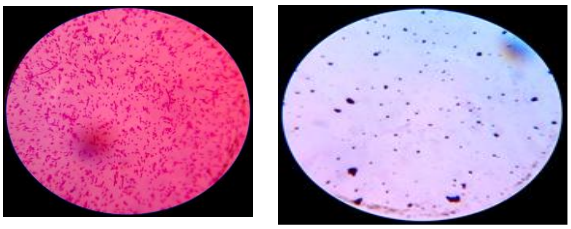

Figure 1 A. Gram negative coccobacilli. B. Gram positive cocci.

CONCLUSION:

Chromium tolerant microorganisms from Thane Creek were isolated. Two bacterial colonies were found to tolerate concentrations upto 800ppm of $K_2Cr_2O_7$. Another organism which could probably be of fungal origin was also observed to tolerate concentration as high as 1000ppm of $K_2Cr_2O_7$. The bacterial colonies were macro and microscopically identified to be Gram positive cocci and Gram negative coccobacilli. These microbial colonies could be useful in bioremediation of the heavy metal chromium (VI) from the polluted water.

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