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G. D. Alias Dr. Bapuji Salunkhe is regarded as the messiah of mass education in Maharashtra. His life was a saga of selfless service in the cause of empowering the poor and downtrodden people. He is universally acknowledged and acclaimed as a maker of modern Maharashtra. He took the Ganges of Education to the huts, hamlets and villages. He founded the parent institute Shri Swami Vivekanand Shikshan Sanstha in 1954 at Kolhapur which is a multidimensional educational institute serving the community through its various branches throughout Maharashtra and Karnataka. It is committed to excellence and providing quality in education. Its motto is "Education for propagation of knowledge, achievement and culture."

About the College :

Dattajirao Kadam Arts, Science and Commerce, Ichalkaranji, established in June 1962, At Present, the college is situated in three storeyed building of its own and is imparting the knowledge for more than 2300 students of graduation, post graduation, B.B.A., B.C.A. and competitive examinations. It is the only college having three faculties in the Manchester city of Maharashtra-Ichalkaranji.

About the Conference :

The main aim of the conference is exchange of thoughts and creating awareness regarding biodiversity conservation for livelihood, as well as to discuss need of biodiversity conservation, role of NGO's in biodiversity conservation in order to have common resolution to mitigate the related problems and solutions from the research scholars of national levels.

From the Desk of the Principal

It gives me immense pleasure to place before you the edition of Manchester depicting proceedings of National Conference entitled Biodiversity Coservation for Livelihood organized by Dattajirao Kadam Arts, Science and Commerce college Ichalkaranji. Higher education gets is sustenance from study and research activities and further the appearance of research output in publications. This issue of Manchester is published by aiming bringing to the notice of important findings to widen the intensity of knowledge in various aspects of biodiversity.

I express my sincere thanks to Shri Abhaykumar Salunkhe (Executive chairman)and Prin. Mrs.Shubhangi Gawade (Secretary)of Shri Swami Vivekanand Shikshan Sanstha Kolhapur for their inspiration and co operation in undertaking research and allied activities. I extend my thanks to authors of research papers who made significant contribution in academic sessions of Conference. Thanks are also due to editorial board for making sincere efforts in producing this awaited issue of Manchster.

Thank you……!

Dr. Milind Hujare
Principal
Dattajirao Kadam Arts, Science & Commerce College,
Ichalkaranji

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Bioinspired Inorganic Nanomaterials Synthesis and their Applications in Imaging, Diagnosis and Therapeutics.

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Abstract :

Inorganic nanomaterials of different sizes, shapes and chemical compositions possess great potential for future clinical applications in imaging, diagnosis, photothermal therapy and therapeutics. One of the important challenges of considerable topical significance in nanotechnology is the development of eco-friendly experimental processes for the economical synthesis of nanomaterials in large quantities of variable size, shape and chemical composition. While it is recognized that some of the most exquisite nanomaterials are made by biological systems (examples include silica in diatoms and magnetite in magnetotactic bacteria), the potential to exploit microorganisms in a creative manner in the laboratory for eco-friendly synthesis of nanomaterials is still largely under-exploited.

In this talk, we describe our research into the use of plant microorganisms and plant extracts in the synthesis of biocompatible, water soluble, fluorescent and protein capped metal, metal sulfide, quantum dots and oxide nanoparticles of different sizes and shapes. In a significant departure from bacteria-based methods for nanomaterial synthesis that have been investigated in some detail, we have shown that plant microorganisms such as fungi and actinomycetes when challenged with aqueous metal ions are capable of reducing the ions both intra and extra-cellularly resulting in the formation of stable metal nanoparticles. The formation of metal nanoparticles occurs by an enzymatic process and thus, the fungus-based synthesis process is not limited to reduction reactions alone. The versatility of this approach is underlined by our findings that enzymes such as sulphite reductase, nitrate reductase and hydrolyzing proteins are secreted by the fungi in response to metal stress thereby leading to the possibility of synthesis of quantum dots, metal nanoparticles and nanooxides. The biosynthesis of nanooxides using fungi is exciting since the synthesis occurs at room temperature and thus could be of considerable commercial value.

Fungi enjoy a close symbiotic relationship with plants and hence, it is quite likely that plant extracts may also possess useful biomolecules which not only carry out the range of biotransformations listed above but also control the shape of nanoparticles. We have studied a number of plant extracts for realizing metal nanoparticles and have observed that the Geranium and Lemongrass extracts result in shape modulated gold nanoparticles. In particular, the reaction of aqueous gold ions with Lemongrass extract resulted in the large-scale synthesis of gold nanotriangles with interesting near infrared absorption. Potential application of the gold nanotriangles, magnetite and other inorganic nanoparticles in hyperthermia of cancer cells, diagnosis, imaging and therapeutic are being investigated.

We have also isolated, purified and completely characterized a range of plant based drugs such as Taxol, Vinblastine, Vincristine and other bioactive secondary metabolites from endophytic fungi and recently initiated further important steps of functionalizing the nanoparticles synthesized by green chemistry approach for targeted drug delivery applications.

Climate Change and Fungal Biodiversity

Ch. Ramesh
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Abstract:

Climate change is a significant and lasting change in the statistical distribution of weather patterns over periods ranging from decades to millions of years. It may be change in the weather conditions or distribution of weather conditions. Climate change is caused by oceanic processes, solar radiation, plate tectonics, volcanic eruptions and human induced alterations of the natural world. This latter resulted into the global warming.

"Biodiversity is the variability among living organisms and the ecological complexes of which they are part." The variety and galaxy of fungi and their natural beauty occupy prime place in the biological world and India has been cradle for such fungi. Only the fraction of the total fungal wealth has been subjected to scientific scrutiny and mycologist have to unravel and explore the hidden wealth.

One third of the fungal diversity of the globe exists in India. Out of 1.5 million fungi only around 5-10% of the fungi can be cultured artificially. Fungi are not only beautiful but play a significant role in the daily life of human beings besides their utilization in Industry, Agriculture and Medicine, Food industry, Textiles, Bioremediation, Bio-fertilizer and many other ways.

Key words : Climate change, Biodiversity, Fungal Diversity

Plant resources of the Western Ghats and the Role of Educational Institutes in Their Conservation

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We have already entered into the age of mass extinction mainly due to various human activities on this planet and we are undergoing biodiversity crisis. Conservation of biodiversity is a burning issue all over the world. It is the biggest challenge for the 21st century. Western Ghats, one of the eight hottest hotspots of the world is under great anthropogenic pressure. Almost one-third plant species of the Western Ghats are threatened. Multiplication and conservation (*in-situ* or *ex-situ*) of RET plant species of Western Ghats is an urgent need of the day.

In-situ and *ex-situ* conservation strategies are the only ways for conservation of RET species. *In-situ* conservation has been deemed the best way for conservation. However, every area that harbours RET species cannot be brought under protected area. Therefore, *ex-situ* conservation of such species is the only way of their conservation. The foremost requirement for conservation is to create saplings of RET and endemic plant species for plantation. The knowledge about wild, RET and endemic plant species, their status, growth requirements, problems in reproductive biology, seed dormancy, storage of seeds, nursery techniques to raise the seedlings, control of diseases, transplantation, etc. mainly lies with the botanists working in various educational institutes. The biology teachers have an added advantage of having young students with them and if teachers and students work for conservation of biodiversity, most of our species can be conserved.

Department of Botany Shivaji University has taken cognizance of the loss of RET species of the Western Ghats and initiated a program of survey, collection of seeds of RET species, raising seedlings, introduction in various botanical as well as public gardens, reintroduction in natural habitats and distribution of seedlings to all those interested in conservation of RET plant species. During the last five years, department has collected the germplasm of over 1000 species of which about 300 species are endemic to the Western Ghats and about 100 are RET species. Garden of the Botany department of Shivaji University has been recognized as the first Lead Garden for the Western India by Ministry of Environment and Forests, New Delhi. Such Botanical Gardens in India will play a significant role in conservation of plant diversity and resources in years to come.

Botanical Gardens of The World: Past, Present and Future

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Botanic gardens are a unique and distinctive kind of scientific and cultural institution. They have contributed to the society in a very wide variety of ways from research to relaxation and rejuvenation. The botanic gardens are part of history of mankind starred in numerous chapters in dispersal and classification of cultivated plants in the past. The botanic gardens have made major botanical and horticultural contributions to our societies. The role of modern botanical garden has changed dramatically from the gardens 300 years ago. In recent years botanic gardens have began to influence and shape international agenda including united convention focused on achieving a more sustainable future. Botanic gardens are effective with networks at national, regional and international levels. Over the centuries, botanic gardens have learned to adapt to advances and changing circumstances. After a long period the emphasis changed during the past 25-30 years and the conservation of biodiversity became a primary concern for most of the gardens. Today's botanic gardens are more complex organizations than garden of last centaury. The Global Strategy for Plant Conservation (GSPC), produced by the Convention on Biological Diversity includes five objectives and 16 targets for plant conservation to be achieved by 2020. Target 14 of GSPC emphasizes the need of understanding the importance of plant diversity and its conservation. Plant species around the world are threatened due to habitat destruction, climate change, invasive alien species, deforestation, population growth and pollution. Climate change is most serious threat of 21st century. It is both environmental and social problem and will have devastating impact on both, society and natural resources. The botanic gardens could play an active role in addressing solutions to environmental and social crisis by unlocking their true potential of expertise and knowledge of plant diversity. Botanic gardens have to redefine their role from traditional gardens to socially relevant gardens focused on engaging every element of society to reconnect with nature. There is need to reassess goals and contribution of botanic gardens in future as a matter of urgency.

Plant Diversity Of Panhala Fort and Role of Municipal Council in Conservation

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Panhala, encompassing an area of about hardly seven sq. kms. is an triangular plateau of lateritic top lying along eastern escarpment of Sahyadri crest. The hilly terrain is the chief natural feature of the fort. Panhala has its own historical heritage and attained the status of an important tourist place. Moreover it is a tehsil place. Inspite of luxuriant vegetation and rich biodiversity, there are some stray publications available, which is far from satisfactory.

'The Flora of the Presidency of Bombay' and 'Flora of Kolhapur District' are the only authorities that are available for the identification of flowering plants. The present investigation was undertaken in the year 1985 with the objectives of preparing a detailed inventory of flowering plants.

TOPOGRAPHY:

Panhala, situated between 16°49'12?north latitudes and 74°7'12? east longitudes is entirely on an outlying spur of eastward hill range that runs from the main crest of Sahyadri, encompassing an area of about 7 sq. kms. The average height above mean sea level varies from 845 meters. The area shows marked differences in topographic features. Fort may be grouped in four parts i.e. (i) The eastern steep slopes with less vegetation, (ii) The northern slope with good vegetation with good diversity, (iii) south-western slope with less vegetation and (iv) and main plateau. The main plateau can be further classified into 2 zones (a) eastern Pawangad zone and western Panhala town zone.

GEOLOGY:

The geological formations in the ascending order of their antiquity are as follows:

Lower Eocene	Deccan trap
Recent and Subrecent	Soil and Laterite

Deccan trap formation overlies the Kaladgi beds and is spread over almost the entire fort and the plateau top is capped by laterite.

SOILS:

Laterite soils occur mainly in the south-western part of the hilly tract which are not covered by forests. Reddish brown soil embraces found in the eastern part of the fort.

CLIMATE:

The climate of the fort is tropical monsoon, pleasant and healthy. It is always cooler.

RAINFALL:

The fort receives precipitation rain from southwest as well as northeast monsoons. The average annual rainfall is 5000-5500 mm.

TEMPARATURE:

In summer the temperature rises as high as 35^0C during the months of April and May and it goes down as low as 14.44^0C during the months of December and January.

FLORISTIC LITERATURE:

There are only few publications available for the flowering plants (Kulkarni & Desai, 1970, 1972 and 1974; Kulkarni & Thite 1977).

PRE-HISTORIC ASPECTS OF BASIC CLASSIFICATION:

Hrishi Parashar of Epic age belongs to this place. Vrikshayurveda is known for information on Cell, Protoplasm, Nucleus, Plant Morphology, Seed Biology, Agronomy, Soil science, Plant Protection and Horticulture.

STATISTICAL ANALYSIS OF THE FLORA:

In the present work a total of 987 species, 3 subspecies and 8 varieties (including cultivated species) belonging to 785 genera and 125 families of flowering plants have been recorded for the fort.

PANHALA HILL STATION MUNICIPAL COUNCIL

It is the smallest municipal council of Maharashtra State with a population is hardly 3500.

PANHALA ARBORETUM:

Arboretum Site is R. S. No. 457 & 466 located along famous Teen Darwaja to Mangeshkar bungalow road. Area under plantation is 2.56 hectares. There are more than 3000 individuals of flowering plants. The planted species include trees (158 sps), shrubs (87 sps), grasses (7 sps), perennial herbs (19 sps), bamboos (6 sps), orchids (3 sps), palms (5 sps), climbers (33 sps), ferns (6 sps), pines (9 sps), cycads (2 sps). The activity itself is an unique activity in Maharashtra and is a joint venture of Panhala Municipal Council, Forest Department and Social Forestry.

PROTECTION TO NIMAJAGA PLATEAU:

It is small piece (hardly two acres or so) of plateau on the western side towards Pusati Point (Sunset Point). This plateau is type locality for *Eriocaulon tuberiferum* Kulkarni & Desai (Eriocaulaceae). Moreover, this plateau also harbor many endemic plants such as *Ceropegia occulata, Indigofera dalzellii, Iphigenia stellata, Utricularia purpurascens* etc. There was regular encroachment of the tourist vehicles on the plateau disturbing entire diversity. When botanical importance of the plateau was brought to the notice of authorities of PMC. Immediately a fence of more than one kilometer was laid down to protect the plateau and steps were taken to conserve the biological wealth.

In the same way there are many activities are now continued by PMC to conserve natural wealth. These activities include regular plantation of native trees, distribution of saplings to the residents, ban for illicit felling, *nirmalya sankalan*, control on misbehaving tourists.

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Study of Physicochemical Limnology of Shendri Reservoir, Gadhinglaj, District Kolhapur (M.S.)

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ABSTRACT:

Study and analysis of some important physicochemical parameters of water from Shendri reservoir Gadhinglaj (Maharashtra) was carried out during June-2011 to May-2012.The study helps in proper utilization of water for drinking, agricultural, industrial purposes, establishment of aquatic bird sanctuaries, pollution control, and also for the improving biodiversity of the tank. The water temperature ranges from 18 to 35^0 c, PH was found to be 7.2 to 8.3, and DO ranges from 4.50 to 9.50 / Lit., Total dissolved solids ranges from 50 to. 200 mg / Lit. Transparency was found to be 50 to 120 cm, Total alkalinity ranges from 25 to 120 mg / Lit. Free carbon dioxide was totally absent during the entire study period. Chlorides and total hardness of water varied from 10 to 105 mg / Lit.

Key words: Limnology, Shendri Reservoir, Alkalinity, Transparency, PH.

INTRODUCTION:

Many limnological studies were carried out on the reservoirs in India. (Kulshrestha et.al.1992, Thomas and Aziz 2000) Similarly number of studies has been conducted on limnology from different regions of Maharashtra (Shashtri and Pendse 2001, Sakhare and Joshi 2002). However no such work was carried out on Shendri reservoir in Kolhapur Dist. of Maharashtra. Water from this reservoir is being used by peoples of Gadhinglaj taluka for drinking and irrigation purposes. Being lentic water system it is essential to study seasonal variation in properties of water. Therefore the present work was undertaken to study the physicochemical limnology of Shendri reservoir.

The selected dam for proposed research work is named Shendri reservoir, which was constructed in the year 1982. The total expenditure spent on the construction was Rs. 41, 44,950=00. It is a small earthen dam five kilometers away to the north side of Gadhinglaj. It is a very beautiful reservoir because on the east side there is wall side, on the western side there is a Gadhinglaj Kolhapur road on a small bridge, at the northern side there is a temple called as Kalbhairav Gramdaivat of Gadhinglaj city.

Table.1 Showing Silent features of Shendri Reservoir MATERIAL AND METHODS

To analyze the water, four sampling stations (Sampling Stations A, B, C and D) were selected as shown in map and table. Water is collected once in a month on 1^{st} day at about 10.00 A.M. The temperature is measured by digital thermometer on the spot.

1.	Name of Reservoir	"Shendri reservoir"
2.	Latitudinal	$16^0$16'0"
3.	Longitudinal	$74^0$21'0"
4.	Catchments area	2.56 Sq.km.
5.	Annual Rain Fall	933 mm.
6.	Total Length of dam	575 meter.
7	Total height of the dam	22.3meter
7.	Maximum height of dam	22.3 meter.
8.	Command area for irrigation	255 hector.
9.	Nature of Lake	Shallow.
10.	Full Capacity at F.S.L.	66.5million Cubic Ft.
11.	Out flow	40 meter
12	Type of dam	Small earthen dam.

Other parameters like PH, DO, Total dissolved solids, Transparency, Free carbon dioxide, Total alkalinity, hardness and Chlorides etc. were analyzed in the laboratory according to the methods suggested by APHA and NEERI. The water samples (at a depth of one meter) were collected with the help of sampler in one- liter plastic containers and brought to the laboratory.

Table.1 Sampling Stations

1	Sampling station-A	East side of the dam	Wall Side
2	Sampling station-B	West side of the dam	Gadhinglaj Kolhapur road side
3	Sampling station-C	North side of the dam	Shri Kalbhairav temple side
4	Sampling station-D	South side of the dam	MIDC Gadhinglaj side

Chart. 1.

OBSERVATION AND DISCUSSION:

The data of various physicochemical parameters at different sampling stations after monthly observation (sampling stations A, B, C, and D) indicating their minimum and maximum ranges during study period June2011 to May2012 have been mentioned in table.

Table. 2 Physicochemical parameter

Sr. No.	**Parameters**	**Range**
1.	water temperature	18 to 35^0 c
2.	PH	7.2 to 8.3
3.	DO	4.50 to 9.50 / Lit.
4.	Total dissolved solids	50 to. 200 mg / Lit
5.	Transparency	50 to 120 cm
6.	Total alkalinity	25 to 120 mg / Lit
7.	Phenolphthalein alkalinity	33.50to 50 mg / Lit.
8.	Chlorides	6.0 to 65.5 mg/ Lit.
9.	total hardness	10 to 105 mg / Lit.
10.	Free carbon dioxide	Nil.

1. TEMPERATURE

It is one of the important physical factors. It is variable according to the seasons. It is found to be high during summer April and May it was 35^0c, and low during winter months i.e. December and January18^0c.

2. PH

The pH affects the taste of water. It is an important indicator of its quality and provides important piece of information in many types of solubility calculations (Hem1985). It also indicates acidic or alkaline nature of water. Water from Shendri reservoir is found to be slightly alkaline as pH varies from 7.2 to 8.3.

3. DO (Dissolved Oxygen)

Oxygen is the important factor that supports the aquatic life. DO in reservoir ranges from 4.50 to 9.50 / Lit. This indicates there is no pollution in water. Only at the sampling station 'D' i.e. MIDC side shows low dissolved oxygen. This is only because of adding sewage washing clothes, animals, bathing and other human activities.

4. HARDNESS

Total hardness ranges from 10 to 105 mg / Lit. The hardness of water is mainly due to the presence of divalent cations of which calcium and magnesium are most abundant. The total hardness for drinking water is specified as 300mg / L. Maximum values were found during summer and lowest value was found during winter months. During present investigation the maximum total hardness (107) was found in the month of May, It minimum (12) recorded in January. In the present study the total hardness values are in the permissible limit.

5. TOTAL DISSOLVED SOLIDS

Total dissolved solids (TDS) irrespective of the seasons ranged from 50 to. 200 mg / lit. The Maximum value of TDS is 200 mg / Lit in April and minimum 40 was detected in the month of August. The observed values of TDS indicate that it was high in summer followed by winter and monsoon.

6. TRANSPERANCY

Water transparency is a physical measurable variable and is quite significant for production. Transparency is inversely proportional to turbidity created by suspended matter. The transparency of 50 recorded in September and maximum 120 cm was recorded during February .The less transparency might be due to the slit brought in to the reservoir during rainy season.

7. TOTAL ALKALINITY

Total alkalinity is the measure of the capacity of water to neutralize a strong acid. The alkalinity in the water is greatly imparted by the salts of carbonates bicarbonates, phosphates, nitrates, borates, silicates etc. together with the hydroxyl ions in Free State. The minimum value of total alkalinity (25mg/l) was noticed in August while the maximum value (120mg/l) was in December. During the study period maximum value was observed in winter followed by summer and monsoon.

8. CHLORIDES

The minimum and maximum values of chlorides were 6.0 and 65.5 mg/ Lit. in the month of February and April respectively.

9. FREE CARBON DIOXIDE

Free carbon dioxide was totally absent in reservoir water.

CONCLUSION:

The study revels that there is on pollution in this reservoir. Only the parameters at sampling station D which is MIDC side shows some degree of pollution. It is probable due to washing clothes, cattle, adding of sewage and bathing.

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Biodiversity of Diatoms from Backwater of Veer Dam in Satara district.

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ABSTRACT:

Present paper envisages study of diatom genera collected from back water of Veer Dam in Satara district. Due to its peculiar geographical location this water body has shown presence of seventeen Bacillariophyceae taxa belonging to two orders. Two genera from centrales and fifteen genera from pennales have been identified. Morphotaxonomic description of these species has been described in this paper. These diatoms are being reported for the first time from the area.

Key words: Diatoms, morphotaxonomy, Veer dam, Satara.

INTRODUCTION:

Diatoms are the unicellular organisms belonging to class Bacillariophyceae of algae, drawing extensive attention of phycologists now a days. A systematic account on diatoms in India was initiated early in the twentieth century by G.S.Venkataraman ((1939). However studies on diatoms in Maharashtra, though scanty, were initiated in the middle of twentieth century. In Maharashtra diatom studies were undertaken by Gonzalves (1947), Gonzalves and Gandhi (1952, 1954), Gandhi (1956, 1957, 1958, 1959, 1960, 1962), Kamat (1965), Sarode and Kamat (1980a, 1984) Nandan and Mahajan (2006), Mahajan, Pawar and Nandan (2008) and Kumawat (2008). These workers made collections from different corners of the state. Earlier workers concentrated mainly on the taxonomy of diatoms. Since Satara district is unexplored regarding taxonomy of diatoms this attempt has been made to explore the Bacillariophycean algae.

STUDY AREA:

The study area is unique as it represents every type of habitat known to support the growth of the diatoms. Veer dam lies between 18^0 07' 39 N latitudes and 74^0 01' 09 E longitude. It is the largest dam on Nira river in Khandala tahasil, Satara district. Khandala is situated on the northern side of Satara district away from 45Km. Nira river flows from the northern border of the tahasil. The samples were collected from four sites of Veer dam.

MATERIALS AND METHODS:

Samples were collected from study area with the help of planktonic net in the plastic bottles. Diatoms were isolated by using Smol's method and samples were cleaned by following protocols suggested by Brun. Cleaned diatoms were preserved in 4% formaldehyde solution. Identification of taxa was done with the help of standard monograph literature. (Sarode and Kamat 1984, Gandhi.H.P. 1998) Species identification was done on the basis of striae in 10 µm and valve appearance.

OBSERVATIONS:

Following species were identified from the samples collected on different sites of the Veer dam backwater

1. *Melosira islandica* O. Muell (Plate I – Fig No. 1)

Frustules 4.8 to 7.8 µm in diameter, cylindrical, united in chains, semicells 8.1 to 13.5 high, rows of areoles 10-12 in 10µm, straight.

2. *Cyclotella Striata* (kuetz) Grun (Plate I – Fig No. 2)

Valves with strong wavy margins in the girdle view and discoid, 14 µm in diameter, central field coarsely punctate, striae 7 -9 in 10 µm

3. *Fragilaria intermedia* Grun (Plate I – Fig No. 3)

Frustules united together to form long bands, linear rectangular, valves 70-82 µm long, 5.2 to 6.8 µm broad, ends tapering very slightly capitates striae 10-12 in 10 µm, absent in an one side in the middle.

4. *Synedra ulna* (Nitz) Ehr. (Plate I – Fig No. 4)

Valves 77 to 124.5 µm long, 5 µm broad, lanceolate, tapering at the ends, pseudoraphe narrow, central area absent, striae 9 -11in 10 µm

5. *Synedra acus* kuetz v acula (Kuetz) V. H. (Plate I – Fig No. 5)
Valves 124.5 µm long, 3.0 µm broad, narrow, needle like, pseudoraphe narrow, central area without striae, striae delicate.

6. *Eunotia major* (W. smith) Rabb. V. Indica (Grun) (Plate I – Fig No. 6)
Valves 60 to 70 µm long, 6.0 to 8.2 µm broad, ventral margin slightly concave, dorsal margin convex, ends constricted on the dorsal side, striae 9-10 in 10 µm in the middle and 11-12 in 10 µm at ends.

7. *Achnanthes gibberula* Grun. V. genuine A. Cl. (Plate I – Fig No7)
Frustules linear and bent in girdle view, valves 20.2µm long, 2.7 µm broad, narrow, linear slightly gibbous in the middle, ends rounded striae difficultly seen.

8. *Stauroneis anceps* Ehr. (Plate I – Fig No. 8)
Valves 54.2 to 61.6 µm long, 15.2 to 17 µm broad, elliptical –lanceolate with constricted, capitates and broadly rounded ends, central area wide and stauroid, striae finely punctate.

9. *Pinnularia legumen* Ehr V. interrupta Gandhi. (Plate I – Fig No. 9)
Valves 76.2 µm long, 9.0 µm broad, linear lanceolate with triundulate margins, rounded ends, central area large, rhomboid, striae 10-13 in 10 µm, thick strongly radial in the middle and convergent at the ends.

10. *Amphora normanii* Rabb (Plate I – Fig No. 10)
Frustules elliptical –lanceolate with constricted, capitates ends in girdle view, Valves 26.2 to 30.5µm long, 9.0 µm broad, narrowed towards ends, central area narrow striae 18-20 in 10 µm.

11. *Cymbella turgid* (Greg) Cleve (Plate I – Fig No. 11)
Valve 21.7 to 61.6 µm long, 7.9 to 16.3 µm broad, strongly convex dorsal and straight ventral margin, ends rounded, raphe strongly excentric, central pores dorsally bent, central area small elliptical, striae 8-9 in 10 µm in the middle and 12-13 in 10 µm at the ends, strong.

12. *Hantzschia amphioxys* (Ehr) Grun. (Plate I – Fig No. 12)
Valve 40-50 µm long, 8 µm broad, dorsal side somewhat convex, ventral side depressed in the middle, ends constricted, bluntely rostrate, keel punctuate 8-9 in 10 µm.

13. *Nitzschia tryblionella* Hantzsch V. levidensis(w. Smith) Grun (Plate I – Fig No. 13)
Valve 29.7-34.2 µm long, 5.9-9.0 µm broad,linear with constricted, slightely produced ends, keel punctae 11-12 in 10 µm, striae 15-17 in 10 µm.

14. *Nitzschia gandershemiensis* Krasske (Plate I – Fig No. 14)
Valve 93.4µm long, 3.9-5.5 µm broad, lanceolate with somewhat constricted rounded ends, keel excentrie, punctae 9-10 in 10 µm distinct, striae fine and indistinct.

15. *Nitzschia obtuse* W.Smith V. scalpelliformis Grun (Plate I – Fig No. 15)
Valve 89.6-98.8µm long, 7.5-8.2 µm broad, linear, sigmoid, wedge shaped rounded ends, keel punctae7-8 in 10 µm large, rounded, striae very fine.

16. *Surirella robusta* Ehr (Plate I – Fig No.16)
Valve 110µm long, 54.3 µm broad, heteropolar narrowly ovate with broadly rounded ends, marginal folds very strongly developed with thick projections.

17. *Surirella linearis* W. Smith f. kolhapurensis f. nov. (Plate I – Fig No. 17)
Valve 21µm long, 7.9 µm broad, linear, lanceolate rounded ends, middle line not visible, flap margin very narrow, costae about 8 in 10 µm.

RESULT:

Present study revels seventeen diatom taxa within thirteen genera from two orders of Bacillariophyceae . Of these, genera *Melosira, Synedra , Cymbella and Nitzschia* shows the dominance in the samples collected from the backwater.

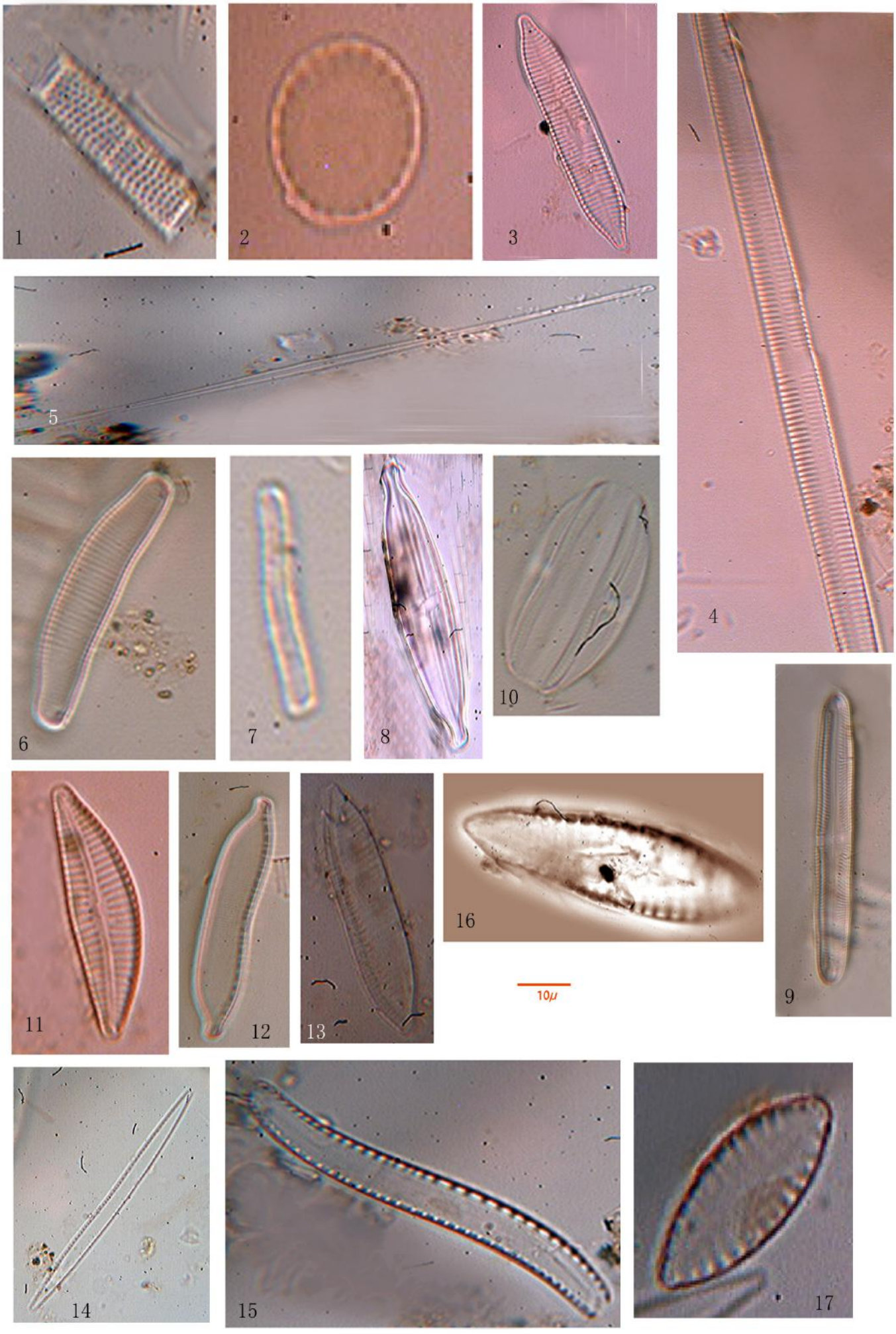
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Plate I

Fig No.

1 *Melosira islandica* O. Muell ,

2. *Cyclotella Striata* (kuetz) Grun

3. *Fragilaria intermedia* Grun

4. *Synedra ulna* (Nitz) Ehr

5. S*ynedra acus* kuetz v acula (kuetz) V. H.

6. *Eunotia major* (W. smith) Rabb. V. Indica (Grun)

7. *Achnanthes gibberula* Grun. V. genuine A. Cl.

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15. *Nitzschia obtuse* W.Smith V. scalpelliformis Grun

16. *Surirella robusta* Her

17. *Surirella linearis* W. Smith f. kolhapurensis f. nov.

Diversity in Aquatic Microfungi Communities from Satara District

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ABSTRACT:

An exhaustive explorations were attempted to investigate aquatic microfungi from hyphomycetes from water bodies and reservoirs existing in western region of district Satara. Among the three distinct groups of hyphomycetes in freshwater habitats, an ingoldian fungi, aero-aquatic and lignicolous aquatic fungi were studied from stagnant water bodies (Ajinkyatara Fort), lakes (Kas lake) ; reservoirs (Kanher and Koyna at Bamnoli site). The baiting technique is used for hunting these fungi.

Thirty five aquatic micro fungi from hyphomycetes were identified from these water bodies and reservoirs out of thirty five, nine species were found to be new to India and five species were found to be new to State of Maharashtra while one species showed only sterile mycelial mat. The species richness index for these aquatic bodies and for microfungi are 28.57 (Ajinkyatara site), 22.85 (Kas lake), 14.28 (Kanher dam) and 17.14 (Koyna dam at Bamnoli site).

Key words : Diversity, Aquatic microfungi, hyphomycetes

INTRODUCTION :

Satara district is a southern district of Maharashtra between $17^{o}5'$ and $18^{o}11'$N latitude and $73^{o}33'$ and $74^{o}54'$ E longitude. It has great phytographical diversity. The western parts of district is rich with mountains and hilly areas of Sahydari ranges of western ghats and rich with semi-evergreen and moist deciduous forests receiving average annual rainfall 1426 mm. This region receives rainfall of average 122 days so that runaway water from the forested areas was collected in reservoirs. The vegetation along these reservoirs play important role in ecology of aquatic fungi. The pH value of water from reservoirs usually remained below neutrality. The water through streams from forest areas carry plant debris in the reservoir so that the species richness usually remain variable (Barlocher, 1987). There were three group of aquatic hyphomycetes viz. Ingoldian fungi, the aero aquatic fungi and the lignicolous aquatic fungi. The ingoldian aquatic fungi grow in well aerated lakes on submerged leaves and twigs. Aeroaquatic fungi are usually found in stagnant ditches, ponds and grow on submerged leaves or woody structures. While lignicolous aquatic fungi are saprophytic hyphomycetes growing on submergd organic litter (on decaying woody branches and twigs. The aquatic hyphomycetous microfungi has not been investigated earlier from Satara district. So that attempt have been made to investigate them from different water bodies (ditches, ponds, lakes, reservoirs) from the district.

MATERIALS AND METHODS :

Water samples, submerged debris (like leaves, twigs) were collected from four water bodies one month after the rain overs. The debris were incubated at 28 ± 2^{o}C for upto three weeks, some baits like nails, hairs fruit rind were also used for incubation in each water sample for three weeks. While fruit rinds incubated in water sample were cultured on Potato Dextrose Agar. After three weeks fungal growth was obtained and slides were prepared for identification. The aquatic hyphomycetes were identified using standard literature (Barnett and Hunter, 1987; Ellis, 1971, 1976; Barbcher, 2004). The Indian records for these micro fungi were checked by using standard literature (Jamaluddin, et. al., 2004 ; Bilgrami, et. al., 1981, 1991)

RESULT AND DISCUSSION :

As compared to macrofungi, the microfungi from Deuteromycetes (Hyphomycetes, Coelomycetes) has not been paid more attention by fungi taxonomists. There were no studies on aquatic microfungi specially hyphomycetes from water bodies, reservoirs and lakes from Satara district. The present investigation deals with the study and investigation of aero-aquatic and lignicolous aquatic hyphomycetes from above water bodies. It revealed that, thirty five species of aquatic microfungi (Table -1) from hyphomycetes were reported (12 from Ajinkyatara site ; 10 from Koyna and Kas sites, and 5 from Kahner dam site). Among these, nine species were found to be new to India and five species were found to be new to State of Maharashtra. Maximum (12) species were found in Ajinkyatara site in stagnant water body which might be due to as it is surrounded by many of herbaceous and shrubby flora. The debris of them carried through water currents in the water body

remain submerged for longer time and certain species of hyphomycetes were growing on these substrata. However, ten species from Koyna dam and Kas lake (each) were reported. Both of these reservoirs are surrounded by semi-evergreen forested area. During the rain, leaves, branches, twigs of trees, shrubs were carried through water currents in the water bodies. The pH of these reservoir water remained below neutrality (3.5 – 4.5) which favours the growth of hyphomycetes on submerged substrata. While the number of species from Kanher dam site is less. As this site at one side (partly) populated area along with grasslands and in small scale fishing is done for livelihood and opposite side is surrounded by scrubby and deciduous forested patches. The anthropogenic activities might be responsible for colonization of these fungi in this site but more exploration in this reservoir at different sites are necessary for correct prediction for number of microfungi from hyphomycetes from this site.

During rainy days, the terrestrial litter (leaves, fruits, branches, twigs, woods) through streams get carried into reservoir which may be primary source f energy and carbon to aquatic hyphomycetes. The rate of decomposition or breakdown of substrata is high than that of terrestrial system (Webster and Benfield, 1986). These hyphomycetes play important role significantly to the overall breakdown of litter of macrophytes. They are involved in mineralization of litter and their conversion into organic matter (Suberkropp and Klug, 1980, 1981). After activity of these microfungi on litter, resulting into a nutritious food source for other life forms in water (Arsuffi and Suberkropp, 1986, 1989) and finally they play key role in mediating the flow of energy from detritus to other components of the food chain in aquatic environment (Barlocher and Kendrick, 1981).

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Table 1 : Distribution and occurrence of aquatic microfungi hyphomycetes (conidial forms):

Sr. No.	Name of aquatic hyphomycetes	Indian Record	Ajinkyatara Stagnant Pond	Kas Lake	Kanher Dam	Koyna (Bamdoli site)
1	*Aspergillus flavus*	-	-	√	-	-
2	*Aspergillus niger*	-	-	-	-	√
3	*Aspergillus* sp.	-	√	-	-	-
4	*Alternaria alternata*	-	√	-	-	-
5	*Alternaria dianthi*	-	-	-	-	√
6	*Alternaria longipes*	-	-	-	-	√
7	*Alternaria raphani*	-	-	-	-	√
8	*Alternaria tenuissisima*	-	√	-	-	√
9	*Alternari* sp.	-	-	-	-	√
10	*Acrodictus deightonii*	NI	√	-	-	-
11	*Bahusandhika calligans*	NI	√	-	-	-
12	*Bispora antennata*	NS	√	-	-	-
13	*Bispora* sp.	-	-	√	-	-
14	*Calacurisporium* sp.	NS	-	-	-	√
15	*Cladosporella* sp.	NI	-	-	-	√
16	*Cladosporium cladosporioides*	-	-	√	-	-
17	*Cladosporium* sp.	-	-	√	-	-
18	*Didymaria* sp.	NI	-	-	√	-
19	*Fusarium* sp.	-	-	-	-	√
20	*Fusarium udum*	-	√	-	-	-
21	*Fusarium* sp.	-	√	-	-	-
22	*Geniculosporium state of Hypoxylon serpens*	N.S.	-	-	√	-
23	*Gyrothrix circinata*	-	-	√	-	-
24	*Humicola grisea*	-	-	-	-	√
25	*Penicillium notatum*	-	-	√	-	-
26	*Pollaccia radiosa*	NI	-	√	-	-
27	*Septonema secedens*	NS	√	-	-	-
28	*Sporidesmium adscendens*	-	-	√	-	-
29	*Stemphyllioma valva radisiacum*	NI	-	-	√	-

30	*Stemphyllioma* sp.	-	-	√	-	-
31	*Stemphyllioma* sp.	-	-	-	√	-
32	*Thielaviopsis basicola*	NI	-	-	√	-
33	*Tricladium* sp.	N.S.	√	-	-	-
34	*Trimmatostroma salicis*	N.I.	√	-	-	-
35	*Xylohypha nigrescens*	N.I.	√	-	-	-
36	*Mycelia sterilia*	-	-	√	-	-
* NI = New to India, N.S. = New to State of		Maharashtra	12	10	5	10

Seasonal Diversity of Protozoans, Rotiferans, Cladocerans, and Copepodans, from Krishna River Ghat near Miraj, Dist. Sangli, M.S. India.

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ABSTRACT:

The present paper deals with the study of zooplankton community of Krishna River ghat near Miraj, M.S.India. The qualitative analysis of zooplankton was done from three different sites S1,S2,and S3 at regular interval of fifteenth day of every month from Sept. 2010 to Aug. 2011. The different species of zooplanktons were identified. About 26 zooplankton species were recorded 11protozoan species,7 rotifera species,4 Cladocera species,3 copopodes species and one nematod species were observed.

Key words: Krishna River - Miraj Ghat - Diversity - Zooplankton

INTRODUCTION:

Information on species diversity, richness eveness and dominance species evolution on the Biological component of the eco-system is essential to understand detrimental changes in environment or deterioration of water quality (Krishnamurthy and Subramanian 1999). Species diversity is a basic measure of community structure and organization and the most important parameter to understand the health status of the ecosystem. The diversity index gives us measure of the way on which individuals in a community are distributed. Zooplankton community of fresh water bodies constitutes an extremely diverse assemblage of organism represented by most of the invertebrate phyla. Copepoda and Cladocera are the dominant represented groups of crustracea in fresh water habitat Groups of crustracea in fresh water habitat. Zooplanktons has been used as an indicator for monitoring the water quality, trophic status an pollution level. The temperature, dissolved oxygen and organic matter have influence on zooplanktons community structure. The zooplanktons, which play a role of converting phytoplankton's in to food, suitable for fish and aquatic animals, have acquired importance in fishery research. The Zooplanktons also play an important role in indicating the presence and absence of certain species of fishes and in determining the population densities. Various ecological aspects of Zooplanktons have been a subject of study in India and several workers like *Khan 1978 ,Saxena and Sharma 1981, Haque 1988 , Somashekar et al 1994, Chandrasekhar and Kodarkar 1996, Annapurna et al 1999,* Pulle 2000 an Narsimha Rao and Jaya Raju 2001 has done enormous work in this field keeping this in view we have selected the Krishna River Ghat near Miraj. The location of Krishna River is approximately 4km from Miraj city. The Krishna Ghat is surrounded by human settlement on both sides of the bank.

METHODOLOGY:

The zooplankton samples were collected from selected three different sites at an regular intervals of fifteen days every month from Sept. 2010 to Aug . 2010 for a year. The plankton net of mesh size 30 mm was swept through subsurface and samples wear transferred to 100 ml capacity plastic bottles. The samples were preserved using 4 % formaline solution, standard key and other literature was used for identification of different species APHA 1989 Pennak 1989. The number of planktons per litter was determined by using Sedgwick rafter cell by taking 1 ml of approximately diluted samples and the observation represent number of zooplankton per litter. The samples were collected during daytime between 4 pm to 5 p.m. lots of cloths washing activities are going on from early in the morning till late afternoon. The sites selected are as follows

1. Site 1 : North side
2. Site 2 : West side
3. Site 3 : South side

Title: Monthly occurrence of zooplanktons in kalikhan at three different sites from Sept.2005 to Aug 2006

Site 1 – Zooplankton

Sr. No	Name of species	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.
I	**PROTOZOA (11 – Species)**												
	A.CILIOPHORA 1)*Epistylis olicatilis*	+	+	+	+	+	+	+	+	+	+	+	+
	2)*Metopus Sigmoides*	+	+	+	+	+	+	+	+	+	+	+	+
	3)*Saprodinium dentatum*	+	+	+	+	+	+	+	+	+	+	+	+
	4)*Sapthidium spatula*	+	+	+	+	+	+	+	+	+	+	+	+
	5)*Stylonchia notophora*	+	+	+	+	+	+	+	+	+	+	+	+
	6)*Vorticella Compunula*	+	+	+	+	+	+	+	+	+	+	+	+
	7)*Vorticella microstoma*	+	+	+	+	+	+	+	+	+	+	+	+
	8) *Paramaecium* Sp.	+	+	+	+	+	+	+	+	+	+	+	+
	B) RHIZOPODA												
	9) *Arcella discoides*	+	+	+	-	-	-	-	-	+	+	-	-
	10) *Amoeba proteus*	+	+	+	+	+	+	+	+	+	+	+	+
	11) *Diffusia* Sp.	-	-	-	+	+	+	+	+	+	+	-	-
II	**ROTIFERA (7-Species)**												
	1)*Branchionus* Sp.	-	-	+	+	-	-	-	-	-	+	+	-
	2) *Colotheca pelgica*	+	+	+	+	+	+	-	-	-	-	-	-
	3)*Keratella cochlearis*	-	-	+	+	+	-	-	-	-	-	-	-
	4)*Macrochaetus* Sp.	-	-	+	+	+	+	-	-	-	-	-	-
	5)*Monostyla* Sp.	+	+	+	-	-	+	+	+	-	-	-	-
	6) *Nothoica acuminata*	-	-	-	-	-	-	+	+	+	+	+	+
	7) *Philodina rosoela*	-	-	-	-	-	-	+	+	+	+	+	+
III	**CLADOCERA (4-Species)**												
	1)*Daphnia cornuta*	+	+	+	+	-	-	-	-	-	+	+	+
	2) *Cerodaphnia cornuta*	-	-	+	+	+	+	+	-	-	+	+	+
	3) *Moina micrura*	+	+	+	-	-	-	+	+	+	+	+	+
	4) *Moina brachiata*	+	+	+	+	+	+	+	-	-	-	+	+
IV.	**COPEPODA (3-Species)**												
	1) *Nauplius*	+	+	+	+	+	+	-	-	-	+	+	+
	2) *Diaptomus*	-	-	-	+	+	+	+	+	+	+	+	+
	3) *Mesocyclops*	-	-	-	-	+	+	+	+	-	+	+	+
V.	**NEMATODA(1-Species)**												
	1)*Diplogaster*	-	-	+	+	-	-	-	-	-	+	+	-

Site 2 - Zooplankton

Sr. No	Name of species	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.
I	**PROTOZOA (11 – Species)**												
	A.CILIOPHORA 1)*Epistylis olicatilis*	+	+	+	+	+	+	+	+	+	+	+	+
	2)*Metopus Sigmoides*	+	+	+	+	+	+	+	+	+	+	+	+
	3)*Saprodinium dentatum*	+	+	+	+	+	+	+	+	+	+	+	+
	4)*Sapthidium spatula*	+	+	+	+	+	+	+	+	+	+	+	+
	5)*Stylonchia notophora*	+	+	+	+	+	+	+	+	+	+	+	+
	6)*Vorticella compunula*	+	+	+	+	+	+	+	+	+	+	+	+
	7)*Vorticella microstoma*	+	+	+	+	+	+	+	+	+	+	+	+
	8) *Paramaecium* Sp.	+	+	+	+	+	+	+	+	+	+	+	+
	B) RHIZOPODA												
	9) *Arcella discoides*	+	+	+	-	-	-	-	-	+	+	-	-
	10) *Amoeba proteus*	+	+	+	+	+	+	+	+	+	+	+	+
	11) *Diffusia* Sp.	-	-	-	+	+	+	+	+	+	+	-	-
II	**ROTIFERA (7-Species)**												
	1)*Branchionus* Sp.	-	-	+	+	-	-	-	-	-	+	+	-
	2) *Colotheca pelgica*	+	+	+	+	+	+	-	-	-	-	-	-
	3)*Keratella cochlearis*	-	-	+	+	+	-	-	-	-	-	-	-
	4)*Macrochaetus* Sp.	-	-	+	+	+	+	-	-	-	-	-	-
	5)*Monostyla* Sp.	+	+	+	-	-	+	+	+	-	-	-	-
	6) *Nothoica acuminata*	-	-	-	-	-	-	+	+	+	+	+	+
	7) *Philodina rosoela*	-	-	-	-	-	-	+	+	+	+	+	+
III	**CLADOCERA (4-Species)**												
	1)*Daphnia cornuta*	+	+	+	+	-	-	-	-	-	+	+	+
	2) *Cerodaphnia cornuta*	-	-	+	+	+	+	+	-	-	+	+	+
	3) *Moina micrura*	+	+	+	-	-	-	+	+	+	+	+	+
	4) *Moina brachiata*	+	+	+	+	+	+	+	-	-	-	+	+
IV.	**COPEPODA (3-Species)**												
	1) *Nauplius*	+	+	+	+	+	+	-	-	-	+	+	+
	2) *Diaptomus*	-	-	-	+	+	+	+	+	+	+	+	+
	3) *Mesocyclops*	-	-	-	-	+	+	+	+	-	+	+	+
V.	**NEMATODA(1-Species)**												
	1)*Diplogaster*	-	-	+	+	-	-	-	-	-	+	+	-

Site 3 - Zooplankton

Sr. No	Name of species	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.
I	**PROTOZOA (11 – Species)**												
	A.CILIOPHORA 1)*Epistylis olicatilis*	+	+	+	+	+	+	+	+	+	+	+	+
	2)*Metopus Sigmoides*	+	+	+	+	+	+	+	+	+	+	+	+
	3)*Saprodinium dentatum*	+	+	+	+	+	+	+	+	+	+	+	+
	4)*sapthidium spatula*	+	+	+	+	+	+	+	+	+	+	+	+
	5)*Stylonchia notophora*	+	+	+	+	+	+	+	+	+	+	+	+
	6)*Vorticella compunula*	+	+	+	+	+	+	+	+	+	+	+	+
	7)*Vorticella microstoma*	+	+	+	+	+	+	+	+	+	+	+	+
	8) *Paramaecium* Sp.	+	+	+	+	+	+	+	+	+	+	+	+
	B) RHIZOPODA												
	9) *Arcella discoides*	+	+	+	-	-	-	-	-	+	+	-	-
	10) *Amoeba proteus*	+	+	+	+	+	+	+	+	+	+	+	+
	11) *Diffusia* Sp.	-	-	-	+	+	+	+	+	+	+	-	-
II	**ROTIFERA (7-Species)**												
	1)*Branchionus* Sp.	-	-	+	+	-	-	-	-	-	+	+	-
	2) *Colotheca pelgica*	+	+	+	+	+	+	-	-	-	-	-	-
	3)*Keratella cochlearis*	-	-	+	+	+	-	-	-	-	-	-	-
	4)*Macrochaetus* Sp.	-	-	+	+	+	+	-	-	-	-	-	-
	5)*Monostyla* Sp.	+	+	+	-	-	+	+	+	-	-	-	-
	6) *Nothoica acuminata*	-	-	-	-	-	-	+	+	+	+	+	+
	7) *Philodina rosoela*	-	-	-	-	-	-	+	+	+	+	+	+
III	**CLADOCERA(4-Species)**												
	1)*Daphnia cornuta*	+	+	+	+	-	-	-	-	-	+	+	+
	2) *Cerodaphnia cornuta*	-	-	+	+	+	+	+	-	-	+	+	+
	3) *Moina micrura*	+	+	+	-	-	-	+	+	+	+	+	+
	4) *Moina brachiata*	+	+	+	+	+	+	+	-	-	-	+	+
IV.	**COPEPODA (3-Species)**												
	1) *Nauplius*	+	+	+	+	+	+	-	-	-	+	+	+
	2) *Diaptomus*	-	-	-	+	+	+	+	+	+	+	+	+
	3) *Mesocyclops*	-	-	-	-	+	+	+	+	-	+	+	+
V.	**NEMATODA (1-Species)**												
	1)*Diplogaster*	-	-	+	+	-	-	-	-	-	+	+	-

RESULT AND DISCUSSION:

The total number of zooplanktons are recorded per litter and it was noted that the total number of zooplanktons varied from 17 to 30 per litter at site S_1, 16 to 33 per litter S_2 and 16 to 26 per litterat S_3 during sept.2010 to Aug. 2011
The Seasonal variation of zooplanktons in order of abundance throughout the year whier as follows,

S_1 - Protozoans > Rotifers > Copepodes > Cladocera > Nematodes

S_2 -Protozoans >Rotifers > Copepodes > Cladocera > Nematodes

S_3 – protozoans > Rotifers > Copepodes > Cladocera > Nematodes

1) Protozoans:

The monthly average and total numbers of protozoan varied from 6 to 11 in no. Per litter at S_1 to S_3 Protozoans are very useful in indicating water quality particularly in pollution studies and it also helps in indicating the purity of water.

2) Rotifera:

The monthly average and total numbers of Rotifers varied from 1 to 7 per litter at S_1,S_2 and S_3 Sites. According to Radwan 1980 a nano olanktos biomass expert there is direct affect on Rotifer fertility while algae toxicity inhibits their fecundity . Peijler 1957 showed that there is no direct effect if pH on Rotifer population .Edmondson 1965 and Baker 1979 observed that there is high Rotifer population in winter due to favorable temperature and availability of food material. Usha Choubery 1997 found that Rotifer Population is minimum in month of July.

3) Copeodes:

The monthly average and total no. of copepdans varied from 1 to 3 species per litter at S_1,S_2,S_3 Sites Usha Choubey in 1997 found that there is high density of copepods during October. Allan 1976 observe that the inverse relationship between high populatin of Rotifers and Cladocera and low population of copepods during winter may be due to feeding pressure of stocked fishes on the latter if the Copepodes are removed then there is sudden rise in the popluatin of rotifers and cladocera

4) Cladocera :

The monthly average and total no. of cladoceras varied from 1 to 4 per litter at S_1, S_2, S_3. The Cladocerans component of zooplanktons plays an important role in the bentic trohodynamics. Quadri and Yousuf 1980 investigated the influence of some of the physico chemical factors on the seasonality of cladocera. The factors like water temperature dissolved O_2, turbidity transparency plays an important role in controlling the diversity of cladocera. In India the limonitic zooplankton community are invariable dominated by the species of cladocera stated by Sharma abd Michel 1987

5) Nematodes:

The monthly average and total no of Nematodes varied from 0 to 1 per litter a t S_1, S_2, and S_3 sites They were present a little amount or neglible amount through out the year. Thus from the above studies of zooplanktons from Krishna River near Miraj Ghat Dist. Sangli M.S. India following 26 speices of zooplanktons were observed .

a) Species of protozoans :

1. *Epistylis olicatilis*
2. *Metopus Sigmoides*
3. *Saprodinium dentatum*
4. *Sapthidium spatula*
5. *Stylonchia notophora*
6. *Vorticella Compunula*
7. *Vorticella microstoma*
8. *Paramaecium* Sp.
9. *Arcella discoides*
10. *Amoeba proteus*
11. *Diffusia Species.*

B) Species of Rotifers :

1. *Branchionous* Sp.
2. *Colotheca pelgica*
3. *Keratella cochelearis*
4. *Macrochaetus* Sp.
5. *Monostyla* Sp.
6. *Nothoica acuminate*

7. *Philodina rosoela*

c) Species of Cladocera :

1. *Daphnia conuta*
2. *Cerodaphnia cornuta*
3. *Monia micrura*
4. *Monia brachiate*

d) Species of Copepodes :

1. *Nauplius*
2. *Diaptomus*
3. *Mesocyclops*

e) Species of Nematodes :

1. *Diploglastar*

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Observations of Species Diversity in Hyphomycetes

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ABSTRACT:

In this paper 12 taxa of hyphomycetes are incorporated. The diagnostic characters of three rare hyphomycetes viz. *Lacillina graminicola*, *Psedopetrakia kambakkamensis* and *Menisporopsis theobromae* are described. Similarly variations or species diversity has been found out in few other forms. In addition seven hyphomycetes which have wide range of distribution in the different regions of Maharashtra are listed.

The different regions of Vidarbha, Central Maharashtra, Northern Maharashtra, Konkan and Goa, experience different environment, vegetation, soil types, rainfall etc. Under the project, "Mycoflora of Mahatashtra and Goa", author has collected and studied interesting hyphomycetes. Few rare and new hyphomycetes were described (Karandikar, K.G. &P.G. Patwardhan 1985, 1986, 1986 a, 1992, Karandikar et.el, 1992, Karandikar & Singh 2010) in this contest. All the specimens are deposited with accession number in Ajrekar Mycological Herbarium (AMH) of Agharkar Research Institute, Pune, and India.411004. The specimens deposited, thus have AMH suffixed accession number.

During this study, few hyphomycetes were also found to have variations with respect to morphology of conidia and conidiophores, size of conidiophores, separating cells etc. These variations were compared with original or authentic description of the holotype.

All these differentiating character/s are discussed here to understand degree of variations within the species and considered the same as parameter of biodiversity in saprophytic hyphomycetes. These variations in specimen can also be considered as "ecotype" of the species.

In all 12 forms are described in this paper. *Lacillina graminicola*, *Psedopetrakia kambakkamensis* and *Menisporopsis theobromae* are described with diagnostic characters. Among these *Lacillina graminicola* and *Psedopetrakia kambakkamensis* showed few variations. These three rare forms are being reported here for the first time from Maharashtra.

Apart from these rare forms, two specimens AMH 6065 and AMH 6227belonging to *Bahusandhika indica* (fig.4) and *Periconia circinata* (Fig.10) respectively have been found with few variations. *Bahusandhika indica* collected from Tadoba has smaller separating cells and *Periconia circinata* (Mangin) Sacc., collected from Bhimashankar has longer conidiophores.

In addition to this few hyphomycetes were found widely distributed in various regions of Maharashtra. Out of these, three specimens AMH 6736, AMH 5560 and AMH 6616 belonging to species .*Pithomyces ellisii*, *Melenographium citri* and *Moorella speciosa* respectively, were found with few variations. Thus in seven specimens the variations ware found, which are summarized in Table no 1

Lacillina graminicola **(Berk.Br.) Petch:** Colonies amphigenous, circular to oval, black, velvety, mycelium immersed, setae simple, flexuous, dark brown to black, septate, narrow at apex, upto945 µm. long, 8.5-14.5 µm. thick near base, 3-5 µm. thick at apex; conidiophores 4 to 5 in group, borne along with setae. Conidiphores simple or loosely branched near apex, pale brown, verrucose, , 145-194 µm. × 3-5 µm. Conidiogenous cells integrated, terminal and intercalary, polyblastic; conidia acropleurogenous, in simple or branched chains, developing acropetally, brown to dark brown, oval to spherical, non septate, thick walled, smooth or minutely verrucose,4.5-6.5 (5.5) µm. in diam. Rarely even 8.0 µm .in diam. (Fig. 1).

On dried leaves of *Saccharum officinarum* L., Patoda, 15-10-1983.AMH 6667; on dead leaves of *Phoenix sylvestris* Roxb. Allapalli, 23-12-1983, AMH 5551.

Remark: The specimen AMH 6667 has longer conidiophores than described by Ellis (1957, 1972).

Psedopetrakia Kambakkamensis **(Subramanian) M. B .Ellis.:** Colonies dark brown to black, irregular to oval; mycelium partly superficial partly immersed, superficial hyphae, mid brown 3-7 µm. thick; conidiophores simple or branched, mid brown, rarely 1to 2 septate, thick, rough walled, 7-20 µm. × 4-5-6.5 µm. Conidiogenous cells integrated, terminal, monoblastic, determinate; conidia acrogenous, solitary, dark brown, oval , slightly curved, muriform with black warts and with1-2 black, tough, thick walled, non septate spines at the anterior end, 25-45 µm. (34.5) × 14.5-27.5(17.5) µm.; spines 7.5-19(17) µm. × 3-5 µm. thick at base. (Fig. 2).

On dead wood of *Ficus* sp., Bhamragad, 23-12-1983. AMH 6623.

Remark: The specimen AMH 6623 has remarkably less i.e. uniformly one to two spines on conidia than described by Ellis (1971) as one to seven spines on conidia.

Menisporopsis Theobromae **Hughes:** Colonies hypophyllus, effuse, brown; mycelium olivaceous brown thin walled , septate; hyphae 1.5-3.5 µm. thick; 15 to 20 conidiophores are tightly packed forming synnemata with single central setae; synnemata 95-118 µm.long and14-32 µm. thick at base, 12-14 µm. thick in the middle and 28-52 µm. thick at apex; seta unbranched, straight or flexuous, dark brown at base,pale brown towards narrow apex, 10-15 septate, smooth, up to 255 µm. high, 3.5-7 µm. thick; conidiophores unbranched, pale brown, septate, smooth, 0.5-1.5 µm. thick at base, 2-3 µm. thick

at apex; conidiogenous cells integrated, monophialidic, terminal; conidia aggregated in slimy mass, hyaline to sub hyaline, fusiform with single setula at each end, non-septate, smooth, 10-17.5 (11.5) µm. × 1.5- .3 (2) µm. setulae 6-11.5 µm. long. (Fig. 3).

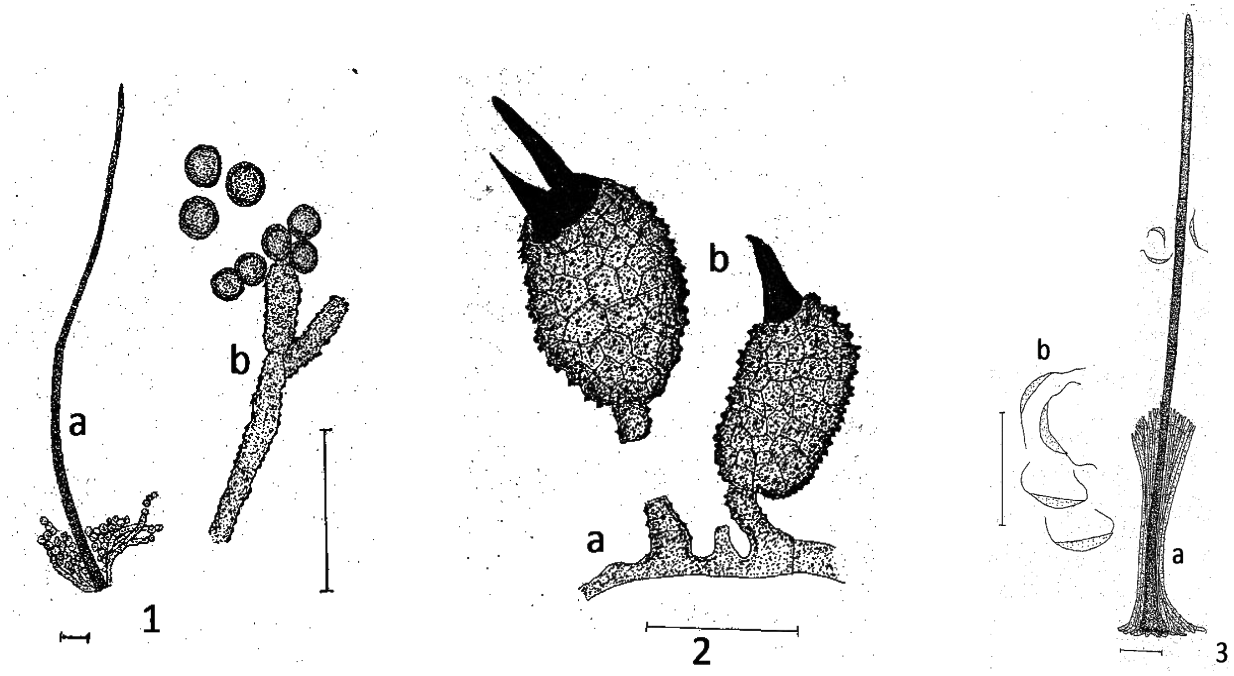
On dried leaves of *Actinodaphne madraspatana* Bedd. ex Hook., Nawegaon, 22-12-1983, AMH 5813.

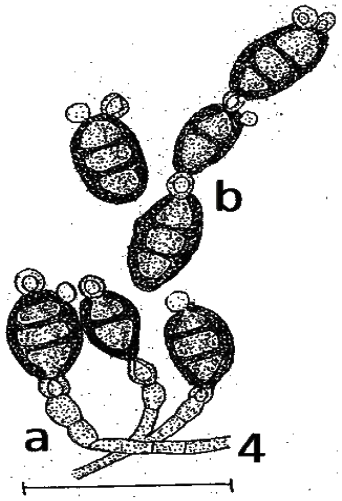
Table No. 1

Sr. no.	Name of the species	Observations in specimen collected.	Details of characters under study, as per authentic description of holotype
1	*Lacillina graminicola* (Berk.Br.) Petch (fig.1) Locality : Allapalli, AMH 5551.	Dimension of Conidiophores: length ×.width 145-194 µm. × 3-5 µm.	Dimension of Conidiophores length ×.width 40-120 µm. × 3-5 µm.
2	*Psedopetrakia kambakkamensis* (Subramanian) M. B. Ellis (fig.2)	1 to 2 dark spines on almost all conidia	1 to 7 dark spines on conidia
3	*Bahusandhika indica* (Subramanian) Subramanian (fig.4) Locality: Tadoba AMH 6065	Rounded separating cells: In 1.5-3 µm. in diameter	Oval separating cells 3.2-4 µm. ×3.2 µm.
4	*Periconia circinata*(Mangin) Sacc. (fig.10) Locality: Bhimashankar AMH 6227	length of conidiphore: Up to 280.0 µm.	length of conidiphore: Up to 200.0 µm.
5	*Pithomyces ellisii* V. Rao and Chary (fig.7) Locality: Pune AMH 6736	length of conidiophore 7.0-14.0 µm.	length of conidiophores 5.5-7.6µm.
6	*Melenographium citri* (Fragoso&Ciferri) M.B.Ellis (fig.8) Locality: Yeotmal AMH 5560	Conidiophores are forked near apical region , which is most uncommon character.	Conidiophores are not forked or not branched near apical region. (A generic character)
7	*Moorella speciosa* P. Raghuveer Rao and Deo Rao (fig.9) Locality: Toranmal AMH 6616	Verrucose conidiophores	Smooth Conidiophores

During the survey, hyphomycetes listed in Table 2 were found, widely distributed in different regions of Maharashtra

Figures

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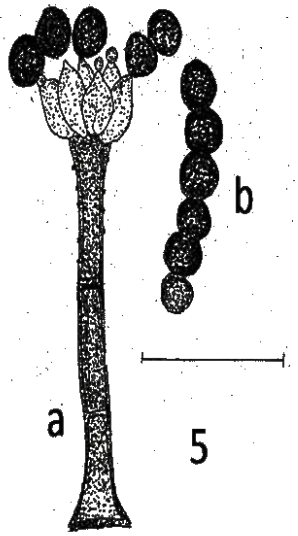
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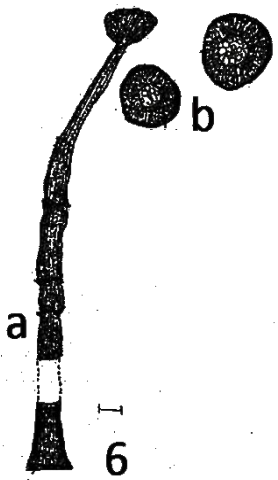
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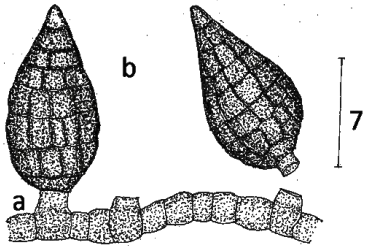
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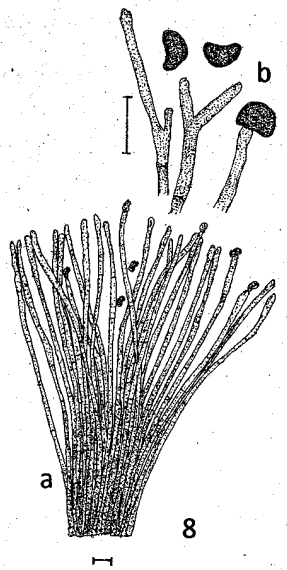
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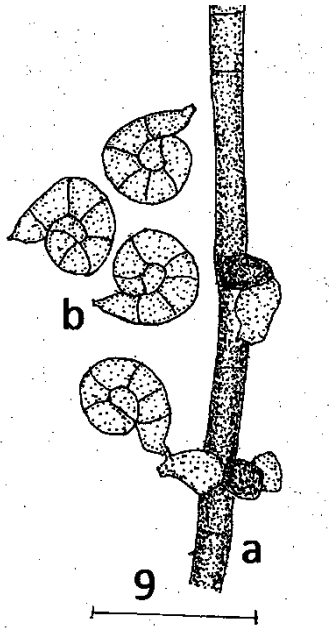
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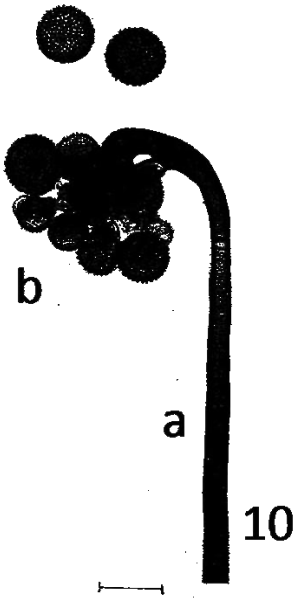
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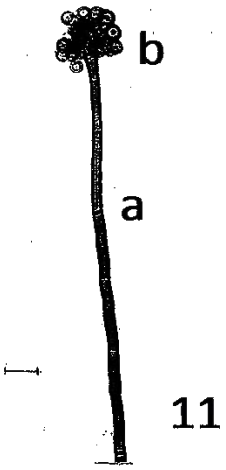
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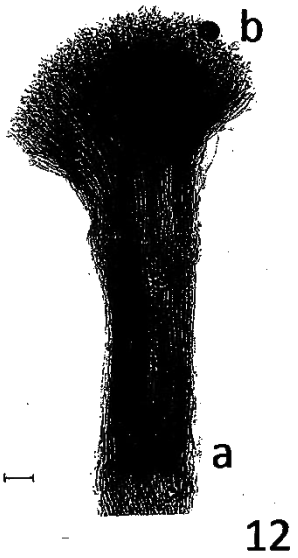
b
a
12

EXPLANATION OF TEXT – FIGURES 1-12

(The bar indicates 20 µm.)

1. Lacillina graminicola – a - Conidiophores with seta, b - Magnified conidiophores and conidia.

2. Psedopetrakia kambakkamensis – a - superficial hyphae and conidiophores, b - conidia.

3. Menisporopsis theobromae – a - conidiophores forming synnemata with single central seta & conidia, b- Magnified conidia.

4. Bahusandhika indica – a - hyphae, conidiophores and conidia, b - conidial chain with separating cells.

5. Memnoniella levispora – a - conidiophores and conidia, b - chain of conidia.

6. Tretopileus sphaerophorus – a - stipe with terminal gemma, b-gemmae.

7. Pithomyces ellisii – a - hyphae, conidiophore with conidium, b - conidia.

8. Melenographium citri – a - conidiophores forming synnemata, b - conidiophores forked at apical region and conidia.

9. Moorella speciosa – a - conidiophore with conidiogenous cells and conidia, b - conidia.

10. Periconia circinata – a - curved conidiophore with conidia, b - head with conidia.

11. Periconia byssoides – a - conidiophore, b - head with conidia.

12. Paathramaya sundara – a – synnemata, b – developing conidia.

Table 2

Sr. No.	Name of the species	Localities of Maharashtra
1	*Melenographium citri* (Fragoso & Ciferri) M. B. Ellis	Karnala of western Maharashtra and Sironcha &Yeotmal of Vidarbha,
2	*Memnoniella levispora* Subramanian	Talkat of kokan, Toranmal of North Maharashtra and Navegaon & Allapalli of Vidarbha,
3	*Moorella speciosa* P. Raghuveer Rao & DeoRao	Toranmal and Yeotmal of Vidarbha,
4	*Paathramaya sundara* Subramanian	Common in dry deciduous forest localities of Navegaon, Allapalli, Sironcha, Darekasa of Vidarbha. Yedshi and Pune of central Maharashtra
5	*Periconia byssoides* Pers ex Merat	Common in dry deciduous forest localities of Bhambragad, Chikhaldara, Tadoba, Nagzira, Allapalli, and Yeotmal of Vidarbha,
6	*Pithomyces ellisii* V. Rao and Chary	Amboli, Mahabaleshwar, Pune, Jowar, Vada of western Maharashtra and Toranmal of North Maharashtra
7	*Tretopileus sphaerophorus* (Berk. & curt.) Hughes & Deighton (fig.6)	Sinhagad, Pune of western Maharashtra and Nagzira, Allapalli and Bhamragad of vidarbha.

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Effect of Gibberellic Acid on Photosynthetic Pigments During Leaf Senescence in *Morus Alba* Linn.

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ABSTRACT

An attempt has been made to study the effect of GA treatment on photosynthetic pigments during leaf senescence in three improved cultivars of Mulberry (*Morus alba*. Linn.) Viz. M5, V1 and S36. The leaf senescence was found to be accompanied with growth hormone GA. It is very effective in maintaining chlorophylls as well as carotenoids in leaves of cultivars M5 and S36 as compared to V1. The chlorophylls and carotenoids level is maintained due to treatment of growth hormone GA, thereby preventing the mulberry leaves from senescence.

Key words - GA, Chlorophylls and carotenoids and *Morus alba*. Linn.

INTRODUCTION

Mulberry plant represents a key component of the Indian sericulture industry as the foliage constituents the major food for the silkworms, *Bombyx mori* Linn. And subsequent cocoon production depends mainly on nutritional composition of Mulberry leaf (Bhuyian., 1981). Many aspects like health and growth of the larvae, cocoon quality and raw silk quality are also influenced by quality of leaf. In addition to evolving varieties, different practices have been worked out to raise leaf production including irrigation schedule, pruning and training types, application of fertilizers etc. (Koul and Bhagat., 1991).

Since, the physiological status of mulberry leaf is important in determining nutritional quality of mulberry leaf, the age of the leaf would have a tremendous influence on silkworm feeding. Ganga (2003) stated that, mature and yellow leaves with low protein content should be discarded and replaced by other nutritious feed for worms. The leaf ageing and senescence involve several catabolic processes and breakdown of the biochemical leading to changes in the chemical composition of the leaves. During present investigation, nutritional constituents of young, mature and senescent leaves from the three cultivars of mulberry (M5, V1 and S36) were compared.

MATERIAL AND METHODS

Healthy young, mature and senescent leaves of mulberry cultivars M5, V1 and S36 were collected and brought into laboratory. They were washed with water and blotted to dry. Leaf discs of 1cm diameter were cut with the help of leaf punch and then mixed randomly. Five hundred milligrams of leaf discs were accurately weighed and allowed to float on 20 ml glass distilled water and plant growth hormone GA concentrations (10ppm, 25ppm, 50ppm) in sterilized Petri plates and kept in dark. After 120 hrs, the levels of chlorophylls in these leaf monitored according to method of Arnon (1949), while carotenoids were estimated by the method of Kirk and Allen (1965). But using the formula of Liasen-Jensen and Jensen (1971).

RESULT AND DISCUSSION

It is evident from the Table 1 that, the effect of gibberellic acid on the level of chlorophylls and carotenoids in detached leaf segments of mulberry cultivars M5, V1 and S36. GA is very effective in maintaining chlorophyll as well as carotenoids in leaves of var. M5 and S36.

Majority of the GAs are catabolites and only a few GAs possess biological activity in plant tissue (Rademacher, 2000). All GAs is basically diterpenoids tetracyclic compound with 19 or 20 carbon atoms and is synthesized via terpenoid pathway. Senescing tissues seem to metabolize GA more rapidly and to contain more bound GA (Aharoni and Richmond, 1978). According to Nooden (1988a), most of the studies show retardation of chlorophyll loss by GA in leaves; however a wide range of other processes and tissues have been studied.

Plant growth hormones have got highly promising role in modern agricultural systems (Nickell, 1982). Several reports indicate that mulberry gives positive response to PGRs (Biswas and Sengupta., 1993 and Reddy and Prasad., 1999). Bose *et al.*, (1995) conducted an experiment to study the effect of foliar application of different levels of some growth regulators on the biochemical constituents of mulberry variety M5, under rain fed conditions. The effect of PGRs on leaf senescence has been studied in some experiments. GA_3 arrested chlorophyllase activity, chlorophyll degradation chloroplast deterioration and retarded senescence in the mulberry leaf disks (Boraiah *et al.*, 1987). The maximum increase in the total chlorophyll content in the range of 8.14% was recorded in variety M5, V1 and S36.

In the present study, we noticed an increase in chlorophyll ‘a’ and ‘b’ content of leaf discs treated with GA followed by consistent increase in carotenoids content. Thus elevations in carotenoids might be playing photoprotective role giving

stability to chlorophylls of mulberry cultivars during the course of leaf senescence in mulberry. Some of these changes would undoubtedly have a negative impact on the nutritional quality of the leaves with respect to silkworm feeding.

Table 1: Effect of GA. treatment on photosynthetic pigments during leaf senescence in *Morus alba* Linn.

Cultivar	Sr. No.	Treatments	Chlorophyll a	Chlorophyll b	Total	Carotenoids
M 5	1	Control	100	100	100	100
	2	10 ppm	177.9	171.9	103.3	174.5
	3	25 ppm	129.4	128.5	104.8	117.0
	4	50 ppm	174.8	135.7	128.3	138.7
V 1	5	Control	100	100	100	100
	6	10 ppm	161.2	170.2	93.8	182.1
	7	25 ppm	103.7	112.8	91.7	116.6
	8	50 ppm	124.2	116.0	111.0	106.2
S 36	9	Control	100	100	100	100
	10	10 ppm	149.0	169.9	87.7	197.2
	11	25 ppm	139.2	155.6	89.3	136.8
	12	50 ppm	144.9	200.3	72.3	146.9

(Cultivars -- M5 (K2), V1 and S36)
(ppm-parts per millions)

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Diversity of Zooplankton and Seasonal Variation in Tulshi Reservoir of Kolhapur District (M.S.), India.

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ABSTRACT:

Zooplanktons are performing at second trophic level in energy flow and switch over to conversion of detritus matter into edible animal food. In this study, we tried to assess the zooplankton species richness, diversity, evenness. The water samples were collected fortnightly from different sites and studied the zooplankton diversity. During present study. A total 39 species of zooplanktons have been found, of which 15 species of Rotifer, 12 species of Copepod, 10 species of Cladocera and 2 species of Ostracoda have been found. Zooplankton population showed positive significant co-relation with physico-chemical parameters like temperature, alkalinity, phosphate, hardness and BOD. Whereas negatively correlated with rainfall and salinity. Seasonal variations in zooplanktons were observed.

Key words: Tulshi reservoir, Zooplankton diversity, seasonal variation.

INTRODUCTION:

Zooplankton constitute important food item of many omnivorous and carnivorous fishes. The larvae of carps feed mostly on zooplankton (Dewan *et al*., 1977) because zooplankton provides the necessary amount of proteins. The principal source of food for fish within the water body, Michael (1968) worked in detail on the ecology of zooplankton population from different waters of India. Rotifers, Cladocerans, Copepods and Ostracods constitute the major groups of Zooplanktons. They occupy an intermediate position in the food web and mediate the transfer of energy from lower to higher trophic levels (Waters, 1987). Being heterotrophic in nature, they play a key role in cycling of organic materials in an aquatic ecosystem (Gupta and Sharma, 2007). Zooplankton communities are typically diverse and are highly sensitive to environmental variation. Due to short life cycle, zooplankton communities often respond quickly to environmental change (Sharma *et al.*, 2007) the changes in physico-chemical conditions of water can be reflected directly on the biotic community of ecosystem. Zooplankton has great significance as pollution indicators. Hence zooplankton association, abundance, seasonal variation, richness and diversity can be used as for the assessment of water pollution and for pisciculture management practices. The present study analyses the one year data. (January 2010 to December 2010) of the zooplankton community structure.

MATERIAL AND METHODS:

Collection of sample and sampling period: Water samples were collected fortnightly around 9.00 to 10.00 a.m. from selected four sites of Tulshi reservoir from January 2010 to December, 2010.

Zooplankton sampling and analysis: Zooplankton samples were collected by filtering 50 liters of water through standard plankton net (77 mesh bolting silk) and the samples were fixed in 5% of formalin. Zooplanktons were identified by keys given by Ward & Whipple (1959), Mellanby (1963), Needham & Tonapi (1980)

Table 1: Diversity of Zooplankton in Tulshi Reservior at selected sites (I,II,III,IV).

	Rotifera	**I**	**II**	**III**	**IV**
1	*Brachionus falcatus.*	+++	+	++	++
2	*Brachionus caudatus.*	+	++	++	+
3	*Brachionus forticula.*	+	++	++	_
4	*Brachionus calyciflorus*	+++	+	+	+
5	*Brachionus angularis.*	+	+	++	+
6	*Brachionus vulgaris.*	+	+	_	+

7	*Brachionus rubens.*	++	+	+	_
8	*Keratella tropica.*	_	+	+++	+
9	*Kellicottia* sp.	+	++	+	+
10	*Filinia terminalis.*	+	+	+	_
11	*Filinia branchiate*	+	+	+	+
12	*Asplanchana pilinia.*	+	++	+	++
13	*Asplanchana brightwelli*	+	+	+	+
14	*Asplanchana priodonta*	+	+	+	_
15	*Testidinella mucronata*	+	_	+	++
	Copepoda	++	+	+	+
16	*Diaptomus nauplius*	+++	+	+	+
17	*Heliodiaptomus viddus*	+	+	++	+
18	*Neudiaptomus diaphorus*	++	++	+	_
19	*Rhinediaptomus indicus*	+	+	+++	+
20	*Cyclopoid* sp.	+	+	++	+
21	*Cyclops bicuspidatus thomasi*	++	++	+	++
22	*Heliodiaptomus viduus*	+	+	+	+++
23	*Mesocyclop hyalinus.*	+	++	+	+
24	*Calanoid* sp.	++	+	_	_
25	*Eucyclops* sp.	+	++	+	+
26	*Paracyclops fimbricatus.*	+	+	+	+
27	*Thermocyclops* sp.	+	++	+	+++
	Cladocera	+	+	+++	+
28	*Daphnia pulex*	+	+	+	+
29	*Daphnia caritiata*	+++	+	+	_
30	*Diaphanosoma brachyarum*	+	++	+	+
31	*Macrothrix laticornis*	++	+	+++	+
32	*Moina macrocopa*	+	+	+	_
33	*Lyneus* sp.	+++	+	+	+
34	*Bosmina* sp.	+	+++	+	+
35	*Allona* sp.	+	+	_	+++
36	*Macrothrix laticornis*	+	+	+	+
37	*Euryalona oriantalis*	+	+	+	_
	Ostracoda	++	+	_	_
38	*Cypris* sp.	+	+	_	_
39	*Stenocypris* sp.	+	_	+	+

The highest total alkalinity was recorded at site IV and III site in the month of April and the lowest in September at site I and II. Bhuiyan (1970) recorded the total alkalinity of medium productive water body ranging from 25-100 mg/l. Chloride values in the present study were not alarming in Tulshi reservoir.

ZOOPLANKTON DIVERSITY:

About 39 species of zooplanktons belonging to four major group's i.e Copepod, Rotifers Cladocera and ostracods. Out of which 12 species of Copepods, 15 species of Rotifers, 10 species of Cladocera and 2 species of Ostracoda were identified and recorded in Table 1. During the study period in Tulshi reservoir. Among the Zooplankton copepod and Rotifera are dominant group than the Cladocera and Ostracoda.

Copepoda > Rotifera > Cladocera > Ostracoda.

Due to the presence of diverse Planktonic forms indicates good ecological condition of the reservoir.

CONCLUSION:

1. Huge diversity of planktons in Tulshi reservoir indicates there is no pollution and play a pivotal role in aquatic ecosystem and shows proper biogeochemical cycles. So Tulshi reservoir is very good for natural pisciculture practices.

2. The positive correlation of Copepods and Rotifers with temperature indicated that they develop better in March and April (warmer period).

3. The positive correlation of Copepods and Rotifers with pH- value indicated that they mainly prefer the alkaline medium for their growth.

4. Zooplankton abundance v/s transparency and also abundance of plankton v/s total alkalinity shows positively correlations. Plankton abundance is negatively correlated with water current velocity and free CO_2.

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Wetlands and Their Role in the Livelihood of Rural Environment: A Case Study Jat Tehsil (Dist-Sangli)

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ABSTRACT:

Wetlands plays a vital role in maintaining the biodiversity and lively hood of the human being. Attempts are made in the present paper to understand the potential importance of manmade wetlands of Jath tehsil of Sangli district of Maharashtra state with respect to their role in the lively hood of rural environment. Jat is a drought prone tehsil of Sangli district located at 17˚ 00'Nto 17° 07'E and 75° 03' E to 75° 09'E.Which forms the boundary between Maharashtra and Karnataka state. Most of the area of the tehsil is hard, rocky with small hills, ravines and bare plateaus of several kilometers with xeric habitat. The annual rainfall is also scanty since last many years. The average annual rainfall between 1959 and 1998 is 21.03 inches. The agriculture is either rain-fed or well water irrigated. Since last few years the numbers of the bore wells are tremendously increased for agriculture and drinking water purpose, the ground water table has considerably decreased. All these conditions are increased the importance of man-made water tanks in the tehsil.

Twenty three small and medium sized water tanks are considered for the study. There tanks are of various water storing capacities and are used for various purposes. Out of these tanks Sankh and Doddnala are considered as medium tanks and others are considered as lower tanks. All these tanks are studied for their establishment year, water storing capacity, total area, and catchment area, benefited land under cultivation, fisheries, drinking water and water used for industries. It is found that most of the tanks are used for the irrigation purpose, which indirectly helps to minimize the fodder problem. The water tanks like Tippehalli and Shegaon is used for the nearby sugar industries. The water tanks at Birnal are the only drinking water source for the Jat town. The Tippehalli and Birnal tanks are also used for the cultivation of fishes like Catla, Rohu, Mrigal etc. Few tanks are providing the habitat for the uncommon birds like Pented stork, Gray heron, little cormorant, Spoon bills, etc. Some of the tanks like Umrani are constructed in collaboration with German Government. The study shows that the water available for agriculture only in Kharip and Rubbi season as most of the tanks are remain dry in the summer season. It is found that the total of 13352.64 ha. Agricultural land is benefited due to these tanks. These water tanks are suffering from the pronounced silting in last few years due to which the water storing capacity of the tanks is decreased.

From the study it is revealed that these man-made water bodies are potentially important with respect to the agriculture, grazing animals, drinking water, industries, fishing, and avifauna of the region. Study also found that these water bodies should be maintained regularly for the efficient and sustainable use. The joint forest management schemes should develop around these water bodies to fulfill the forest based needs of the neighboring people.

INTRODUCTION:

Water is one the basic need of life of all the living organisms. Water is available from various sources in the nature. But most of this natural water is not efficiently utilized unless it is stored properly. It is stored by two ways either it is stored in the natural reservoirs or it is artificially stored in the man-made wetlands. The second type of storage of water plays a significant role in the livelihood of rural environment. These man-made water bodies are potentially important with respect to the agriculture, grazing animals, drinking water, industries, fishing, and avifauna of the region. In recent observations it is found that these water bodies are found as new sites for the migratory birds like flemingos, storks etc.

MATERIAL METHODS:

The extensive field visits are arranged regularly to these places and information is collected through the questionnaire prepared.

RESULT AND CONCLUSION:

Twenty three small and medium sized water tanks are considered for the study. There tanks are of various water storing capacities and are used for various purposes(Table-1). Out of these tanks Sankh and Doddnala are considered as medium tanks and others are considered as lower tanks. All these tanks are studied for their establishment year, water storing capacity, total area, and catchment area, benefited land under cultivation, fisheries, drinking water and water used for industries. It is found that most of the tanks are used for the irrigation purpose, which indirectly helps to minimize the fodder problem. The water tanks like Tippehalli and Shegaon is used for the nearby sugar industries. The water tanks at Birnal are the only drinking water source for the Jat town. The Tippehalli and Birnal tanks are also used for the cultivation of fishes like Catla, Rohu, Mrigal etc(Table-2). Few tanks are providing the habitat for the uncommon birds like Pented stork, Gray heron, little cormorant, Spoon bills, etc. Some of the tanks like Umrani are constructed in collaboration with German Government.

The study shows that the water available for agriculture only in Kharip and Rubbi season as most of the tanks are remain dry in the summer season. It is found that the total of 13352.64 ha. Agricultural land is benefited due to these tanks. These water tanks are suffering from the pronounced silting in last few years due to which the water storing capacity of the tanks is decreased.

From the study it is revealed that these man-made water bodies are potentially important with respect to the agriculture, grazing animals, drinking water, industries, fishing, and avifauna of the region. Study also found that these water bodies should be maintained regularly for the efficient and sustainable use. The joint forest management schemes should develop around these water bodies to fulfill the forest based needs of the neighboring people.

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Table-1 SALIENT FEATURES OF WATER-BODIES OF JAT TEHSIL

Sr. No	Name	Irrigation Capacity (Seasonal) Ha.	Length of canal (km)	Estb year	Estbl. season	Water storing capacity (MCUM /MCFT)						
		Kharip	Rubbi	Twice	Summe	Total				Total	Usable	Dead
1	Shigaon	150	700	-	-	850	9	1974-75	Rubbi	8.0821	5.8160	2.2661
2	Tippehalli	48	206	-	-	254	5	72-73	Rubbi	1.5829	1.4307	0.1522
3	Kosari	15	180	-	-	195	6	71-72	Rubbi	1.4481	1.3235	0.1246
4	Walekhindi	176	327	85.34	-	503	7	79-80	Rubbi	4.1350	3.1004	1.0346
5	Sidhanath	153	700	-	-	853	9.2	79-80	Summ	2.9094	2.9094	3.5253
6	Revnal	95	157	-	-	252	4.8	81-82	Rubbi	2.3678	2.1491	0.2187
7	Mirwad	49	205	-	-	354	2.48	82-83	Rubbi	1.5849	1.3964	0.1885
8	Tikundi-1	90	360	-	-	450	5.60	83-84	Kharip	2.8034	2.3444	0.4590

9	Soradi	120	480	-	-	600	5.60	83-84	Rubbi	1.3244	1.3244	3.0010
10	Tikundi-1	96.66	289	-	-	383.6	9.9	88-89	Kharip	2.4533	2.2030	0.2503
11	Jalyal	65	226	-	-	291	2.97	84-85	Rubbi	2.2354	1.9163	0.3190
12	Sanmadi	31	353	-	-	384	6	88-89	Rubbi	1.9896	1.7811	0.2005
13	Yelavi	120	196	-	-	316	3.60	87-88	Rubbi	2.5618	2.2391	0.3427
14	Gugwad	10	192	-	-	202	3.50	87-88	Rubbi	1.5863	1.4055	0.1808
15	Pratappur	49	196	-	-	245	5	91-92	Kharip	1.6677	1.4417	0.2260
16	Dafalapur	36	142	-	-	178	3.5	92-93	Rubbi	1.3957	1.1847	0.2110
17	Birnal	56	200	-	-	256	5	82-83	Rubbi	1.3957	1.1847	0.2110
18	Bilur-k	26	155	-	-	181	3	95-96	Summ	1.6666	1.4442	0.2243
19	Doddnala	400	600	-	-	1000	5	88-89	Rubbi	7.7699	6.9586	1.7230
20	Sankh	1240	1860	-	-	3100	32	95-96	Summ	19.928	16.678	3.7493
21	Umrani	140	191	-	-	331	Storage	2001-02	Rubbi	1.1380	0.9710	0.1670
22	Belanki	64	191	-	-	255	Storage	2000-01	Rubbi	2.0064	1.6660	0.3404
23	Bhiwargi	798	1197	-	-	1995	Storage	2000-01	Rubbi	2.0064	1.6660	0.3404

Total benefited land: - 13352.64 ha.

Table -2 FISHING PATTERN AT THE WATER-BODIES OF JAT TEHSIL

TYPE OF FISH	LOCATION	DURATION OF FISHING	RANGE OF WT. OF INDIVIDUAL (Kg.)	NO. OF EGGS USED/COST (Rs)	PROBABLE YIELD AFTER 6 MONTHS (Kg)	PROBABLE COST OF THE FISH (Rs)
PANKAJ	BILUR-K	180-200	4 TO 5	1000/300	4000	80,000
KSHIPRIN	BILUR-K	180-200	3.5 TO 10	1000/400	3500	70,000
CATLA	BIRNAL	180-200	4.5 TO 5	1000/350	4500	90,000
ROHU	UMRANI	180-200	5 TO 6	1000/250	5000	1,00,000
TAMBER	SANKH	180-200	1.2 TO 2	1000/300	1200	24,000
	TOTAL	**3,64,000**				

Diversity of Medicinal Plants and its Role in the Livelihood of Arid Zone Environment

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ABSTRACT:

Diversity in plants plays a multifaceted role in the lively hood of human being. The plants are used for various purposes. The use of plants for medicinal purpose has a long standing history as old as human history. In today's modern world the plant based medicines are more preferred as allopathic medicines are showing detrimental side effects. Plant based medicines are proved to be more effective, cheap and easily available in the nature. The studies on medicinal uses and bioactive potential of flowering plants of Jat Tehsil of Sangli district of Maharashtra state (17^0 00" N to 17^0 07" N and 75^0 03" E to 75^0 09" E) revealed that some of the medicinal plants are also found in the drought prone areas also with so much adverse conditions. Most of the plants show xerophytic adaptations to withstand extreme conditions of water and temperature. Besides all these adverse conditions some of the rare and unique species with medicinal uses show their appearance which need to be detected and understand. The study was focused for documentation of traditional knowledge of local people about use of native medicinal plants as ethno medicines. The ethno medicinal data on seventy one plant species were recorded during the present study. The ethno medicinal inventory was developed by botanical name, followed by local name, family, part used and ethno medicinal uses. Some plants are tested for presence of bioactive compounds and it is found that some of the plants contain bioactive compounds which are useful for the treatment of serious diseases. The study proved to be the baseline data for the bioactive potential of the plants from arid zone environment. The bioactive compounds of some plants are enlisted in the present piece of work. This study will help scientific community to undertake further investigations on plants of this region.

Key words : Medicinal plants, Livelyhood, Bioavtive Compounds, Arid Zone, Maharashtra

INTRODUCTION:

Jat is a drought prone tehsil of Sangli district. It is located between 17^0 00' N to 17^0 07' N and 75^0 03' E to 75^0 09' E. The plants show xerophytic adaptations. Some of the rare and uniquemedicinal plant species show their appearance. The present study has analyzed thirty seven plants for their medicinal uses.

MATERIAL AND METHODS:

Present study was confined to the identification of useful flora of Jat tehsil. Frequent field visits were arranged in order to collect the information about the medicinal plants used traditionally due to their unique medicinal properties. Inventory was developed consisting botanical name followed by their local name, family part used and ethno medicinal uses.

Table – I List of plants with their medicinal Importance and Bioactive Compounds

SR. NO.	BOTANICAL NAME	VAR. NAME	FAMILY	PARTS USED	MEDICINAL USES	BIOACTIVE COMPOUNDS
1	*Tribulus terrestris*	Gokru	Zygophyllaceae	Leaves, seeds	Cough, urinary stones, impotency, raktapitta.	Kaempferol, Quercetin, Harnine, Harmol
2	*Calotropis gigantea* (L) R.Br. *C.Procera* (Ait) R.Br.	Rui	Asclepiadaceae	Leaf, stem, roots, latex	Piles, asthma, filaria, earache, boils, abortificient, antitussive	B-Sitosterol, Triterpene, Giganteol, B-Amyrin, Sigmasterol, Calotropeols, Akundarin, Cardenolides, Uscharin
3	*Pongania pinnata* Linn.	Karanja	Papilionaceae	Root, leaf, seeds.	Skin diseases, eczema, leucoderma	Furoflavanes, Kaaranjin, Pongapin, Pinnatin, Glabrol, Kaempferol
4	*Solanam xanthocarpum* Schrad. Wendi. *S. vargineatum*	Kateringani	Solanaceae	Whole plant	Piles, carminative, laxative, cough, asthma, facial paralysis, abdominal pain, urinary disorders, earache, anti abortive	Tigonenin, Uttronins, Steroidal, Glycosides, Quercetin

5	*Solunum indicum* Linn.	Brhati, Moti ringani	Solanaceae	Whole plant	Anti-alopecia, digestive disorders, piles, eye problems.	Tigonenin, Uttronins, Steroidal, Glycosides, Quercetin
6	*Solanum nigrum* Linn.	Kanguni	Solanaceae	Whole plant	Eye disorders, rat poisoning, skin disorders, oedema, cough, conception, strength, ulcer	Tigonenin, Uttronins, Steroidal, Glycosides, Quercetin
7	*Andrographis paniculata* Burn F. syn. *Swertia chirata* Roxb.	Olenkirayat, Kalamegha	Acanthaceae	Whole plant	Abortificiant, Anti bacterial, Hepatotoxic, Anti Fertility, Anti ulcer.	Andrographine, Andrographidine, Panicolin, Apigenin, Carvacrol, Eugenol, Kalmeghin
8	*Balanites aegyptica* (L.) Delile *B. roxburghii* Planch (L.)	Hinganbeta	Balanitaceae	Whole plant	Cosmetic, ulcer, liver spleen problems, malaria, snake poison, sperm deficiency, diabetes.	Balabyptin, Sapoginins, Balanitin, Bergapten, Cholestadient
9	*Citrullus colocynthis* (Linn.) *Trichosanthes bracteata* lam. *Cucumis trigonus* Roxb	Kadu-indravani	Cucurbitaceae	Root, Fruits	Jaundice, warts, alopecia, hair problems, arthritis, abortion, amenorrhoea	6'-Methoxycinchonidine, 6'-Methoxycinchonine, ,Aflukin, Chinin ,Chinine, Coco-Quinine ,Quinine Dab ,Quinine, Anhydrous ,Quinineanhydrous, Quinoline Alkaloid
10	*Abrus precatorius* Linn.	Gunja	Fabaceae	Root, stem, leves	Dental caries, dandruff, scalp, cardiac problems, anti fertiilty	Abrine, Abrectonin, Abrasine, Abrin, anthocyanin, campesterol, choline, cycloartenol, gallic acid, trigonelline, precol, abrol, abrasine, precasine delphinidin glycyrrhizin
11	*Tinospora cordifolia* (willd.) Hook.	Gul-vel, Geloe	Menispermeaceae	Stem, leaves	Fever, Kustha, jaundice, headache, anti-toxic, antipyretic.	Furanoditerpenes, Columbine, Tinosporaside, Jattrrhizine, Palmatine, Berberine, Tembeterine, Sesquiterpene, Glucoside, Tinocordifoliside, A & B-Choline, Tinosporal
12	*Aloe vera* Linn. *A. barbadensis* Mill.	Korphad Ghrtakumari	Liliaceae	Leaf, root	Spleenomegaly, jaundice, breast, pain, fever, headache, epilepsy, palpitation in heart	Aloe emodin, Aloin, Chrysophanic acid, Uronic acid, Anthrone
13	*Ricinus communis* Linn.	Eranda	Euphorbiaceae	Seeds, roots, leaves	Seed oil medicinal, vatvyadhi, fever, constipation, diarrhea, piles, cough, chest pain heart pain, stomach ache, digestive problems	Ricinin, Kaempferol, Ricinolic acid,
14	*Cynadon dactylon* (Linn.) Pers.	Durva, Harali	Poaceae	Whole Plant	Anti haemorrhage, wound healing, scabies, worms, vomiting, menstruation cycle disorder, burning sensation.	Pyrazol,Menthol,Benzoic acid, Decanoic acid, Ar-tumerone, Tumerone, Curlone, Tricyclo- Hexadecanoic acid, Phytol,Linolenic acid, Octadecanoic acid, Propanoic acid, 2-oxo-Furfural, Pantolactone, Pentanoic acid,

						4-oxo-Levoglucosenone, Hexanediamide, Hydroquinone,Phthalic anhydride,Ethanone, Vanillic acid, Syringic acid, Pyrrolidin, Cinnamic acid
15	*Leucas aspera* (Willd) Spreng *L. cephalotes L. plukenetil*	Kumbha	Lamiaceae	Whole plant	Jaundice, Fever, eye-disorders, anti venom, psoriasis.	Glucoside, Triterpenes, Ursolic acid, Antivenin
16	*Dhatura metel* Nees.	Dhotra	Solanaceae	Leaves, seeds	Anti Fever, Anti organism, Anti lice, Anti Filaria	Scopalamine, b-sitosterol, daturadiol, tropine, daturilin
17	*Grewia tiliaafolia* Vahl. *G. optiva* Drummond.	Dhavana	Tiliaceae	Bark, leaves, buds	Fever, cough, anti colic, blood disorders	α – Cellulose , Hemicellulose , Lignin
18	*Oxalis corniculata* Linn.	Cangeri	Oxalidaceae	Whole plant	Grahani, atisara, piles, insect bite.	Flavanoids, tannins, phytosterol, phenol, glycoseides, fatty acids and volatile oil, iso vitexine and vitexine-2”- O- beta – D-glucopyrunoside, palmitic acid,oleic, linoleic, linolenic and stearic acids, vitamin, tartaric and citric acid, malic acid, phytoestrogens
19	*Santalum album* L.	Chandan	Santalaceae	All parts	Anti biotic, anti toxic, antihyperglycemic, anti tumor, anti hyper cholesterol, diuretic.	santalol, santyl acetate and santalene
20	*Cassia tora* Linn.	Takla	Caesalpiniaceae	Seeds, roots, leaf.	Skin diseases, rheumatism, leprosy, delivery problems.	Flavonol glycosides, Anthraquinone, Emodin, Chrysophanic acid,
21	*Cassia auriculata* Linn.	Tarvad	Caesalpiniaceae	Leaves flowers	Diabetes, skin disorders, stomatitis, eye disorders.	Flavonol glycosides, Anthraquinone, Emodin, Chrysophanic acid,
22	*Bacopa monnieri* (L.) Pennell. *Centela asiatica* Linn.	Brahmi	Scrophulariaceae Apiaceae	Whole plant	Mental disorders, insanity, epilepsy, promote intellect.	Alkoloids(3 and does not exist)" 3), does not exist)"saponins (d-mannitol and 3, acid A, and does not exist)"3), does not exist)"flavonoids (luteolin and apigenin), betulic acid, stigmasterol, beta-sitosterol, and 3 (bacosides A, bacosides B, bacopaside II, bacopaside I, bacopaside X, bacopasaponin C, bacopaside N2). The minor components include bacopasaponin F, bacopasaponin E, bacopaside N1, bacopaside III, bacopaside IV, and bacopaside does not exist)"

23	*Phyllanthus amaras* Schum. *P. urinaria* Linn. *P. niruri* Linn.	Bhumi amalaki	Euphorbiaceae	All parts	Jaundice, dysentry, dyspepsia, cough, indigestion, diabetes, urinary problems, skin problem, ulcer, swelling.	Lignans, tannins, polyphenols, alkaloids, flavonoids, terpenoids and steroids
24	*Eclipta alba* Hassk. Linn.	Bhrungraja Maka,	Asteraceae	Whole plant	Hair problems, muscle relaxant, spasmolytic, anti hypocholesterol.	Coumestos, Wadelolactone, Dimethyllactone, Thiophene, Ecliptene, Nicotine, Apigenin
25	*Clerodendrum serratum* (L.) Moon. *C. indicum* (L.) kun.	Bharangi	Verbanaceae	Leaves, roots.	Snake bite, shock, dropsy, rheumatism, fistula, skin disorders, stomach ache, cough, fever, anti fertility.	Iridoid glycosides, stigmasterol (Ⅰ),Bis(2-ethylhexyl) phthalate (Ⅱ),oleanolic acid(Ⅲ),5,7,4′-trihydroxy-flavone(Ⅳ),serratumin A(Ⅴ) and acteoside(Ⅵ).
26	*Aegle marmelos* (Linn.) Corr.	Bel, Bilva	Rutaceae	Fruit, leaves, seeds	Anti vomiting, anti diorrhoea	Trans-Cinnamic acid,Methyl cinnamate ,Cinnamic acid,beta.-Selinene,3-phenylacrylamide,2 (4H)-Benzofuranone, n-Dodecanoic acid, Cinnamamide, Myristic acid, Caryophyllene oxide, Methyl palmitate, Palmitic acid, Ethyl palmitate, Mono (2-ethylhexyl) phthalate, Stigmasterol acetate, 1-Heptacosanol, gamma-Sitosterol, Alpha-amyrin
27	*Amaranthus spinosus* Linn.	Bhandira Katemat	Amaranthaceae	Whole plant	Piles, Bleeding, Filaria	α-spinasterol and some saponins. Sterols, n-alkanes, hydrocyanic acid, lectin,
28	*Sida acuta* Brum. F. *S. cordifolia* Linn.	Bala	Malvaceae	Whole plant	Diarrhoea, goiter, bleeding piles, hemiplagia, filarial, delivery pains, hypotensive, wounds.	Methoxy tocopherol, Tocopherol Oil, Tocospiro B
29	*Zizypus mauritiana* Lam. *Z. hummularia* Weight. *Z. vulgaris* Lam.	Jungly bor	Rhamnaceae	Leaf, root, bark, seed	Burning sensation, diarrhea, cough, voice, headache, obesity, piles	Peptide alkaloids, Mauritines, A-F, Frangufoline, Amphibines, Jubanines, Mucronine, Triterpenes, Spinosin
30	*Acacia nilotica* (L.) Willd *A. arabica* Del..	Babul	Mimoceae	Leaves, Fruit, bark	Diarrhoea, excessive perspiration, lacrimation, pain relief, abdominal disorders. Diuretic, blood purifier, haemostatic, skin disorders, arthritic, acidity, burning sensation	Resins
31	*Melia azedarach* Linn. *M. composita* willd.	Garad Nimb.	Meliaceae	Leaf, root, bark	Skin disorders, arthritis, acidity, burning sensation	β-sitosterol (I), vanillin (II), benzoic acid (III), vanillic acid (IV), daucosterol (V) and α-D-glucopyranose (VI). Compounds III and VI

32	*Withania somnifera* (Linn.) Dunal.	Ashvagandha	Solanaceae	Root, leaf, seeds	Antibiotic, analgesic, anti malarial, respiration stimulant, anti spermato genic, muscle relaxant, ulcer, tumor	Nicotine, Somnoferine, Withanin, Isopelleterine, Tropine, Choline, Anaferine, Withanolides, Withanone, Sominone
33	*Achyranthes aspera* Linn.	Aaghada	Amaranthaceae	Root, leaf,	Excessive hunger, piles, calculi, wound, difficult labour, eye disorders, dog bite.	Betanine, Achyranthine, saponins A & B, Ecdysone, Ecdysterone, Inokosterone, Olenolic acid, Glycosides
34	*Alangium salvifolium* (Linn.) F. Wang.	Akalechapala Ankol	Alangiaceae	Rook bark, seeds, seed oil	Diarrhoea, jaundice, abdominal disorders, animal poisoning, rabies, bronchial asthma	Allangenine
35	*Clerodendrum Flomoides* Linn. F. *C. multiflorum* Linn.	Agnimantha, Tarkari	Verbenaceae	Bark, leaf, leaves	Malarial fever, liver and rheumatism, abortificient, hypogly cemic activity, hypotensive, muscle relaxant, uterine stimulant, diabetes.	Triterpenes, Daucosterol, Luteolin, Nellionol, Premenol, Premnazole, Beta- setosterol
36	*Trichodesma indica* R. Br.	Pathari	Boraginaceae	Whole plant	Leprosy, skin disorders	n-Decanyl laurate , n-tetradecanyl laurate , n-nonacosanyl palmitate , stigmast-5-en-3β-ol-21(24)-olide, n-pentacos-9-one, n-dotriacont-9-one-13-ene , stigmast-5-en-3β-ol-23-one, lanast-5-en-3β-D-glucopyranosyl-21 (24)-olide
37	*Sesbania grandiflora* (L.) Poiret.	Shewari	Fabaceae	Leaves, flowers	Fever, night blindness, cough, epilepsy, astringent, small pox, ulcer, muscle relaxant	Ascorbic acid, Alpha carotene, cyanin, Kaempferol 3-7-diglucoside, Leucocyanidin, Alkanes, Alkanols, triterpenes, Beta-sitosterol, Stigmasterol
38	*Commelina benghalensis* L.	-	Commelinaceae	Whole plant	Bedsores, breast sore, pimples	Chloramphenicol , Ciprofloxacin, Gentamicin, Imipenem
39	*Abutilon indicum* (L.) Sweet.	Mudra	Malvaceae	Whole plant	Jaundice	5-Oxatricyclo (Didicane 12-Trimethy lene, 9-Methylene) 4.35% cubenol 4.45%, Hinesol 12.04%, Acetic acid 4.70% Palmitic acid 43.18% Phytol 31.27%., palmitic acid 5.47% , Phytol 17.12%, All-trans-squalene 13.66%, n-tetracosane 5.68% Terta contane). 7.35%, dl-alpha-tocopherol 15.79% Gamma-sistosterol 6.62%, Lupeol 5.23%, D-Tocopherol (vitamin E)
40	*Echinops echinatus* Linn.	Bramhadandi	Compositae	Whole plant	Energetic, urinary troubles, blood purifier, semen problems	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
41	*Glossocordia linearifolia*	Ranshepu	Compositae	Whole plant	Arthritis	D-glucose, D-xylose, aglycone - 5, 6, 7, 4′ tetrahydroxy 3- methoxy flavones, 5, 6, 7, 4′ -tetrahydroxy 3-methoxy flavones, 6, 4´-

						dimethoxy-5, 7-dihydroxy-flavone. Isoorientin. 5,6,7, 4´-tetrahydroxy- 3-methoxy flavones, D-glucose and D-xylose, Pyranose,7-hydroxy- 5, 6, 4´-trimethoxy-flavone , 2, 3, 6-tri-O-methyl-D-glucose and 2, 3,4- tri-O -methyl-D-xylose, 5, 6, 7, 4′, tetrahydroxy 3-methoxy flavones-xylopyranosyl, glucopyranoside. 6, 4´-dimethoxy-5, 7-dihydroxy-Luteolin 6-C-glucoside,
42	*Capparis decidua* Forsk.	Neptad	Capparidaceae	Leaves, roots, fruits, Bark.	Bleeding piles, dry piles, oedema, blood purifier, eye sight problem, laxative.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
43	*C. aphylla* Forsk.	Neptad	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
44	*C. divaricata* Forsk.	Waghati	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
45	*C. zeylanica* Forsk.	Waghati	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
46	*C. Floribunda* Forsk.	Waghati	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
47	*C. rotundifolia* Forsk.	Waghati	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
48	*Cadaba indica* Forsk.	Waghati	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
49	*Gynandropsis gynandra* L. *G. pentaphylla* L. Briquet.	Pandhari tilvan	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
50	*Cleome viscosa* Linn. *C. Gynanadra* Linn.	Tilvan	Capparidaceae	Leaves, roots, fruits, Bark.	Jaundice, swelling, fracture.	Glycosides, Anthocyanins, Flavonoids, Steroids, Beta-sitosterol, Daucosterol, Tarpenes
51	*Saccharum spontaneum* Linn.	Kagara	Poaceae	Whole plant	Whole plant epilepsy, dysuria, diuretic, aphrodiasiac	Triterpenes
52	*Phoenix paludosa* L. *P. sylvestris* L. *P. dactylifera* L.	Shindi	Arecaceae	Leaves Fruit	Cough, haematoria, asthma, fever, hiccough, burning.	Alcohol, carotenoids, fatty acids, flavonoids, steroids, triterpenes, (W)

53	*Caesalpinia bonducella* (L) Fleming.	Gajaga	Caesalpinoideae	Leaves seeds	Pain, killer, indigestion, piles, worms, cough, diabetes, skin disorders, abdominal distension	Homoisoflavonoids, caesalpinianone, 6-O-methylcaesalpinianone, hematoxylol, stereochenol A, 6′-O-acetylloganic acid, 4′-O-acetylloganic acid, and 2-O-β-d-glucosyloxy-4-methoxybenzenepropanoic acid. glutathione, S-transferase
54	*Lawsonia inermis* L.	Mehandi	Lythraceae	Leaves	Diabetes, haemorrhage, skin disorders, hair problems	Lawsone, Laxanthone II, Luteolin, B- sitosterol, mannitol, Lawsoniaside, Lalioside, Gallic acid, Napthaquinone
55	*Gymnema sylvestre* (Retz). R. Br. Ex. Syn. *Pergularia daemia* (Forsk.)	Bedaki	Asclepiadaceae	Leaves	Inflammation of glands, enlargement of spleen, indigestion, constipation, jaundice, piles, sinusitis, cough, respiratory problems, urinary stone, fever, diabetes	Oleanane type triterpenoid saponins, gymnemic acids, acylated (tigloyl, methylbutyroyl etc.,) derivatives of deacylgymnemic acid (DAGA) which is 3-O-glucuronide of gymnemagenin (3, 16, 21, 22, 23, 28-hexahydroxy-olean-12-ene)2. The individual gymnemic acids (saponins) include gymnemic acids I-VII, gymnemosides A-F, gymnemasaponins**.**
56	*Cyperus rotundus* Linn.	Lavala	Cyperaceae	Whole plant	Digestive, disorders, diarrhea, arthritis, quick healing	Alkaloids, cardiac glycoside, Oils-copadiene, rotundone, cypertone, epoxyguaiene, Benzoquinone
57	*Vitex nigundo* L.	Nirgudi	Verbanaceae	Leaves	Cough, asthma, guinea worms, skin, epilepsy, gandmala, arthritis	Polyphenolic compounds, terpenoids, glycosidic iridoids and alkaloids, negundoside, agnuside, vitegnoside, 7,8 dimethyl herbacetin 3-rhamnoside, 5,3'-dihydroxy-7,8,4'-trimethoxy flavanone, 5-hydroxy-3,6,7,3',4'-pentamethoxy flavone, 5,7 dihydroxy- 6,4' dimethoxy flavonone, and 5 hydroxy-7,4' dimethoxy flavones, vitegnoside, and 7, 8 dimethyl herbacetin 3-rhamnoside
58	*Butea monosperma* (Lam). Taub.	Palas	Fabaceae	Roots, leaves, petioles, flower, seeds	Fever, diarrhea, haemorrhage, worms, filarial, scorpion bite, contra septive, rejuvinative	Dihydrochalcone, dihydromonospermoside, chalcones, butein, monospermoside, isoliquiritigenin, flavone, 7,3',4'-trihydroxyflavone , four flavanones, butin, butrin, isomonospermoside, liquiritigenin, isoflavones, formononetin, afrormosin, formononetin-7-O-beta-D-glucopyranoside,
59	*Boerhavia diffusa* Linn. *B. rependa* Linn.	Punarnava	Nyctaginaceae	All parts	Rejuvinative, night blind ness, oedema, abdominal distension, anti-itching, urinary stones, sleeping problem	Glycosides, alkaloids, flavonoids, tannins, steroids, terpenoids, essential oils and phenolic compounds, sterols, β-sitosterol punarnavine, punarnavoside, anti fibrinolytic agent, potassium nitrate, ursolic acid boerhavin,

						boerhavic acid, Hentriacontane, β-sitosterol and ursolic acid, glucose, fructose, sucrose ,C-methyl flavones characterized as 5,7-dihydroxy-6-8-dimethoxy flavones, boerhavone, boerhavisterol, boerhadiffusene, diffusarotenoid, boerhavilanastenyl benzoate, rotenoid, boerhavinone, rotanoids, boeravinones viz., boeravinone A, boeravinone B, boeravinone C, boeravinone D, boeravinone E,d boeravinone F, Punarnavoside, Bioactive eupalitin 3-O-β-D-galactopyranoside (5,4'-dihydroxy 6,7-dimethoxy-flavonal-3-O-β-D-galactopyranoside) and eupalitin, Eupalitin 3-O-β-D-galactopyranoside (1>2)-β-D-glucopyranoside, eupalitin 3-O-β-D-galactopyranosyl-(1">2")-O-β-D-galactopyranoside, 3,3',5-trihydroxy-7-methoxyflavone, 4',7-dihydroxy-3'-methylflavone, 3,4-dimethoxyphenyl-1-O-β-D-apiofuranosyl-(1">3')-O-β-D-glucopyranoside, dihydroisofuranoxanthone, methyl 3,10-dihydro-11-hydroxy-1-methoxy-4,6-dimethyl-10-oxo-1H-furo [3,4-b] xanthenes-3-carboxylate, borhavine
60	*Vernonia cinerea* less.	Sahadevi	Asteraceae	Roots	Eruptive boils, fever, filaria, leucorrhoea	Diterpene abieta, Acerosin, Vitexin, Wogonin, Artemetin, Agnuside, Cadinol, Camphene, Gardenin, luteolon, Orientin
61	*Tephrosia purpurea* (L.) Pers.	Unhali	Fabaceae	Roots, seed, ash	Diabetes, dysentery, fever teeth disorders, wound healing, cough, semen retention, snake poisoning, skin disorders.	Aromatic ester, sesquiterpene, prenylated flavonoid
62	*Argemone maxicana* Linn.	Pivla dhotra	Papaveraceae	Whole plant	Skin disorders, arthritis, abdominal disorders	Benzophenanthridine-alkaloids,N-demethyloxysanguinarine pancorine, benzylisoquinoline-alkaloids, tetrahydro-1-(2-hydroxymethyl-3,4-dimethoxyphenylmethyl)-6,7-methylenedioxyisoquinoline, higenamine, reticuline, demethyloxysanguinarine 1,2,3,4-tetrahydro-1-(2-hydroxymethyl-3,4-dimethoxyphenylmethyl)-6,7-methylenedioxy-isoquinoline, argenaxine
63	*Sarcostema brevistigma* Wight Am. Syn. *Ephedra gerardiana* Wall.	Sher	Asclepiadaceae	All parts	Anti insecticidal	Amino acids, carbohydrate, glycosides, organic acids, saponins, alkaloid, phenols, cardiac glycosides, lactones, coumarins, sterols, triterpenes, volatile oil, fats, 4-

						methoxysalicylaldehyde, butyl acetate, 2-methyl-1,3-dioxy-cyclopentyl-ethyl acetate, S-[8-(diethylphosphono)octyl] ethanethioate, 1,1,3,3,-tetrabutoxy -2-propanone, 4-methyl-2-pentanone, butyl formate,1-(1-ethoxyethoxy)-butane, 2-butoxytetrahydropyran, butyl ether, p-amyrin acetate, 4-methoxysalicylaldehyde lactoside, periplocoside E and a cardiac glycoside,
64	*Celosia argentia* L.	Kurdu	Amaranthaceae	Leaf, seeds	Diuretic, abdominal colic, renal calculus, gonorrhea, cystitis	Triterpenoid saponins, Celosin-E, F,G, Cristatain, palmitic acid, stear ic acid, oleic acid , linonic acid, li nolenic acid, unsaturated fatly acid s
65	*Fagonia critica* L.	Dhamasa	Zygophyllaceae	Whole plant	Abortion, dropsy, cough, asthma, small pox, antidote	Glucopyranosyl-nahagenin, ursolic acid, rhamnoside, quercetin
66	*Tridax procumbens* L.	Dagadipala	Asteraceae	Leaf	Boils, blisters, dysentery, earache, urinary stones.	Steroids, Saponins, Flavonoids, Antitrypanosomal, Cathechin, Quercetin, Genistein
67	*Erythrina indiaca* L.	Pangara	Fabaceae	Leaves, bark	Bleeding piles, eye disorders, sleeping problem, swelling, arthritis, milking in mother, teeth ache, earache.	Pterocarpans,one flavanone, two triterpenes, two alkaloids, esters and two steroids. ery-thrabyssin II , erystagallin A, erythrabissin-1, 5-hydroxysophoranone, sandwicensin, soyasapogenol B, 8 -oxoerythrinine, erythra-tine, alkyl trans-ferulates, β-sitosterol, stigmasterol, erybraedin A, erythra-byssin II, erystagallin A , erythrabissin-1 erycris-tagallin,5-hydroxysophoranone, erysubin F, sophoradiol, soyasapogenol B, lupeol, cycloeucalenol,
68	*Morinda pubescens* J.E. Smith. *M. tomentosa* Hook. F. *M. ticntoria* Roxb.	Bartondi Nagalkuda	Rubiaceae	Fruit, root, leaves	Energetic, anti-oxidant, disease resistant, blood disorders	Scopoletin, octoanoic acid, potassium, vitamin C, terpenoids, alkaloids, anthraquinones, nordamnacanthal, morindone, rubiadin, and rubiadin-1-methyl ether, anthraquinone glycoside, β-sitosterol, carotene, vitamin A, flavone glycosides, linoleic acid, Alizarin, amino acids, acubin, L-asperuloside, caproic acid, caprylic acid, ursolic acid, rutin, putative proxeronine

RESULTS AND DISCUSSIONS:

Some of the information about the ethno medicinal importance of the plants has been compiled and published under the title ethno botany (Tiwari and Padhye. 1993, Vartak. 1959.) On the same lines the accounts has been attempted by (Mathew. 1983, Das. 2006, Katewa. 2006.) A critical survey of flowering plants of some parts of the western Maharashtra has been made by (Yadav and Sirdesai. 2002.). Seventy plants are selected and studied for their medicinal properties and uses and are listed in the Table –I. Some of the plants are used for headache, snakebite, diarrhea, malaria, cough and cold, and stomach troubles etc. Some medicinal plants are fast dwindling, due to human interference.

SUMMARY AND CONCLUSION:

The study conclude that the further work in these lines should formulized on base line of indigenous studies because there are still some diseases like Cancer and Aids for which there are no identified cures. It was concluded from this study that a nation wide survey of medicinal flora should be conducted to investigate and update the inventory of existing natural plants resources. It is suggested to establish small scale processing units for the valued drugs.

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Short-Nosed Fruit Eating Bat (*Cynopterus Sphinx)*, Grape Damage and Control Measures at Palus Tahsil, District Sangli, Maharashtra

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ABSTRACT:

Grape damage, and control measures of the bats (*Cynopterus sphinx)*, was studied at the Palus Tahsil, District: Sangli, Maharashtra. Grape damage by bats was found to be positively correlated with fruits maturity. This study showed that grape gardens present in open space had more bat damage, than gardens nearer to city and on the road. Damage was significantly higher where grape gardens were surrounded by bushes and trees, compared to open space. It was also indicated that growing trees around the gardens may be supportive to the bats. Even erecting around small mesh sized nylon net from ground level to garden height did not prevent bats to grape damage. The best management strategy was found to involve erecting the small mesh sized nylon net covering whole grape garden; this gave effective control of the short nosed fruit eating bats. This method is highly expensive and causes hurdle to farmers while spaying pesticides but it is safe and nondestructive method for controlling fruit eating bats.

Key words: Bats, C*ynopterus sphinx*, grapes, damage, Palus, Tahsil

INTRODUCTION:

Short-nosed fruit eating bat, *C. sphinx* is commonly found in India and Srilanka (Adhvani, 1982b; Bates and Harrison 1997). It feeds on flowers, fruits and leaves of more than 23 of plants species (McCann, 1940; Bhat, 1994; Srinivasulu and Srinivasulu, 2001). This species lives in old monuments, bridges, wells, larger trees, and caves in smaller to larger colonies. Palus Tahsil comes under Sangli district and situated on the bank of the Krishna river basin. Agricultural land is highly fertile, ever green and cultivating highly commercial crops like, grapes, sugar cane, turmeric, banana, and pomegranates. Only Sangli district itself covered more than one lack nine thousand acres of grape cultivation area and grows Tas-A-Ganesh, Thomson, Sonaka and Sharad varieties. Farmers of Palus Tahsil have been implementing advanced and modern agricultural techniques in agriculture. They have adopted water harvesting, storage and conservation systems, and also using high quality of tonics, pesticides and fertilizers. As a result, they produce high quality of grapes and get handsome amount within a short period. Most often fruit eating bats cause heavy damage to the ripen grapes in Palus Tahsil and this loss is non tolerable to the grape growers. Some research paper have been reported on heavy damage caused by ripen grapes by short-nosed fruit eating bats (Bhat and Kunz, 1995; Srinivasulu and Srinivasulu, 2001; Chakravarthi and Girish, 2003). There are no reports on mode of damage to ripen grapes caused by short-nosed bats and their control measures in the Sangli district. Present paper reports first time on the extent of damage of grapes and control measures of fruit eating bats in the Palus Tahsil.

MATERIALS AND METHODS:

The present study was carried out from December, 2010 to April, 2012. Grape gardens were visited at early evening to discuss with farmers regarding bats activities and mode of damage. And few pilot observations were made. Considering farmers experiences and pilot observations, we have selected five different sites for the critical observations of foraging activities of fruit eating bats. Observation was made from 7.00 PM to 5.00 AM in the months of December to April. Bats were observed by using torch, focus lights and regular fitted bulbs. The following were at the five different sites viz Site I. Near the city and sides of the road, Site II. Open area, surrounding the grape garden. Site III. Grape garden area surrounded by bushes and trees, Site IV. Grape gardens surrounded by small mesh sized nylon net up to height of garden, and Site V. Whole garden area covered with small mesh sized nylon net.

RESULTS AND DISCUSSION:

It was observed that short-nosed fruit eating bats *C. sphinx* (fig. 1a) were visiting the grape gardens from late evening to early morning. Our observations in five different sites were, Site – I: The bats never visited the fields located near city and along road sides it might be due to heavy disturbances caused by the anthropogenic activities and vehicles. Site – II:

In the grape gardens at open place, without any trees around, there was less damage by fruit eating bats. Even though damage can be reduced by persistent watching and creating the disturbance using noise producers, fire cracking. Site – III: Grape gardens surrounded by bushes and trees showed maximum damage to ripen grapes from bats. In early evening bats, inhabiting nearby trees and bushes, were start to come one by one and slowly flow was increasing up to late night. First they make one or two pilot rounds for selecting the space suitable for enter in the garden. Most probably where the branches were less and a gap space was more they use for entering in the garden and select only ripen grape bunches for eating (Figs. 1b-d). Frequently bats were return to their sitting place with some of the ripen grapes in mouth, and start to eat or suck the sap and thrown out the raps or half eaten part of grapes on sitting ground (Fig. 1a-e). Number of bats as well as frequency of damage was increasing at late night. It appeared that the growing trees around the farm were supporting the activities of the bats. Site – IV: The farms surrounded by small mesh sized net, erected up to height of grape plants could not prevent the damage caused by bats. Site – V: When the grape garden was completely covered by small mesh sized nylon net, it could reduce the loss of fruits (fig. 1f). Moreover, this is safe and nondestructive control measures. Similar statement has been reported by Verghese (1998) and Srinivasulu and Srinivasulu (2001).

CONCLUSION:

After the long survey and critical observations we came to know that farmers were struggling to protect their grape gardens from the bats by using variety of control measures like, night watching, focusing high voltage lights, fire cracking, setting noise producers, trapping and sometimes to kill the bats with poisons. Covering whole grape garden with small mesh sized nylon net can reduce maximum loss of ripen grapes from fruit eating bats. However, it is highly expensive and may create hurdle while spraying pesticides and growth regulators on the plants. This is one of the best nondestructive controlling methods for bats.

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FIGURES 1 A-F

a) Bat, *Cynopterus sphinx* Vahl, 1797

b) Ripened grape bunches without damage

c) Ripen grape bunches damaged by bats

d) Fully damaged bunches by bats

e) Half eaten grapes fallen on the ground

f) Whole garden covered by nylon mess net

Diversity and Distribution of Mangroves from Ratnagiri District Coast of Maharashtra.

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ABSTRACT:

The present investigation was aimed to study the diversity and distribution of mangrove from west coast of Ratnagiri district, Maharashtra. During present study total 12 species of mangroves belonging 6 ifferent families and 7 genera were observed. These twelve species of mangroves showed variation in species composition. Family Sonneraticae, Rhizophoracae and Avicenniacae having a maximum species composition (25%) and minimum in family Acanthaceae, Myrtaceae and Combretaceae (8.33% each).

The mangrove species along the coast of Ratnagiri district growing in specific locations in estuary and having appropriate position in the intertidal region. The relative abundance of mangrove species was maximum in *S. alba* (100%) followed by *A. ilicifolius* (84.84%), *C. tagal* (81.81%), *A. alba*, *A. officinalis*, *S. apetala*, *R. mucronata* and *R. apiculata* (72.72%), *A. marina* (66.66%) and minimum in *S. caseolaris* (54.54) and *A. corniculatum* (51.51).

The results are discussed in detail in the light of species composition, location in estuary and relative abundance of mangroves.

Key words: *Diversity, distribution, Mangroves, Ratnagiri coast.*

INTRODUCTION:

India is one among 12 mega - biodiversity countries and 25 hotspots of the richest and highly endangered eco-regions of the world (Myers *et. al.,* 2000). The total area of the estuarine habitats of India has been estimated to be about 2, 14, 500 ha. India has a coastline of 7500 km with an exclusive economic zone of 2015 X 10^6 km^2 which is 61% of the land area. Konkan region of Maharashtra is a narrow strip of 27 – 48 km broad and about 720 km long. The coastal strip of 15 – 17 km is a marshy saline bed due to incoming of Arabian Sea. (Singh *et. al.,* 2000). According to report from Forest Department of Maharashtra the mangrove areas of Maharashtra is about 209.17 Sq. km, distributed in five districts viz. Sindhudurg (15.06 Sq. km), Ratnagiri (33.50 Sq. km), Raigad (85.52 Sq. km), Thane (48.12 Sq. km) and Mumbai (26.97 Sq. km). (Bhosale, 2005).

According to Blasco (1975), mangrove is a type of coastal woody vegetation that fringes muddy saline shores as estuaries in tropical and sub tropical regions. These mangrove ecosystems are reservoirs of species of plants and animals together over a long evolutionary time. The variety of fishes, prawns, molluscs, crabs, reptiles, birds etc., use the mangrove habitat for deriving food and shelter. Deep sea fishes and freshwater prawns are known to use the habitat for breeding and rearing the juveniles in the food-rich and safe shelters of mangroves (Kumbhar, 2001).

Untawale *et. al.,* (1973, 1978 and 1980); Untawale (1985a, b) extensively studied the status and multiple use practices of mangroves in India and suggested that, the mangroves on the Indian coast are the most neglected living resources, which have been over exploited for various purposes. Parulekar, (1985) worked on the Indian mangrove ecosystems in addition to annual cycle of environmental factors and recommended the suitability of the mangrove habitats for the aquaculture practices. Blasco *et. al.,* (1985) finds out the influence of ecological factors on the biology of Indian mangroves. Mulik (1991) studied the pollution index in the Bhatye estuary and found that the pollution load in the estuary affects the germination as well as the growth of the mangroves.

The large physical forces in tide water, salinity level and lack of stable substratum are some of the natural factors which affect the species diversity (Upadhyay *et. al.,* 2002). The mangroves are dominated by single species stands of *Avicennia marina* (Forsk.), which is known for its tolerance for extreme environment. Thivakaran *et. al.* (2003) were studied the vegetation structure of Kuchchh mangroves of northwest coast of Gujarat.

MATERIAL AND METHODS:

Study Area: Ratnagiri is located at latitude 16^0 59’ 10” N and longitude 73^0 16’. 25” E on the west coast of Maharashtra. It has twenty major and minor estuaries and creeks. About 3000 hectares of mangrove habitat exists over 60 km. stretch of Ratnagiri district. For the investigation of mangroves total thirty three localities were considered on the basis of pilot survey.

For the studies of mangroves the visits were made in the flowering season of different plants. For the identification a twig of every plant having inflorescence, flowers, fruits, leaf arrangement, was taken and herbaria were made in the laboratory. The identification of mangrove species was made on the basis of morphological and floral characters by referring

the available published literature and different field guides (Bhosale, 2005). The information regarding use of plant parts was collected from local people. The data obtained is analyzed statistically and represented in the result.

RESULTS AND DISCUSSION:

The survey was carried out in the months of April – May and October - November. Species of mangroves were collected, identified and recorded from 33 localities. During present study total 12 species of mangroves belonging to 6 different families and 7 genera were observed. The species like *Sonneratia alba; S.apetala; S. caseolaris; Rhizophora mucronata; Rhizophora apiculata*; *Ceriops tagal; Avicennia marina; A. alba; A. officinalis; Lumnitzera racemosa; Acanthus ilicifolius and Aegiceros corniculatum* were recorded from different localities on the coast of Ratnagiri district of Maharashtra. The checklist of these mangroves is given in the (Table - 1).

The twelve species of mangroves showed variation in species composition , Family Sonneraticae, Rhizophoracae and Avicenniacae having a maximum species composition (25%) and minimum in family Acanthaceae, Myrtaceae and Combretaceae (8.33% each). (Fig. 1). Family sonneraticae having three species i.e. *S. alba, S. apetala* and *S. caseolaris;* Family Avicenniacae having three species Viz. *A. marina, A. alba* and *A. officinalis* and the family Rhizophoracae also having three members like *R. mucronata, R. apiculata* and *Ceriops tagal.* The families like Acanthaceae, Myrtaceae and Combretaceae represents only one species on the coast of Ratnagiri district.

The mangrove species along the coast of Ratnagiri district growing in specific locations in estuary and having appropriate position in the intertidal region (Table - 2). The species like *Sonneratia alba, S. apetala, S. caseolaris, Lumnitzera racemosa* were observed only at downstream in estuary. *Ceriops tagal, R. mucronata, Avicennia marina* was found at downstream as well as intermediate location in estuary. *A. officinalis* was observed in intermediate location only, whereas *A. ilicifolius* was in intermediate as well as at upstream location in estuary. The species of mangroves like *S. alba, A. officinalis, A. marina* were found in low and intermediate position in the estuary as they have high salinity tolerance capacity. The species like *S. apetala; C. tagal; R. apiculata; R. mucronata* and *A. alba* were at low and / or middle position in estuary whereas, *L. racemosa* and *A. ilicifolius* were recorded at middle as well as high intertidal position. *A. corniculatum* was found only at high intertidal position as; it has low salinity tolerance capacity. The diversity and distribution of mangrove vegetation differs from site to site and are affected by salt concentrations, wave energy, nutrient levels, soil oxygen etc. (Bhosale, 1992).

The occurrence of all the 12 species of mangroves were recorded at Veshavi-Bankot, Varavade, Aaray, Kalbadevi, Sakhartar, Shirgaon, Mirya, Bhatye, Karla, Phansop and Jaitapur followed by Aade, Veldur, Utamber, Saitawade, Ranpar, Golap, Kombhe, Juve, Wada-Vetye, Sagwe, Kelshi, Adkhal-Anjirle, Bakole-Dande, Maglad, Kolambe, Purnagad, Gaonkhadi and minimum mangrove species were found at Rohile, pomedi, Someshwar, Sakhari-Natye and Tawsal. This occurrence of all species in particular habitat might be due to highly productive areas with rich organic matter and limited or negligible anthropogenic activities. Deshmukh (1995) also reported that, the diversity of mangrove plants is maximum, where most of the environment is undisturbed by anthropogenic activities. The mangrove species that finds suitable conditions for their growth or can tolerate the varying conditions better than others, tend to become dominant (Rao, 1994).

The localities like Rohile, Someshwar and Pomedi from Ratnagiri district having minimum species of mangroves might be due to comparatively lower saline waters and habitat with more sand and boulders. The various factors that affect growth, vegetation pattern, and density of mangrove plants are physicochemical nature of water and soil, pollution, climatic conditions and anthropogenic activities etc. Salinity is one of the major factors, which plays an important role in distribution pattern of mangrove plants. The relative abundance of mangrove species was maximum in *S. alba* (100%) followed by *A. ilicifolius* (84.84%), *C tagal* (81.81%), *A. alba, A. officinalis, S. apetala, R. mucronata* and *R. apiculata* (72.72%), *A. marina* (66.66%) and minimum in *S. caseolaris* (54.54) and *A. corniculatum* (51.51) **(**Table - 3). The mangrove species, which require high salt concentration for their growth, are found distributed in high salinity regions, whereas the species which occur away from mouth of estuary or creek requires low salt concentration. Such species are found near mixing zone of seawater and freshwater inflow (Rao *et. al.* 1963). Even though, the growth of maximum mangrove species is better in moderate salinity region. The species like *Rhizophora mucronata* and *Avicennia marina* require high salinity and grow near the mouth of estuary or creek (Yeragi *et. al.* 2000); whereas, the species like *Aegiceras corniculatum* and *Acanthus ilicifolius* grow better in low salinity and occurs on the banks or inward region (away from open coast) of estuary or creek. Most of the mangroves in the coastal regions of Ratnagiri district of Maharashtra are with stunted growth and the common species *Avicennia marina var. acutissina, Lumnitzera racemosa* and *Acanthus ilicifolius* grow very scattered due to anthropogenic disturbances and these species having risk of extinction from some parts of Ratnagiri coast.

The mangroves present on the Ratnagiri coast of Maharashtra having ecological significance by protecting and supporting the habitat of different organisms, as different types of roots holds the soil firmly and avoids soil erosion. At the same time they protect the villages from the cyclonic storms and these mangroves also act as buffer zone during tsunamis. The litter of these plants plays important role in the productivity of these ecosystems. Besides, the local people are using these plants for several purposes like timber, fuel and charcoal preparation, fodder for the cattles, preparation of tannin, dyes and sometimes the fruits and flowers are used as food by the local people. The honey collected from the mangrove forests having great commercial value, at the same time the parts of these plants are used for medicinal purpose. According to Upadhyay *et. al.,* (2002), overexploitation for firewood, charcoal and timber, deliberate land reclamation for urban and industrial development, shrimp farming and dumping of pollutants include the serious causes of mangrove forest loss.

In the study area some of the mangrove habitats were cut for the aquaculture practices. The practice of converting the best mangrove areas into shrimp grow out ponds, however, leads to a number of somewhat predictable economic and ecological problems that challenge the basic premise. The activities like bunding for preparation of aquaculture ponds,

erosion and deposition causes change in the tides and currents, which in turn have strong impact on mangroves ecology in general. Shrimp farming alone caused a loss of 65,000 ha mangrove in Thailand. Java, Sulawesi and Sumatra have lost 70%, 49% and 36% mangrove area respectively. (World Resources, 1996-97).

In the absence of adequate facilities the sewage and sullage are directly discharged into the estuaries. The industries which border the estuaries release considerable quantity of pollutants into the estuarine ecosystem. Pesticides and chemical fertilizers used in the agriculture and aquaculture increase vulnerably to disease and genetic changes in the ecosystem. Jagtap (1994) observed that within last three decades, approximately 40% of the mangrove area has been converted to agriculture or urban centers along the west coast. As a result of continuous biotic pressure, the mangrove and other marine resources are experiencing habitat loss, changes in species composition, and shifts in dominance, loss in biodiversity and threat to survival.

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Table – 1: Checklist of mangroves from Ratnagiri district coast of Maharashtra. Kingdom : Plantae Phylum : Tracheophyta Class : Angiosperm

Order	**Family**	**Genus**	**Species**
I. Myrtales	Sonneratiaceae	Sonneratia	1) *alba* (Smith);
			2) *apetala* (Buch – Ham.)
			3) *caseolaris* (L.) Engler
	Combretaceae	*Lumnitzera*	4) *racemosa* (Willd)
II, Lamiales	Avicenniaceae,	*Avicennia*	5) *marina* (Forsk.) Vierh;
			6) *officinalis* (Lamark)
			7) *alba* (Blume)
III. Personales	Acanthaceae	*Acanthus*	8) *ilicifolius* (Lamark)
IV. Rhizophorales	Rhizophoraceae,	*Rhizophora*	9) *mucronata* (Lamark); 10) *apiculata* (Blume)
		Ceriops	11)*tagal* (Perr.) Robinson
V. Primulales	Myrsinaceae	*Aegiceros*	12)*corniculatam* (L.) Blasco

Table – 2: Mangrove species growing in the coastal habitats of Ratnagiri district (Maharashtra) along with their estuary location and appropriate position in the intertidal region.

Sr. No.	**Name of mangrove plant & family**	**Estuary Location**	**Intertidal position**
1	*Sonneratia alba* (Sonneratiaceae)	D	L
2	*Sonneratia apetala* (Sonneratiaceae)	D	L, M
3	*Sonneratia caseolaris* (Sonneratiaceae)	D	M, H
4	*Ceriops tagal* (Rhizophoraceae)	I, D	M, L
5	*Rhizophora apiculata*(Rhizophoraceae)	I	M, L
6	*Rhizophora mucronata*(Rhizophoraceae)	I, D	M, L
7	*Avicennia alba* (Avicenniaceae)	D	L, M
8	*Avicennia marina* (Avicenniaceae)	D, I	L, M
9	*Avicennia officinalis* (Avicenniaceae)	I	L
10	*Lumnitzera racemosa* (Combretaceae)	D	M, H
11	*Acanthus ilicifolius* (Acanthaceae)	I, U	M, H
12	*Aegiceros corniculatum* (Myrsinaceae)	D, I	H

(Locality in the estuary is shown as D: Downstream; I: Intermediate; U: Upstream. L: Low; M: Middle and H: High).

Table – 3: Occurrence of mangrove plant species at 33 sites of Ratnagiri district coast.

Sr. No.	Species Spots	A	B	C	D	E	F	G	H	I	J	K	L	Total
1	Veshwi-Bankot	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
2	Kelshi	✓	✓	--	--	✓	✓	✓	✓	✓	--	✓	--	8
3	Aade	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	11
4	Utamber	✓	--	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	10
5	Adkhal-Anjirle	✓	--	--	--	✓	✓	✓	✓	✓	✓	✓	--	8
6	Veldur	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	11
7	Rohile	✓	--	--	--	--	--	--	✓	--	--	✓	--	3
8	Tawsal	✓	--	--	--	--	--	--	--	--	--	--	--	1
9	Saitwade	✓	✓	--	✓	✓	✓	✓	✓	✓	✓	✓	--	10
10	Varvade	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
11	Aaray	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
12	Kalbadevi	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
13	Sakhartar	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
14	Shirgaon	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
15	Zadgaon-Mirya	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
16	Bhatye	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
17	Karla	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
18	Juve	✓	✓	✓	✓	✓	✓	✓	✓	--	--	✓	--	9
19	Phansop	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
20	Maglad	✓	--	--	✓	--	✓	--	--	✓	✓	✓	✓	7
21	Kolambe	✓	--	--	--	--	✓	--	--	✓	--	✓	✓	5
22	Someshwar	✓	--	--	--	--	--	--	--	--	--	--	✓	2
23	Pomedi	✓	--	--	--	--	--	--	--	--	--	✓	✓	3
24	Ranpar	✓	✓	--	✓	✓	✓	✓	✓	--	✓	✓	✓	10
25	Golap	✓	✓	✓	✓	✓	✓	✓	✓	✓	--	✓	--	10
26	Purnagad	✓	✓	--	--	--	✓	✓	--	--	--	--	--	4
27	Gaonkhadi	✓	✓	--	✓	--	--	--	✓	--	--	--	--	4
28	Wada-Vetye	✓	✓	--	✓	✓	✓	--	✓	✓	✓	✓	--	9
29	Kombhe	✓	--	✓	✓	✓	✓	--	✓	✓	✓	✓	✓	10
30	Sakhari-Natye	✓	✓	--	--	--	--	--	--	✓	--	--	--	3
31	Jaitapur	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	12
32	Bakole-Dande	✓	✓	✓	✓	✓	✓	--	--	✓	--	✓	--	8
33	Sagwe	✓	✓	--	✓	✓	✓	✓	✓	✓	--	✓	--	9
	Total	33	24	18	24	24	27	22	25	25	20	28	17	287
	Relative frequency	11.49	8.36	6.27	8.36	8.36	9.40	7.66	8.71	8.71	6.96	9.75	5.92	
	Relative abundance (%)	100	72.72	54.54	72.72	72.72	81.81	66.66	75.75	75.75	60.60	84.84	51.51	

A- *S. alba;* **B**- *S. apetala;* **C**- *S caseolaris;* **D**- *R. Mucronata;* **E**- *R. apiculata*; **F**- *C. tagal;*
G- *A. marina;* **H** - *A. alba;* **I**- *A. officinalis;* **J**- *L. racemosa;* **K**- *A. ilicifolius;* **L**- *A. corniculatum.*

Babujamal Hills one of the Holy Places : As A Repository of Medicinal Plants in Hatkanangale Tehsil, Dist. Kolhapur

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ABSTRACT

Now a days assessment of biodiversity and its conservation has become a key issue in the scientific society. However the basic requirement is to inventories a particular region for total biota. But before this assessment; whatever the biota exist in the region should be conserved through *in-situ* way by tribals or local communities in the forest pockets referred as sacred groves. The noth western ghats in Maharashtra is rich with such sacred groves and there were about 180 sacred groves in western ghats **(Gadgil and Vartak, 1975)**.

In present investigations, attempt has been made to inventorise botanical biota with their ethnomedicinal importance from one of the holy places (In Hatkanangale tehsil from Kolhapur district) namely Babujamal hills situated east to Bahubali. The Babujamal dargah is a very famous holy place and worshipped by several people. Due to its holy importance the forest patches surrounding it were well protected and conserved. It is evident from the preliminary survey for these hills, there were 61 flowering plants found to be ethnomedicinal and were used by local people for treatment of health ailments.

Key words: Sacred groves, biota, biodiversity, conservation, Babujamal hills.

INTRODUCTION:

The Indian subcontinent harbours rich diversity due to which it has been catagorised within one of the megabiodiversity centres by IUCN. The Northern western ghats from Sahyadri ranges harbours more than 4500 flowering plant species. As far as diversity of flowering plants of western ghats is concern the Kolhapur district harbours more that 2227 flowering plant species **(Yadav and Sardesai 2002).** Many of them are considered ethnomedicinal plants by communities from villages as well as from tribals. It is the fact that our ancestors were fully aware of natural resources for their sustenance and they were also aware of the fact that these should be conserved for sustenance of future generations but human centered activities became threat to this concept. Most of the wild plants used traditionally were of ethnomedicinal importance which were recognized very earlier as in Ayurveda (**Pei 2001)** for traditional medicines. The Ethnobotany is the science in which total relationship between human beings and vegetation (which exist in primitive communities) can be studied since from last decade this science has become a topic of intrest for inventorisation of medicinal importance of the plants for making the remedies for human health ailments

It is a very essential need to inventorise a particular region for inventorisation of ethnomedicinal plants to enrich local biodiversity register. In this context , the sacred groves as well as holy places play very important role in protecting and conserving plant from above category in present investigation an attempt has been made for inventorisation and documentation of plants of ethnomedicinal values from particular holy places such as Babujamal hills from Hatkanangale tehsil of Kolhapur district.

STUDY AREA AND METHODS:

In present investigation one of the holy places from Hatkanangale Tehsil have been selected for inventorisation of ethnomedicinal importance of some flowering plant species and their importance discussed with local people and confirmed through ayurvedic medical practioner Dr. Balaraj Kamble, Biology Clinic, Kolhapur. This holy place is named as 'Hajarat Peer Babujamal Saheb Kalandar Pahadi Shareek Dargah' situated between 16^0 47' N latitude 74^0 27' E longitude at Kumbhoj and at an altitude of 602 m from mean sea level. Because of the holy importance the plant species have been conserved in these hills and have ethnomedicinal values. Several visits were organized to inventorise the flowring plant species. The specimens were collected and identified by referring standard floras **(Singh and Karthikeyan,2000; T. Cooke, 1967; Yadav and Sardesai,2002)**

RESULTS:

The present paper describes medicinal uses inventorised at Babujamal hills along with their medicinal use administered (singally or in mixture) internally or externally. The remedies can be practiced only under the advice of Ayurvedic medicinal practitioners only

Table No. 1 Inventory of Medicinal plants from Babujamal Hills

Sr. No.	Name of the species	Family	Vernacular name	Part used	Medicinal Uses
1	*Clematis gouriana* Roxb. ex DC.	Ranunculaceae	Morvel	Leaves	As Immuno modulator, In rhematoid arthritis and psorisis
2	*Clematis hedysarifolia* DC.	Ranunculaceae	Morvel		
3	*Annona squamosa* L.	Annonaceae	Sitaphal	Bark	Enhance function of liver
				Leaves	Antidiabetic property
				Fruits	As high calorific diet and rich source of minerals and vitamins
4	*Cocculus hirsutus* (L.) Theob.	Menispermaceae	Vasanvel	Leaves, roots	Diuretic, anti-inflammatory and in cystitis
5	*Tinospora cordifolia* (Willd.) Miers ex Hook. f. Thoms	Menispermaceae	Gulvel	Bark, stem	Jaundice, Liver cirhhosis and good appetizer
6	*Argemone mexicana* L.	Papaveraceae	Pivla Dhotra	Root, Seeds	In Scabies, Brachial Asthma, As anti-Helminthic
7	*Capparis zeylanica* L.	Capparaceae	Waghati	Fruits	In cough, fever, Anti inflammatory
8	*Cleome gynandra* L.	Cleomaceae	Pandhri Tilwan	Leaves	Anti-helminthic, Antibacterial, Anti-inflammatory
9	*Cleome viscosa* L.	Cleomaceae	Pandhri Tilwan		
10	*Portulaca oleracea* L.	Portulaceae	Bhuigoli	Leaves, Stem, Fruit	In Skin diseases, As diuretic and in prostate gland enlargment
11	*Abutilon indicum* (L.) Sweet. Var.*indicum*	Malvaceae	Mudra	Leaves, Stem	In renal calculis, As diuretic and in prostate gland enlargment
12	*Sida acuta* Burm.	Malvaceae	Lahan Chikna	Leaves, fruits,stem	As general tonic, In paralysis, Leeorrhoea
13	*Sida cordifolia* L.	Malvaceae	Bala		
14	*Sida rhombifolia* L. ssp. retusa	Malvaceae	Ati-Bala		
15	*Urena lobata* L. ssp. Lobata	Malvaceae	Van-Bhende	Roots	Diuretic,Lumbago, Rheumatism
16	*Bombax ceiba* L.	Bombaceae	Katesavar	Bark, fruits	Aphrodisiac, Diuretic, pimples
17	*Grewia hirsuta* Vahl.	Tiliaceae	Kirmid	Bark, fruits	Enhances sperm count, In Dirrhoea, Antiinflammatory
18	*Tribulus terrestris* L.	Zygophyllaceae	Gokhru	Fruits	Enhances sperm count, In renal calculis, acts on uterus so used in many female complaints
19	*Oxallis corniculata* L. var. *corniculata*	Oxalidaceae	Ambushi	Entire plant	In piles, Acidity and abdominal pains, Good appetizer

20	*Aegle marmelos* (L.) corr.	Rutaceae	Bel	Fruits	Chronic dysentry, Chronic piles, Heart diseases and for palpitation
21	*Balanites aegyptiaca* (L.) Del	Balanitaceae	Hinganbet	Fruits	Anti-helminthic, In skin diseases, Piles
22	*Boswellia serrata* Roxb. Ex. Colebr.	Burseraceae	Salai	Bark	In Diarrhoea, Asthma and Piles
23	*Azadirachta indica*	Meliaceae	Limb	Leaves, flower, fruits, Bark	In Acidity, skin diseases, and as a blood purifier
24	*Cassine glauca* (Rottb.) O.Ktze	Celastraceae	Tamraj	Fruits, Bark	Antidote against snake bite, Anti-inflammatory, In Eczema of skin
25	*Celastrus paniculatus* willd.	Celastraceae	Malkangoni	Fruit	As brain tonic, In paralysis and skin diseases
26	*Maytenus puberula* (Laws.) Loes	Celastraceae	Pitari	Bark, leaves	In Skin diseases, diarrhoea and acid peptic diseases
27	*Maytenus rothiana* (Walp.) Lobreau- collen	Celastraceae	Yenki		
28	*Zizyphus mauritiana* Lam.	Rhamnaceaed	Bor	Fruits, Leaves	As blood purifier, to stop bleeding and in skin diseases
29	*Ampelocissus latifolia* (Roxb.) Planch	Vitaceae	Dokela	stem	In snake bite, rhematoid arthritis and cataract
30	*Leea macrophylla* Roxb. Ex. Horn.	Leeaceae	Supad	Leaves, Bark	As Anti-diarrhoeal, painkiller, blood hemostasis
31	*Cardiospermum halicacabum* L.	Sapindaceae	Kapalphodi	Bark	In Eczema of skin, Psoriasis
32	*Dimocarpus longan* Lour.	Sapindaceae	Umb	Bark, fruits	Mental relaxation
33	*Dodonea viscosa* (L.) Jacq.	Sapindaceae	Banduchpala	Leaves	As a plaster for wounds
34	*Buchnania cochinchinensis* (Lour.) Almeida	Anacardiaceae	Char	Fruits, Bark	As toothpaste and for wounds and cuts
35	*Lannea coromandelica* (Houtt.) Merr.	Anacardiaceae	Shimti	Bark	Decoction as a Toothpaste
36	*Mangifera indica* L.	Anacardiaceae	Amba	Cotyledons	In Piles and Uterine bleeding
37	*Rhus mysorensis* G. Don	Anacardiaceae	Amani	Leaves, fruits	In Dysentry, dry cough and bronchial asthma
38	*Semecarpus anacardium* L.	Anacardiaceae	Bibba	Fruits	In gastric cancer
39	*Moringa oleifera* Lam.	Moringaceae	Shevga	Leaves, Resin, Bark	In constipation, Anti-inflamatory spleeno megaly
40	*Erythrina suberosa*Roxb.	Fabaceae	Pangari	Leaves	In Uterine diseases, Anti-helminthic and acts on Central nervous system
41	*Mucuna pruriens*(L.) DC.	Fabaceae	Kavach	Seeds	Enhances sperm count, As health tonic and to weight gain
42	*Pongamia pinnata* (l.) Pierre	Fabaceae	Karanj	Bark, Seeds	In Rhematoid arthritis , Diabetis, Harpes, zooster

43	*Tephrosia purpurea* (L.) Pers	Fabaceae	Sarpunkha	Bark, Fruits	In Jaundice, dry cough and liver cirrhoses
44	*Cassia auriculata* L.	Caesalpinaceae	Tarvad	Leaves, bark	In HIV infection, to weight gain and as a liver tonic
45	*Cassia obtusifolia* L.	Caesalpinaceae	Takla	Leaves, seeds	In Rhematoid arthritis and as anti-inflammatory
46	*Cassia tora* L.	Caesalpinaceae	Takla		
48	*Acacia nillotica* (L.) willd. Ex Del.	Mimosaceae	Babul	Bark, Leaves, fruit	To reduce weight and colesterol level
49	*Albizia lebbek* (L.) Bth	Mimosaceae	Siras	Bark	Aphrodisiac, Tighten the teeth and in goiter
50	*Mimosa pudica* L.	Mimosaceae	Lajalu	Entire plant	Blood purifier and in all skin diseases
51	*Kalanchoe pinnata* (Lam.) Pers	Crassulaceae	Panphuti	Leaves	Treatment of wounds, skin ulcers and Influenza
52	*Terminalia cuneata* Roth.	Combretaceae	Arjun Sadada	Bark, fruits	in heart diseases and to lower cholesterol
53	*Psidium guajava* L.	Myrtaceae	Peru	Leaves	As general tonic, Blood hemostesis and in piles
54	*Syzigium cumini* (L.) Skeels	Myrtaceae	Jambhal	Fruits, Bark	In Diabetis and to loose weight
55	*Woodfordia fruticosa* (L.) Kurz.	Lythraceae	Dhayati	Bark, leaves, flowers	Dysentry and Menorrhoegaea
56	*Ludwigia octovalvis* (Jacq.) Raven ssp. Octovalvis	Onagraceae	Panlavang	Entire plant	In irregular menstruation and as antibacterial
57	*Coccinia grandis* (L.) Voigt	Cucurbitaceae	Tondli	Fruits	Diabetis, Melitus and Skin diseases
58	*Diplocyclos palmatus* (L.) Jaffrey	Cucurbitaceae	Shivlingi	stem	In rheumatic pain and fever
59	*Mukia maderaspatna* (L.) Roem.	Cucurbitaceae	Chirbut	Fruits	Diuretic and Vertigo
60	*Opuntia elatior* Mill	Cactaceae	Nivdung	Phyllode	Antibacterial and Anti Diarrhoeal
61	*Centella asiatica* (L.) Urban.	Apiaceae	Brahmi	Entire plant	Mental tonic and in Skin diseases

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Distribution of Tree Species in the Light of Geomorphology and Geology of Ratnagiri District of Maharashtra, India

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ABSTRACT

Number of factors governs the occurrence and distribution of plant species spatially. Among these geology, geomorphology and climate are very important. An attempt has been made to document the tree diversity of Ratnagiri district. This district of Maharashtra is Coastal in location. It is a narrow belt in between the Arabian Sea and Sahyadri ranges. Geologically it shows three distinct zones along the sea viz. **Khalati**- Facing the sea, **Walati**- Next to Khalati and foot hill of **Sahyadri.**

Khalati region is transverse by number of estuaries. This region is geomorphologically unique, characterized by erosional and depositional forces. The Walati region shows presence of plains or table lands while the foot hill of Sahyadri is characterized by presence of small hills and stiff slopes at some places. 68 tree species were studied from the microgeographic areas in all the three regions. Some of the species are common in occurrence while some shows restricted distribution.

Key words- Geomorphology, Khalati, Walati, Sahyadri

INTRODUCTION

Ratnagiri district is situated on the west coast of Maharashtra at 16^0.30 to 18^0.04 North and 73^0.02 to 73^0.52 East. In this geological belt we can recognize three zones parallel to the coastline, Khalati, Walati, and Sahyadri ranges. 'Khalati' indicate coastal belt with width approximately 15Km., 'Walati' is the middle part between Khalati and foot hills of Sahyadri. The third zone includes 'Sahyadri ranges' and its transverse members including hill tops and slopes. The district is at the centre of the Konkan lined in between Arabian Sea and Sahyadri ranges and having length approximately 250Km. The width of district is more towards north (Raigad district) and becoming narrow towards south (Sindhudurg District). Most of the areas of this district are hilly and remote. Ratnagiri district is characterized by a monsoonal land with great contrast in nature of heights and plains of wet and dry seasons, of forested and cultivated stretches, of bare lateritic plateau surfaces and intensely tilled valleys. The eastern portion consists of the main areas of Sahyadri ranges and its transverse members sprawling into the Konkan plain. The mountainous face is deeply scarred by ravines and the Deccan lava topography yields the typical step like appearance, with bold and bleak scarps alternating with softer debris slopes on the crest line towards plateau.We can observe mellowed, smooth, contoured lines. The entire district shows undulated nature. The characteristic feature of the district is the destruction of vegetal cover and bare rocky expanses.

The geological condition of the district influences distribution of plant species in these three zones. **(Table-1)**

MATERIAL AND METHOD

The Study area was located in the coastal belt of Maharashtra, namely Ratnagiri district (16^0.30 to 18^0.04 North and 73^0.02 to 73^0.52 East.). It is a part of South Konkan and situated in between the district Sindhudurga and Raigad. It is comparatively a narrow belt parallel to coast line but it shows diverse eco-climatic conditions including Geology and Geography.

Collection of Data

The observations were made through frequent field visits in the district. Geological position, elevation and overall geological observations were made. This district comprises nine tehsils but for convenience different locations were selected across and along the coast line as study sites.

Study sites (Sampling sites)

At each study site a plot of 100 X 100 m^2 was considered for collection of species specific data. As per the change in eco-climatic conditions 5 different plots were considered separately. These are representative of all types of ecosystems at the study site.

Species data Collection

The number of individuals of tree species was recorded from each plot. Observations are also made on field regeneration.

RESULTS AND DISCUSSION

The climate plays an important role in the distribution of plant species. The theory of spatial distribution of individuals of the species is the central theory of Ecology. Patchiness of the degree to which individuals are aggregated or dispersed is crucial to how a species uses the resources and its reproductive biology **(Condit et. Al. 2000). Gadgil (2011)** has proposed a protocol and methodology for mapping ecologically sensitive, significant and salient areas of Western Ghats. According to them there are three important categories of attributes that need to be considered in defining the ecological sensitivity of an area. There are geo-climatic features, biological features and social relevance. Climatic conditions in the Konkan are strongly influenced by its geographical position and relief and provide a major physical control of vegetation type. The soils of this coastline have coarse texture and are well drained mostly lateritic.

Geomorphology and land forms have a key role in the type grown and distribution of vegetation. **(Singh, 1995)** Geomorphological characters of three different regions of Ratnagiri district are depicted in Table- 1. This region is considered as densely forested area **(Shinde 1980)** but now it has been exploited and degraded to a considerable extent. The Ratnagiri district shows mostly tropical semi evergreen and tropical moist deciduous forest overall the flora is rich from the point of view of domestic economy.

To know the diversity and distribution of tree species ecological documentation is carried out in three different regions as mentioned earlier. The occurrence of the plant species in the different geographical belt is presented in the table no.- 2. It is interesting to note that the number of species is more in walati region and less in the Sahyadri ranges some of the species are cosmopolitan in the nature while some are strictly restricted to a certain region. *Crataeva magna*, *Holigarna grahmii*, *Hydnocarpus pentandra*, *Madhuka longifolia* and *Mammea suriga* are mostly restricted species.

Not only the occurrence but the frequency and density of tree species is variable. Species like *Acacia chundra, Anacardium occidentale, Bridelia retusa* and *Holarrhena pubescens* are highly frequent species. While *Wrightia tinctoria, Acacia nilotica* etc. are less frequent species.

Relative density and Relative frequency of *Acacia chundra, Anacardium occidentale, Bridelia retusa, Garcinia indica, Helicteres isora, Holarrhena pubescens, Mangifera indica, Terminalia elliptica,T. paniculata, Catunaregam spinosa* and *Morinda citrifolia*is comparatively high. It may indicate commonness of these species in the district.

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Table 1 : Geological conditions of the Ratnagiri district

	Khalati	Walati	Sahyadri Range
Rainfall	Comparatively less	Medium	High
Humidity	Uniformly high- 65-75%		
Temperature	Up to 38^0C	Up to 41^0C	Up to 39^0C
Elevation	Up to 100m	100 to 150m	150 to 300m
Soil	Wet soil- Coastal alluvial to lateritic	Lateritic	Varkas soils to Lateritic
Forest	Tropical evergreen	Tropical deciduous	Tropical semi evergreen

Table 2 : Occurrence of the tree species in different geological belts

Sr. No.	Botanical Name	Family	Local Name	Geological Belt		
				Khalati	Walati	Sahyadri Ranges
1	***Crataeva magna*** (Lour.) DC.	Capparidaceae	Waiwarna	✓	✓	
2	***Hydnocarpuspentandra*** (Buch-Ham.) Oken, Allg.	Flacourtiaceae	KaduKavath	✓		
3	***Calophyllum inophyllum***L.	Clusiaceae	Undi	✓		
4	***Garcinia indica*** (Du Petit-Thou.) Choisy.	Clusiaceae	Kokam	✓	✓	✓
5	***Mammeasuriga***(Buch.-Ham. ex Roxb.) Kosterm.	Clusiaceae	Surangi	✓		
6	***Thespesia populnea*** (L.) Soland. ex Corr.	Malvaceae	Paraspimpal	✓	✓	✓
7	***Bombax ceiba***L.	Bombacaceae	Sawar	✓	✓	✓
8	***Helicteres isora*** L.	Sterculiaceae	Murudsheng	✓	✓	✓
9	***Sterculia guttata***Roxb.	Sterculiaceae	Vandri		✓	
10	***Sterculia urens***Roxb.	Sterculiaceae	Pandruk	✓		✓
11	***Erinocarpus nimmonii***Grah.	Tiliaceae	Cher, Chira	✓		✓
12	***Zanthoxylum rhetsa***(Roxb.) DC.	Rutaceae	Chirphal	✓	✓	✓
13	***Nothapodytes nimmoniana*** (J. Grah.) Mabberley	Icacinaceae	Amruta,	✓	✓	
14	***Zizyphus jujuba***Mill.	Rhamnaceae	Bor	✓	✓	✓
15	***Sapinduse marginatus***Vahl	Sapindaceae	Ritha		✓	
16	***Anacardium occidentale*** L.	Anacardiaceae	Kaju	✓	✓	✓
17	***Buchanania cochinchinensis***(Lour.) Almeida	Anacardiaceae	Charoli	✓	✓	✓
18	***Holigarna grahmii*** (Wt.) Kurz.	Anacardiaceae	Ran bibba	✓		
19	***Mangifera indica*** L.	Anacardiaceae	Amba	✓	✓	✓
20	***Semecarpus anacardium*** L. f.	Anacardiaceae	Bibba		✓	✓
21	***Butea monosperma*** (Lam.) Taub.	Fabaceae	Palas		✓	✓
22	***Erythrina variegata***L.	Fabaceae	Pangara		✓	✓
23	***Pterocarpus marsupium***Roxb.	Fabaceae	Bibla, Bijjaka	✓		

24	***Bahunia tomentosa***L.	Caesalpiniaceae		✓	✓	✓
25	***Bahunia racemosa***Lamk.	Caesalpiniaceae	Apta	✓	✓	✓
26	***Bauhinia roxburghiana***Voigt.	Caesalpiniaceae			✓	
27	***Cassia fistula***L.	Caesalpiniaceae	Bahava			✓
28	***Saraca asoca*** (Roxb.) de Wilde	Caesalpiniaceae	Ashok		✓	
29	***Tamarindus indica*** L.	Caesalpiniaceae	Imli		✓	✓
30	***Acacia chundra*** (Roxb. ex Rottle.) Willd.	Mimosaceae	Khair	✓	✓	✓
31	***Acacia nilotica*** (L.) Del	Mimosaceae	Babhul		✓	
32	***Albizia lebbeck*** (L.) Bth.	Mimosaceae	Shirish		✓	✓
33	***Terminalia belerica***(Gaertn.) Roxb.	Combretaceae	Beheda	✓	✓	✓
34	***Terminalia chebula***Retz.	Combretaceae	Hirda	✓	✓	✓
35	***Terminalia cuneata***Roth	Combretaceae	Arjun	✓	✓	✓
36	***Terminalia elliptica***Willd.	Combretaceae	Ain	✓	✓	✓
37	***Terminalia paniculata***Roth.	Combretaceae	Kinjal	✓	✓	✓
38	***Careyaa rborea***Roxb.	Myrtaceae	Kumbhi	✓	✓	✓
39	***Psidium guajava*** L.	Myrtaceae	Peru		✓	
40	***Syzygium cumini*** (L.) Skeels	Myrtaceae	Jambhul	✓	✓	✓
41	***Barringtonia racemosa***(L.) Spr.	Barringto-niaceae	Samudra-phal	✓		
42	***Memecylon umbellatum***Burm.	Melastonataceae	Anjan	✓	✓	
43	***Catunaregam spinosa***(Thunb.) Tirveng.	Rubiaceae	Gela	✓	✓	✓
44	***Morinda citrifolia***L**.**	Rubiaceae	Bartondi	✓	✓	✓
45	***Madhuka longifolia***(Koen.) Mac.	Sapotaceae	Moha	✓		
46	***Mimusops elengi***L.	Sapotaceae	Bakul	✓	✓	
47	***Alstonia scholaris***R.Br.	Apocynaceae	Saptaparni	✓	✓	✓
48	***Holarrhena pubescens*** (Buch-Ham.) Wall. ex G. Don Gen.	Apocynaceae	Kala kuda, Indrajaw	✓	✓	✓
49	***Plumeria rubra***L.	Apocynaceae	Lal Chapha	✓		
50	***Tabernaemontana alternifolia*** (Roxb.) Nicols& Suresh	Apocynaceae	Nagel kuda		✓	✓
51	***Wrightia tinctoria***R.Br.	Apocynaceae	Kala kuda		✓	✓
52	***Strychnos nux-vomica*** L.	Loganiaceae	Kajra	✓	✓	✓
53	***Cordia dichotoma***Forst.	Boraginaceae	Bhokar	✓	✓	
54	***Oroxylum indicum*** (L.) Vent.	Bignoniaceae	Tetu, Shyona-aka		✓	✓
55	***Gmelina arborea***Roxb.	Verbenaceae	Shivan, Gamb-hari	✓	✓	✓
56	***Tectona grandis*** L. f.	Verbenaceae	Sag	✓	✓	✓
57	***Pongamia pinnata*** (L.) Pierre	Lamiaceae	Karanj	✓		
58	***Santalum album*** L.	Santalaceae	Chandan		✓	
59	***Bridelia retusa*** (L.) Spreng.	Euphorbiaceae	Asana	✓	✓	✓
60	***Emblica officinalis***Gaertn.	Euphorbiaceae	Avla	✓	✓	✓

61	***Mallotus philippensis*** (Lam.) Muell.	Euphorbiaceae	Shendri	✓	✓	✓
62	***Sapium insigne***Bth.	Euphorbiaceae	Hura	✓	✓	
63	***Artocarpus heterophyllus*** Lam.	Moraceae	Phanas	✓	✓	✓
64	***Ficus bengalenisis*** L.	Moraceae	Vad	✓	✓	✓
65	***Ficus racemosa***L.	Moraceae	Umbar	✓	✓	✓
66	***Ficus religiosa*** L.	Moraceae	Pimpal	✓	✓	✓
67	***Caryota urens***L.	Arecaceae	Bherli mad	✓	✓	✓
68	***Cocus nucifera*** L.	Arecaceae	Naral	✓	✓	
				51	**57**	**45**

Table 2 : Density, Frequency and Abundance of Tree species in the three different regions of Ratnagiri district.

Sr. No.	Botanical Name	Geological Belt								
		Khalati			Walati			Sahyadri Ranges		
		Density	Frequency	Abundance	Density	Frequency	Abundance	Density	Frequency	Abundance
1	***Crataeva magna* (Lour.) DC.**				0.33	0.83	40			
2	***Hydnocarpus pentandra*** (Buch-Ham.) Oken, Allg.	0.33	5.43	6.2						
3	***Calophyllum inophyllum***L.	0.01	1.08	1						
4	***Garcinia indica*** (Du Petit-Thou.) Choisy.	0.61	21.73	2.85	0.67	13.33	5.06	0.04	4.47	1
5	***Mammea suriga*** (Buch.-Ham. ex Roxb.) Kosterm.	0.03	2.17	1.5						
6	***Thespesia populnea*** (L.) Soland. ex Corr.	0.04	1.08	4	0.03	2.5	1.33	0.04	1.49	3
7	***Bombax ceiba***L.	0.36	16.3	2.26	0.36	20.83	1.76	0.59	29.85	2
8	***Helicteres isora*** L.	1.51	14.13	10.69	3.63	21.66	16.76	0.17	17.91	13.1
9	***Sterculia guttata***Roxb.				0.01	1.66	1			
10	***Sterculia urens***Roxb.	0.02	2.17	2				0.11	4.47	2.66
11	***Erinocarpus nimmonii***Grah.	0.09	3.26	3				0.01	1.49	1
12	***Zanthoxylum rhetsa***(Roxb.) DC.	0.19	13.04	1.5	0.31	15	2.11	0.64	13.43	4.77
13	***Nothapodytes nimmoniana*** (J. Grah.) Mabberley	0.01	1.08	1	0.19	1.66	11.5			
14	***Zizyphus jujuba***Mill.	0.28	11.95	2.36	0.29	16.66	1.75	0.47	17.91	2.66
15	***Sapinduse marginatus***Vahl				0.11	4.16	2.8			

16	***Anacardium occidentale*** L.	**4.14**	**55.43**	**7.47**	**4.19**	**45.83**	**9.14**	**1.77**	**29.85**	**5.95**
17	***Buchanania cochinchinensis*** (Lour.) Almeida	**0.63**	**17.39**	**3.62**	**0.23**	**5**	**4.66**	**0.11**	**7.46**	**1.6**
18	***Holigarna grahmii*** **(Wt.) Kurz.**	**0.07**	**3.26**	**2.3**						
19	***Mangifera indica*** L.	**3.73**	**58.69**	**6.37**	**3.07**	**62.5**	**4.92**	**2.73**	**56.71**	**4.81**
20	***Semecarpus anacardium*** L. f.				**0.008**	**0.83**	**1**	**0.01**	**1.49**	**1**
21	***Butea monosperma*** (Lam.) Taub.				**0.75**	**9.16**	**8.18**	**0.53**	**11.94**	**4.5**
22	***Erythrina variegata*** **L.**				**0.05**	**1.66**	**3**			
23	***Pterocarpus marsupium***Roxb.	**0.02**	**2.17**	**2**						
24	***Bahuniatomentosa***L.	**0.06**	**3.26**	**2**	**0.04**	**3.33**	**1.25**	**0.19**	**2.98**	**6.5**
25	***Bahuniaracemosa***Lamk.	**0.04**	**4.34**	**1**	**0.31**	**16.66**	**1.9**	**0.16**	**11.94**	**1.37**
26	***Bauhinia roxburghiana***Voigt.				**0.008**	**0.83**	**1**			
27	***Cassia fistula***L.							**0.01**	**1.49**	**1**
28	***Saraca asoca*** (Roxb.) de Wilde				**0.01**	**1.66**	**1**			
29	***Tamarindus indica*** L.				**0.008**	**0.83**	**1**	**0.02**	**2.98**	**1**
30	***Acacia chundra*** (Roxb. ex Rottle.) Willd.	**0.89**	**15.21**	**5.85**	**7.7**	**64.16**	**12.01**	**2.94**	**35.82**	**8.2**
31	***Acacia nilotica*** (L.) Del				**0.01**	**1.66**	**1**			
32	***Albizia lebbeck*** (L.) Bth.				**0.008**	**0.83**	**1**	**0.02**	**2.98**	**1**
33	***Terminalia belerica***(Gaertn.) Roxb.	**0.38**	**15.21**	**2.5**	**0.78**	**20**	**3.91**	**0.38**	**14.92**	**2.6**

34	***Terminalia chebula***Retz.	**0.4**	**11.95**	**3.36**	**0.36**	**12.5**	**2.93**	**0.1**	**2.98**	**3.5**
35	***Terminalia cuneata***Roth	**0.03**	**1.08**	**3**	**0.15**	**5**	**3**	**0.07**	**5.97**	**1.25**
36	***Terminalia elliptica***Willd.	**1.01**	**14.13**	**7.15**	**1.53**	**17.5**	**8.79**	**1.41**	**14.92**	**9.5**
37	***Terminalia paniculata***Roth.	**4.38**	**34.73**	**12.59**	**1.19**	**27.5**	**4.33**	**1.65**	**25.37**	**6.52**
38	***Careya arborea***Roxb.	**0.7**	**19.56**	**3.61**	**0.6**	**15.83**	**3.84**	**0.91**	**19.4**	**4.69**
39	***Psidium guajava*** L.				**0.03**	**1.66**	**2**			
40	***Syzygium cumini*** (L.) Skeels	**0.51**	**10.86**	**4.7**	**0.15**	**6.66**	**2.25**	**0.35**	**17.91**	**2**
41	***Barringtonia racemosa* (L.) Spr.**	**0.01**	**1.08**	**1**						
42	***Memecylon umbellatum***Burm.	**3.48**	**32.6**	**10.7**	**0.03**	**2.5**	**1.33**			
43	***Catunaregam spinosa* (Thunb.) Tirveng.**	**1.07**	**23.91**	**4.27**	**1.36**	**24.1**	**5.65**	**1.23**	**31.34**	**3.95**
44	***Morinda citrifolia*L.**	**1.3**	**15.21**	**8.57**	**0.25**	**8.33**	**3.1**	**0.13**	**1.49**	**9**
45	***Madhuka longifolia* (Koen.) Mac.**	**0.11**	**3.26**	**3.66**						
46	***Mimusops elengi***L.	**0.06**	**5.43**	**1.2**	**0.03**	**3.33**	**1**			
47	***Alstonia scholaris***R.Br.	**0.02**	**2.17**	**1**	**0.75**	**1.66**	**4.5**	**0.05**	**4.47**	**1.33**
48	***Holarrhena pubescens*** (Buch-Ham.) Wall. ex G. Don Gen.	**14.2**	**64.13**	**22.15**	**12.06**	**62.5**	**19.3**	**13.25**	**67.16**	**19.73**
49	***Plumeria rubra***L.	**0.03**	**3.26**	**1**						
50	***Tabernaemontana alternifolia*** (Roxb.) Nicols& Suresh				**0.03**	**1.66**	**2**	**0.11**	**1.49**	**8**

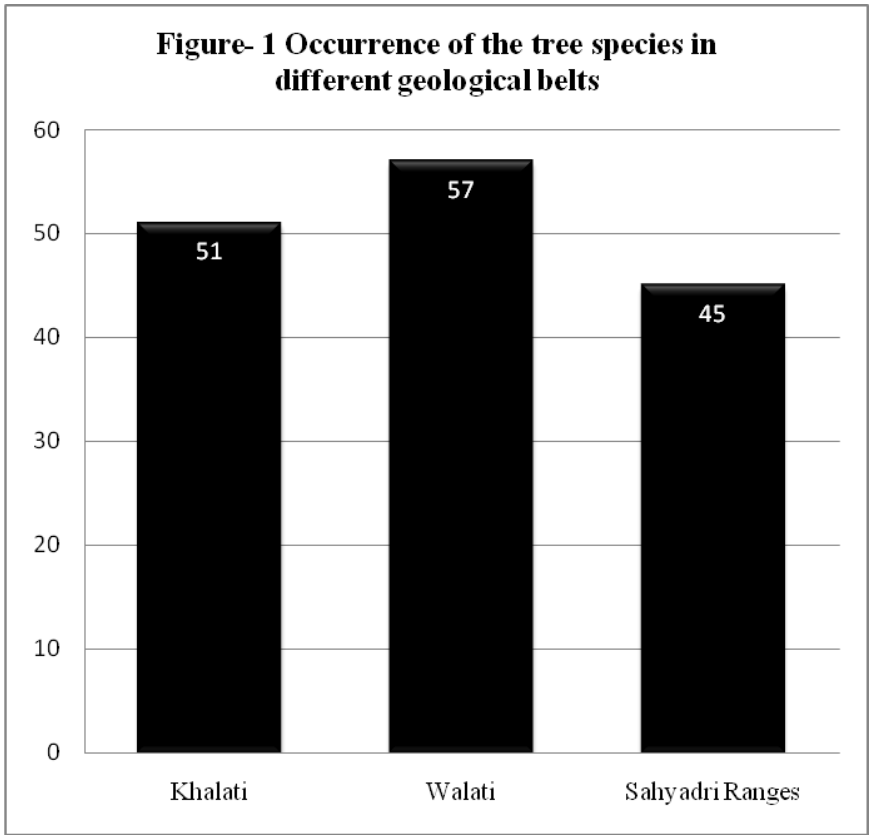
51	***Wrightia tinctoria***R.Br.	**-**			**0.01**	**5.83**	**2.85**	**1.05**	**11.94**	**8.87**
52	***Strychnos nux-vomica*** L.	**0.35**	**17.39**	**2.06**	**0.058**	**2.5**	**2.33**	**0.01**	**1.49**	**1**
53	***Cordia dichotoma***Forst.	**0.02**	**1.08**	**2**	**0.03**	**1.66**	**2**			
54	***Oroxylum indicum*** (L.) Vent.				**0.05**	**3.33**	**1.75**	**0.04**	**2.98**	**1.5**
55	***Gmelina arborea***Roxb.	**0.09**	**5.43**	**1.08**	**0.37**	**14.16**	**2.64**	**0.38**	**13.43**	**2.88**
56	***Tectona grandis*** L. f.	**1.23**	**19.56**	**6.33**	**0.94**	**15**	**6.27**	**2.55**	**28.35**	**9**
57	***Pongamia pinnata*** (L.) Pierre	**0.02**	**2.17**	**1**						
58	***Santalum album*** L.				**0.008**	**0.83**	**1**			
59	***Bridelia retusa*** (L.) Spreng.	**4.83**	**68.47**	**7.06**	**3.48**	**45.83**	**16.72**	**2.7**	**46.26**	**5.83**
60	***Emblica officinalis*** Gaertn.	**0.5**	**9.78**	**5.11**	**0.08**	**6.66**	**1.25**	**0.59**	**17.91**	**3.33**
61	***Mallotus philippensis*** (Lam.) Muell.	**0.17**	**3.26**	**5.33**	**0.04**	**0.83**	**5**	**0.46**	**7.46**	**6.2**
62	***Sapium insigne***Bth.	**0.46**	**14.13**	**3.3**	**0.008**	**0.83**	**1**			
63	***Artocarpus heterophyllus*** Lam.	**0.13**	**5.43**	**2.4**	**0.15**	**8.33**	**1.8**	**0.62**	**5.97**	**10.5**
64	***Ficus bengalenisis*** L.	**0.18**	**13.04**	**1.41**	**0.09**	**6.66**	**1.37**	**0.059**	**5.97**	**1**
65	***Ficusracemosa***L.	**0.01**	**1.08**	**1**	**0.04**	**0.83**	**5**	**0.23**	**7.46**	**3.2**
66	***Ficus religiosa*** L.	**0.06**	**4.34**	**1.5**	**0.03**	**3.33**	**1**	**0.23**	**13.43**	**1.7**
67	***Caryota urens***L.	**0.01**	**1.08**	**1**	**0.15**	**5.83**	**2.71**	**0.01**	**1.49**	**1**
68	***Cocus nucifera*** L.	**0.09**	**2.17**	**4.5**	**0.008**	**0.83**	**1**			

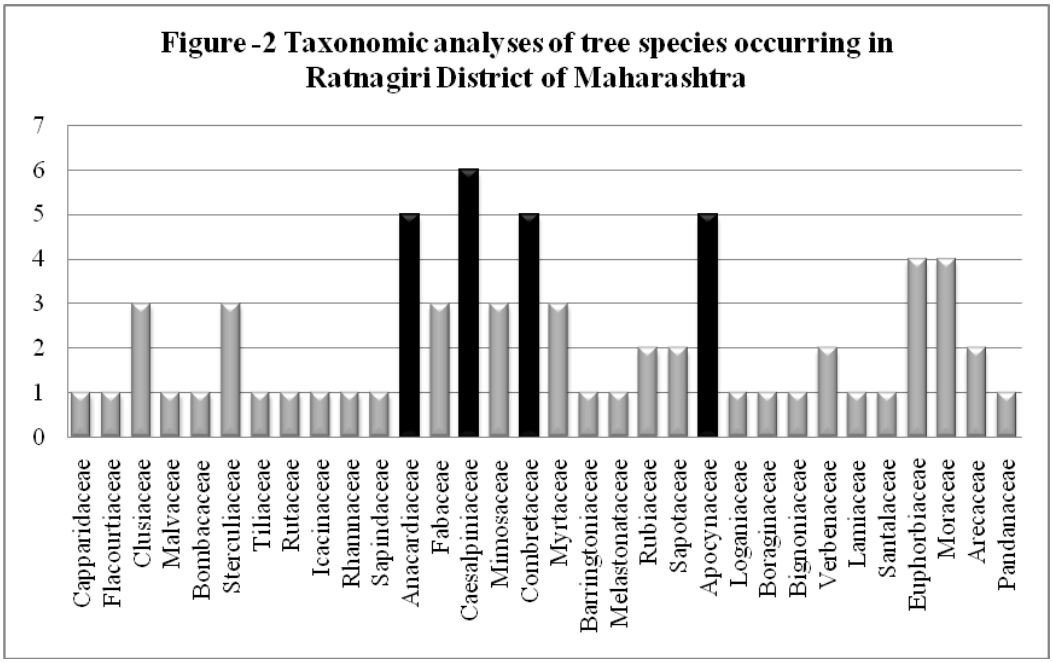
Table - 3 Relative density and relative frequency of tree species in different geological belts of Ratnagiri district.

Sr. No.	Botanical Name	Relative Density			Relative Frequency		
		Khalati	Walati	Sahyadri	Khalati	Walati	Sahyadri
1	***Crataeva magna***(Lour.) DC.		0.7			0.12	
2	***Hydnocarpus pentandra*** (Buch-Ham.) Oken, Allg.	0.66			0.79		
3	***Calophyllum inophyllum***L.	0.02			0.15		
4	***Garcinia indica*** (Du Petit-Thou.) Choisy.	1.22	1.43	0.1	3.19	2.04	0.69
5	***Mammea suriga***(Buch.-Ham. ex Roxb.) Kosterm.	0.06			0.31		
6	***Thespesia populnea*** (L.) Soland. ex Corr.	0.08	0.07	0.1	0.15	0.38	0.23
7	***Bombax ceiba***L.	0.73	0.77	1.43	2.39	3.19	4.64
8	***Helicteres isora*** L.	2.99	7.72	5.66	2.07	3.32	2.78
9	***Sterculia guttata***Roxb.		0.03			0.25	
10	***Sterculia urens***Roxb.	0.04		0.28	0.31		0.69
11	***Erinocarpus nimmonii***Grah.	0.19		0.03	0.47		0.23
12	***Zanthoxylum rhetsa***(Roxb.) DC.	0.38	0.67	1.14	1.75	2.55	2.78
13	***Nothapodytes nimmoniana*** (J. Grah.) Mabberley	0.02	0.4		0.15	0.25	
14	***Zizyphus jujuba***Mill.	0.56	0.62	1.14	1.75	2.55	2.78
15	***Sapinduse marginatus***Vahl		0.24			0.63	
16	***Anacardium occidentale*** L.	8.21	8.91	4.26	8.14	7.03	4.64
17	***Buchanania cochinchinensis***(Lour.) Almeida	1.25	0.49	2.9	2.55	0.76	1.16
18	***Holigarna grahmii***(Wt.) Kurz.	0.15			0.47		
19	***Mangifera indica*** L.	7.42	6.54	6.54	8.62	9.59	8.83
20	***Semecarpus anacardium*** L. f.	0.28	0.01	0.03	1.11	12.74	0.23
21	***Butea monosperma*** (Lam.) Taub.		1.59	1.29		1.4	1.85
22	***Erythrina variegata*** L.		0.1			0.25	
23	***Pterocarpus marsupium***Roxb.	0.04			0.31		
24	***Bauhinia racemosa***Lamk.	0.08	0.67	0.39	0.63	2.55	1.85
25	***Bahunia tomentosa***L.	0.12	0.08	0.46	0.47	0.51	4.46
26	***Bauhinia roxburghiana***Voigt.		0.01			0.12	
27	***Cassia fistula***L.	0.02		0.03	1.15		0.23
28	***Saraca asoca*** (Roxb.) de Wilde		0.03		0.25		
29	***Tamarindus indica*** L.		0.01	0.07		12.74	0.46

28	***Saraca asoca*** (Roxb.) de Wilde		0.03		0.25		
29	***Tamarindus indica*** L.		0.01	0.07		12.74	0.46
30	***Acacia chundra*** (Roxb. ex Rottle.) Willd.	1.76	16.39	7.06	2.23	9.85	5.57
31	***Acacia nilotica*** (L.) Del		0.03			0.25	
32	***Albizia lebbeck*** (L.) Bth.		0.01	0.07		0.12	0.46
33	***Terminalia belerica***(Gaertn.) Roxb.	0.75	1.66	0.93	2.23	3.07	2.32
34	***Terminalia chebula***Retz.	0.79	0.77	0.25	1.75	1.91	0.46
35	***Terminalia cuneata***Roth	0.06	0.31	0.17	0.15	0.76	0.92
36	***Terminalia elliptica***Willd.	2	3.26	3.4	2.07	2.68	2.32
37	***Terminalia paniculata***Roth.	8.69	2.53	3.98	5.11	4.22	3.95
38	***Careya arborea***Roxb.	1.4	1.29	0.64	2.87	2.43	3.02
39	***Psidium guajava*** L.		0.07			0.25	
40	***Syzygium cumini*** (L.) Skeels	1.01	0.31	0.86	1.59	1.02	2.78
41	***Barringtonia racemosa***(L.) Spr.	0.02			0.15		
42	***Memecylon umbellatum***Burm.	6.92	0.07		4.79	0.38	
43	***Catunaregam spinosa***(Thunb.) Tirveng.	2.02	2.9	2.97	3.51	3.7	4.88
44	***Morinda citrifolia***l.	2.58	0.54	0.32	2.23	1.27	0.23
45	***Madhukalongifolia***(Koen.) Mac.	0.23			0.47		
46	***Mimusops elengi***L.	0.12	0.07		0.79	0.51	
47	***Alstonia scholaris***R.Br.	0.04	0.15	0.14	0.31	0.25	0.69
48	***Holarrhena pubescens*** (Buch-Ham.) Wall. ex G. Don Gen.	28.19	25.66	31.86	9.42	9.59	10.45
49	***Plumeria rubra***L.	0.06			0.47		
50	***Tabernaemontana alternifolia*** (Roxb.) Nicols& Suresh		0.07	0.28		0.25	0.23
51	***Wrightia tinctoria*** R.Br.		0.35	2.54		0.89	1.85
52	***Strychnos nux-vomica*** L.	0.71	0.12	0.03	2.55	0.38	0.23
53	***Cordia dichotoma***Forst.	0.04	0.07		0.15	0.25	
54	***Oroxylum indicum*** (L.) Vent.		0.12	0.17		0.51	0.46
55	***Gmelina arborea***Roxb.	0.19	0.79	0.93	0.79	2.17	2.09
56	***Tectona grandis*** L. f.	2.45	2	6.13	2.87	2.3	4.41
57	***Pongamia pinnata*** (L.) Pierre	0.04			0.31		
58	***Santalum album*** L.		0.01			12.74	
59	***Bridelia retusa*** (L.) Spreng.	9.59	7.4	6.49	10	7.03	7.2
60	***Emblica officinalis***Gaertn.	0.99	0.17	1.43	1.43	1.02	2.78
61	***Mallotus philippensis*** (Lam.) Muell.	0.34	0.08	1.11	0.47	12.74	1.16
62	***Sapium insigne***Bth.	0.92	0.01		2.07	12.74	
63	***Artocarpus heterophyllus*** Lam.	0.25	0.31	1.42	0.79	1.27	0.92

64	***Ficus bengalenisis*** L.	0.36	0.19	0.14	1.91	1.02	0.92
65	***Ficus racemosa***L.	0.02	0.08	0.57	0.15	0.12	1.16
66	***Ficus religiosa*** L.	0.12	0.07	0.57	0.63	0.51	2.09
67	***Caryota urens***L.	0.34	0.33	0.03	1.13	0.89	0.23
68	***Cocos nucifera*** L.	0.19	0.01		0.31	0.12	





Occurrence of an Owl Moth *Erebus Macrops* (Linn. 1768) from Sangli City

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ABSTRACT:

In the present study a species of owl moth *Erebus macrops* of the family Noctuidae has been described and studied. The Noctuidae is the largest family in the order Lepidoptera. This particular species is characterized by exceptionally large wing span and oscillate mark of the wings surrounded by three concentric dark areas. This is the first reporting of the species from Sangli city and hence we report range extension of *Erebus macrops.*

Key words: Owl Moth, *E. macrops,* Noctuidae, Camouflage

INTRODUCTION:

Sangli district is a part of western Maharashtra. It is situated in the basins of river Krishna and Warna and many small rivers like Panchaganga also flow in the nearby areas. Physical settings of this district show variety of landscapes and is influenced by varied climate and vegetation. It is situated between $16^{O}4$ and $17^{O}1$ North latitudes and $73^{O}40$ and 75^{O} East longitude.

Lepidoptera is a large order of insects that includes moths and butterflies. It is one of the most widespread and widely recognizable insect order in the world (Powell, Jeroy A. 2009). Lepidopterans are among the most successful group of insects. Moths and butterflies are important in the natural ecosystem. They are integral participants in the food chains, having associated with flowering plants and predator. Lepidopteran species have formed a network of trophic relationships between autotrophs and heterotrophs. The adults are included in the food webs in much broader range of consumers (Resh, Vincent H., T. Carde July 2009). The Noctuidae is the largest family of the order Lepidoptera. This family is at present divided into a number of subfamilies of widely varying variety. The higher classification is likely to be modified considerably through the activities of taxonomists. The current higher classification and history of its development have been revised (Holloway J.D. 1988). In India very scanty information and report of occurrence of this owl moth is available.

SYSTEMIC POSITION:

The Owl moth *Erebus macrops* shares following systemic position.

Kingdom : Animalia
Phylum : Arthropoda
Subphylum : Hexapoda
Class : Insecta
Order : Lepidoptera
Family : Noctuidae
Tribe : Erebini
Genus : *Erebus*
Species : *macrops*

Binomial name is thus ***Erebus macrops*** (Linnaeus, 1768)
Synonyms:

§ Erebus boopis (Guenee, 1852)
§ Patula boopis (Guenee, 1852)
§ Erebus bubo (Fabricius, 1775)
§ Noctuca bubo (Fabricius, 1775)

E. macrops is a species of moth of the family Noctuidae. It is found in the subtropical region of Africa and Asia. The wingspan is Ca. 12 cm making it exceptionally large for a Noctuidae species. The larvae feed on Acacia and Entada species.

Other members of the genus found in India are: *E.strigipennis* (Moore 1883), *E. superb* (Swinhoe 1908), *E. jaintiana* (Swinhoe, 1896)

MATERIAL AND METHODS:

The specimen was observed a single occurrence during night in the month of September. It was collected using butterfly net. It was killed using chloroform in the laboratory. The moth was pinned, spread on spreading board and oven dried at 40^{o}C.

The identification was carried out using standard identification key, standard reference books and internet resources.

The specimen was photographed using Cannon Ixus (105 SL), 12 MP camera.

RESULTS:

The occulate mark of the forewing is very large and it is surrounded distally by three concentric dark areas including the inner surrounding ring. The markings on the wings are more conspicuous, irregular and all over the wings. But towards the base they are more blotchy.

The wing span is exceptionally large. The adult moth shows very large oscillate mark of the forewings surrounded distally by three concentric dark areas. The span of the forewings is at more than right angles to the abdomen.

Plate1

Plate 2

Plate 3

Plate 4

(Plate 1-4 showing the full wing span of the owl moth and the large occulate marks with three concentric dark areas around the marks which is the characteristic of the species *Erebus macrops*)

DISCUSSION:

Geographical range:

Indian sub region, West china, Burma, Thailand, Sumatra, Borneo is the regions of occurrence of this species

Habitat Preference:

Only one report of Bornean species has been seen from G. Kinabalu Mountains in 1930.

BIOLOGY:

Bell (MS) described the larva as a semi looper, ophinsine in shape, fattest centrally with only the pro-legs on A3 reduced to half size. A8 is lumped towards the posterior, with a prominent pair of tubercles set apart and having rounded apices. Segments A1 and A2 are extended relative to the rest. The body is smooth, the primary setae arising from black dots. It is rufous brown, marbled finely all over with grayish white color. A yellow dorsal band is marbled finely brown and there is a similar, double lateral line.

The adults of the owl moth rest on the shaded tree trunks or on the rock faces during day time. The moth enters dwelling on occasions but rarely comes to light. The present moth was sighted when it had come to light. The host plant of

the sighted moth is Acasia (Leguminosae) (Bell). The adult has been recorded as a fruit piercer in Thailand (Banziger, 1982; Kuruko and Lewvanich, 1993).

The false eye marking of the owlet moth will come to its defense when a bird tries to attack it. The 'eye spots' give the impression of a larger creature such as cat or owl, which most birds will avoid at all costs (Isacc Kehinkar). Thus the owlet moth shows excellent camouflage.

The physiological or molecular identification of moths have not been done so far and it needs urgent attention.

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Diversity in Theleporoid, Corticioid and Polyporoid Fungi of Rajaram College Campus Kolhapur

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ABSTRACT:

An attempt has been made to inventorize wood decaving theleporoid, corticioid and polyporoid fungi from Rajaram College Campus, Kolhapur as a case study. In preliminary survey 36 species of such fungi were collected belonging to 24 genera from ten families of Aphyllophorales of Basidiomycotina on 25 cultivated and naturally occurring angiosperm hosts in the campus. Among the 36 wood rotting species, eleven species are found to be new to India, 30 species are new to State of Maharashtra which are reported on 39 new angiosperm hosts. Among the 10 families of Aphyllophorales, family polyporaceae found to be dominated the campus by representing 21 species. The species richness index of wood rotting fungi to this campus is 66.66.

Key words : wood rotting fungi, Diversity.

INTRODUCTION :

The wood rotting species from order Aphyllophorales (Basidiomycotina) are usually saprobes on dead wood (Donk, 1964; Talbot, 1973, Alexopoulos *et al*., 1996). The species from Corticiaceae, Hymenochaetaceae and Polyporaceae are major wood decomposers. However, Corticiaceous and Polyporaceous members are ephimerals that appear quickly on woods. While species from other families establish slowly and survive to staying stable for longer time in with or without combination of co-occurrence of other wood rotting species. These species play very important role in ecosystem as decomposers and results in nutrient recycling, releasing them in soil from decaying of wood for a longer period of time.

MATERIALS AND METHODS :

Rajaram College campus harbors more than 230 cultivated and natural angiosperms trees and shrubs and cultivated gymnosperms. The studies on wood rotting fungi (from Aphyllophorales) from this campus has not been attempted earlier, so that in present investigation, these fungi were collected and all substrates favourable to *Aphyllophorales* colonisation were surveyed frequently and observed critically whether they are colonising on wood/ twigs in exposed or luminised area and unluminised sides of fallen logs. These were collected, dried and deposited in the college herbarium. The specimens were identified by using standard literature (Ainsworth *et al*. 1971; Bakshi, 1971; De and Roy, 1981; Ganesh and Leelavathy 1986; Eriksson, 1958; Roy, 1981; Fergus, 1960; Cockcroft, 1979) Fungi species record is checked by using standard literature (Bilgrami *et al*., 1979, 1981, 1991; Jamaluddin *et al*., 2004; Roy and De 1996).

RESULT:

The theleporoid, corticioid and Polyporoid wood rotting fungi species inventorized from the campus (2011-2012). Among the 36 species, 27 are identified at species level while nine at generic level. These species are belonging to 24 genera from ten families from Aphyllophorales. Family Polyporaceae is represented by 21 species (15 identified at species level and remaining at generic level) and found to be dominating the wood decaying fungi in the campus than others (Table-2). Twelve species showed resupinate type of basidiocarp, while sixteen species showed effused type of basidiocorp however, murulioid - alveolate, imbricate, applanate - ungulate, erect-wavy, corky-stipitate type of basidiocarp are represented by one species by remaining genera (Table-1).

The Indian records of wood rotting species revealed that, (Table-1) from present investigations, eleven species are found to new to India while 30 species are found to be new to State of Maharashtra. All these species are collected on fallen woods of 25 angiosperm hosts (Table-1). However, colonization and occurrence of wood rotting species (Table -3) are found to be higher on *Mangifera indica* (8 spp.) followed by *Leucaena latisitiqua* (5 spp.), *Glyricidia sepium* (5 spp.) and 3 spp. each on *Thevetia neriifolia, Cordyline terminalis, Cassia siamea.* However, remaining 19 angiosperm hosts are represented by one wood rotting fungal species each.

DISCUSSION :

Among the wood rotting species inventorized, species of *Pycnoporus, Schizophyllum* and *Thelephora* are growing on angiosperm woods in open areas in luminised condition in the campus, that means these species get adopted to less humid environment or with high temperature (Lodge and Canthrell, 1995). However, species of genera like *Hydnum, coriolopsis, Trametes* and *Poria* are found to be growing under the shadow of big trees either on exposed surfaces of fallen wood while species of *Sparassis, Coniophora, Chondrostereum, Aleurodiscus* and *Phellinus* are growing on unluminized sides of fallen woods. *Gandoderma lucidum, Naviporus floccossus* are growing at the base of standing tree trunks or on the exposed roots at considerable humid conditions in the month of August-September.

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Table 1 : Occurrence of wood rotting fungi from Rajaram college campus, Kolhapur (M.S.)

Sr. No.	Name of wood rotting fungi	Nature of Basidiocarp	Angiosperm Host	New to India	New to State of Maharashtra	New to Host record
I. 1	**Family - Hydnaceae** *Hydnum* sp.	Stipitate	*Leucaena latisiliqua, Cordyline terminalis*	--	✓	✓
2	*Radulum sulphureum*	resupinate	*Dombeya acutangula*	--	✓	✓
II. 3	**Family - Coniophoraeae** *Caniophora puteana*	Effused reflexed	*Samania saman*	✓	✓	✓
4	*Serpula lachrymans*	Merulioid alveolate	*Glyricidia sepium*	✓	✓	✓
III. 5	**Family - Polyporaceae** *Coriolopsis carperata*	Effused	*Acacia auriculiformis*	✓	✓	✓
6	*Fomitopsis officinalis*	Effused applanate	*Cassia siamea*	✓	✓	✓
7	*Fomes affinis*	Effused	*Acacia ferruginea*	✓	✓	✓
8	*Trametes serpens*	Effused	*Moringa oleifera Leucaena latisiliqua Pithecoelobium dulce*	--	✓	✓

9	*Trametes cingulata*	resupinate	*Mangifera indica* *Cassia siamea* *Glyricidia sepium* *Leucaena latisiqua*	--	✓	✓
10	*Poria cineracens*	resupinate	*Albizzia lebbek*	--	✓	✓
11	*Poria eupora*	resupinate	*Moringa oleifera*	--	✓	✓
12	*Poria rhizomorpha*	resupinate	*Glyricidia sepium*	--	✓	✓
13	*Poria incrassata*	resupinate	*Thevetia neriifolia*	--	✓	✓
14	*Poria* sp.	resupinate	*Cordyline terminalis*	--	✓	✓
15	*Poria* sp.	resupinate	*Acacia nilotica*	--	✓	✓
16	*Poria* sp.	resupinate	*Mangifera indica*	--	✓	✓
17	Poria sp.	resupinate	*Cordia dichotoma*	--	✓	✓
18	*Poria* sp.	resupinate	*Crotalaria* sp.	--	✓	✓
19	*Naviporus floccossus*	resupinate effused	*Glyricidia sepium*	--	✓	✓
20	*Microporus xanthopus*	effused stipilate	*Mangifera indica*	--	--	✓

Table 2 : Family-wise occurrence of wood rotting fungi (Aphyllophorales) from Rajaram College Campus

Sr. No.	Aphyllophorales - Family	Name of Genera	Total Number of species	Number of species new to India	Number of species new to State of Maharashtra	Number of angiosperms species reported as new hosts
1.	Hydnaceae	02	02	-	02	02
2.	Coniophoraceae	02	02	02	02	02
3.	Polyporaceae	11	15 identified 6 unidentified	04	18	22
4.	Hymenochaetaceae	01	01	-	01	01
5.	Ganodermataceae	01	01	-	-	01
6.	Sparassidaceae	01	01	-	01	01
7.	Thelephoraceae	01	01	01	01	01
8.	Schizophyllaceae	01	01	-	01	05
9.	Corticiaceae	02	01 identified 02 unidentified	01	01	01
10.	Stereaceae	02	02 identified 01 unidentified	03	03	03
	Total 10 families	24	27 identified 09 unidentified 36 : Total .	Total : 11	Total : 30	Total : 39

Floristic Inventory of Ramling and Dhuleshwar from Hatkanangale, Tahsil Part I

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ABSTRACT:

The present paper deals with as a part of an all taxa biodiversity inventory with reference to a special group of plants i.e. angiosperms. Twenty five species of angiosperms from dicotyledons have been described along with their updated nomenclature, family from holyplaces like Ramling and Dhuleshwar, of Hatkanangale Tahsil.

Key words : Biodiversity, inventory, angiosperms, Dhuleshwar.

Ramling and Dhuleshwar are two famous holyplaces from Kolhapur district in Hatkangale tahsil, situated in between 16" 45' N latitude and $74^0$22'E longitude. Due to religious background vegetation surrounding these localities have been well conserved. Though the flora of Kolhapur district has been published (Yadav and Sardesai, 2002), the study area receives very less average annual rainfall, the different flowering plants harboured in coarse shallow soils and show dry deciduous composition of, newly emerging concept to be tested as a part of all taxa biodiversity inventory (Janzen and Hallwachs, 1994) an attempt has been made to enumerate one group of plants i.e. only floweing plants of this geographical area.

During the survey, many angiosperms taxa were collected from these regions. Specimens were processed for herbarium specimen by routine standard technique. All of the specimens for dicotyledons were identified by using standard floras (Cooke, 1904, 1905; Karthikeyan 2000, Singh, et. Al 2001). The correct and updated citation, short description is given for each taxon and voucher specimens are deposited in Herbarium department of Botany, Dr. Patangrao Kadam College, Sangliwadi, Sangli.

1)	**Annonaceae :**	
	Artabotrys hexapetalus (L. F.) 'Hirva Chafa'	PKCH – 72.
2)	**Capparaceae**	
	Cadaba indica Lam. 'kalitaka'	PKCH - 90
3)	**Malvaceae**	
	Sida acuta (Burm), 'Lahan Chikana'	PKCH – 50
4)	**Tiliaceae**	
	Corchorus acutangulus Lam.	PKCH – 74
5)	**Tiliaceae**	
	Triumfetta rhomboidea Jacq	PKCH – 7
6)	**Fabaceae**	
	Butea monosperma (Lam;) ' Palas '	PKCH – 82
7)	**Fabaceae**	
	Dliricidia sepium (Jacq.)	PKCH – 95
8)	**Fabaceae**	
	Abrus precatorius L. 'Gunj'	PKCH – 95
9)	**Fabaceae**	
	Crotalaria habecarpa (DC). 'Godhadi'	PKCH – 78
10)	**Caesalpiniaceae**	
	Peltophorum pterocarpum (DC;).	PKCH – 88
11)	**Combretaceae**	
	Terminalia paniculata Roth; 'Honal', 'Kindal'	PKCH – 132
12)	**Lytharaceae**	
	Laterstroemia parviflora Roxb. 'Bondara'	PKCH – 62
13)	**Lytharaceae**	
	Woodfordia fructicosa. (L.), 'Dhayati'	PKCH – 117
14)	**Turneraceae**	
	Turnera ulmifolia L.	PKCH – 42
15)	**Rubiaceae**	
	Ixora parviflora Vahl, 'Lokhandi'	PKCH – 85

16)	**Family : Plumbaginaceae**	
	Plumbago zeylanica L. 'Chitrak'	PKCH – 98
17)	**Apocynaceae**	
	Plumeria alba L.	PKCH – 100
18)	**Apoeynaceae**	
	Carissa congesta Wight; 'Karvanda'	PKCH – 64
19)	**Bignoniaceae**	
	Jacaranda acutifolia Humb.	PKCH – 105
20)	**Martyniceae**	
	Martynia annua L. 'Vaghnakhi'	PKCH – 3
21)	**Acantheceae**	
	Barleria prionitis L. 'kate-koranti'	PKCH – 15
22)	**Acantheceae**	
	Rungia elegans Dalz.	PKCH – 80
23)	**Verbenaceae**	
	Clerodendrum serratum (L.) 'Bharang'	PKCH – 20
24)	**Amaranthaceae**	
	Celosia argentea (L). 'Kurdu'	PKCH – 35
25)	**Euphorbiaceae**	
	Mallotus philippensis (Lam) 'Kumkum'	PKCH – 57

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Diversity of Myxomycetous Fungi of Fort Panhala

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ABSTRACT:

An attempt has been made to explore most neglected group of microfungi – myxomycetes from a very famous historical place, Fort Panhala also called Panhalagad from Kolhapur district. The monumental and historical structures like forts are ideal places for exploring floristics of any group of organisms, as these are situated at high altitudes and remain preserved by archives department. It is also remain protected from anthropogenic activities, this serve the favorable environment for richness of flora and fauna to such sites. In present investigations, 29 microfungi species from myxomycetes belonging 14 genera (from seven families) have been reported for the first time from this site. The species richness for this group for this site is found to be 48.3 Among the six families, family Didymiaceae is represented by higher number of species (11) and dominated by genus Diderma with seven species, family Trichiaceae is represented by 6 species, followed by family Physaraceae (4 spp.), Stemonitaceae (4 spp.) and Enteridaceae and Cribrariaceae by only one species each. During rainy days, this site is to be explored thoroughly because plant wealth of this site may provide sufficient substrata for till more number of myxomycetes members.

Key words : Diversity, myxomycetes, species richness index

INTRODUCTION :

The State of Maharashtra is rich with monumental and historical forts which may be ideal sites for studying flora fauna of any group of organisms. As many of the forts are not easily accessible, so that these remained protected from severe anthropogenic activities, even most of the forts are situated at high altitudes from mean sea level, hence vegetation at such sites remain conserved naturally. With this reason, Panhalgad or Fort-Panhala is selected from Kolhapur district. This group (myxomycetes) of microfungi has not been paid more attention by earlier mycologists.

There were many scanty reports on study of myxomycetes (Thite and Patil, 1982-83; Thite, 1970; Patil and Thite, 1977 (1979) from Kolhapur district. Panhala was explored once by Tembhurne and Nanir (2011) and reported six species of this group. Therefore intensive explorations were attempted at this site to investigate myxomycetes members.

The microfungi group like myxomycetes or the slime moulds often called "fungi like organisms" which possess an assimilative phase in the form of free living multinucleate mobile mass of protoplasm i.e. plasmodium and that, sporulating in a `mass' of spores borne in a simple or complex membranous or tough acellular spore case.

Though the species of slime moulds area widely distributed and luxuriently growing and found abundantly on dead decaying leaves, twigs, logs in the forest, as well as on decaying papers, straw but not easily visible due to microstructures, so that it requires thorough attention for observations and collection. As their holozoic nutrition habit is by phagocytosis and feed on living bacteria, fungal spores, pollens, mycelial, fragments and bits of organic matter, these microfungi form a very distinct ecological group.

Materials and Methods :

The ideal season for hunting the slime- mould microfungi is July to September. During this period, several explorations were organized to collect these fungi from Panahalgad (Fort-Panhla). These were collected (when their fructification were fully mature) along with the substratum and were immediately transferred in empty match boxes, cigarette cases or similar cardboard boxes and brought to the laboratory for further investigations. These were dried in air carefully. The good specimens along with substratum were fixed on a piece of white paper (4x7 cm) with the help of suitable adhesive like fevi-quick or fevicol. This paper (with the slime mould specimen) was folded on opposite full length sides and fitted in cigarette cases and were accessional with date of collection and locality. All these cases are deposited in a cardboard box using naphthalene balls in box to protect them from insects. After preservation of specimens in dry form, each specimen is mounted on a slide using few drops of 70% alcohol and then followed by few drops of dilute KOH (2.5%). Such slides are used for identification, after staining with cotton blue in lactophenol (Thind, 1977).

The standard literature (Macbride & Martin, 1934; Martin, 1949; Martin and Alexopoules, 1969; Kharat, 1999; Kowalski, 1970; Lakahanpal and Mukerji, 1981 ; Nanir, 1985; Nanir and Rokade, 1987; Thind, 1977; Thind and Sehgal, 1963; Tembhurne and Nanir, 2011).

Results and Discussion :

As far as macrofungi are concerned and well documented, the studies on microfungi, due to their microscopic structures, extraordinary range of form and lack of angiosperm taxonomy knowledge, they were paid less attention my mycologists. In present investigations (Table –1) microfungi from myxomycetes were explored from Panhala fort and its surroundings within the border. Due to high altitude, substantial substrata for growth of these fungi revealed that, there were 29 species of slime moulds belonging to 14 genera (seven families). Among the six families, family Didymiaceae is found to

be dominant by representing ten species with dominant genus Diderma with seven species. Didymiaceae is followed by family Trichiaceae with six species belonging to four genera. Family Physaraceae and Stemonitaceae were represented by four species and two genera each respectively while family Cribrariaceae and Enteridaceae were found to be representing only one species each. As far as the species richness index (48.3) for this site and for this group is concerned, the site is needed till more explorations successively for the next years to get idea about actual account of diversity of slime moulds.

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Table – 1 : Occurrence of microfungi from myxomycetes at Fort Panhala (Dist. Kolhapur)

Family	Sr.	Name of the slime mould	Name of the Host Substrata
Ceratiomyxaceae	1	*Ceratiomyxa fruticulosa* (mull.) Macbr.	Decaying leaves of *Dendrocalamus strictus*
Trichiaceae	2	*Tricha favoginea* (Batsch.) Pers,	On bark of *Mangifera indica*
	3	*Hemitricha serpula* (Scop.) Rost.	On sheath of Caryota urens
	4	*Hemitrichia calyculata* (Speg.) Farr.	Sheath *of Caryota urens*
	5	*Perichaena depressa* A. Libert.	Decaying leaves of *Dendrocalamus strictus*
	6	*Arcyria dunudata* (L.) Wettst.	On decaying wood of *Syzygium cumini*
	7	*Arcyia cinerea* (Bull.) Pers	On decaying unidentified wood
Enteridiaceae	8	*Lycogala epidendrum* (L.)Fries	On Leaf sheath of Fan Palm
Physarceae	9	*Fuligo cinerea* (Schw.) Morgan	On unidentified bark
	10	*Physarum kowalskii* Tembhurne & Naniv	On unidentified bark nd Book of *Grewia* sp.
	11	*Physarum pusillum* (Berek and Curto) Go	On unidentified bark
	12	*Physarum globuliferum*	On unidentified leaves
	13	Physarum stellatum (Massee) Martin	On rachis of Fan Palm
Didymiaceae	14	Diachea bulbillosa (Berk. And Br.) Lister	On unidentified leaves
	15	*Diachea subsessilis* Peck.	On unidentified leaves
	16	*Diderma effusum* (Schw.) Morgan	On unidentified leaves
	17	*Diderma farrianum* Tembhurne and Nanir	Unidentified decaying leaves
	18	*Diderma corrubrum* Macbr.	On leaves of Silver oak
	19	*Diderma subdictyosporum*	On unidentified rotting leaves and sticks
	20	*Diderma marie*	On unidentified bark

	21	*Diderma rimosum* U. Eliass and Nann. Brem	On unidentified bark
	22	*Diderma deplanatum* Fries	On unidentified bark
	23	*Didymium verrucosporium* Welden	On unidentified bark
	24	*Didymium simlensis* Lakhan and Muker	On leaves of Silver oak
Cribrariaceae	25	*Dictydium cancellatum* (Batsch.) Macbr.	On sheath of caryota urens
Stemonitaceae	26	*Stemonitis pallida* Wingate	On unidentified leaves
	27	*Stemonitis nigrescens* Rex.	On decaying leaves
	28	Stemonitis nigrescens Rex.	Fresh leaves of *Dracaena draco*
	29	*Lamproderma arcyrionema* (Sommerf.) Rost.	On living leaves of *Caryota urens*

Role of Water Canals in Conservation of Avifaunal Diversity In and Around of Karad Tahasil of Satara District, M.S, India

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ABSTRACT:

Karad Tahasil is the part of Satara district of Maharashtra state, India. Geographically it lies in between **N** $72^0$22'01" latitude and **E** $17^0$37'29" longitude. It occupies in and around total an area of 42.0 sq. Kilometers. Receiving an annual rainfall of about 700 - 800 mm. It is surrounded by two major rivers (Krishna and Koyana), on it built number of small dams. Also present number of water canal network for agriculture. Most of the land is irrigated surrounded by trees. The water canal are the rich source of food includes fishes, crabs, prawns, mollusc and aquatic plants so birds gets plenty of food, shelter/ hiding place and breeding grounds. The water canals are surveyed to document avian diversity. Total 84- Species of birds recorded from the study site during year 2011- 12. Among these 14- birds are migratory and 70- are native birds of 18- Orders and 40- Families. Results revealed that smaller wetlands- water canals are very important in conservation of biodiversity especially for water birds. The preliminary survey of Avifauna will help in facilitate conservation strategy and management plan as these are the key components of ecosystem.

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Key words: Avifaunal diversity, Water canals, Conservation

INTRODUCTION:

Wetlands includes rivers, lakes, reservoirs and their water canals are the most precious life-sustaining water resources. Water is a basic and primary need of all vital processes and it is now well established that the life first arise in aquatic environment. Ever since the pre-historic times man has been intimately associated with water and it has been continuously proved by the evidences of past civilization that all historic human settlements were around inland fresh water resources. These wetlands are traditional zones that occupy intermediate position between dry land and open water (Vachnth et. al. 2012). These wetlands are rich in flora and fauna and birds are one of the important biotic factors which prefer to live near these wetlands.

MATERIALS AND METHODS:

The frequent visits are made throughout year to observe the local and migratory birds at the study site. Different species of birds have been cited and identified with the help of pair of Canon 7×40 and 20 x 50 power field binoculars. They were identified with the help of standard literature and field guides on the basis of their special features (R. Grimmett *et. al.* 1998, Salim Ali and Dillon, 1995 and Kukudolkar, 2011). Photographs of different bird species were taken by using Canon 1100 D camera with 18- 55 mm and 55- 250 mm lenses for confirmation of species.

RESULT AND DISCUSSION:

During the period of study (July 2011 - June 2012), Out of 79- Families of avifauna present in the Indian subcontinent, 40- Families were observed at study site. Total of 84- Species of birds have been recorded in and around water canals of Krishna and koyana rivers. They belonged to 18- Orders and 40- Families. 1- belonged to **Podicipediformes,** 2- belonged to **Pelecaniformes,** 15- belonged to **Cicconiformes,** 4- belonged to **Anseriformes,** 7- belonged to **Falconiformes,** 2- beloged to **Galliformes,** 3- belonged to **Gruiformes,** 5- belonged to **Charadriiformes**, 4- belonged from **Columbiformes,** 3- belonged to **Psittaciformes ,** 2- belonged to **Cuculiformes,** 2- belonged to **Strigiformes** , 8- belonged to **Coraciiformes,** 2- belonged to **Apodiformes,** 1- belonged from **Piciformes** , 1- belonged from **Cuculiformes,** 1- belonged from **Caprimulgiformes** and 21- Species belonged to **Passeriformes** (Table No. 1). Among these 14- species are migratory and 70- species birds are native. The water birds are specific in their choice of wetlands. This often strongly associated with prey distribution and abundance (Kelsey & Hassal 1989). Water birds mainly feeds on benthic invertebrates (Van da kam et. al. 2004) which shows wide variations in the density and diversity between seasons and hence the variations in the prey population dynamics should influence the bird populations.

Physico-chemical parameters of water canals of Krishna and Koyana rivers, show monthly variations from July 2011 to June 2012. The air temperature ranges from 23^0 C to 35^0C and that of water ranges from 20^0C to 29^0 C. Both air

temperature and water temperature are important which determines the distribution of different life forms. In this study it has been found that air and water temperatures go more or less parallel, proving the fact that the atmospheric temperature governs water temperature (Welch, 1952 and Yadav, 2003). The pH values ranges from 7.96 to 8.85. It was minimum in the month of Jul., Aug. and maximum in the month of May. Krishna Ram H. et. al. (2007) showed similar range of pH. Higher values were recorded during summer which may be due to high growth rate of algal population utilizes CO_2 through photosynthetic activity (Powar and Sonawane, 2012).

Table No. 1: Systemic list of bird species observed during the year July 2011- June 2012 in and around water canals of Krishna and Koyana rivers, according to their taxonomical group

1	Little Greb/ Dabchick	*Podiceps ruficollis (S)*	Podicipitiformes	Podicipedidae	C
2	Little Carmorant	*Phalacrocorax niger (V)*	Pelecaniformes	Phalacrocoracidae	VC
3	Large Carmorent	*Phalacrocorax carbo (S)*	Pelecaniformes	Phalacrocoracidae	VR
4	Pond Heron / Paddybrd	*Ardeola grayii (S)*	Ciconiiformes	Ardeidae	VC
5	Little Egret	*Egretta garzetta (L)*	Ciconiiformes	Ardeidae	C
6	Indian Reef Heron	*Egretta gularis (H)*	Ciconiiformes	Ardeidae	Ra
7	Eastern Purple Heron	*Ardea purpurea (M)*	Ciconiiformes	Ardeidae	VR
8	Large Egret/Great White	*Ardea alba (L)*	Ciconiiformes	Ardeidae	Ra
9	Cattle Egret	*Bubulcus ibis (B)*	Ciconiiformes	Ardeidae	Ra
10	Little Green Heron	*Butorides striatus (H)*	Ciconiiformes	Ardeidae	VR
11	Chestnut Bittern	*Ioxbrychus cinnamomeus (G)*	Ciconiiformes	Ardeidae	VR
12	Painted Stork	*Mycteria leucocephala (P)*	Ciconiiformes	Ciconiidae	Ra
13	Openbill Stork	*Anastomus oscitans (B)*	Ciconiiformes	Ciconiidae	VR
14	White Necked Stork	*Ciconia episcopus (B)*	Ciconiiformes	Ciconiidae	Ra
15	Painted Stork	*Myceteria leucocephala (P)*	Ciconiiformes	Ciconiidae	Ra
16	White Ibis	*Threskiornis aethiopica (L)*	Ciconiiformes	Threskiornithidae	VR
17	Indian Black Ibis	*Pseudibis papillosa (T)*	Ciconiiformes	Threskiornithidae	Ra
18	Spoonbill	*Platalea leucorodia (T)*	Ciconiiformes	Threskiornithidae	VR
19	Spotbill Duck	*Anas poecilorhyncha (F)*	Aneseriformes	Anatidae	C
20	Ruddy Shelduck /	*Tadorna ferruginea (P)*	Aneseriformes	Anatidae	VR
21	Common Teal	*Anus crecca (L)*	Aneseriformes	Anatidae	UC
22	Pintail	*Anus acuta (L)*	Aneseriformes	Anatidae	UC
23	Pariah kite	*Milvus migrans (S)*	Falconiformes	Accipitridae	C
24	Indian Sparrow Hawk	*Accipiter nisus (H)*	Falconiformes	Accipitridae	C
25	Blackwinged Kite	*Elanus caeruleus (L)*	Falconiformes	Accipitridae	C
26	Brahminy Kite	*Haliastur Indus (B)*	Falconiformes	Accipitridae	Ra
27	Tawny Eagle	*Aquila rapx (F)*	Falconiformes	Accipitridae	VR
28	Buzzard	*Buteo buteo japonicas (T)*	Falconiformes	Accipitridae	UC
29	Short Toad Eagle	*Circaetus gallicus (G)*	Falconiformes	Accipitridae	UC
30	Grey Quail	*Coturnix coturnix (L)*	Galliformes	Phasianidae	VC
31	Indian Peafowl	*Pavocristatus (L)*	Galliformes	Phasianidae	C
32	White breasted Water hen	*Amaurornis phoenicurus (P)*	Gruiformes	Rallidae	C
33	Purple Moorhen	*Porphyrio poliocephalus (L)*	Gruiformes	Rallidae	Ra
34	Coot	*Fulica atra (L)*	Gruiformes	Rallidae	VC
35	Spotted Sandpiper	Tringa glareola (L)	Charadriiformes	Charadriidae	Ra
36	Redwattled lapwing	*Vanellus indicus (B)*	Charadriiformes	Charadriidae	UC

37	Indian little Ringed Plover	*Charadrius dubius (L)*	Charadriiformes	Charadriidae	VR
38	Blackwinged Stilt	*Hemantopus hemantopus (L)*	Charadriiformes	Charadriidae	UC
39	Indian River Tern	*Sterna aurantia (G)*	Charadiiformes	Laridae	UC
40	Blue Rock Pigeon	*Columba livia (H)*	Columbiformes	Columbidae	VC
41	Indian Ring Dove	*Strptopelia decacto (F)*	Columbiformes	Columbidae	C
42	Indian Spotted Dove	*Strptopelia chinensis (G)*	Columbiformes	Columbidae	UN
43	Indian Red Turtle Dove	*Strptopelia tranquebarica (H)*	Columbiformes	Columbidae	C
44	Roseringed Parakeet	*Psittacula krameri (B)*	Psittaciformes	Psittacidae	C
45	Southern Blossom Headed	*Psittacula cyanocephala (L)*	Psittaciformes	Psittacidae	Ra
46	Indian Lorikeet	*Loriculus vernalis (S)*	Psittaciformes	Psittacidae	VR
47	Common Crow-Pheasent	*Centropus sinensis (S)*	Cuculiformes	Cuculidae	C
48	Indian Cuckoo	*Cuculus micropterus (G)*	Cuculiformes	Cuculidae	VR
49	Indian Barn Owl	*Tyto alba (H)*	Strigiformes	Strigidae	VR
50	Western Spotted Owl	*Otus spilocephalus (H)*	Strigiformes	Strigidae	VR
51	White breasted Kingfisher	*Halcyon smyrnensis (B)*	Coraciiformes	Alcedinidae	VC
52	Small Blue Kingfisher	*Alcedo atthis (G)*	Coraciiformes	Alcedinidae	UC
53	Pied Kingfisher	*Ceryle lugubris (H)*	Coraciiformes	Alcedinidae	VC
54	Stork Billed Kingfisher	*Pelargopsis (L)*	Coraciiformes	Alcedinidae	VR
55	Green Bee Eater	*Merops orientalis (J)*	Coraciiformes	Meropidae	VC
56	Hoopoe	*Upupa epops (L)*	Coraciiformes	Upupidae	VC
57	Indian Roller/ Blue Jay	*Coracias benghalensis (L)*	Coraciiformes	Coraciidae	UN
58	Grey Hornbill	*Tockus birostris (S)*	Coraciiformes	Bucerotidae	UC
59	Palm Swift	*Cypsiurus parvus (G)*	Apodiformes	Apodae	C
60	House Swift	*Apus affinis (A)*	Apodiformes	Apodae	C
61	Crimsonbreasted Barbet/	*Megalaiama haemacephala (L)*	Piciformes	Capitonidae	UC
62	Indian Koel	*Eudynamys scolopacea (L)*	Cuculiformes	Cuculidae	C
63	Indian Little Nightjar	*Caprimulgus indicus (L)*	Caprimulgiformes	Caprimulgidae	VR
64	Magpie Robin	*Copsychus saularis (L)*	Passeriformes	Muscicapidae	C
65	Tickells Babbler	*Trichastoma tickelli (S)*	Passeriformes	Muscicapidae	C
66	White- eye	*Zosterops palpebrosa (H)*	Passeriformes	Zosteropidae	UC
67	Yellow Wagtail	*Motacilla flava (B)*	Passeriformes	Motacillidae	C
68	White browed Wagtail	*Motacilla moderaspatensis (S)*	Passeriformes	Motacillidae	C
69	Pied Bush Chat	*Saxicola caprata (L)*	Passeriformes	Turdinae	C
70	Purple Sunbird	*Nectarinia asiatica (L)*	Passeriformes	Nectariniidae	C
71	Singing Bush Lark	*Mirafra javanica (B)*	Passeriformes	Alaudidae	UC
72	Indian Wire Tailed Swal-	*Hirundo smithii (S)*	Passeriformes	Hirundinidae	VC
73	Rufous Backed Shrike	*Lanius schach (V)*	Passeriformes	Laniidae	C
74	Oranged Billed Jungle	*Acridotheres javanicus (B)*	Passeriformes	Sturnidae	C
75	Indian Jungle Crow	*Corvus macrorhynchos (S)*	Passeriformes	Corvidae	VC
76	House Crow	*Corvus splendens (S)*	Passeriformes	Corvidae	VC
77	Peninsular Scarlet Minivet	*Pericrocotus flammeus (F)*	Passeriformes	Campephagidae	C
78	Common Iora	*Aegithina tiphia (L)*	Passeriformes	Irenidae	UC
79	Redvented Bulbul	*Pycnonotus cafer (L)*	Passeriformes	Pycnonotidea	VC
80	Red Whiskered Bulbul	*Pycnonotus Jocosus (B)*	Passeriformes	Pycnonotidea	VC

81	Indian Golden Oriole	*Oriolus oriolus (S)*	Passeriformes	Oriolidae	Ra
82	Black Drongo/King crow	*Dicrurus adsimilis (V)*	Passeriformes	Dicruridae	C
83	Black Headed/ Brahminy	*Sturnus pagodarum (G)*	Passeriformes	Sturnidae	C
84	Indian Myna	*Acridotheres tritis (L)*	Passeriformes	Sturnidae	VC

Electronic Waste Effects

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INTRODUCTION:

Electronic waste (e-waste) is a popular, informal name for electronic products nearing the end of their useful life. Any broken or unwanted electrical or electronic appliance would be considered as e-waste. Computers, televisions, VCRs, stereos, copiers, and fax machines are common electronic products. Many of these products can be reused, refurbished or recycled . Unfortunately, electronic discards are one of the fastest growing segments of our nations waste stream. It is a point of concern considering that many components of such equipment are considered toxic. Electronic waste, e-waste, e-scrap, or waste electrical and electronic equipment (WEEE) describes discarded electrical or electronic devices. There is a lack of consensus as to whether the term should apply to resale, reuse, and refurbishing industries, or only to product that cannot be used for its intended purpose. Informal processing of electronic waste in developing countries may cause serious health and pollution problems, though these countries are also most likely to reuse and repair electronics. Some electronic scrap components, such as CRTs, may contain contaminants such as lead, cadmium, beryllium, or brominates flame retardants. Even in developed countries recycling and disposal of e-waste may involve significant risk to workers and communities and great care must be taken to avoid unsafe exposure in recycling operations and leaching of material such as heavy metals from landfills and incinerator ashes. Scrap industry and USA EPA officials agree that materials

In 1991, the first e-waste recycling system was implemented in Switzerland beginning with collection of refrigerators. Over the years, all other electric and electronic devices were gradually added to the system. E-waste is both valuable as source for secondary raw material, and toxic if treated and discarded improperly. E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater. Many of these products can be reused, refurbished, or recycled in an environmentally sound manner so that they are less harmful to the ecosystem.

DEFINITION :

"Electronic waste" may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators. This definition includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal. Others define the re-usable (working and repairable electronics) and secondary scrap (copper, steel, plastic, etc.) to be "commodities", and reserve the term "waste" for residue or material which is dumped by the buyer rather than recycled, including residue from reuse and recycling operations. Because loads of surplus electronics are frequently commingled (good, recyclable, and non-recyclable), several public policy advocates apply the term "e-waste" broadly to all surplus electronics. Cathode ray tubes (CRT) are considered one of the hardest types to recycle.[1] CRTs have relatively high concentration of lead and phosphors (not to be confused with phosphorus), both of which are necessary for the display. The United States Environmental Protection Agency (EPA) includes discarded CRT monitors in its category of "hazardous household waste"[2] but considers CRTs that have been set aside for testing to be commodities if they are not discarded, speculatively accumulated, or left unprotected from weather and other damage.

THE SERIOUS PROBLEMS OF E-WASTE:

E-waste is of concern largely due to the toxicity of some of the substances if processed improperly. The toxicity is due in part to lead, mercury, cadmium and a number of other substances. A typical computer monitor may contain more than

6% lead by weight. Up to 36 separate chemical elements are incorporated into e-waste items. Following are the problems of e -waste

1. Fast-growing surplus of electronic waste around the globe

Rapid changes in technology, changes in media (tapes, software, MP3), falling prices, and planned obsolescence have resulted in a fast-growing surplus of electronic waste around the globe. Dave Kruch, CEO of Cash for Laptops, regards electronic waste as a "rapidly expanding" issue.[4] Technical solutions are available, but in most cases a legal framework, a collection system, logistics, and other services need to be implemented before a technical solution can be applied. Display units (CRT, LCD, LED monitors), Processors (CPU chips, RAM), and audio components have different useful lives. Processors are most frequently out-dated (by software) and are more likely to become "e-waste", while display units are most often replaced while working without repair attempts, due to changes in wealthy nation appetites for new display technology.

2. High concentrations of lead

Nearly 250 million computers will become obsolete in the next five years, according to the EPA. Discarded electronics (e-waste) can contain toxic lead, mercury, cadmium, hexavalent chromium, and fire retardant. Of particular concern are the cathode ray tubes (CRTs) in computer monitors, which contain high concentrations of lead. Though the EPA considers each of these materials dangerous, household electronics aren't classified as hazardous waste and aren't subject to federal regulation. Therefore, in most states it's up to individuals to decide the fate of discarded equipment.

3. Effects on environment

Disposal of e-wastes is a particular problem faced in many regions across the globe. Computer wastes that are landfilled produces contaminated leachates which eventually pollute the groundwater. Acids and sludge obtained from melting computer chips, if disposed on the ground causes acidification of soil. For example, Guiyu, Hong Kong a thriving area of illegal e-waste recycling is facing acute water shortages due to the contamination of water resources. This is due to disposal of recycling wastes such as acids, sludges etc. in rivers. Now water is being transported from faraway towns to cater to the demands of the population. Incineration of e-wastes can emit toxic fumes and gases, thereby polluting the surrounding air. Improperly monitored landfills can cause environmental hazards. Mercury will leach when certain electronic devices, such as circuit breakers are destroyed. The same is true for polychlorinated biphenyls (PCBs) from condensers. When brominated flame retardant plastic or cadmium containing plastics are landfilled, both polybrominated dlphenyl ethers (PBDE) and cadmium may leach into the soil and groundwater. It has been found that significant amounts of lead ion are dissolved from broken lead containing glass, such as the cone glass of cathode ray tubes, gets mixed with acid waters and are a common occurrence in landfills.

4. Effects on health

Following table shows the effect of e-waste on health

MANAGEMENT OF E-WASTES:

Source of e-wastes	Constituent	Health effects
Solder in printed circuit boards, glass panels and gaskets in computer monitors	Lead (PB)	• Damage to central and peripheral nervous systems, blood systems and kidney damage. • Affects brain development of children.
Chip resistors and semiconductors	Cadmium (CD)	• Toxic irreversible effects on human health. • Accumulates in kidney and liver. • Causes neural damage. • Teratogenic.
Relays and switches, printed circuit boards	Mercury (Hg)	• Chronic damage to the brain. • Respiratory and skin disorders due to bioaccumulation in fishes.
Corrosion protection of untreated and galvanized steel plates, decorator or hardner for steel housings	Hexavalent chromium (Cr) VI	• Asthmatic bronchitis. • DNA damage.

Cabling and computer housing	Plastics including PVC	Burning produces dioxin. It causes • Reproductive and developmental problems; • Immune system damage; • Interfere with regulatory hormones
Plastic housing of electronic equipments and circuit boards.	Brominated flame retardants (BFR)	• Disrupts endocrine system functions
Front panel of CRTs	Barium (Ba)	Short term exposure causes: • Muscle weakness; • Damage to heart, liver and spleen.
Motherboard	Beryllium (Be)	• Carcinogenic (lung cancer) • Inhalation of fumes and dust. Causes chronic beryllium disease or beryllicosis. • Skin diseases such as warts.

It is estimated that 75% of electronic items are stored due to uncertainty of how to manage it. These electronic junks lie unattended in houses, offices, warehouses etc. and normally mixed with household wastes, which are finally disposed off at landfills. This necessitates implementable management measures. In industries management of e-waste should begin at the point of generation. This can be done by waste minimization techniques and by sustainable product design. Waste minimization in industries involves adopting:

- inventory management,
- production-process modification,
- volume reduction,
- recovery and reuse.

Inventory management

Proper control over the materials used in the manufacturing process is an important way to reduce waste generation. By reducing both the quantity of hazardous materials used in the process and the amount of excess raw materials in stock, the quantity of waste generated can be reduced. This can be done in two ways i.e. establishing material-purchase review and control procedures and inventory tracking system.

Developing review procedures for all material purchased is the first step in establishing an inventory management program. Procedures should require that all materials be approved prior to purchase. In the approval process all production materials are evaluated to examine if they contain hazardous constituents and whether alternative non-hazardous materials are available.

Another inventory management procedure for waste reduction is to ensure that only the needed quantity of a material is ordered. This will require the establishment of a strict inventory tracking system. Purchase procedures must be implemented which ensure that materials are ordered only on an as-needed basis and that only the amount needed for a specific period of time is ordered.

Production-process modification

Changes can be made in the production process, which will reduce waste generation. This reduction can be accomplished by changing the materials used to make the product or by the more efficient use of input materials in the production process or both. Potential waste minimization techniques can be broken down into three categories:

i) Improved operating and maintenance procedures,

ii) Material change and

iii)Process-equipment modification.

Improvements in the operation and maintenance of process equipment can result in significant waste reduction. This can be accomplished by reviewing current operational procedures or lack of procedures and examination of the production process for ways to improve its efficiency. Instituting standard operation procedures can optimise the use of raw materials in the production process and reduce the potential for materials to be lost through leaks and spills. A strict maintenance program, which stresses corrective maintenance, can reduce waste generation caused by equipment failure. An employee-training program is a key element of any waste reduction program. Training should include correct operating and handling procedures, proper equipment use, recommended maintenance and inspection schedules, correct process control specifications and proper management of waste materials.

Hazardous materials used in either a product formulation or a production process may be replaced with a less hazardous or non-hazardous material. This is a very widely used technique and is applicable to most manufacturing processes. Implementation of this waste reduction technique may require only some minor process adjustments or it may

require extensive new process equipment. For example, a circuit board manufacturer can replace solvent-based product with water-based flux and simultaneously replace solventvapor degreaser with detergent parts washer.

VOLUME REDUCTION:

Volume reduction includes those techniques that remove the hazardous portion of a waste from a non-hazardous portion. These techniques are usually to reduce the volume, and thus the cost of disposing of a waste material. The techniques that can be used to reduce waste-stream volume can be divided into 2 general categories: source segregation and waste concentration. Segregation of wastes is in many cases a simple and economical technique for waste reduction. Wastes containing different types of metals can be treated separately so that the metal value in the sludge can be recovered. Concentration of a waste stream may increase the likelihood that the material can be recycled or reused. Methods include gravity and vacuum filtration, ultra filtration, reverse osmosis, freeze vaporization etc.

For example, an electronic component manufacturer can use compaction equipments to reduce volume of waste cathode ray-tube.

RECOVERY AND REUSE:

This technique could eliminate waste disposal costs, reduce raw material costs and provide income from a salable waste. Waste can be recovered on-site, or at an off-site recovery facility, or through inter industry exchange. A number of physical and chemical techniques are available to reclaim a waste material such as reverse osmosis, electrolysis, condensation, electrolytic recovery, filtration, centrifugation etc. For example, a printed-circuit board manufacturer can use electrolytic recovery to reclaim metals from copper and tin-lead plating bath.

However recycling of hazardous products has little environmental benefit if it simply moves the hazards into secondary products that eventually have to be disposed of. Unless the goal is to redesign the product to use nonhazardous materials, such recycling is a false solution.

SOLUTIONS TO ELECTRONIC WASTE:

1. Donate.

Give an operable computer to a local family, friend, school, or nonprofit such as Goodwill or Technology Training Foundation. Computers for Schools,

2. Recycling

Today the electronic waste recycling business is in all areas of the developed world a large and rapidly consolidating business. Part of this evolution has involved greater diversion of electronic waste from energy-intensive downcycling processes (e.g., conventional recycling), where equipment is reverted to a raw material form. This diversion is achieved through reuse and refurbishing. The environmental and social benefits of reuse include diminished demand for new products and virgin raw materials (with their own environmental issues); larger quantities of pure water and electricity for associated manufacturing; less packaging per unit; availability of technology to wider swaths of society due to greater affordability of products; and diminished use of landfills.

Sum Up

Proper recycling of hazardous materials from computers is an important health and safety concern. However computer waste also contains valuable parts and precious metals such as gold and copper which offer potential business opportunities. Appropriate recycling systems are being setup in EU , Japan and some states of US. Owing a lack of knowledge, Indian recyclers, however, are currently engaged in only material salvaging instead of identifying recyclable parts out of e-waste in general.

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Biodiversity Conservation of Coral Reefs

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ABSTRACT :

Some parts of ocean have very high biological diversity concentrated in a small area. These places include coral reefs, sometimes called rainforests of the ocean. They concentrate diversity& are also fragile& vulnerable to climate change & human impact.

INTRODUCTION:

From the driest desert to the dripping forests, from the highest mountain peaks to the deepest ocean trenches, life occurs in a marvelous spectrum of sizes, colours, shapes, life cycles & interrelationship.

The varieties of organisms & complex ecological relationships give the biosphere its unique characteristics. Biodiversity makes the world a more beautiful& exciting place to live.

Coral reefs constitute important & productive source of biodiversity. They harbor large no. of fishes as well as a total species diversity containing more phyla than rainforests. Reefs also represent a significant source of food for many coastal communities. Coral reefs have fascinated people for thousands of years.

They are among the world's most productive ecosystems.

ECOLOGY OF CORAL REEFS:

Coral are animals with simple anatomical design. (Phylum Coelenterate). It consists of sac like polyp that housed in a rigid calcium carbonate exoskeleton corallites. It may live solitary or as a colonial aggregate. Large no. of plant cells, modified dinoflagellates called zooxanthellae are embedded in the outer layer of corals flesh. Both organisms benefit mutually from their association

Hermatypic varieties of corals are with zooxanthellae & Ahermatypes are without zooxanthellae.

Environmental factors, water, temperature& light intensity are the primary regulators of reef development. Hermatype are responsible for building large coral colonies in shallow tropical seas. They build reefs along with no. of organisms such as calcareous algae, gastropods, echinoderms, foraminifera & Mollusca.

Certain special condition are required for growth of corals such as temperature above $20^{o}C$, Shallow water, normal salinity (27% to 40%) clear oxygenated water, adequate food supply, presence of submarine platform etc.

Based on occurrence& nature, there are various types of coral reef. Fringing reefs are formed along the peripheries of islands or continents. The barrier reefs grow farther offshore, separated from main land shore. The atoll is reefs found in open sea. They show ring shaper or horseshoe shape reef structure.

IMPORTANCE OF CORAL REEFS :

Coral reefs support a rich & abundant assortment of life forms in a tropical setting that normally is sparsely populated with life.

Zooxanthepallae produce food photo synthetically, using metabolic waste products. Calcareous algal, encrusting algal mats, phytolanktons also play role as producer.

Coral colonics grow asexually& secrete a skeletal framework of calcium carbonate. Uneven substrate is created. It contains countless cracks, crevices, holes, tunnels, over hangs, which provides a rich assortment of habitat & niches for benthic animals.

Abundant food & geometric complexity of reef structure are the main reasons for unusually high species diversity of tropical reefs.

The coral reef ecosystem displays immense biological diversity, particularly in its fishes. The colour, habits, body shapes of coral reef fishes vary enormously, reflecting large number of ecological niches that this ecosystem provides.

Most of the world biodiversity concentrations are near the equator, especially tropical rainforests & coral reefs.

Coral reefs serve important functions as atoll island foundations, coastal protection structures & source of beach sand. They have economic value for tourism.

The total area extent of living coral reefs has been estimated at about 255000 km^2

Reefs serve as nurseries for many fisheries on which humans depend for food.

CLIMATE CHANGE & EFFECT ON CORAL REEF:

Coral reefs are vulnerable to human activities onshore, especially farming, land clearing, deforestation of mangrove forests, industrialization, that causes erosion & pollution. Silt & mud clouds water, reducing photosynthetic activities. Destructive fishing practices have also destroyed reefs in many parts of Southeast Asia.

Coral reefs as considered at risk from human activities which include tourism & urbanization, overfishing, coral mining, land reclamation, increased sedimentation etc.

Human impact on coral reefs has increased, so reefs are threatened globally.

Increase in CO_2, temperature, cause reefs to change. Some coral species already show much greater tolerance to climate change. Maximum species show coral bleaching. Coral start looking pale, off white, leaving their colorfulness. There is a link between increased GHGS, climate change & bleaching of corals.

Change in ocean chemistry also weakens coral skeletons.

Coral bleaching represents loss of zooxanthellae algae. Bleaching is the response of coral to abrupt changes in temperature, salinity & turbidity.

Bleaching often may be temporary. Some corals in Indian Ocean, pacificOcean &Caribbean Sea are known to bleach on an annual basis, in response to seasonal variations in temperature.

Coral reefs will undergo major charges in response to climate change rather than disappearing entirely. Reef calcification may get reduced.

If reef viability decreases, fish yields will be reduced, leading to reduced yields of proteins for dependent human population. Reef productivity is reduced & this will affect marine mammals & birds also.

CONSERVATION MANAGEMENT :

Coral reefs are highly productive hot spots of biodiversity. Their protection is one of the sensitive socio-economic as well as environmental issues. Critical management is needed to reduce GHGS & other waste emissions. Renewal of efforts is required to improve resource management including restriction on the use of resources & globalization of resources trade, run off & waste production & balancing potential reef production & resource consumption.

Climate change is a global issue yet local conservation effects can be helpful in limiting long term damage of corals from bleaching & related human impacts. The focus should be on reducing pollution, protecting food webs & managing key functional groups such as reef constructors, herbivores, as insurance for sustainability. Global warming coupled with pre-existing human impact is a grave threat that has already caused much damage. We urgently need a system of underwater national parks & preserves.

Conclusion:

Coral reefs are shallow sub tidal ecosystems of the tropical oceans formed at the edge of land & Sea. They constitute a unique marine ecosystem that is characterized by a geologic component, the deposition of calcium carbonate by corals & other organism. Coral reefs are very fragile & sensitive to changing conditions. These reefs are threatened by warming Seas & other reasons. It is our duty to conserve these important biodiversity hotspots.

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Diversity and Conservation of Medicinal Plants of Ajara Tahsil, District Kolhapur, Maharashtra, India

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Abstract:

India is rich in biodiversity. About 6.7% of global species are found in India. It is also a birth place for variety of alternative medicinal systems like ayurveda, sidha and unani. All these systems are depending on plants as a major source of medicine. The survey on medicinal plants from Ajara tahsil revealed that there are 158 plant species belonging to 68 families have been documented for their healing properties. The local people very commonly used these plants to treat various ailments like cough, cold, fever, asthma, dysentery, skin diseases, toothache, jaundice, rheumatism, urinary infection, piles, etc. It is also seen that the local people of Ajara tahsil are well equipped with the knowledge of medicinal plants, their uses and still depend traditionally on them for the primary health care. Hence there is urgent need to conserve the traditional knowledge and medicinal plant species potentials for the welfare of the human beings.

Key words: Health care, medicinal plants, ailments, healing properties.

Introduction:

Medicinal plant diversity is the capital asset of India. Out of 17,000 species of higher plants reported to occur within India, 7500 are known to have medicinal uses. According to World Health Organization (WHO), the herbal medicine serves the health need of about 80% of the world population. The drug obtained from plants is believed to be much safer and exhibits a remarkable efficacy in the treatment of various ailments (Siddiqui et. al., 1995).

Even though there is extensive work done on medicinal plants of India, which mainly deals with description, active principles and uses, there is little information on their occurrence in the wild, abundance and availability. Medicinal plants of Maharashtra have also received very less attention. The present work was carried out to assess the diversity of ethno-medicinal plants available in the study area and to trace out their significance in the overall live-hood of the local people. According to Posey (1992), the knowledge about medicinal plants is accumulated by local people through a long series of observations from one generation to another and is transmitted by oral communication. Therefore documenting indigenous knowledge through ethno-botanical studies is important for conservation of biological resources to their sustainable utilization.

Ajara is known as one of the Southern-most tahsil of Kolhapur district of Maharashtra. It is known for its scenic beauty, green landscape and Ghansal (a variety of rice). The sub-tropical climate, complimented with heavy rainfall from Southwest monsoon and favourable edaphic factors, create an ideal condition for luxuriant growth of plants.

Methodology:

Periodic field trips were conducted in different seasons during the year 2010-2012, to collect information on the medicinal uses of plants found in the Ajara tahsil. The ethno-botanical data i.e. local name, plant parts used, mode of administration, its uses were collected through the interviews and discussions with the local experienced-aged folk layers, local herbal drug sellers and from the available literature. The plants collected during survey were also identified with the help of the published regional flora- The Flora of Kolhapur district (Yadav and Sardesai, 2002) and The Flora of the Presidency of Bombay (Cooke Theodore, 1967). During survey, seeds or propagules of some medicinally important plants were collected and used for ex-situ conservation.

Result and discussion:

A total 158 plant species, distributed into 68 families have been documented for their healing properties. Out of them 58 families are from dicotyledon and remaining 10 from monocotyledons. The families euphorbiaceae and apocynaceae contributed the maximum number of medicinal plants (8), followed by combretaceae and fabaceae with 6 plants and 5 from families like asclepiadaceae, asteraceae, malvaceae, mimoseceae and Verbenaceae. The first hand information on some of the most important and widely used medicinal plants by the local people is arranged alphabetically by genus and species in Table No.1 These commonly occurring medicinally important plants are used to treat various ailments like cold, cough, fever, asthma, dysentery, diabetes, skin diseases, toothache, jaundice, antidote for poison, piles, etc. Medicinally important 25 plants were properly cultivated in the botanical garden of our college.

Among the plant parts, the leaves are most frequently used for treatment of diseases. The roots, fruits, bark, gum and latex, stem, seeds and flowers are also used as per their availability and curing ability.

The traditional uses of medicinal plants from different regions of India and world have been reported by Vikneshwaran et. al. (2008), Bhosale et. al. (2009), Hiramath et. al. (2010), Dahare and Jain (2010).

Most of the medicinally important plants used by local people of Ajara tahsil are forest based or the dwindling area of forest and in India, almost all medicinal plant raw materials are collected from wild population. This has led to unsustainable exploitation of many of them. Therefore it is necessary that suitable efforts and requirements are needed to protect them and the ancient knowledge regarding their medicinal importance.

Table No. 1. Some of the important and widely used medicinal plants from Ajara tahsil.

Sr. No.	Botanical Name	Common Name	Family	Parts used	Medicinal Uses
1.	*Adhatoda vasica (Justicia adhatoda)*	Adulsa	Acanthaceae	Root, leaves	Bronchitis, asthma, fever, jaundice
2.	*Azadirachta indica*	Kadu Nimb/ Neem	Meliaceae	Leaves, bark, fruits	Antiseptic, astringent, purgative, leprosy, skin diseases, tooth ache.
3.	*Butea monosperma* (Flame of forest)	Palas	Fabaceae	Bark, leaves, flower.	Aphrodisiac, piles, tumors, diarrhea, fractures of bones.
4.	*Carissa carandus* L (Bengal carrants)	Karvand	Apocynaceae	Roots, ripe and unripe fruits	Laxative, appetizer, cooling, antipyretic, aphrodisiac.
5.	*Dioscorea bulbifera* L	Kadu karanda	Dioscoreaceae	Tubers, bulbs	Diuretic, jaundice, piles, abdominal pains, bone fracture, ulcer.
6.	*Emblica officinalis* Gaertn	Amla, Awala	Euphorbiaceae	Fruits, seeds	Fever, laxative, bronchitis, anemia, antioxidant, diabetes.
7.	*Gloriosa superba* L (Glory lily)	Kal Lawi	Liliaceae	Under-ground tubers	Abortificiant, Anthelmintic, purgative, syphilis, chronic ulcer, skin diseases.
8.	*Gymnema sylvestre* Retz	Gudmari	Asclepiadaceae	Roots, leaves	Diabetes, expectorant, carminative, heart stimulant.
9.	*Helicteres isora* L	Murad Sheng	Sterculiaceae	Bark, Pods	Demulcent, diarrhoea, dysentery, astringent, diabetes.
10.	*Terminalia bellerica* Gaertn	Behada	Combretaceae	Fruits	Laxative, antipyretic, horseness, anticephalagia, antibilious.
11.	*Terminalia Chebulla* Retz	Hirda	Combretaceae	Fruits	Laxative, diuretic, cardiotonic, expectorant, ulcer, dental caries.
12.	*Tinospora cordifolia*	Gulvel	Menispermaceae	Stem, leaves	General debility, fever, cough, cardiotonic, chronic diarrhoea, anodyne.

Conclusion:

Medicinal plants play an important role in providing the knowledge to the researchers in the field of ethno-botany and ethno-pharmacology. The growing interest in traditional medicine will lead to a further increase in the demand of medicinal plants. The study also point out that certain species of medicinal plants are being exploited by the local people who are unaware of the importance of them in the ecosystem. Hence there is urgent need to conserve the traditional knowledge and medicinal plant species potential for the welfare of the human beings.

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Migratory Avifaunal Diversity of the Mouni Vidyapeeth Campus, Kolhapur District, Maharashtra, India

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ABSTRACT:

The migratory avifaunal diversity in Mouni Vidyapeeth campus from Gargoti, Kolhapur district, Maharashtra, India was studied for a period of November, 2011 to February, 2012. The campus shows varied vegetation patterns and wetlands. The campus of Mouni Vidyapeeth inhabits several local and migratory bird species. This habitat attracted 26 species of birds belongs to 14 families of 3 orders. The results of the study indicate that, the campus of Mouni Vidyapeeth has a good habitat for migratory birds.

Key words: Migratory Avifauna; Diversity; Mouni Vidyapeeth Campus

INTRODUCTION:

Birds play vital and assorted roles in ritual, religion and popular culture. They have their functional role in the ecosystem as potential pollinators and scavengers and are rightly called as bio-indicators. Birds are most useful to human as destroyers of harmful insects and as consumers of weed seeds.

Birds are an important component of wetland ecosystems, as they form vital links in the food webs. Many birds are migratory, undertaking annual movements between their breeding and nonbreeding grounds. In the process, they regularly cross national boundaries. Therefore, it is the communal duty of all nations to make efforts for their conservation. Baseline information is a condition for planning and monitoring management actions for migratory birds and their habitats (Wetlands Int. 2002; Arun kumar et al., 2003).

Many ornithologists studied various wetlands, forest parts ans civilized areas for migratory avifaunal checklist. Inac et al. (2008) studied the bird species of Kumasir Lake, Turkey and the role of environmental ethics on sustainable wet land management. Gupta et al. (2009, 2010) and Gupta and Kaushik (2010, 2011) have done substantial research work in the migratory bird diversity of Haryana state.

In Maharashtra, 245 species were recorded as local and true migrants (Abdulali, 1981). Most of the migratory birds were seen in central Maharashtra in large number, which indicate that, this part of Maharashtra is on the rout of migration. Southern Maharashtra is little aside from this route. Another reason for large number of bird population in central part of Maharashtra is due to large number of old lakes, which still exist and are having ecological diversity.

No work has been done so far on migratory avifauna of Bhudargad tahsil of Kolhapur district. The present study was carried out to prepare the baseline data of migratory birds in the said region by choosing a campus of Mouni Vidyapeeth.

MATERIALS AND METHODS:

STUDY AREA:

The study area of Mouni Vidyapeeth campus is situated in Bhudargad Tahsil of Kolhapur district. The area covered by the campus is about 70 hectare. The campus contains planned garden, amarai, agricultural field sites, two wetland regions, educational complexes and residential houses. The Mouni Vidyapeeth campus has varied vegetation from grassland to trees.

Visit to study area were made twice in a week for 12 weeks and total 25 observations were made during early morning hours and in the evening (November, December 2011 and January, February, 2012). Observation was made from 07.30 hrs to 10.30 hrs in the morning and 16.30 hrs to 18.30 hrs in the evening. Birds were observed with aid of 10 x 50 super Zenith prismatic field binocular. Identification of bird species was done with the help of standard literature of Salim Ali (1996) and Ali and Ripley (1983).

RESULTS AND DISCUSSION:

Result based on the observations made during November, 2011 to February, 2012 at Mouni Vidyapeeth campus, 26 species of birds belongs to 14 families of 3 orders were identified and categorized under migratory and local migratory (Table 1).

Table 1: Check list of migratory birds from Mouni Vidyapeeth campus:

Order	Family	Common Name	Scientific Name	Status
Ciconiformes	Scolopacidae	Common or Fantail Snipe	*Gallinago gallinago*	Migratory
		Marsh Sandpiper	*Tringa stagnantilis* Bechstein	Migratory
		Common Sandpiper	*Tringa hypoleucos* Linnaeus	Migratory
		Wood or Spotted Sandpiper	*Tringa glareola* Linnaeus	Migratory
	Charadridae	Black-winged Stilt	*Himantopus himanatopus* (Linnaeus)	Migratory
		Little ringed Plover	*Charadrius dubius* Scopoli	Migratory
	Laridae	Indian river Tern	*Sterna aqrantia* J. E. Cray	Migratory
	Accipitridae	Pale Harrier	*Circus macrourus* S. G. Gmelin	Migratory
		Sparrow Hawk	*Accipiter nisus* Linnaeus	Migratory
	Falconidae	Kestrel	*Falco tinnunculus* Linnaeus	Migratory
	Ardeidae	Gray Heron	*Ardea cinerea* Linnaeus	Migratory
Passeriformes	Lanidae	Rufousbacked Shrike	*Lanius schach* Linnaeus	Local migratory
		Baybacked Shrike	*Lanius vittatus* Valelciennes	Local migratory
	Corvidae	Black Drongo	*Dicrurus adsimilis* Bechstein	Local migratory
	Muscicapidae	Red breasted Flycatcher	*Muscicapa parva* Bechstein	Migratory
		Collared Bushchat	*Saxicola torquata* Linnaeus	Migratory
	Hirundinidae	Common Swallow	*Hirundo rustica* Linnaeus	Migratory
		Red-rumped Swallow	*Hirundo daurica* Linnaeus	Migratory
	Sylviidae	Great Reed Warbler	*Acrocephalus stentoreus* (Hemiprich and Ehenberg)	Migratory
		Brown Leaf Warbler	*Phylloscopus collybitta* (Blyth)	Migratory
	Passeridae	Yellow Wagtail	*Motacilla flava* Linnaeus	Migratory
		Gray Wagtail	*Motacilla cinerca* Tunstall	Migratory
		Tree Pipit	*Anthus trivialis* Linnaeus	Migratory
Coraciformes	Coraciidae	Indian Roller	*Coracias benghalensis* (Linnaeus)	Local Migrant
	Meropidae	Small Green Bee-eater	*Merops orientalis* Linnaeus	Local Migrant

The present study revealed that the order Passeriformes was dominant with 13 species followed by order Ciconiformes (11 species) and order Coraciformes (2 species). The maximum number of migratory birds from order Passeriformes was also recorded by Harney et al. (2011).

The diversity of migratory birds depends upon the varied food and feeding type. The ample availability of food in the form of insects, molluscs, small fishes etc. attract many species of migratory birds towards a specific area (Jayson and Mathew, 2000; Wadatkar and Kasambe, 2002; Kedar and Patil, 2005). The Mouni Vidyapeeth campus harbors a varied vegetation type from grass to trees. The wetland bears number of aquatic plants and weeds in the submerged as well as floating state on which thrive a large number of organisms. The whole campus provides suitable habitat for migratory as well as many resident birds. Present study shows the potential of the area as a good habitat for avifauna. The present work was intended to study only a migratory avifauna. This data will be helpful to carry out various conservation strategies for migratory birds and their habitat in the study area.

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Impact Assesment of Industrial Pollution On Ground Water Quality of Udymnagar in Kolhapur City

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ABSTRACT:

Kolhapur city is one of the Industrial city where different metal processing units such as machine fabricating and electroplating units automobile servicing centers are working from last many years. Shivaji udyamnagar is one of the industrial area located in Kolhapur city. The present paper deals with water quality analysis of under ground water from some bore wells located in Shivaji udyamnagar industrial area. The physico-chemical parameters such as temperature, pH, electric conductivity, dissolved oxygen hardness, calcium., magnesium, chlorides, total dissolved solids (TDS), sulphate, sodium, potassium etc. were studied along with ionic metal content such as iron, copper, lead, cadmium etc. The results were compared with WHO and ICMR standards. The results reveals that effluent discharge from industry may be responsible for changing the water quality.

INTRODUCTION:

Today world is facing serious challenge to save its environment from pollution. With fast industrialization and modernalisation the use of water increases continuously. The rapid growth of urbanization and industrialization has adversel y affected the ground water quality. Generally, ground water is recharged by leakage from river channels in certain geological situations. Now a days river Panchaganga is severely polluted due to direct discharge from municipalities and Industries. The water supply to Kolhapur city is mainly from river Panchaganga hence even today large number of people have no access for safe, clean water In certain areas of Kolhapur city ,due to irregularity and less water supply from KMC and non-avability .of other water sources .bore well water is used to large extent for domestic and some times for drinking purposes. But now a days the underground water quality is deteriorated Therefore the present study has been under taken to evaluate the quality of underground water from industrial area of Kolhapur city.

MATERIALS AND METHODS:

Groundwater samples were collected from bore well for the purpose of studying the groundwater quality of' industrial area from Kolhapur city. Sampling was carried out in the month of March2005 to February2006. The water samples were collected in sterilized 2-L plastic containers and analyzed as per the standards procedures of APHA (1985). Physico-chemical parameters such as temperature, pH, dissolved oxygen are determined at site only. Electric conductivity (EC), total dissolved solids (TDS), hardness, calcium, magnesium, alkalinity, sulphate, chlorides, sodium, potassium etc. were determined. For metal analysis the water samples were collected in pre cleaned bottles and acidifies with concentrated nitric acid for preservation, soon after collection. Metal like iron, copper cadmium, lead were determined by atomic absorption spectrophotometer (AAS).

RESULTS AND DISCUSSION:

The results of physico –chemical analysis and metal content of groundwater samples are presented in table number 1 . Temperature of water sample ranges from 26^0C to 31^0C. pH values of water sample are well within permissible limit (6.48 to7.80). Water samples are slight acidic to slight alkaline in nature, pH has no direct adverse effect on health (Khadsan et. al. 2003). Electro-conductivity changes from 864.5 □mhos/cm to 977.75 □mhos /cm. These high values of EC were due to high concentration of ionic constituents present in water under study and reflect concentration from salinity, intrusion as well as pollution by industrial and domestic waste (Abbasi et. al. 1999).

Total Dissolved Solid cross the permissible limit, ranges from 573.25 to 702.08 mg/l. The higher values of dissolved solids can be related with the solid waste deposit mg/l. s near bore well (Sharma & Kanr 1998, Mehta 2003).Dissolved oxygen recorded was low from 3.78 to4.30,mg/l ,values of dissolved oxygen in groundwater indicating pollution by organic waste .(Sharma et. al. 1999). Hardness values cross the permissible limit (396.67 to 420.70 mg/1), hardness of water is important parameter determining the suitability of water for drinking and domestic uses.. Park and Park (1986) observed a correlation between hardness of water and its role in heart diseases. Hardness of water is also related kidney diseases (Keller 1979). Calcium is higher than permissible limit ranges from 89.34 to 99.79 mg/1 and magnesium is (36.13 to 44.65 mg/1) within permissible limit.

Alkalinity (413.37 to 495.65) in ground water sample were above the excessive limit it is due to presence of salts such as carbonates, bicarbonates, silicates etc (Sastry 2003). All groundwater samples from study area have higher alkalinity which can be attributed to the concentration of calcium and magnesium salts. The leaching process through surface water during rainy season can also add to higher value of alkalinity (Pande and Sharma 1999). Concentration of sodium and potassium were higher than permissible limit ranges between 41.58 to 53.91 mg/l and 3.5 to 4.16 mg/1 respectively. Higher values of potassium in groundwater may be due to industrial and urban activity (Sharma et. al. 1996) Chloride and sulphate values in ground water were within permissible limit.

Excess quantity of iron is reported in groundwater sample ranges from 1.166 to1.94It cross the permissible limit of standard it may be permissible limit **due** to industrial effluents and discharge from automobile garages. Long time consumption of drinking water with high concentration of iron leads to liver diseases as hemosiderosis (Mehta 2003).

The lead influences growth, and its excess leads to damage to brain, kidney and liver (Taqui Khan, 1986). Lead concentration (0.2872 to 0.7536)) is higher than excessive limit. It may be due to waste water from electroplating and battery manufacturing units. In present investigation the concentration of copper and cadmium is very low, below the permissible level of WHO &ICMR standard.

Table No. 1: Physicochemical Parameters of Ground Water Resources From Industrial Area of Kolhapur City.

Parameters	GW I	GW II	GW III	GW IV			
Temperature ^{0}C	28.08 ± 1.10	28.04 ± 2.51	28.04 ± 2.76,	28.0 ± 1.29			
pH	7.39 ± 0.18	7.21 ± 0.27	724 ± 0.27	7.19 ± 0.27			
EC µmhos/cm	977.75 ± 78.41	8644.5 ± 84.88	837.58± 127.1	875.83 ± 135.0			
TDS mg/L	702.08 ± 74.99	639.83 ± 68.67	573.25 ± 71.42	601.16±76.60	593.066 ± 411.03	628.7 ± 309.04	735 ± 87.8919
Dissolved Oxygen	3.78 ± 1.17	4.30 ± 0.98	4.066 ± 1.15	4.09 . ± 1.15			
Hardness	406.11 ± 45.11	420.70± 34.16	396.67 ± 51.16	397.89 ± 60.65			
Calcium	89.34 8.57	95.95± 11.15	93.42 ± 12.50	99.79± 20.12			
Magnesium	44.65 ± 6.27	44.05 ± 4.62	39.86 ± 5.80	36.13 ± 5.11	2.133 ± 0.2332	1.94 ± 0.1838 Dissolved Oxygen	
Chlorides47	139.5 ± 13.44	140.14 ± 16.79	112.61 ± 21.72	112.9 ± 17.52			
Alkalinity	495.65 ± 19.90	457.58 ± 34.42	445.68 ± 19.30	413.37±34.93			
Sulphate	129.71 ± 51.08	129.17± 52.16	128.87 ± 71.81	118.62± 51.14			
Sodium	53.91 ± 13.70	49.5 ± 22.74	43.0 ± 18.26	41.58 ± 15.12			
potassium	3.5 ± 2.93	3.83 ± 2.54	4.08 ± 2.64	4.16 ± 2.51			
Iron	1.94± 0.074	1.69 ± 0.12	1.54 ± 0.08	1.66 ± 0.124			
Lead	0.485± 0.057	0.344 ± 0.051	0. 2872 ± 0.070	0.7536±0.011			
Copper	0.031 ± 0.004	0.22 ± 0.035	0.036±0.004	0.035±0.0055			
Cadmium	0.008±0.0014	0.007±0.0019	0.004±0.0016	0.007±0.0006			

Values are mean + standard deviation. All values are in mg/L. except pH otherwise stated.

CONCLUSION AND RECOMMENDATION:

It is significant to note that the quality of groundwater is deteriorated in the industrial area of Kolhapur city. This is mainly because of percolation of sewage and industrial effluents constantly through surface water in rainy season. There fore it is advisable that the constant monitoring and treatment of ground water is essential, as prerequisite for use of this water for drinking purpose. If, this is not feasible, it is recommended that this water be used only for industrial purposes. Because of excessive amount of iron, potassium, sodium, calcium, magnesium and very hard nature of water it is not suitable for drinking purpose.

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Studies on Biodiversity of Zooplankton in Kas Lake during Rainy and Winter Seasons

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ABSTRACT

Satara city is a well known historical place situated at the foot hills of Sahyadri mountains. Around 25 Kmupon the mountain,away towards the western side of Satara,there is a natural lake available, invented by the Britishers and constructed. Water which was accumulated by the natural percolations is the potable water . This water is brought to the Satara city by the Britishers, by using the excellent technique of siphoning. This lake is full with biodiversity, rich with flora and fauna. So I have choosen this lake for my present,study.

The qualitative analysis of Zooplankton of the lake indicates seventeen species durinboth rainy and winter seasons. The major groups of Zooplankton in discending order are protozoa and arthropoda. The highest density of zooplankton was noted during rainy season where as it decreased to winter. Of the seventeen zooplanktonic species seven from protozoa, one from each porifera,cladocera, ostracoda and mollusca, four from arthropoda,few fishes and different larval stages of frog from amphibian are recorded.Simultaneously physico-chemical parameters such as physical appearance, atmospheric and surface temperature, pH, chloride, ammonia nitrate, Hardness, CO2,Iron, Fluoride, DO and Solids values were recorded. All the values of physico-chemical parameters showed variations during rainy and winter seasons.

INTRODUCTION

The global aquatic system contains different organisms which are dependent on the substratum or free from it.All type of aquatic eco-systems except for fast moving rivers contain planktonic organisms. In any water body along with the large animals and plants smaller microscopic phytoplanktons and zooplanktons occurs. The planktons have great significance in biology of aquatic ecosystem as they provide nourishment to aqutic organisms.The planktons form the base of food pyramide. There is no balanced ecosystem without planktons in an aquatic ecosystem. They form an important constituent of the food of young ones of many fishes aswell as other organisms. This indicates that in aquatic systems planktons are essential links in the food chain. Both zooplankton and phytoplankton constitute a vital link in the aquatic food chain. While phytoplankton play phenomenal role in the biosynthesis of organic material, the zooplankton, an important component of secondary production, provide a link between the producers and consumers.

The values of physicochemical parameters always vary with the density of the planktons. The seasonal variation in the values of these parameters is also related to the changes in the growth of the planktons. The phytoplanktons constitutes 95% of the total marine plant production (babu,2001) so they form a vital source of energy of the first tropical tier and also serve as a direct source of food to several aquatic animals.The zooplankton, an important component of secondary production, provide a link between producers and secondary consumers. The fry or juveniles of aquatic organisms first feed on the phytoplanktons because of direct gain of energy and ease of digestion. This chain of food ingredients further accelerates the growth of juvenile forms of aquatic organisms.

The fishery is directly correlated to the plankton production and upwelling of sea yeragi(1997).The fluctuation in fishery is mainly due to the variation of plankton both qualitatively and quantitatively.Thus importance of study of zooplankton lies in understanding the productivity of the aquatic system.The' KAAS' lake is much popular for its variety of biodiversity throughout the year, because of abundant availability of primary production.The present study related to evaluate the total population density of zooplankton species in tropical lake KAAS during rainy and winter season and also to estimate the physicochemical parameters and biological characteristics of same lake.

MATERIAL AND METHODS

Study Area:

The late taken up for the present study is located in the Western Ghat region 25km away from Satara City.This lake is called 'KAAS' lake according to name of the village nearest to it i.e. 'kaasegoan'.It is an open lake fully exposed to the atmosphere and surrounded by high trees.It was constructed during British period.It has following parameters. Name of the lake-'KAAS LaKE',Location=Near KAASGOAN.(Tal. And Dist.SATARA), Total Area-7.123sq.km,Height of Water level-1125.58meter,Depth of water-1123.45, Level of storage-1122.38meter,Deadstock level-1115.53meter,Tap water level-1108.39meter, Total water level-30.3Lac Cubic-ft,Storage of Useful water-26.8Lac Cubic-ft, Dead stock water-3.5Lac Cubic-ft,Type of water releasing-Stone Waste Wear, Total Length of Lake-27km[21km.constructed+6km.door.],Daily water consumtion-60.0Lac Cubic-ft.

Collection of water Samples:-

The surface water was collected in bottle of one liter capacity separately from five different places. It was filtered through a No.14 blotting paper.

Collected macro-organism with the help of hand net and the samples and organism were brought in the laboratory were transferred to settling chamber and kept for 24 hours after adding a few drops of formalin. Then taking a drop of water with the glass dropper on a clean and dry slide and place the cover slip on it. Remove excess of water with the help of blotting paper and observed under the low power of microscope.

OBSERVATIONS

Under the microscope few micro-organisms were seen.For getting more organisms large quantity of sample was centrifuged and the supernatant was removed.A drop of sediment was teken on the slide and observed the body movement of the organism under the microscope.Then sketches and figures of the zooplankton were done. To study detailed structure of zooplankton.A drop of glacial acetic acid was used for cessation of the movement of organisms. The organism get fixed due to glacial acetic acid. This procedure was repeated 2-3 times and recorded different types of forms as well as the list of organisms according to their phylum was prepared which as follows.

Table 1 :

Sr. No.	Phylum	Name Of The Zooplankton
1	Protozoa	Euglena,Paramecium caudatum,Vorticella campanula,V. microstoma.
2	Porifera	Spongilla.
3	Cladocera	Daphnia sp.
5	Arthropoda	Mosquito larvae, water bugs, may fly, nymph, culex pupa, Caddisfly larva.
6	Mollusca	Lymnea stagnalis.
7	Fishes	Few fishes are also observed.
8	Amphibia	Different larval stages of frog.

Water samples were collected using glass bottle between 7.00 to 9.00 am. Temperature,pH,Turbidity, Chloride,Ammonia, Nitrate, Hardness, Solids, Oxygen, CO2, Iron and Fluoride were recorded. Standard methods were followed for various analytical procedures

Table 2 : Variations in physico-chemical parameters of water during Rainy and Winter seasons.

Sr. No.	Parameters	Rainy Season	Winter Season		
		July	August	October	November
1	Physical appearance	Clear	Clear	Clear	Clear
2	Odour	No smell	No smell	No smell	No smell
3	Surface temperature(^{0}c)	26.1	28.00	30.00	32.1
4	pH	8.08	8.01	7.4	7.1
5	Hardness(as CaCO3)	210.00	215.00	172.00	172.00
6	DO(ml/L)	5.8	5.2	4.3	4.1
7	FreeCO2(mg/L)	3.00	3.7	6.00	6.2

RESULTS

The data of Zooplankton summarized in Table No.1 and seasonal variations of certain physic-chemical characteristic of Lake Water during rainy and winter seasons are shown in Table No.2. The physico-chemical parameters are the main controller of the development of the zooplankton. All the hydrological parameters and the nutrient are direct correlated with the growth of the zooplankton. The ecological factors are acutely sensitive in aquatic ecosystem which makes the effect on production.

Water Temperature

Water temperature of lake generally depends upon the season and time. Temperature is one of the most important physical factors, which regulate natural process within the ecosystem. Atmospheric and surface water temperature vary from

20.00^0c to 30.1^0c and 26.1^0c to 32.1^0c respectively. Both these temperatures of KAAS lake vary considerably during different seasons, like rainy and winter. Temperature being the lowest in the month of July is highest in the month of November. Increased temperature is generally caused by increase in solar radiations. Maximum record of water temperature in November (32.1^0c) may also be attributed to highest load of suspended matter. Similarly, gradual reduction in sola illumination may explain the fall in both atmospheric and surface water temperatures from June to November

***PH:-**

The chemical factors like PH, free Co2 and alkalinity showed only minor seasonal fluctuations. It was recorded and it appears reasonable to suggest that low phytoplankton population was responsible to decrease in pH (George 1961,zutshi 1976).

***Dissolved Oxygen:-**

It is one of the important parameters for life in wter bodies. Dissolved oxygen was found to be higher in rainy season (5.2 to 5.8ml/L) and lower in winter months. Winter decreased dissolved oxygen has also been worked out earlier by Sigh et. al.(1980) and Rao (1986) and it appears to be due to its grater solubility, reduces microbial-decomposition of dead organic matter.

***Free CO_2:-**

The amount of free CO_2 ranged between 5.00 and 6.4 mg/L, being higher in winter and lower in rainy months. Inverse relationship of dissolved oxygen and free CO_2 was observed. Well known workers (Welch 1952, Hutchinson 1957 and Kadlec 1962) observed similar tren

DISCUSSION:

The total number and development of zooplankton is totally related to the values of environmental parameters of lake water. The maximum number of zooplanktons was recorded in rainy season due to availability of varieties of nutrients due to natural percolation of potable water and the productivity of zooplankton was found least in winter season due to increased temperature of the surface of the water. This indicates that production of the zooplanktons always shows the negative correlation with temperature. This is also true in case of phytoplankton's which was noticed by Yeragi(2005)and Patole (2010).

The quantitative as well as qualitative values were high during rainy season only. It is also noticed that the productivity is directly related to the dissolved oxygen. In rainy season The temperature is decreased and the oxygen content is increased which is considered as a favorable condition for development of zooplankton. It is also observed that during rainy season the nitrate concentration becomes high which further accelerates the growth of zooplanktons. Temperature is an abiotic factor which only helps in regularizing the growth of the zooplankton. In the present investigation it was observed that total hardness and production of zooplankton are in positive correlation. The seasonal variation of number of zooplankton may be due to heavy inflow of percolation. According to literature it is clear that of portable water. Heavy rainfall affects the density of zooplankton because of the speedy water current. The present investigation observation due to continuous heavy rainfall in lake area. The results of the present investigation coincides with the above results.

Dissolved oxygen showed an inverse relationship with water temperature. This is probably due to two reasons. In winter temperature is increased as compare to rainy season. Hence rate of oxidation of organic matter in water increased and oxygen is consumed during process. Secondly, at higher temperature water has a lesser oxygen holding capacity and some oxygen is lost to the atmosphere (Rajendran Nair 2000). So, the present study reveals that the inverse relationship observed between the dissolved oxygen and temperature was similar to that observed by many workers (Ganapati 1943,Saha et. al. 1959)Singh(1960).

Actually planktonic animals in freshwater are dominated by three major groups, the rotifers and two subclasses of Crustacea, the cladocera and the cope-pods (Wetzel, 1983). But in the present study, a few more groups were also recorded. Fifteen species of Zooplankton belonging to 7 groups namely protozoa, porifera, Cladocera, Ostracoda, Arthropoda, Mollusca, Amphibia and fishes were recorded in KAAS lake during rainy and winter month.

The group protozoa was represented in the lake by four species namely paramecium caudatum Euglena, Vorticella companula etc. and other groups are summarized in Table No.1. among the total zooplanktonic organisms, the protozoans are shows maximum number during rainy season. The low population of group Cladocera was recorded in the rainy season but its number is increased during winter. It may be due to low temperature and other physic-chemical factors of the aquatic bodies. It can be said that the winter peak of this population workers supported by Pahwa and Mehrotra(1996),while Govind (1969) and Das and Shrivastav(1956) observed winter maxima in tropical water. But, generally quantitative analysis of zooplankton during winter shows lower density than that of the rainy season. The decrease in the zooplankton population may be attributed to the high temperature. Welch(1952) also reported that quantitatively, the plankton are likely to be less in tropical in landwaters than in temperate waters. The fall in density of zooplankton during winter months may also be due to the decrease in the nutrients and phytoplankton population.

The results of present investigation obviously indicate higher number of zooplankton during rainy season and their stabilization during post rainy period and further decline during winter. The above results and discussion clearly showed that the development and growth of the zooplankton is correlated to the values of environmental parameters.

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