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President: Prof. Sunil Kumar Chaturvedi

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I
PRESIDENTIAL ADDRESS

President: Prof. Sunil Kumar Chaturvedi

Presidential Address

**ADAPTATION FOR BIOTIC AND ABIOTIC POLLINATION AMONG
INDIGENOUS ORCHIDS OF NORTH – EAST INDIA FOR MUTUALISTIC
BENEFITS AND CONSERVATION OF GERMPLASM**

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Hon'ble Chairperson, distinguished botanists, delegates, students and august audience!

I express my deep sense of gratitude to the almighty God and members of the sectional committee for providing the opportunity by unanimously electing me as the President, Section of Plant Science, for 108th Indian Science Congress Association conference. I express my deep sense of gratitude to the foreign delegates Professor Amots Dafni, laboratory of pollination Ecology, Institute of Evolution, Faculty of Sciences and Science Education, University of Haifa, Haifa, Israel and Professor KanchitThammasiri from the department of Plant Science, Mahidol University, Bangkok, Thailand and other Invited Botanists from our country, India who have very kindly accepted our invitation to deliver the Invited talk. I wish to pay my tributes to the great Botanists of our country who have inspired me to pursue Plant Science for my career and laid high standard of Botany in India. I owe my gratitude to my mentors and well-wishers like Late Professor S.N. Chaturvedi, RBS college, Agra, Late Professor H.Y. Mohan Ram, FNA, FNASI, FNASc, former PVC, Delhi University, Professor A.K. Koul, former Head, Department of Botany, Jammu University Jammu and the Vice chancellor of BGSB university, Rajouri, J & K, Professor Bir Bahadur, former Head, Department of Botany, Kakatiya University, Warangal, Professor S.M. Reddy, former Head, Department of Botany, Kakatiya University, Warangal, Professor Manoharachari, Osmania University, Hyderabad, Late Professor SVS Chauhan, former Head, Department of Life Sciences, BSBR Ambedkar University, Agra, Professor Y.S. Chauhan, former Head, Department of Botany, North Eastern Hill university, Shillong (Meghalaya), Professor G.D. Sharma, former Vice Chancellor, Nagaland University, Kohima and AVBU, Bilaspur (CG) and Dr. U.C. Lavania, FNA, Scientist G, CIMAP, Lucknow, Professor S.R. Yadav, FNA, Dr. P. Faruqui of DST, Govt. of India, I owe my deep sense of gratitude to my D.Phil. Supervisor late Professor Divya Darshan Pant, FNA, FNASC, FLS, Head, Department of Botany, University of Allahabad, Allahabad and Dr. (Mrs.) Radha Pant,

Head, Department of Biochemistry and Home Science, University of Allahabad, Allahabad for their guidance not only in the research on “Pollination Biology of Indian Plants” but in my professional career too. Last but not the least I owe my sincere thanks and gratitude to my family for helping and supporting me in my endeavour.

Although, I have reported modes of pollination in various plant groups ranging from Grasses, Palms, Aroids, Zingibers, Boerhavia, Asclepiads and Orchids, yet, I decided to confine my Presidential lecture on “Adaptation for Biotic and Abiotic Pollination among Indigenous Orchids of North – East India for mutualistic benefits and conservation of germplasm”.

Key words- Biotic and Abiotic Pollination, Orchids of North-East India, Germplasm Conservation, Sapromyophilous blossoms

Abstract

Indigenous orchids of North- East India are mostly visited and pollinated by a variety of insect pollinators belonging to order Hymenoptera, Diptera, Lepidoptera and Coleoptera. The investigated orchid taxa are Melliferous, Odoriferous and both Melli-odoriferous. Except for insects no other animals were found visiting orchids of this region. Anthecological studies revealed that the phenomenon of pollination among orchids takes place through the various body parts of the insects during their foraging on the flowers and were assigned different terminology, viz., **Frontotriby** (pollination through the head of the insects), **Probonotriby** (pollination through the mouth- parts of the insects), **Thoraxenotriby** (pollination through the Thorax of the insects) and **Abdomenotriby** (pollination through the abdomen of the insects). The rewarding orchids, viz., *Aerides odorata*, *A. rosea*, *Arachnis labrosa* (Spider orchid), *Calanthe sylvetica*, *Coelogyne nitida*, *C. corymbosa*, *C. fimbriata*, *Cymbidiumaloifolium*, *Dendrobium* (six species), *Flickingeria fugax*, *Pholidota articulate*, *Rhynchostylis retusa*, *Thunia alba* and *Vanda coerulea* are foraged for nectar by the various insects and get pollinated. The non rewarding orchids, viz. *Phaius tankervilleae* and *Paphiopedilum insigne* (lady's slipper orchid) are visited and pollinated by the carpenter bees of *Xylocopa violacea* and syrphid flies of genus *Syrphus* respectively. Since, the lady's slipper orchids trap the insects and during their exit of pollination takes place, the flowers have been categorized as "sapromyophilous blossoms". In addition to the biotic pollination, abiotic pollination has also been observed in four species belonging to four genera, viz. *Cymbidium sinense*, *Anthogonium gracile*, *Flickingeria fugax* and *Phalaenopsis taenialis* due to movement of the floral parts. Out of twenty for investigated species twenty species (82.61%) exhibit biotic pollination, whereas, four species i.e. 17.39 % exhibit Abiotic pollination and fruit and seed. Thus, the successful fruit and seed set in Orchids of North- Eastern state of India helps in sustainable development and conservation of these important taxa.

Introduction

The structural details and the presence of column along with vivid colours and fragrance in most of the orchid flowers show that orchids are adapted for Zoophily. It has been reported by various workers that the orchid flowers are pollinated by birds (Van der Pijl & Dodson 1966, Cingel 2001, Johnson & Brown 2004), mouse (Wang *et al.* 2008) and insects like bees, wasps, moths, butterflies, flies, beetles etc). However, Darwin (1862, 1877) has reported autogamy in those orchid taxa where visitors fail to visit the flowers. The search for autogamy in orchids was continued till the middle of twentieth century by the authors like Kirchner (1922a,b), Smith (1929), Uphop (1938) and Hagerup (1952).

These authors along with Van der Pijl & Dodson (1966) reported that in parts of middle and northern Europe around 200 species of the native orchids are autogamous. According to Catling (1980) 3% of the native orchids (i.e. 600-1000) are autogamous. However, towards the second half of the twentieth century many more data was collected on the direct and indirect autogamy among the orchids by various workers on pollination (Reinhardt 1977, Richards 1982, Catling 1980, 1983, Gandawidjaja & Arditti 1982, Robatsch 1983, Burn Balog *et al.* 1987, Dafni & Bernhardt 1990, Lloyd & Schoen 1992, Argue 1994 and Kurzweil 2000). The autogamy caused by rain was reported by Gonzalez-Diaz & Ackerman (1988) in two Puerto Rican populations of *Oeceoclades maculata*. Zu-Li Fan *et al.* (2012) have reported rain mediated autogamy in a deceptive orchid viz., *Acampe rigida* from South-west China. Ackerman *et al.* (1997) published an informative research on the variation of pollinator abundance and selection on fragrance phenotypes in *Tolumnia variegata*, an epiphytic orchid from three localities in Puerto Rico. In the beginning of twentieth Century a significant discovery of Pseudo-copulation by Correvon & Pouyanne (1916) in genus *Ophrys* opened a new line of orchid pollination. During twenty first century a number of papers on the biotic pollination have been published by Singer and Sazima (2001), Anderson *et al.* (2005), Ciotek *et al.* (2006), Smidt *et al.* (2006), Tyteca *et al.* (2006), Martins & Johnson (2007), Singer *et al.* (2007), Li *et al.* (2010), Cabral de Melo *et al.* (2011), Ackerman and Roubik (2012), Dangat & Gurav (2014) and Chen *et al.* (2021). During twenty first century in India Chaturvedi (2009a, 2012,) and Chaturvedi and Chaturvedi (2011) have reported autogamy in *Cymbidium sinense* Jaks. ex Ander) Willd., *Phalaenopsis taenialis* (Lindl.) E.A. Christensen & Pradhan and *Flickengeria calocephala* Tsi & Chen, due to various abiotic factors. In addition to the reports of mechanical autogamy in Indian Orchids, Chaturvedi (2005, 2008, 2009a, 2009b, 2012), Chaturvedi and

Buragohain (2021a & 2021b), Chaturvedi & Chaturvedi (2010, 2011) have reported biotic pollination through the agency of various insects pollinators. However, Buragohain & chaturvedi (2016, 2020), Buragohain *et al* (2015, 2016a, 2016b) have made a significant contribution in the field of orchid pollination in India. In addition to these authors from India a few reports have also been publishes on orchid pollination by Dangat & Gurab (2014, 2020), Kaur (2019) and Pal *et al* (2019). The aim of present investigation is to explore and identify various modes of pollination in Indian orchids so as to increase their population in *in vitro* and to establish them in their wild localities for the sustainable conservation of germplasm.

Material and Methods

The observations on orchid pollination in North –East India were taken at various localities in Mokokchung, Zunheboto districts of Nagaland and Mariani and Golaghat district of Assam during 2005 to 2020. The field photographs were taken by Canon digital camera ESO 550 D with EFS 18-55 mm lense. Identification of insects were done by using the reference specimens kept in the Botany Department, Nagaland University, Lumami. The observations on the pollination were made from 5.00 A.M. – 5.00 P.M. but for *Calanthe sylvetica* observations were made from 8.00 A.M. – 8.00 P.M. Studies related to pollinaria attachment were made by capturing insect visitors in the wide mouthed plastic bottles. The captured insects were instantly killed by using xylene soaked cotton plugs. The close-up lenses were used to take close up photographs of the insects while foraging the flowers so as to know their foraging behavior.

Results and Conclusion-

North- Eastern state of India exhibit presence of 900 species under 165 Genera of orchids. The orchids of this region represents 72.8% of the total orchid species in India. About 34 species of orchids are listed among the threatened plants of India (Nayar and Sastry 1990; Ahmedullah et al. 1999) from North- Eastern states. However, 93 species of orchids are endemic to this region (BSI-2015). Gogoi, (2018) have reported 396 species belonging to 102 genera from the state of Assam, and Deb (2013) has reported 396 species belonging to 92 genera from Nagaland. Present investigation deals with the strategies for pollination in twenty four species of orchids (terrestrial and epiphytic) belonging to 14 genera. As shown in the table- 1 and Photo – Plates-1-3, out of 24 species 20 shows insect pollination and no other animals were observed on the flowers of these orchids, however, only four species exhibit autogamy due to various abiotic factors like proliferation of apical portion of column as in *Cymbidium sinense* and *Anthogonium gracile*, due to 360° movement of stype of pollinaria as seen in *Phalaenopsis tanealis*

and due to in-folding of lip lamellae as exhibited in *Flickingeria calocephala*. Remaining of the 20 species are visited by various insects belonging to order Hymenoptera, Diptera and Lepidoptera. However, yellow beetles have also been observed on the species of *Luisia* in Assam. No other animals were seen visiting the investigated orchids in Assam and Nagaland state. On the basis of foraging behavior and attachment of pollinaria on various parts of the body of these insect pollinators, Chaturvedi

and Buragohain (2021) has categorized orchid pollination in for categories viz. Probonotribic, frontotribic, thoraxinotribic and abdomenotribic. Most of the orchids viz. *Aerides odorata*, *A. rosea*, *Arachnis labrosa* (Spider orchid), *Calanthe sylvetica*, *Coelogyne nitida*, *C. corymbosa*, *C. fimbriata*, *Cymbidium aloifolium*, *Dendrobium devonianum*, *D. fimbriatum* var. *oculatum*, *D. moschatum*, *D. primulinum*, *D. dendiflorum* and *D. chrysotomum*, *Flickingeria fugax*, *Pholidota articulata*, *Rhynchostylis retusa*, *Thunia alba* and *Vanda coerulea* are foraged for nectar by various insects visitors viz., *Xylocopa violacea*, *X. (Biluna) nasalis*, *X. aestuans*, *Apis indica*, *Megapis dorsata*, *Andrena parvula*, *Lasioglossum pavonotum*, *Lasioglossum sp.*, *Parapolybia varia*, *Notocrypta carvifasica*, *Udaspes folus*, *Pelopidas sinensis* and *Macroglossum sp.*. However, the non-rewarding orchids, viz. *Phaius tankervilleae* and *Paphiopedilum insigne* (lady's slipper orchid) are visited and pollinated by the carpenter bees of *Xylocopa violacea* and syrphid flies of genus *Syrphus* respectively. Since, the lady's slipper orchids trap the insects and during their exit from the synsepalum the process of pollination is completed, the flowers have been categorized as "sapromyophilous blossoms". Further, it has been found that fourteen species of investigated orchids are Monophilous i.e. they are visited and pollinated by single insect pollinator *Arachnis labrosa* (Spider orchid), *Coelogyne nitida*, *C. corymbosa*, *C. fimbriata*, *C. aloifolium*, *D. devonianum*, *D. fimbriatum* var. *oculatum*, *D. moschatum*, *D. primulinum*, *D. dendiflorum* and *D. chrysotomum*, *Flickingeria fugax*, *Thunia alba* and *Vanda coerulea*. Out of fourteen orchid taxa only two viz. *Phaius tankervilleae* and *Paphiopedilum insigne* exhibit non-rewarding pollination and attract insects through their fragrance only. The quality and quantity of nectar offered by the orchid taxa to the forager insects has been found to play an important role in pollination. It has been found that the taxa like *Aerides* which produces less quantity of more concentrated nectar produces more fruits in comparison to those taxa viz. *Rhynchostylis retusa* which produces more nectar which is less concentrated (fig.-1). It has also been found that the presence of anther at the apical portion of column, the presence of stigma at sub-apical position and the presence of rostellum in between the anther and column is also a strategy for the success of biotic cross pollination among the orchids. With the help of the investigation made on the pollination of

some orchid taxa it has been concluded that the orchid taxa apply various strategies to attract insects and get them pollinated so as to produce maximum number of viable and mature fruits and seeds for the survival and successful propagation of progeny in their natural habitats in North-East India.

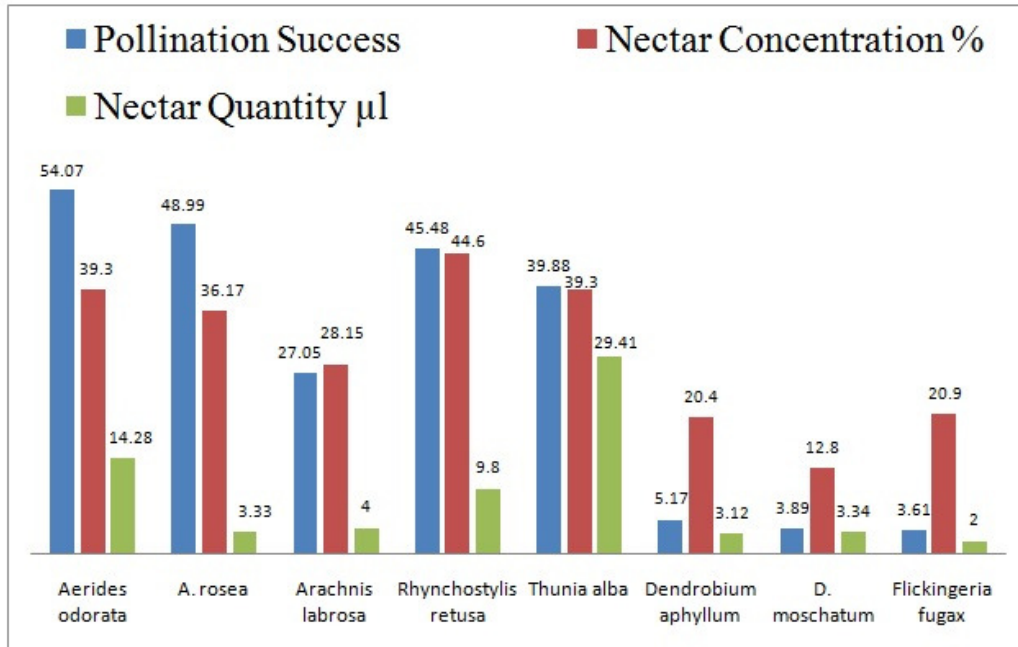


Fig.- 1. Showing pollination success in *Aerides odorata* is maximum in comparison to other taxa which produce more nectar.

Table -1. Showing name of orchid taxa, mode of pollination and name of pollinators-

Sl.No.	Name of the taxa	Mode of pollination	Name of pollinator/s
1.	<i>Aerides odorata</i>	Promiscuous	<i>Bombus, Xylocopa</i>
2.	<i>A. rosea</i>	Promiscuous	<i>Bombus and Xylocopa</i>
3.	<i>Arachnis labrosa</i> (Spider orchid)	Monophilous	<i>Parapolybia varia</i> (Paper wasps)
4.	<i>Calanthe sylvetica</i>	Promiscuous	<i>Notocripta carvifasica,</i> <i>Udaspes folus,</i> <i>Pelopidas sinensis</i> and <i>Macroglossum sp</i>
5.	<i>Coelogyne nitida,</i>	Monophilous	Honey bees <i>Apis indica</i>
6.	<i>C. corymbosa</i>	Monophilous	Honey bees <i>Apis indica</i>
7.	<i>C.. fimbriata</i>	Monophilous	Honey bees <i>Megapis dorsata</i>
8.	<i>Cymbidium aloifolium</i>	Monophilous	<i>Apis indica</i>
9.	<i>Dendrobium. chrysotoum</i>	Monophilous	<i>Lasioglossum sp.</i>
10	<i>D. densiflorum</i>	Monophilous	<i>Lasioglossum sp.</i>
11	<i>D. devonianum,</i>	Monophilous	<i>Lasioglossum sp.</i>
12.	<i>D. moschatum,</i>	Monophilous	<i>Lasioglossum sp.</i>
13.	<i>D. primulinum,</i>	Monophilous	<i>Lasioglossum sp.</i>
14.	<i>Flikingeria fugax</i>	Promiscuous	<i>Andrena parvula,</i> <i>Lasioglossum pavonotum</i>
15.	<i>Pholidota articulata</i>	Promiscuous	<i>Apis indica</i> <i>Parapolybia varia</i>
16.	<i>Rhynchostylis retusa</i>	Promiscuous	<i>Xylocopa aestuans,</i> <i>Xylocopa violacea</i>
17.	<i>Thunia alba</i>	Monophilous	<i>Bombus lapidarius</i>
18.	<i>Vanda coerulea</i>	Monophilous	<i>Xylocopa(Biluna) asalis</i>
19	<i>Phaius tankervilleae</i>	Monophilous	<i>Xylocopa violacea</i>
20	<i>Paphiopedilum insigne</i> (lady's slipper orchid)	Monophilous	<i>Syrphus sp.</i>

21.	<i>Cymbidium sinense</i>	Due to proliferation of Apical portion of Column	Mechanical autogamy
22.	<i>Anthogonium gracile</i>	Due to proliferation of Apical portion of Column	Mechanical autogamy
23.	<i>Phalaenopsis tanealis</i>	Due to 360° movement of stype of pollinaria	Mechanical autogamy
24.	<i>Flickingeria calcephala</i>	Due to in folding of Lip lamellae	Mechanical autogamy

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Plate-1, Figs. A-H, Modes of pollination in various orchid taxa of North – east India, A-C, *Anthogonium gracile*, A. flowering twig in natural habitat, B. Apical portion of column showing proliferation of tissues for autogamy; C. Fruiting twig; D-H. *Arachnis labrosa* (spider orchid), flowers

with pollinator paper wasp *Parapolybia varia*. D. Wasp with pollinaria on back of the head: E. wasp foraging the flower and the pollinaria come in contact with head; F. Close up of the column after pollination; G. Column with pollinaria inserted into the stigma; H. Close-up of *Parapolybia varia* showing attachment of Pollinaria on the Head.

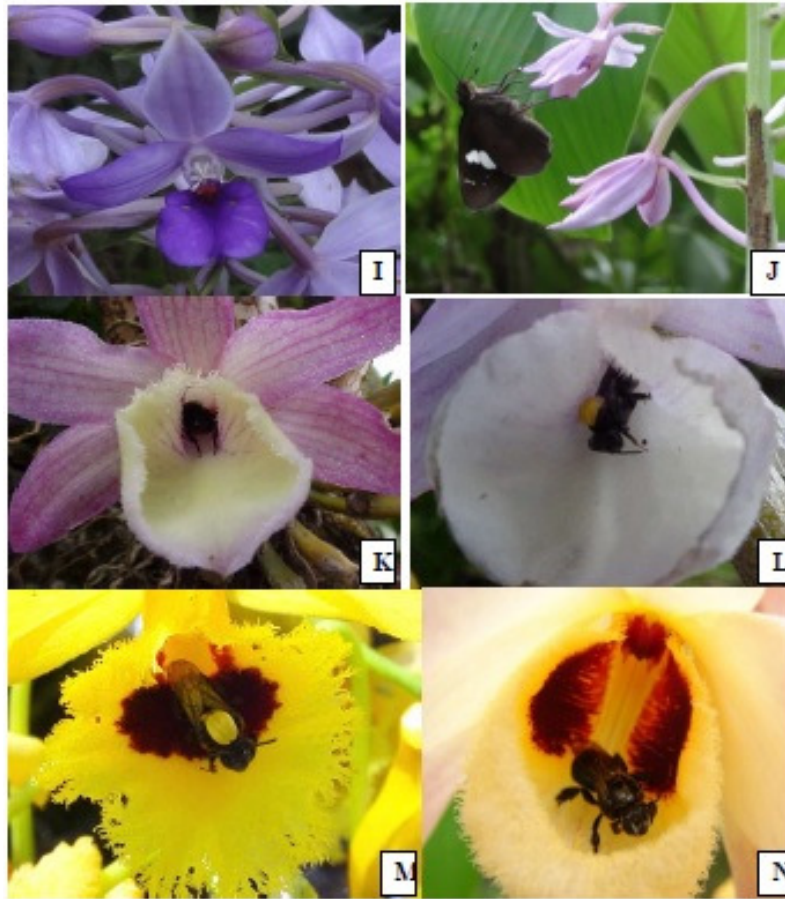


Plate-2.Figs. I-N., Flowers of various Orchid taxa showing insect pollinators. I-J. *Calanthe sylvatica*, A. Close -up of a flower after removing anther- cap , showing pollinaria attached on the apical portion of the column; J. *Udaspes folus* with long proboscis foraging the flowers of *C. sylvatica*. K-L, *Dendrobium primulinum* flowers with insect forager, *Lagioglossum* Sp., K. Insect approaching the nectary and touches the column. L. The visitor bees sleep inside the flower due to sudden inclement weather, showing pollinaria attached on the thorax.; M. *Dendrobium fimbriatum* with insect pollinator. The pollinaria attached on the thorax of the insect. N. A cup shaped flower lip of *Dendrobium moschatum* with insect pollinator showing broken stipe of pollinaria attached on the thorax.



Plate-3, Figs. O-V, pollinators of various orchids, O. *Pholidota articulata* inflorescences in natural habitat; P- Q. Paper wasp *Parapolybia varia* foraging the flowers, P. with pollinaria attached on fore Head, Q. Licking nectar from the flower. R,S,U & V, Insect pollinators of orchids showing attachment of pollinaria. R. *Apis indica* with pollinaria on mouth-parts; S. *P.varia* with pollinaria on fore-head; U. *Apis indiacae* with pollinaria attached on the joint of thorax and abdomen; V. *Lasioglossum* sp. with pollinaria on thorax. T. *Megapis dorsata* (Rock honey bee) foraging the flower of *Coelogyne fimbriata*.

108th INDIAN SCIENCE CONGRESS

3 – 7 January, 2023

Nagpur

II

**ABSTRACTS OF
PLATINUM JUBILEE LECTURES /
AWARD LECTURES**

PLATINUM JUBILEE LECTURE

**ARBUSCULAR MYCORRHIZA IN AUGMENTING THE YIELD OF
MEDICINAL PLANTS: DELVING INTO THE ROOTS OF MECHANISM**

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Keywords: Arbuscular mycorrhiza,

Arbuscular mycorrhiza (AM) has received considerable attention for its potential in sustainable agriculture to support plant nutrition while reducing fertilizer input. This symbiosis is especially relatable in the existing time wherein organic agricultural system is highly valued. AM characterizes the most efficacious and pervasive symbiotic association of plants with soil fungi (subphylum-Glomeromycotina). The fungus establishes in root cortex and bequeaths it with an array of recompenses in exchange of carbohydrates and some fatty acids. The benefits provided by the fungus include improved nutrient uptake, augmented yield, and enhanced resistance and tolerance to abiotic and biotic stress. The role of AM in improving growth and yield of aromatic and medicinal plants has been increasingly realized. There are several studies on the positive effects of AM on herbage yield and concentrations of active principles in aromatic plants. To harness the potential of AM fungi in improving the production of secondary metabolites, it is imperative to understand the biochemical and molecular basis for their increase in mycorrhizal plants. Systemic effects of AM were observed on the physiology and development of *Artemisia annua* L. that could not be mimicked with similar levels of phosphorus in non-mycorrhizal plants. AM fungi modulated the production of phyto-hormones, such as jasmonic acid that further influenced the transcription of genes encoding enzymes implicated in the biosynthesis of artemisinin (a commercially valuable sesquiterpene lactone).

It was observed that AMF not only enhanced the transcript levels of genes encoding upstream rate-limiting enzymes (such as 1-deoxyxylulose 5-phosphate synthase and 1-deoxyxylulose 5-phosphate reductoisomerase) that facilitate the utilization of universal precursors, like acetyl CoA towards the terpenoid biosynthesis pathway, but also enhanced the expression of genes encoding enzymes down the pathway to boost the synthesis of artemisinin among suits of other terpenoids. Probable mechanisms underlying increase in production of commercially valuable secondary metabolites, such as stevioside and rebaudioside-A in *Stevia rebaudiana* (Bertoni) that are valued as low calorie sweeteners, eugenol (a valued phenylpropanoid) and β -caryophyllene (sesquiterpene hydrocarbon) in *Ocimum tenuiflorum* L. Valued for anti-cancerous and antioxidant properties will be discussed.

PROF. ARCHANA SHARMA MEMORIAL AWARD

**Agricultural Utilization of Waste: Appraisal of Potential Effects on
Soil and Plant Growth**

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Abstract

The overall utilization of wastes in a proper and ecofriendly way, is supposed to be linked with economic and environmental technique in this modern time. The environmental problems and pressures have led to integrate techniques to utilize wastes and implement it in the best possible way. However, presence of many toxics such as heavy metals, pesticides etc restricts its direct land application. Direct application not only may contaminate the soil, but also may lead the food chain contamination. Most of the existing researchers have focused on the utilization of sewage sludge, wastewater and animal manure in agriculture, whereas the study for vegetable waste and biowaste compost consumption in agriculture is very restricted. Application of these wastes after bioprocessing can help to supply vital nutrients to plants, that can also boost the soil physico-chemical and biological properties. Wastes can be either augmented to the soil directly or occasionally require pretreatment former to its agricultural utilization. Vermicomposting of waste, before land application can be a sustainable waste management option, as the vermicast attained at the end of vermicomposting process is rich in plant nutrients and also devoid of pathogenic organism. Application of vermicast formed from waste in agriculture will not only help the country's economy by dropping the application of inorganic fertilizer, but will also help in resolving land degradation problems. In this manner, consumption of urban wastes is facilitated and reduction of wastes are done. In this view, agricultural utilization of wastes would enable recycling, and also providing nutrients to the soil-plant system, which could be a sustainable approach in the direction of management of this massively generated waste.

Keywords: Agricultural Utilization, Wastewater, Vermicomposting, Waste Management, Urban Wastes, Environmental Problems

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III
ABSTRACTS OF
SYMPOSIUM / INVITED LECTURES

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Invited talk by Foreign Scientist

**THE IMPLICATIONS OF DECEPTIVE POLLINATION ON TAXONOMY
AND NATURE CONSERVATION POLICY.**

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Keywords: *Deceptive Pollination, Taxonomy*

Deception in pollination is a situation in which advertisement in flowers is not coupled with a reward. Most of the deceptive flowers are orchids. The different pollination syndromes of Mediterranean orchids (reward, offering shelter, food deception, and sexual deception) have a profound impact on the type of reproductive barriers among species and thus on processes of species sorting and extinction. Sexually -deceptive orchids have specific pollinators. Here pollinator -specificity is the main (and sometimes only) reproductive isolation mechanism among species. Food-deceptive orchid species may easily share pollinators. Here, pollinator-specificity cannot act as a reproductive isolation mechanism and strong post-mating barriers maintain species boundaries. The weak reproductive isolation mechanisms cause many inter specific hybridizations and introgressions. The result is a taxonomic “chaos” in the deceptive Mediterranean orchids. This situation has profound implications for species delineation and conservation policy. A given taxonomy has many synonyms, which may influence decisions on the identity and range of the “taxonomic entity”. This situation engenders confusion and renders the IUCN (International Union for Conservation of Nature) categories of rarity (the key to any conservation action) useless. Thus, the “Red Books” (if available) become an “impractical tool”. Examples within the genera *Ophrys*, *Orchis*, and *Iris* are shown. Based on our results, we suggest conserving endangered species in relation to all their habitat components. Other rewarding plant species which subsidize the deceptive ones. The main partners of the “Pollination web”. The bees and their ecological requirements, such as the availability of nest sites. Interrelationships between bees (e.g. between cuckoo bees and host bees). The size of the conservation area depends on the supply of the “needs” of the plants as well as their pollinators.

Invited talk by Foreign Scientist

DEVELOPMENT OF ORCHID BIOTECHNOLOGY IN THAILAND

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Keywords: Thailand, orchid tissue culture, a complete cycle of orchid production.

Development of orchid biotechnology in Thailand started from tissue culture research in some universities in 1967. Later in 1972, orchid tissue culture business expanded rapidly to over 30 million plantlets and employ over 300 workers in 15 labs with about 2.4 million US\$. The suitable protocols and low-cost tissue culture were developed by the government organizations, institutions, growers, and private companies for about 50 years. The export value started from a few million baht to about three billion baht in 2019. Major growing factors in natural growing habitats are concerned for appropriate commercial cultivation after tissue cultured plantlets. They are altitude, light, temperature, relative humidity, nutrients, and air movement. At present, saran houses constructed with cement poles, cement benches, galvanized pipes for hanging orchid baskets, and black netted nylon roof with 50-60% shade and open sides are developed for low cost, long lasting, and suitability for growing tropical orchids for cut-flower and potted orchids. The cultivation is mostly for many outstanding cultivars of pink -red, white and yellow -green flowered dendrobiums and blue, pink, and yellow flowered vandaceous orchids which need hot and humid conditions.

A complete cycle of orchid production which need breeding program, micro propagation, planting materials (mainly coconut husks, charcoal, and cement block), plastic containers, watering, fertilizer, pest control, post -harvest technology, and transport from farm to packaging houses are effectively implemented. Thailand is famous for exporting cut-flower orchids applying low-cost cultivation but high production. Orchids continue to dominate other ornamental crops in Thailand due to better technology know -how, suitable climatic conditions for dendrobiums and vandaceous orchids, experienced and skillful growers and exporters, as well as their nationwide popularity. Apart from all these, orchids are a symbol of Thailand that reflects the country's pride internationally.

Symposium-I

IN SITU AND EX SITU

**CONSERVATION OF PLANT BIO DIVERSITY AND SUSTAINABILITY
SUSTAINABLE DEVELOPMENT: CHALLENGES
AND BIOTIC INTERVENTIONS**

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Keywords: *Reclamation, Reuse, Reduce, Recycle and redefine our needs*

“Sustainability means meeting our own needs without compromising the ability of future generation to meet their own needs”. Increasing demands on resources due to increasing population and exponential pace of resource consumption because of rising affluency is creating lots of physical and physiological disturbances impacting humans. A big question mark is over survival and wellness of humankind. Our sustainability is closely related to the sustainability of our ecosystem. Biodiversity is a key component of the “environmental health” pillar of sustainable development. Biodiversity provides people with basic ecosystem goods and services. It also plays an important role in economic sectors that drive development, including agriculture, forestry, fisheries and Industries, transport, tourism and livelihood.

However, all our requirement of good health, good living conditions and long-term wealth creation for everybody must occur within the carrying capacity of the planet. Today what we are enjoying as natural resource have accumulated or have grown over thousands or even millions of years! What we are seeing now is shrinkage of fertile land, increase in non-productive habitat and loss of natural resources. Change in the climate is also one of the out-come of these unconcerned uncontrolled badly conceived activities. To overcome, all these maladies and for sustainability of ecosystem, conservation has to be prioritised various in vitro and in vivo techniques are already recognised and are in use. Innovative techniques are required to increase food productivity per unit area, to develop various tolerant, resistant races of food crop which can be grown in different agro-climatic zones.

Production of organic food needed assessment for Herbal weedicides, insecticides and pesticides. For developing cheap healthcare system, again we have to scan our Materia medica and traditional systems. For identification of new molecules thorough screening of diverse plants is urgently needed.

BIODIVERSITY- A FUNCTION OF PLANT - POLLINATOR INTERACTIONS

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Keywords: *gymnosperms, Cycas, pollinator*

Biodiversity is a function of web of interactions taking place between plants and animals. The interactions between them are very complex, intricate and function in association with meteorological factors such as temperature, relative humidity and wind speed. Since biodiversity is the key for the structural and functional integrity of ecosystems and foundation for the very survival and sustainability of life on this planet, it is imperative to understand the interactions and interrelationships that exist between plants and animals. Without field studies, it is impossible to understand and frame effective conservation and management measures for the sustainability of biodiversity. Tropical latitudes in general and India in particular are rich in biodiversity and formed the basis for the origin and development of various societies and civilizations. It is in this context, I intend to explain the relationships, one-sided or mutual, that exist between different plants and different categories of insects, birds and others in flowering plants and gymnosperm species such as Cycas. Further the talk would also focus on how insect/bird-flower interactions contribute to the sustainability of biodiversity and its constituent species in forest and non-forest ecosystems. Recent reports indicate that climate change is impacting plant - pollinator mutualism, an interaction facilitated largely by floral color and scent.

Floral scent production decreases with an increase in ambient temperature; in effect a significant decrease in the emission of scent compounds occurs. This drop in floral scent production is the result of arrested expression and activity of proteins that help in the biosynthesis of the compounds. Floral scent provides a sensory signal to pollinators and drop in floral scent production could make them less attractive to pollinators. Floral colors provide a visual signal to pollinators and shifts or change in their color would affect the visitation by pollinators. Increase in ambient temperature could cause early fading or shift in floral color and thus affecting the pollination rate by pollinators. Elevated temperatures affect the physiology of flowering plants due to which production rate of flowers, nectar and pollen gets altered. Warming temperatures influence foraging activity, body size at maturity, as well as the individual life span of insect pollinators. Insect larvae mature into

adults sooner, some bird species lay eggs earlier in the season, and many plants bloom earlier. In addition to advancing many phenological events, climate warming is altering the distributions of both plant and pollinator species. Climate change also brings about positive effects for certain plant and pollinator species. Increased ambient temperature enables some plant species to proliferate well and some other plant species to be invasive and occupy new habitats across latitudes, longitudes and altitudes. Similarly, some pollinator species such as stingless bees multiply and produce numerous colonies, especially in urban settings where warm conditions exist. Therefore, field biologists have a tremendous challenge to understand how climate change influences plant-pollinator interactions and biodiversity.

BOTANIC GARDENS: CENTERS FOR EX -SITU CONSERVATION OF PLANT DIVERSITY

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Keywords: *Ex-situ* Conservation; Threatened taxa; Sustainable utilization;
Botanic Gardens; India

Botanic Gardens all over the world in one form or the other have been a significant instrument in the scientific and cultural development of the mankind over the centuries. Long history and the key role played by the Botanic Gardens during 16th, 17th & 18th century has lead towards the development of botany in those days and deep medical foundations round the world which motivated for the strong commitment to serve the scientific research for education, conservation, bio - aesthetics as well as showcasing. Several Botanic Gardens played pivotal and important role in the economic development and the commercial advancement in many parts of the world. Tropical Botanic Gardens in particular were considered as a major hub and tool of colonial expansion during the 18th& 19th centuries and were responsible for the introduction, transfer and flow of the germplasm of economic and medicinal plant species from one part of the world to the other. Today the Botanic Gardens are transforming very fast and equipping multifariously for the R&D studies about ex-situ conservation to combat the dangers of extinction of plant diversity and fast depleting natural resources from earth . During the past 5-6 decades rapidly growing human population, various developmental activities and unprecedented continuous wars in many parts in the world have taken a serious toll of the precious forest and other natural resources leading to the loss of plant diversity all over the world. Ongoing more than 6 months long war between Russia and Ukraine has been a living example of mass destruction of plant diversity. As per the recent estimates, there are approximately 3,80,000 known species of higher plants on this globe of which about 25% taxa are facing serious threats. Several plant species have become endangered or even extinct before their economic potential could be researched, validated and Harnessed for the mankind. Developing nations are more prone to such threats resulting to the loss of plant diversity alarmingly. Indian subcontinent has been bestowed with remarkably rich plant diversity having around 18,000 taxa of higher plants in various phyto - geographical regions. It is one of the 12 mega diversity nations in the world with 2.5% of the land area, accounting 7.8% of the documented species globally with 4 global hotspots situated in: Western Ghats, Himalayas, North - Eastern India and Andaman &

Nicobar Islands. India has been rated as the 10th in the world and 4th in Asia among the nations rich in diverse plant resources. As result the value of our plant diversity increases many fold which may also serve as an insurance policy possessing tremendous potential for value addition, product development and conservation. Out of nearly 1900 Botanic Gardens all over the world, developed countries have far more botanic gardens as compared to the developing nations. In such a scenario the responsibility of the Botanic Gardens in developing countries increase particularly the countries like India to ensure the survival of threatened taxa, their conservation as well as sustainable utilization. There are about 90 Botanical Gardens in India but hardly very few gardens are actively engaged in the ex-situ conservation of the threatened plant species. Ministry of Environment, Forests and Climate Change, New Delhi had been geared up for providing the financial Assistance to the Indian Botanic Gardens (ABG) to enhance the ex-situ conservation studies which is being closely monitored by the Botanical Survey of India, Kolkata. Many Botanic Gardens attached with several organizations as well as universities have come forward for this important task by undertaking projects for the multiplication and formulation of the conservation strategies for threatened taxa in a phased manner quite successfully. Some botanic gardens have been designated as the Lead Garden in different geographical regions by the ministry so that they can act as a guiding force for the other gardens in the area of ex-situ conservation. However, there is still an urgent need for more Botanic Gardens to come forward in the area of plant conservation and exchange of germplasm resources within the country for research, education and display. Networking and multi-institutional research programmes involving Botanic Gardens should be initiated for the mass multiplication and reintroduction studies for the threatened plant species. It has also been emphasised that all the plant materials must be exchanged under the material transfer agreement (MTA) among the participating organizations so that the responsibilities of each participant can be determined. CSIR-NBRI Botanic Garden located at Lucknow serves as a National Facility due to immense contributions towards ex-situ conservation and sustainable utilization of important plant resources of economic, ornamental, horticultural, biological, ecological, educational and recreational significance as well as to promote R&D activities in areas of plant conservation, floriculture and aesthetics. This Botanic Garden is conserving the living collection of diversified groups of plants comprising 3500 taxa/cvs. distributed under 212 families. Studies on the ex-situ conservation in the Botanic Garden at CSIR -National Botanical Research Institute along with few success stories in the other Botanic Gardens will be highlighted during the course of presentation.

**DIVERSITY AND CONSERVATION OF MANGROVES IN INDIA:
AN OVERVIEW**

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Keywords: *Mangroves, Heritiera fomes, Sonneratiagriffithii*

Mangroves are specialized marine ecosystem of a group of salt tolerant plants found in tropical and subtropical intertidal regions of the world. Mangroves are structurally and functionally unique to have well-developed aerial roots, viviparous germination, salt regulation, and nutrient retention. Mangroves forests are a rare type of forest in the world with only 73 tree species, occupying 15.2 million hectares in 123 countries. Mangrove forests provide varied ecosystem services. Mangroves offer coastal protection against the fiery effects of natural calamities. The potential of mangroves in carbon capture and sequestration is remarkable in mitigating the impacts of global warming and climate change. India is the third richest country for mangrove biodiversity in the world, after Indonesia and Australia. Mangrove forest in India cover approximately 4921 sq. km. Sundarbans (West Bengal) has the largest mangrove cover followed by Gujarat and Andaman and Nicobar Islands. There are about 11 species which are under IUCN Red List. India has two globally threatened species: *Heritiera fomes* and *Sonneratiagriffithii*. Mangrove diversity is threatened due to over exploitation, agriculture, settlement, urbanization, and deforestation. There is need for mangrove conservation by identifying selected areas for in situ conservation, developing nurseries for ex situ conservation and adopting multidisciplinary approach involving State Governments, Universities, Research Institute and Local Organizations.

**MEGA -DIVERSITY CENTERS IN INDIA - INVASIVE ALIEN PLANTS IN
INDIAN HIMALAYAN REGION (IHR)**

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Keywords: *Biodiversity conservation, Himalaya, Invasive alien plants,
Mega diversity center*

In India, there are 4 mega -diversity centers namely, Himalaya (entire Indian Himalayan region), Indo -Burma (entire North-eastern India, except Assam and Andaman group of Islands), Sundalands (Nicobar group of Islands), Western Ghats (entire Western Ghats incl. Sri Lanka). The Himalayan region which is an enchantment territory of the nature, which harbors invasive alien plants mostly from American continent, and majority of invasive alien plants exhibit herbaceous life- form. The invasive alien plants adversely affect the ecosystem functioning in addition to the economic effects. On other hand, the invasive alien species are beneficial in terms of environmental services, and economic and medicinal values. The IUCN is actively engaged in invasive plants control, and has developed Global Invasive Species Database. In India, the GBPIHED Almora, an establishment of the MoEF & CC, is the nodal institute for effective control of invasive alien plants.

**REPRODUCTIVE BIOLOGY OF CALANTHE SYLVATICA (THOUARS)
LINDL. AND CONSERVATION MEASURES**

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Keywords: Butterflies, moth, pollination, conservation, xenogamy.

Calanthe sylvatica is a terrestrial orchid grows luxuriantly on the humus rich forest bed. The study was conducted in the Hologaper gibbon wild life sanctuary of Jorhat District of Assam, India in between the years 2013 to 2020. *Calanthe* basically propagate by means of vegetative reproduction. Very negligible number of seeds were found to grow in some areas of the sanctuary which give us some hope that the orchid can be introduce in new area in the sanctuary. The study was conducted in two parts, No. 1. Study of reproductive biology where pollination biology

was mainly focused and No. 2 restoration and introduction of the orchid species in some selected areas of the sanctuary. Floral morphology of *Calanthe sylvatica* reveals that the flowers of this orchid exclusively pollinated by butterfly and moths only and pollination occurs both day and night. In natural open condition the male reproductive success is 60 to 80%. while production of pods are restricted by 4 to 12% only. The flowers are showy, attracting bloom in large numbers but they are non rewarding provide nothing to their visitors and pollinators. The flowers of *C. sylvatica* follow a deceptive pollination system where they exploit the pollinators. The flowers are self compatible and non autogamous. Experimental pollination results were as follows a. self pollination 90%; b, geitenogamy 92% and xenogamy 94%. The rhizome of the young *Calanthe* plants are consumed by Stump tailed monkey as food, local people use the young leaves to prepare rice bear and rhizome are used by the local healer in the treatment of urinary problem, diarrhoea, and skin problem.

ROLE OF MYCORRHIZA IN ALLEVIATING HEAVY METAL STRESS

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Keywords: Heavy Metal Stress; Bio-remediation; Bio-amelioration; AM Fungi

Ecosystems have been contaminated with heavy metals due to various human and natural activities. There are various sources of heavy metal contamination in the soil as burning of fuels, mining and smelting of metalliferous ores, municipal waste, fertilizers, pesticides, sewage sludge amendments etc. The high concentration of heavy metals adversely affects plant growth and development. Soil micro-organisms are also disturbed due to the presence of various pollutants in soil. Several physiological, biochemical and molecular processes are disturbed as a result of heavy metal stress in soil. Plant growth is inhibited and these heavy metals result in various defects like low seed germination, turgor loss, chlorosis, necrosis, senescence and ultimately plant death. AM fungi establish natural symbiotic association with majority of the higher plants and provide a direct physical link between soil and plant roots. Mycorrhizal fungi can play a role in bioremediation of heavy metal pollution in soil. Plants having mycorrhizal association accumulate metallic pollutants by storing these heavy metals in vesicles as well as in fungal hyphae in their roots, hence these metallic pollutants are

immobilized and do not inhibit the growth. Mycorrhizal fungi also release various organic acids which increase the solubilisation of insoluble phosphate compounds present in soil. The unavailable forms of phosphorus are converted into available forms as a result of organic acids produced by these fungi. These fungi also release glomalins that are certain metal sorbent glycoproteins which increase the immobilization of toxic metals. Another protein is metallothionein released by certain AM fungi, which also reduces the heavy metal toxicity in soil. Mycorrhizal fungi also induce resistance in plants against pathogens, drought and salinity stress. Investigation on heavy metal stress resistant genes in mycorrhizal plants can be very helpful for phytoremediation. All these aspects will be discussed in detail during presentation of the Conference proceedings.

ENDOPHYTE-MEDIATED ABIOTIC STRESS MANAGEMENT IN CROP PLANTS

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Keywords: *endophytes, abiotic stress*

Microbes have been applied as biopesticides /biocontrol agents (targeting pests and pathogens by producing a pesticidal effect), biofertilizers (providing plant nutrients) and biostimulants (aiding nutrient assimilation by the plant without being nutrients, pesticides or soil amendments) (Marrone, 2019). Beneficial microorganisms play an essential role in plant growth and development. They being used as biofertilizers, biostimulants, and biocontrol agents for many years. For eco -friendly and sustainable agriculture under fast -changing climatic conditions, microorganisms closely associated with the crop plants, namely endophytes, are being prospected. Endophytes living in apoplast are considered part of the plant system (holobiome) and interact closely with the host. They regulate several plant traits and can adapt to harsh environmental conditions faster than their host plants. In our study, we identified many fungal endophytes from stress -adapted plants and examined their role in conferring abiotic stress tolerance in both horticultural and field crops. Colonization of endophytic fungi activated physiological traits, which significantly improved growth and stress tolerance in the crops. In this talk, I will discuss endophytes ' positive

effects on plant growth and development and the possible mechanisms of plant-endophyte interactions. Our results indicate that endophyte enrichment in compatible crops can be highly beneficial to boost crop productivity. This type of eco -friendly approach can refine agricultural practices and can help in improving stress resilience in crops.

POSSIBILITIES OF MICROBIAL DEGRADATION OF SYNTHETIC PLASTIC MATERIALS

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Keywords: Plastics material, microbes, Biodegradation

The management of plastic pollution is now really a big problem for mankind. Almost all parts of the world get affected. Commercialization of plastic material should be all along with safe disposal of products. Microbes such as bacteria, fungi and algae are involved in plastic degradation in its natural habitat as per report. Among them, algae were given very less importance. Microbes were found to be useful for the biodegradation which is reported with applicable evidences. This biodegradation approach is safe and eco-friendly.

**GENETIC SYSTEMS AND RARITY- CASE STUDY OF GLORIOSA
SUPERBA L.**

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Keywords: *Gloriosa Superba L, anthropogenic, Colchicaceae*

Extinction and invasive species introduction are two major biodiversity crisis of contemporary era. A species may become endangered and extinct eventually when its death rate exceeds birth for a prolonged duration. On the other hand, few become invasive when their reproductive strategies allow them to proliferate well beyond their place of origin. The reasons for these may be natural or anthropogenic. Anthropogenic activities are well visualized and documented especially in case of endangered species. Major threats enlisted for plants are habitat degradation, habitat fragmentation, urbanization, climate change and unsustainable harvesting for their multifarious utilization. Several species however have several internal bottlenecks also adding to their rarity. *Gloriosa superba L.* an important traded medicinal plant of family *Colchicaceae* is one example specifying it. A native to Tropical Asia and Africa, it is highly valued in modern medicine because of the presence of *Colchicine*. Due to its incessant exploitation in wild as well as problems faced during cultivation, it is at the verge of extinction. Extensive exploration carried out by us revealed the population size of the species as extremely small with the number of individuals ranging from 2 to a maximum of 27 only per population in the natural habitat scanned so far. Saving such an economically important species with extremely small population is a challenge and calls for detailed studies on various aspects of the species. In this regard presentation will elaborate on population structure, meiotic details, breeding behavior, reproductive efficiency and threat perception to the species. Use of this data for formulating effective conservation measures will also be discussed.

**CONSERVATION OF *DECALEPISHAMILTONII*: AN ENDANGERED
TWINER WITH MODERN RELEVANCE IN HEALTH FOOD**

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Keywords: *Decalepishamiltonii*, Deccan Peninsula, Western Ghats of South India

Decalepishamiltonii Wight & Arn., (Family Apocyanaceae sub-family Ascelpiadoideae) is an endangered plant native to the Deccan Peninsula and Western Ghats of South India and traditionally known for its food and medicinal uses. Extensive research on its edible (culinary spice, medicinal) and non-edible uses such as insecticide and antimicrobial, along with commendable contributions and leads from CSIR-CFTRI in Mysore, are among those aroused great interest to the researchers. The tubers of this plant contain the vanillinisomer 2-hydroxy-4-methoxy benzaldehyde and are also rich in bioactive phenols and flavonoids. The anti-cancer potential of tuber extracts has been demonstrated. The tubers of this endangered plant are heavily exploited today, so its conservation is essential. Various *invitro* and *exvitro* approaches have been reported for the conservation of *D.hamiltonii*. Methods have also been developed to improve the levels of root-specific flavor compounds and to increase the flavor content of post-harvest tubers. Development of processing technology for flavor extract for food applications and its transfer to industry was accomplished. Recently, *D.hamiltonii* commercial-scale cultivation is gaining momentum farmers see it as a lucrative cash crop.

AUGMENTING AQUACULTURE WITH AUTOCHTHONOUS ALGAL FEED ADDITIVE FOR SUSTAINABLE NORTH EAST: PROSPECTS AND CHALLENGES

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Keywords: Algae, Algae meal, feed additive, formulated fish meal, supplement feed, North East India

Fish is one of the lucrative sources of protein for people of North East India. Bestowed with Himalayan Mountains and Purvanchal sub-mountain ranges, the region houses a good number of lentic and lotic fresh water bodies which are the prime sources of fish in the entire region. Each and every tribe and community residing in the region have their traditions of fishing in their own way. Consumption of fresh, processed, dried and fermented fish are the typical culinary customs of the tribes. It has been observed that in each and every state, there is a gap between production and supply of fish, resulting import of fish from outside at the expense of huge amount of money affecting rural economy.

Further, the entire eastern Himalayan belt to which North East India is a part, is also a good source of ornamental fish diversity amounting around 60 percent of the total fish fauna so far recorded from the region. The recent pictorial promotion of the NE's ornamental fish diversity helps in many fold increase of trade in this sector which has encouraged the younger generation to enter into the field of aquaculture in recent years. An encouraging numbers of entrepreneurs have come forward to shoulder the responsibility of conservation, captive production and commercialisation of the local breed fish in last few years. Surveys revealed that the budding entrepreneurs are in search of cheapest and alternative fish meals not only for enhancing nutrient values but also for colour retention of the beautiful local breed fish and as well as to reduce the operational cost in their farms. As algae has been proved to be one of the most important food sources and feed additive in the commercial rearing of many aquatic animals/fish, it is being projected as a good replacement due the presence of a broad spectrum of nutritious compounds including protein, vitamins, lipids, essential amino acids, minerals, and pigments. It has already attracted world interest for considering it as dietary additive for the fish. With the huge algal resources in the lotic and lentic habitats of the region, a few potential algae meal have been formulated and have been in trial to examine the

efficacy of the same as feed ingredients. But the challenges ahead are social acceptability of the augmented fish meals in the culturally diverse and fragmented population groups in the region. Scientific interventions and awareness may encourage the common mass to accept the new innovations and technologies to uplift the economy of the region.

EX SITU CONSERVATION OF BIODIVERSITY: AN OLD TRADITION IN MODERN APPROACH

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Keywords: Biodiversity, Vedas, Puranas, Upnishads

Biodiversity is defined as the variety or differences in the living organisms on earth. All living organisms on the land, water and in air have their own diversity. The word Biodiversity was coined by Walter G. Rosen in 1985 and first appeared in publication in 1988. Biodiversity is the extraordinary variety of life on Earth from gene and species to ecosystems and the valuable functions they perform. Each of these species and organisms work together in ecosystems like an intricate web, to maintain balance and support life. But unfortunately, at present, the biodiversity is losing very fast rate due to several anthropogenic activities such as habitat loss and fragmentation by deforestation, urbanization, industrialization, agriculture expansion, mining and quarrying, illegal wildlife trade, poaching and hunting of animals, overexploitation of medicinal plants and timber yielding plants for commercial purpose, invasive species, pollution, global climate change etc., coupled with various natural calamities such as floods, drought, landslides, storms, forest fires, diseases and pests etc. The conservation of biodiversity is biggest challenge now a days. Though, there are two methods for conservation of biodiversity are proposed viz. *In situ* and *Ex situ*. The process of protecting an endangered plant or animal species in its natural habitat is commonly known as *in situ* conservation. On other hand, *ex situ* conservation is the relocation of endangered or rare species from their natural habitats to protected areas equipped for their protection and preservation. For in situ conservation of biodiversity, Govt. of India established 106- national parks, 564- wildlife sanctuaries, 18- biosphere reserves, 7- Natural World Heritage Sites, 49- Ramsar Wetlands, 218- Community Reserves, 99- Conservation Reserves etc covering as areas of about 5.26%. For ex situ conservation there are

more than 164 zoological parks, about 122 botanical gardens various gene banks, cryo banks, DNA banks, pollen banks etc are also established. But, for the ex situ conservation of plants, establishment of gardens and parks was an integral part of vedic culture. Sanatan dharma ancient Sanskrit literature such as Vedas, Puranas, Shastras, Epics (Ramayana and Mahabharata), Upnishads, Smrities, Kalidasa literature, Kam Sutra etc. describes about the importance of gardens and parks. They are known as Bag, Upvan, Vatika, Madhuvan, Pramodavan, Nandanvan, Vriksha Vatika etc. Ancient sages and hermits were quite aware about the importance of plants, plantations, forests, wildlife, gardens, parks, arboriculture, ponds, wells, step wells, mountains, rivers etc to the society. That is why they have connected living and non living things to the religion of Sanatan dharma for proper functioning of ecosystems and other life supporting systems. We are now facing various environmental problems like loss of biodiversity, climate change, pollution, natural resources degradation etc due to not following the path shown by our sage and hermits thousand years ago. Now it is time we should go back to the basics for prosperous future.

DETECTION OF GENETIC DIVERSITY OF INDIAN BEAN *DOLICHOS LABLAB (L.)* BASED ON SSR AND AFLP MARKER

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Keywords: *Dolichos lablab(L.)*, Polymorphic Information Content, Resolving Power, SSR, AFLP.

In this study, genetic diversity in *Dolichos lablab (L.)* were surveyed utilizing SSR and AFLP markers on ten Indian *lablab* genotypes got from Indian gene bank. Also evaluate the polymorphism information for checking the efficiency of markers. For SSR and AFLP analysis, 5 primers were used for checking the diversity in *Dolichos lablab (L.)* and the performance of markers were measured by using 4 parameters (1) PIC, (2) Mean resolving Power, (3) Resolving Power and (4) MI.SSR (05) markers produced a total of 51 bands, out of which 45 bands (88.23%) were polymorphic which varies from 6 (Primer -111) to 15 (Primer -AGB -9) with mean of 10.5 bands per primer while AFLP (05) markers produced a total of 52 bands, out of which 45 bands (88.46%) were polymorphic which varies from 6 (M-CAT/E-ACT) to 13 (M-CAC/E-ACC, M-CAC/E-ACT) with mean of 9.00 bands per primer. In the UPGMA dendrogram, the 10 genotypes were separated into two main clusters all the primers used. Our present examination

uncovered that genetic markers might be effectively used for deciding hereditary variety and connections in *Dolichos lablab* (L.) genotypes and could be utilized as a part of breeding programs.

QUEST FOR UNDERSTANDING REPRODUCTIVE BEHAVIOUR OF TREES FOR THEIR CONSERVATION

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Keywords: reproductive ecology, pollination, pollinators, melittophilous

A forest without the trees is unimaginable, and there is a genuine concern over continuous decimation of forests across the world due to a variety of known reasons. Tropical regions including India are among the worst affected, as the effects of climate change and habitat destruction are more pronounced. Many tropical tree species have suffered due to paucity of compatible mates and loss of pollinators. It has become a daunting task for the conservation biologists to recover forest tree species and salvage the remaining. Our group at Delhi has been pursuing reproductive ecology of tree species for the past 20 years, in order to develop a database of their reproductive strategies. The information has its application in species recovery and sustainable utilization. Detailed investigation of nearly 25 tree species at the Delhi school has demonstrated that a great majority of them are self-incompatible, and many of these follow a mixed-mating pattern owing to the prevalence of geitonogamy. Fruit-set is dependent on pollinators, and is highly variable at the population level. Our studies have established a variety of pollination syndromes ranging from pollination by fly, honeybees, birds, and squirrel to bats, though a majority is melittophilous. Natural recruitment is poor due to paucity of ecological safe sites in the shrinking forest patches. India is home to nearly 2500 species of trees, and many of them are facing an imminent threat primarily due to climate change, and because of their declining populations. The information on the dynamics of interaction between trees and their reliable pollinators is grossly inadequate. In order to rescue them, a multidisciplinary approach at different levels of biological organizations, including the knowledge of their natural mode of perpetuation is essential. In the absence of a strong database on the reproductive strategies, many of the tree species might become threatened.

ROLE OF CELLULAR TOTIPOTENCY IN UNDERSTANDING THE BOTANICAL FRONTIERS

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Keywords: Clonal, conservation, gametic, homozygous, somatic, totipotency

The unique capacity of plant cells, irrespective of their ploidy level, has found many applications in plant improvement, propagation and conservation other than basic and applied plant sciences. It would not only surmount the limitations of vegetative propagation but also can hasten the production of clonal material for field planting. The cells of the shoots-apex are uniformly diploids and least susceptible to genotypic changes under culture conditions. Thus, it guarantees that the characteristics of the source plants are conserved. It offers many advantages over the conventional methods of vegetative propagation: (1) the rate of multiplication is extremely rapid and can continue round the year, independent of the season. Thus, over a million plants can be produced in a year starting from a small piece of tissue. (2) The enhanced rate of multiplication can considerably reduce the period between the selections of plus trees and raising enough planting material for field trials. The other application of cellular totipotency is the production of haploid plants which are extremely valuable in plant breeding and genetics. With haploids, homozygosity can be achieved in a single step otherwise obtaining homozygous lines of woody perennials by the conventional method of recurrent inbreeding is impractical and time consuming because of highly heterozygous nature and long generation cycle of these plants as well as inherent inbreeding depression. The study is an endeavour not only to develop pure breed lines but also to yield desired metabolites at a constant rate, independent of seasonal and geographical variations. *In vitro* expression of cellular totipotency has thus facilitated and/ or accelerated almost every aspect of the botanical frontiers, like cytology, histology, cell physiology, cell pathology, cell susceptibility, resistance, and the study of tumors and viruses.

**ROLE OF EDUCATIONAL AND RESEARCH INSTITUTES IN
DOCUMENTATION, CONSERVATION, BIOPROSPECTING AND
UTILIZATION OF BIODIVERSITY IN 21ST CENTURY**

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Keywords: Conservation, Biodiversity, Western Ghats of India, Lead Botanical Garden (LBG)

The green-ward covering mother earth is the true matrix of human life. Plants on this earth are very essential for survival of animals and plants. Man has intricately fascinating physical, emotional and spiritual relations with biodiversity. There is tremendous diversity of life on earth and angiosperms is the most dominating and useful group of all terrestrial ecosystems of this planet. Mother earth has amazing diversity of life forms. India is blessed with great diversity of habitats supporting diverse type of ecosystems, flora and fauna. India is one of the 17 mega-diverse countries with 3 hot-spots of biodiversity supporting over 18700 species of flowering plants alone. Biologists of 21st century have great responsibility of documenting, describing, naming and more importantly bio-prospecting and conserving our biodiversity. Botanists have the knowledge of plant diversity, their occurrence, importance and field status of various species. Botanists is the community with whom major and critical information about plants is available. This information is of crucial importance both in utilization and conservation of plant diversity. However, most of the persons trained in botany are engaged in their day-to-day activities and seldom think and contribute as botanists of 21st century-the century which is known for mass extinction. If all the botanists of our country give serious thought for plant conservation, most of the plant species can be conserved. There may be more than one lack persons trained in botany in this country and we have just total of 18-19 thousand species of flowering plants. If each one of us adopt one species and work on various aspects including conservation, we can conserve almost all the plant species of Angiosperms. Botanists can provide yeoman service to plant diversity conservation. Educational institutes like Schools, Colleges, and Universities have strength of talented, hardworking, enthusiastic, passionate, motivated students who can be trusted for conservation of our biodiversity. Students is the strength of country and through the force of these students, we can conserve maximum plant diversity. Teachers, students and supporting staff of Botany department of Shivaji University have developed a Lead Botanical Garden (LBG) which presently supports more than 1200

species of plants. The garden is playing an important role in conservation of plant diversity of especially Western Ghats. Department of Botany is contributing to conservation through raising saplings, planting them and providing the saplings to anyone interested in plantation. This should form a guideline for other educational institutes. The present lecture narrates the role of Educational and Research Institutes in documentation, conservation, bioprospecting and utilization of biodiversity in 21st century.

STIGMA IN BIGNONIACEAE

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Keywords: *Bignoniaceae*

Bignoniaceae is predominantly a neotropical family with 82 genera and 827 species cosmopolitan in distribution. In India the family is represented by 23 genera and 50 species found chiefly in western and southern parts and a few are found in Himalayan region also. Most of these are highly ornamental and only four genera are found in natural habitats. The members of the family exhibit great deal of diversity in their habit (trees, shrubs, shrubs, phenology, leaf morphology, flowering phenology, blossom architecture, pollen fertility, pollinators (bats, birds and bees), embryology, structure of stigma and nectaries and dehiscent and non -dehiscent nature of fruits, fruit formation and seed morphology. Bignoniaceae is characterized by the presence of bifid, wet stigma covered with numerous medium sized unicellular papillae. The style raises the stigma usually at the level of stamens or may be above the level of stamens or rarely below the level of stamens (Heterostyly). The stigma is very sensitive to external stimuli and due to any kind of stimulus, the stigmatic lobes close down within 1-2 minutes, but reopen after 4-5 hours. However, the closed stigmatic lobes fail to reopen after conspecific pollination. The permanent closure of stigma after cross-pollination has been recorded in several members of this family. The stigma opening and closing also depends upon the climatic conditions. Receptivity of stigma is marked by opening of stigmatic lobes and presence of hyaline exudates on it. In most of the members of the family, the stigma becomes receptive after anther dehiscence showing protandrous condition. Formation of fruits in the members of this family is closely under the influence of environmental conditions and in India, the plants may bear fruits or remain fruitless. The stigmatic lobes in fruit

bearing plants are large, open and wet. Stigmatic papillae develop by the formation of small protuberances from the epidermal cells. These elongate to form unicellular papillae. The stigmatic papillae in fruit bearing and fruitless plants exhibit marked differences in their number, size and structure. In fruit bearing plants, the stigmatic papillae are elongated, thin walled, and the cuticle-pellicle layer is disrupted. The ruptured cuticle-pellicle layer facilitates the release of exudates and makes the stigma receptive. On the other hand, in fruitless plants, the papillae are small, dry, thick walled, compactly arranged and covered with thick and intact and thick cuticle -pellicle layer which inhibits the release of exudates making the stigma non-receptive. The protoplast of papillae on stigma of fruit bearing plants consists of dense cytoplasm, well organized nucleus and other cytoplasmic organelles (mitochondria, golgi complex and ribosomes) and several small vacuoles. The histochemical localization of non-specific esterase shows that the stigmatic papillae in seed bearing plants are thin, disrupted and covered with exudates. On the other hand, the cytoplasm of stigmatic papillae of fruitless plants is highly vacuolated and the number of organelles is reduced and they are in disintegrated form. Biochemical estimations (UV spectrum, TLC, HPLC) have pointed out that the quantity of total phenolics in the stigma of fruitless plants is significantly higher as compared to that in fruit bearing plants. The simple phenolic compounds identified by mass spectrophotometer are p-hydroxycinnamic, di-hydroxycinnamic and hydroxyl - methoxycinnamic acids, while *Tecoma stans* show the presence of caffeic acid. It is interesting to note that the derivatives of hydroxyl cinnamic acid in the stigma of fruitless plants are present in higher quantity as compared to their fertile counterparts. The quantity of boron in the stigma of fruit bearing plants is significantly higher than that of stigma in fruitless plants. It seems that deficiency of boron in the stigma leads to the accumulation of phenolics which inhibits pollen germination on stigmatic surface and formation of fruits.

**THE ROLE OF CROP-WILD RELATIVES OF POPULAR LEAFY
VEGETABLES IN WEST BENGAL TOWARDS SUSTAINABLE
UTILIZATION OF PLANT DIVERSITY**

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Keywords: Leafy vegetables, crop-wild relatives, vine spinach, Chenopods, Amaranths, nutrient and antinutrient factors.

The regular diet of people in hot humid tropics are enriched with many leafy vegetables rich in dietary protein, vitamins, minerals as well as anti nutrients. Many of them are associated with equally nutritive and palatable crop-wild relatives, which have not received proper attention and recognition. Some prime vegetables have been identified with crop-wild relatives, like - vine spinach (*Basella alba* L.), Chenopods (*Chenopodium album* L.) and vegetable Amaranths (*Amaranthustricolor* L.). Their proper taxonomic delimitation, affinity, evaluation in terms of palatability, nutrient and anti nutrient factors are necessary towards broadening the vegetable list and sustainable utilization of plant diversity as well.

**IMPORTANCE AND NECESSITY OF GYMNOSPERMS BIODIVERSITY
CONSERVATION: A FUTURISTIC APPRAISAL**

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Keywords: Plants conservation, depletion, environmental changes, threat.

Gymnosperms are classified into five orders: Cycadales, Ginkgoales, Taxales, Coniferales, and Gnetales. There are approximately 84 genera and 126 species in the world, spread across all continents. In India, gymnosperms were found in 46 genera, 146 species, and 8 varieties (indigenous/introduced). Habitat loss, habitat degradation, climate change, disease, forest fire, logging, and human disturbances are the most serious threats to gymnosperms. The primary causes of plant biodiversity loss are logging and deforestation. Natural disasters and

forest fires adversely affect the decline in plant diversity. Gymnosperms are among the most threatened living organisms on the planet, with approximately 40% of their species facing high risk of extinction, which is twice as many as the latest estimates for all plants (i.e. 21.4%). The gymnosperms are the first plant class for which an EDGE priority list has been developed. The large number of species on the verge of extinction highlights the importance of quick action and objective prioritization in order to ensure their survival. Evolutionary Distinct and Globally Endangered (EDGE) technique evaluates species quickly based on evolutionary distinctiveness and extinction threats. Gymnosperms were subjected to EDGE using a phylogenetic tree with DNA sequence data for 85% of gymnosperm species (923 out of 1090 species), including the 167 missing species, and IUCN Red List assessments for 92% of species. The four conifer families Araucariaceae (monkey puzzle trees), Cupressaceae (redwoods), Podocarpaceae (yellowwoods), and Taxaceae (yews) account for eighteen of the twenty gymnosperms with the highest EDGE values. The Australian indigenous Wollemi pine (*Wollemia nobilis*), a member of the Araucariaceae family, has the highest EDGE rating. It was discovered in 1994 in the Blue mountains of Australia. It had previously only been identified through the fossil record. *Ginkgo biloba* is the only member of the order Ginkgoales. *Araucaria angustifolia*, a different member of the Araucariaceae family, takes third place. Its historic range in Brazil and Argentina has shrunk by 97% in the last century, and it is now considered Critically Endangered. The kauri tree, *Agathis australis* (Araucariaceae), a large tree from northern New Zealand, occupied fourth place. *Acropyle sahniana*, one of only two species in the genus, is ranked fifth (Podocarpaceae), less than 200 members are found on the Fijian islands. The question now is, why should we care about gymnosperm preservation? Gymnosperm biodiversity must be protected for a variety of reasons, as follows:

- Furniture
- Terpene and resins
- Ornamental trees and plants
- Musical instruments (Guitars, Soundboards)
- Edible seeds
- Flavouring agents and incense sticks
- Anticancerous drug (Taxol from *Taxus baccata*)
- Decongestant drug (Ephedrine from *Ephedra*)

As a result, it is critical to preserve gymnosperm biodiversity. Conservation can be accomplished through a variety of means. Some of the short and long-term programmes for the conservation of gymnosperm biodiversity could include both ex-situ and in-situ conservation, resource management, and proactive climate change adaptation. The use of cultural symbols such as sacred groves may be another method of preserving gymnosperm biodiversity. As a result, strict protection and management are required in the future to avail of their various miraculous benefits.

POLLEN, POLLINATION AND FOOD SECURITY FOR SUSTAINABLE DEVELOPMENT

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Keywords: Pollen, Pollination, Food Security

Pollen, the male partner in the fertilization process of flowering plants, because of its unique structure and haploid nature, provides an excellent material for several physiological and biochemical studies of fundamental and applied nature, which can give interesting clues regarding storage, longevity, viability, different phases of pollen development, etc. Pollen is a major source of morbidity for atopic patients, leading to various allergic disorders. Pollen has also proved to be an excellent tool in taxonomic studies. The application of pollen characters in solving controversial taxonomical and phylogenetic problems, has now been widely recognized all over the world. Application of pollen characters in understanding plant affinity and phylogeny is also well documented. However, these studies have been largely confined to major morphological characters of pollen grains, including apertural form, number, distribution and position, exine ornamentation and stratification patterns and pollen association and pollen nuclear number, all of which have provided the best taxonomic criteria, being least variable. Pollination is a basic force for gene recombination in flowering plants, plays a key role in plant breeding programmes. In angiosperms the pollination mechanism is typically developed in three phases: (a) release of pollen from anther, (b) transfer of pollen from anther to stigma, and (c) finally successful placement of the pollen on the receptive stigma surface, followed by

germination of pollen grains which begins the next phase of fertilization. Each of the three phases shows great diversity. Pollination, pollen germination and stigma receptivity must be analysed critically on a species by species basis, as it reflects the basic criteria for breeding programmes. Besides, pollen viability and nutrient requirements differ from species to species. Structural, physiological and cytochemical features of the stigma is of prime importance in the biology of sexual reproduction and seed formation, but the pollination biology of most tropical plant species is still unknown. As such, a detailed knowledge about pollination, pollen germination and stigma receptivity will be helpful to produce genetically superior stocks. Globally, of the estimated 1330 crop plants grown for food, beverages, fibers, spices and medicines, approximately 1000 (75%) are pollinated by animals. It has been calculated that pollinators deliver one out of every three mouthfuls of food we eat, and beverages we drink. Pollinators are essential components of the habitats and ecosystems that many wild animals rely on for food and shelter. Approximately 25 percent of birds include fruit or seeds as a major part of their diet. Plants provide egg laying and nesting sites for many insects. More than 218,000 of the world's 250,000 flowering plants, including 80% of the world's species of food plants, rely on pollinators for reproduction. For over a decade, biologists have been concerned about apparent declines in pollinators, especially those that migrate between regions, and the concomitant declines in seed production of flowering plants. This concern over plant-pollinator interactions has contributed to a paradigm shift from protecting individual species to protecting inter-specific relationships and landscape-level ecological processes. Despite the importance of pollinators, the ever-expanding conversion of landscapes to human uses adversely affects their habitats. A growing body of evidence indicates that these beneficial creatures are in serious decline, due to loss, modification, and fragmentation of habitat, and the excessive use of pesticides. The risk of losing the essential role of pollinators required for the successful propagation of plant communities and wildlife habitats is real. As plantings have grown larger, the need for concentrated pollinators at bloom time has grown. At the same time populations of many pollinators has been declining, and this decline has become a major environmental issue today. The study of pollinator decline is also interesting to some scientists, as pollinators have the potential to become a keystone indicator of environmental degradation. While an awareness of these relationships and processes is not new to conservation biology, the recent attention given to these topics by resource managers, policy-makers, environmental educators, and the press has been unprecedented. The ultimate goal of the pollinator conservation system is to ensure healthy and self-sustaining populations of pollinator resources

in botanic gardens. The present lecture will highlight the recent problems and future prospects of plant and pollinator resources in the context of environmental degradation and global warming for biodiversity conservation.

MICROBES FOR BIOPROSPECTING POTENTIALS, PRODUCT DEVELOPMENT AND SUSTAINABILITY

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Key Words: Bio-prospection, Bio-remediation, sustainable development, microbial product

Microbial world, a treasure in itself, if exploited judiciously, can contribute to the sustainable development. Microorganisms and microbial metabolites we can utilize as a future sustainable for agricultural, environmental and industrial developments. The latest advances in the utilization of various microorganisms for bio prospecting including their wide range of applications, environmental protection, pharmaceutical industry, and designing strategies can be harness their potential Application. Microbes have been used for microbial bioremediation approaches, including genetic manipulation, metagenomics analysis and bacteriophage-based sensors for the detection of food-borne pathogens. The latest advancement regarding the role of microbes to the sustainable development of various industrial products and their commercial utilization will be the potential application.

Symposium-II

**SUSTAINABILITY AND HEALTHCARE,
FOOD SECURITY & CLIMATE CHANGE
INNOVATION IN PLANT SCIENCE**

**RELEVANCE OF GM/GE TECHNOLOGY IN FOOD AND
ENVIRONMENTAL SECURITY OF INDIA**

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Keywords: GM/GE Technology, Food security

Farmers in India are restless because of rising cost of inputs and low farm returns. Governments have tried to diffuse the crisis through subsidies, loan waivers, price support mechanism and direct fund transfers. However, real solution lies in reducing input expenses and enhancing crop productivity. More than half of our land, about 60 percent of workforce, and nearly 80 percent of water resource are committed to agriculture, leaving much less for other sectors. With 55 percent under plough, can we aspire for recommended 33 percent forest cover? Farmers use a huge quantity of pesticide, affecting health and biodiversity. We figure low on hunger and malnutrition indices. As much as 90 million hectare is regarded wasteland. Climate change is already posing fresh challenges! Most of these problems can be addressed by application of crop biotechnology. Technology development, biosafety evaluation, regulatory process, and public awareness should go hand-in-hand to reap full benefits. GM/GE need to focus on pest resistance, stress tolerance, higher yield and improved nutritional quality. After what we know of experience with herbicides elsewhere, permitting their use in India is undesirable. Botanical community can play an important role in analyzing cost-benefit and mobilizing farmer-consumer support.

PLANT PRODUCTS AND BIOMOLECULES IN HUMAN WELFARE

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Keywords: Medicinal and Aromatic Plants, Traditional System of Medicine, Natural Products, Plant as Pesticide, Plant as Pharmaceuticals.

Plants and its products have a long history of their use for various purposes. It has been used in Ayurvedic, Homeopathic, Naturopathic and other Traditional Systems of Medicine for the prevention and treatment of various diseases and ailments. Many plants and its products have already been explored for their potentials efficacy viz., anti-aging, anti-bacterial, anti-cancerous, anti- dermatophytic, anti-diabetic. anti-fungal, anti-malarial, anti-oxidant as well as for insecticidal purposes. The traditionally used plants including *Allium sativum*, *Aloe vera*, *Azadirachta indica*, *Centella asiatica*, *Curcuma longa*, *Cymbopogon flexuosus*, *Mentha spicata*, *Phyllanthus emblica*, *Syzygium aromaticum*, *Tamarindus indica*, *Trachyspermum ammi* and *Zingiber officinale* etc were categorize as need of special attention. Further, considerable researches on pharmacognosy, pharmacology, medicinal chemistry, clinical therapeutics and drug development have already been explored on „phytochemicals“ which have great potentialities in the pharmaceutical industries. It includes the organic components of the plants such as phenolics and polyphenols; simple phenols and phenolic acids; quinones; flavones, flavonoids, and flavonols; tannins; coumarins; terpenoids and essential oils; alkaloids; lectins and polypeptides; mixtures and other compounds. Hence, these plant/ plant products can be used as an alternative to the synthetics- which have been reported as non-biodegradable and having several side effects, thus threatening our lives and environment. Therefore, the present topic deals with some of the traditionally used plant/ plant products and their biomolecules' that can be explored as potential source for human welfare.

**ROLE OF AM FUNGI IN CERTAIN FOREST AND FRUIT TREES
ENSURING AVAILABILITY OF VARIETY OF FOOD SUBSTANCES IN
CHANGING CLIMATE**

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Keywords: AM Fungi, fruit trees

Besides routine food crops like cereals and pulses the importance of other crops like pseudo-cereals and trees was realized when crop failures and famine were recorded in Ireland (failure of potato during 1845-49) and Great Bengal famine (due to loss of paddy in 1770). Great Botanist William Roxburgh suggested to the Governor of Bengal for the road side plantation of fishtail palm (*Caryota urens* L.) as the stem pith and seeds are edible and can save the man from hunger. We consume lot of coconut but leaves of fishtail act as fodder and in scarcity we can eat the stem part of fish tail palm is not known to many. In Indian villages people consume dried flowers of *Madhuca indica*, fruits of ber (*Zizyphus* spp.), date (*Phoenix dactylifera* L.), Tamrind (*Tamarindus indica* L.), plum and peach (*Prunus* spp.) etc. A large number of spices are obtained from trees and seeds of dry fruits like charoli (*Buchnania lanzan* Spreng), chilgoza (*Pinus girardiana* Wall. ex D. Don), walnut (*Juglans regia* L.) and almond (*Prunus amygdalus* Batsch.) and certain others are nutritious and relished by one and all. The relationship between AMF and plants is purely symbiotic in nature. The AMF acts as extension of the root system of plants, to assist in absorbing water and nutrients, whilst the plant provides the fungus with a source of carbohydrates. This relationship is essential for AMF as they are considered obligate biotrophs, in that they are unable to grow and complete their life cycle without the association with a living root. The symbiotic relationship is initiated when a potential host plant, releases strigolactones, a phytohormone (i.e. plant hormones), that promotes seed germination and root and root-hair elongation. The AMF hyphae penetrates the plant's epidermal cell wall, and the mycelium forms "arbuscules" which are highly branched structures for nutrient exchange with the plant. The *Pinus* has ectomycorrhiza while 95% of the angiosperms have Endomycorrhiza or AM Fungi associated with them. The paper will discuss performance of AM fungi with certain tree species which should be promoted in social forestry and agro forestry programs of government and this will help to ensure food security in difficult times.

ROLE OF AYURVEDIC HERBAL DRUGS IN THE PREVENTION AND MANAGEMENT OF COVID-19 INFECTION

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Keywords: COVID-19, Ayurveda, Herbal drugs

COVID-19 is the third known epidemic caused by highly pathogenic human coronavirus in the last two decades after Middle East Respiratory Syndrome (MERS) in 2012 and Severe Acute Respiratory Syndrome (SARS) in 2003. It can present as asymptomatic or mild to moderate illness to a severe pneumonia leading to a potentially fatal acute respiratory distress syndrome. As per World Health Organization, about 80 per cent of the COVID-19 cases are asymptomatic or mild to moderate; 15 per cent cases have severe disease; and 5 per cent progress to a critical stage with complications. Elderly population, individuals with co-morbidities and frontline healthcare workers are at the highest risk for developing COVID-19. Recently, increasing incidence of COVID-19 in younger adults and children has also been observed. The physical, psychological, social, and economic consequences of the pandemic along with the considerable morbidity and mortality have affected the world in the most unprecedented manner and has challenged the healthcare systems globally. Several countries across the globe again witnessed a rise in COVID-19 cases in 2021, comparable to or worse than the peak touched during 2020. Apart from vaccines, significant efforts have been made to develop prophylactic and therapeutic interventions against COVID-19. As of now, very few approved therapeutic options are available for the management of COVID-19, though their clinical impact is under debate in different scenarios. The current strategy of conventional medicine is broadly based on the repurposing and repositioning of existing medications and recommends them for symptomatic support. On the basis of published empirical evidence, several therapeutic interventions such as anti-viral, anti-malarial, anti-inflammatory, and monoclonal antibodies have been proposed, however, the clinical outcomes observed in clinical trials are not very promising. Traditional Chinese Medicine and other complementary herbal medicines have been found to be effective in the management of SARS-CoV-2 infection. There is growing interest in scientifically exploring the potential of Indian traditional medicine systems such as Ayurveda to manage COVID-19. Further, integrating Ayurveda with conventional medicine could offer a novel and cost-effective approach to reduce the disease burden

and assist the over-burdened healthcare infrastructure. Repurposing Ayurveda herbal interventions for early-stage COVID-19 is felt needed, given that their traditional use has established safety; and experimental studies have demonstrated their immunomodulatory, anti-inflammatory, anti-oxidant properties, and anti-viral activity. The Government of India has also supported the use of Ayurveda interventions in early-stage COVID-19 considering practice-based evidence and preliminary studies while underscoring the need for more studies on these interventions. The herbal drugs such as *Saptaparna* (*Alstonia scholaris* R. Br.), *Katuki* (*Picrorhiza kurroa* Royle ex. Benth), *Kiratatikta* (*Swertia chirata* Pexbex. Karst), *Kuberaaksha* (*Caesalpinia crista* L.), Ginger (*Zingiber officinale*) and *Ashwagandha* (*Withania somnifera*) with proven efficacy in infective febrile conditions such as malaria, microfilaraemia, chikungunya, and influenza with no safety issues observed in published clinical studies. Furthermore, previous experimental studies suggest that these drugs might exert immuno modulating, anti-inflammatory, and antioxidant activities. These effects could halt the intense inflammatory responses in COVID-19 that cause progression to significant morbidity. These drugs are repurposed for COVID-19 in this study based on a previous clinical study that showed these drugs were effective in Influenza like Illness (ILI) and a molecular docking study that revealed 35 phyto constituents isolated from these drugs demonstrated anti-viral activity against SARS-CoV-2. The details of the paper will be presented during presentation.

**THINK LOCALLY ACT GLOBALLY WITH REFERENCE TO GREEN
CHEMICALS AND ETHNOMEDICINAL PLANTS IN HEALTHCARE AND
FOOD SECURITY**

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Keywords: ethnomedicinal plants, green chemicals

India is a mega-biodiversity rich country and has varied climatic zones comprising approximately 17000-18000 species of flowering plants of which 6000-7000 are estimated to have medicinal usage in folk practices. In India, around 25,000 effective plant-based formulations are used in traditional and folk medicine and the country enjoys an important position in the global pharmaceuticals sector. Medicinal plants have been in use for the treatment of a range of diseases from the beginning of civilization. Around 65–80% of the world population living in the developing countries believes in traditional herbal medicines for their primary health care. Even in the modern allopathic system, medicinal plants are playing a key role in public health care. According to an estimate, approximately 25% of currently used medications are obtained from different higher plants. In addition, exploration of phyto-chemicals so as to formulate some novel plant based green pesticides for the management of agricultural pests is currently gaining momentum in the agriculture sector also. In view of post application side effects such as pest resistance, residual toxicity, non – biodegradable nature, ozone layer depleting effects, disruption of ecological balance and interference with the reproduction of non target species, most of the synthetic chemicals (often called as grey chemicals or xenobiotics) used as pesticides have their own limitations . Plant based formulations are chiefly biodegradable and are recognized as better sustainable and eco-friendly alternatives of synthetic pesticides in food security. Every nation has sovereign right over its biodiversity which is frequently violated by the act of biopiracy or gene robbing. There are many examples of exploitation of traditionally used medicinal plants by the biotechnologically rich but biodiversity poor countries. *Pentadiplandra brazzeana* from tropical Africa, *Vinca rosea* from Madagascar, *Curcuma longa*, *Azadirachta indica* and *Withania somnifera* from India are some classical examples of biopiracy. Due to recent developments in gene technologies, many biotechnologically rich but biodiversity poor countries are involved in the act of biopiracy by illegally patenting the traditional knowledge of other countries. Bioprospection would help the native countries in legal exploitation of the bioresources by preventing the act of

biopiracy. Hence, there is a lot of scope for India to achieve global leadership in the field of green pesticides to be sustainably and eco-friendly used in pharma sector. Looking in to different acts of biopiracy exploiting indigenous knowledge on herbal products without recognition of the owner country, there is need for bioprospection of Indian flora for novel formulations to be used in agriculture as well as pharma sector.

**SUSTAINABILITY AND HEALTH CARE, FOOD SECURITY AND
CLIMATE CHANGE - INNOVATIONS IN PLANT SCIENCES**

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Keywords: health care, food security, climate change

In the present era of uncertainties, new researches in plant sciences have succeeded in mitigating the problems in the areas of health care, food security and climate change besides others. Of all the necessities, feeding 7.5 billion mouths is the biggest challenge. Besides traditional breeding strategies, newer approaches like molecular breeding, crispr-cas/9 technology have revolutionized the gene manipulation techniques and has resulted in enhanced photosynthetic efficiency, resistance, desired nutritional supplements etc.

Another one of the biggest challenges is climate change resulting in erratic and unpredictable variations in temperature, rainfall, gaseous composition, seasonal changes etc. All of these have forced plant scientists to rethink and reassess the traditional strategies used for developing new varieties of crop plants. The challenge has been accepted and a number of new ideas have been converted into realities by developing new crop varieties adaptable for changed climatic scenario. The Covid -19 pandemic has also brought into light the innovations in plant science research, traditional as well new, to reduce, if not fully cure the impact of the deadly virus. Various dimensions of innovations in plant science research would be discussed in the presentation.

**SUSTAINABLE CONSERVATION AND UTILIZATION OF
MEDICINAL AND AROMATIC PLANTS: EMERGING VISTAS
AND FUTURISTIC PERSPECTIVES ON THE LIFE-SAVING
ANTINEOPLASTIC, ANTIVIRAL, RADIO PROTECTIVE /
RADIOMITIGATIVE COMPOUNDS**

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Keywords: Sustainable conservation strategies, medicinal and aromatic plants, alternative production systems for antineoplastic, antiviral and antiradiation compounds Medicinal and aromatic plants (MAPs) are a rich source of biologically active compounds and based on their chemical structures, several synthetically-derived compounds today are an integral part of the armamentarium for tackling several recalcitrant diseases. Consequently, the overexploitation of MAPs that yield antineoplastic, antiviral and radioprotective/radiomitigative compounds has necessitated the development of strategies for conservation and sustainable utilization of these plant species using both in situ and ex situ approaches. We developed innovative technologies for conservation of several such plant species using novel and modern biotechnological approaches and their sustainable utilization for novel and unexplored medical applications. The target species comprises of many rare, threatened and endangered species (RTEs) viz., Podophyllum hexandrum, Hippophae rhamnoides, Rhodiola imbricata, Combretum sps., Andrographis paniculata, Camptotheca acuminata, Astragalus sps., Nothapodytes foetida, Astragalus sps., Inularacemosa etc. These approaches have led to the isolation, characterization and sustainable production of important life-saving new chemical entities without affecting the environment. Our studies have also focused on Catharanthus roseus, that synthesizes some of the most structurally, chemically and biologically diverse bioactive natural anti cancer dimeric monoterpenoids indole alkaloids (MIAs) exhibiting a range of pharmaceutical activities will be highlighted. C. roseus is the sole source of the antineoplastic compounds viz., vincristine and vinblastine. The low in planta availability (0.0001-0.0005% d.w.) of these high-value, low-volume MIAs and non-availability of alternative chemical synthesis modalities has resulted in their exorbitant market cost. The MIA biosynthetic pathway is highly complex, and involves a multistep cascade of enzymatic network that completes in different cellular and sub-cellular cell and tissue compartments of the plant and is

under strict spatio-temporal regulation. MIA biosynthesis initiates with the enzyme strictosidine synthase-mediated coupling of shikimate pathway product aromatic amino acid tryptamine and the secoiridoid monoterpene- secologanin, a product of isopentenyl diphosphate pathway and produces the MIA central intermediate viz., strictosidine. Strictosidine is further processed to form the monomeric MIAs viz., vindoline and catharanthine. Finally, catharanthine and vindoline coupled through enzyme α -3,4-anhydrovinblastine synthase form α -3,4- anhydrovinblastine, which is further converted to the antineoplastic compounds vinblastine and vincristine. Alternative production systems have been investigated using tissue culture and metabolic engineering approaches in both homologous and heterologous systems. Use of improved recombinant technologies, along with genomics and metabolomics tools, further paved the path for production of these medicinally important compounds. The research conducted with medicinal plant species for sustainable production of life-saving, antineoplastic, antiviral and antiradiation compounds will be deliberated upon. A tenable model developed for some such rare, threatened and endangered species of the high-altitude cold desert region will be discussed. Our research highlights the actualization of sustainable conservation and utilization strategies for several such medicinally important species of the dry cold desert region, that are either threatened in their natural habitat and are on the verge of extinction.

HYDROGEN PRODUCTION BY ANOXYGENIC PHOTOTROPHIC BACTERIA – A POTENTIAL SOURCE OF NON-CONVENTIONAL ENERGY

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Keywords: Hydrogen, Anoxygenic Phototropic Bacteria, Non-conventional Energy

The dwindling natural resources, ever-increasing human population and the consequent increase in the demand for goods and services that are beneficial to human welfare have made it necessary to look into newer, safer, cleaner and renewable energy to cater to the human needs. Hydrogen has the highest gravimetric energy density of any known fuel and is compatible with electrochemical and

combustion processes for energy conversion without producing carbon-based emissions that contribute to environmental pollution and climate change. Further, hydrogen holds the promise of being highly efficient energy that can be used in a situation where the transfer of energy as electricity is inefficient, impractical, or impossible. It is the least capital intensive and most inflation fighting. Anoxygenic phototrophic bacteria which are widely distributed and are recorded in all kinds of stagnant water bodies proved to be efficient in hydrogen production in an economic way. Some of the purple sulfur bacteria (*Chromatium vinosum* and *C.minutissimum*), Purple non – sulfur bacteria (*Rhodospirillum*, *molish-ianum*, *Rhodobacter sphaeroides*, *Rba.capsulatus*, *Rba.sulfidophilus*, *Rba.marinus*, *Rhodopseudomonas palustris*, *Rps.acidophila*, *Rps.rutila*, *Rhodomicrobium vannielli* and *Rhodocyclus gelatinosus*) are reported to be efficient in hydrogen production. These bacteria grow under variety of conditions both as anaerobic and aerobic conditions have an added advantage for hydrogen production. Development of new technologies allowing the application of up-to-date clean and neat sources of high energy is one of the main aims of biotechnology. Varying amounts of hydrogen production were reported when they have used different technologies. Immobilization of active bacterial cells for prolonged production of hydrogen proved to be most successful. The utilization of distillery waste water for hydrogen production in one-stage and two-stage processes involving photo fermentation are also reported. The various aspect of hydrogen production by anoxygenic Phototrophic bacteria and large scale fermentative production of hydrogen have been discussed. The biological significance and prospects of hydrogen as alternate energy source for future are discussed in the light of recent researches.

CAMPTOTHECIN AND CAMPTOTHECIN PRODUCING PLANTS

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Keywords: Camptothecin, bioactive compounds, quinoline alkaloid
Camptotheca acuminata, Nothapodytes nimmoniana

Drug discovery from medicinal plants includes numerous fields of inquiry which begins with taxonomists, ethnobotanists, chemists and ethnopharmacologists. Phytochemical diversity in higher plants still offers a valuable source of novel lead discovery, but rapid identification of the bioactive compounds of natural product mixtures remains a critical factor to ensure that this new tool of drug discovery need to compete with recent developed technologies such as chemical compound libraries and high throughput screening of combinatorial synthetic efforts. Camptothecin is a quinoline alkaloid, initially isolated from the bark and stem extracts of the Chinese tree *Camptotheca acuminata*. In India it is being extracted from *Nothapodytes nimmoniana*. Camptothecin analogues are useful in treatment of colon, lung breast, uterine, and cervical cancers and is also an active inhibitor of Topoisomerase I and HIV replication in vitro. It is the third greatest promising and sought after alkaloid by the pharmaceutical industry around the globe after taxol and vinca alkaloids. Worldwide demand for camptothecin is escalating every year and its market size has reached 3 billion US \$ per year for which nearly one ton of raw camptothecin is required. Studies on the mode of action of camptothecin revealed that the synthesis of macromolecules such as RNA, DNA and protein are inhibited by camptothecin in tumor or dividing mammalian cells. Furthermore it was found that the molecular target of camptothecin is DNA topoisomerase. Apart from anticancer activity this compound exhibits potent anti-HIV efficacy and also against parasitic trypanosomas and leishmania. Camptothecin analogs reported from taxonomically unrelated families of Apocynaceae, Betulaceae, Gelsemiaceae, Icacinaceae, Loganiaceae, Nyssaceae and Rubiaceae. Among the 416 families of higher plants represented worldwide, 6 families and 17 genera are reported as camptothecin sources. But all the members of the plant groups are not screened so far with regard to the identification of the respective phytochemicals.

Random selection of medicinal plants for drug discovery programme is effective and sometime efficient for getting appropriate candidate medicinal species for drug investigation purposes. Only two CPT analogues are launched in the market that are Topotecan and Irinotecan and other 15 more analogues are yet to be screened for their anticancer potential. Camptothecin chemistry, Pharmacological potential of camptothecin analogues, pharmacological properties evaluated so far, biosynthetic routes and bioengineering process, production of camptothecin through various tissue culture methods, production through endophyte culture, biotransformation studies by Agrobacterium mediated gene transfer, elicitation of camptothecin synthesis by chemical elicitors and finally detection of gene based screening by bio mining methods will be discussed.

UNDERSTANDING PLANT REPRODUCTIVE BEHAVIOR AND ITS RELATIONSHIP WITH SUSTAINABILITY AND CLIMATE CHANGE

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Keywords: climate change, stress-tolerant crop, stress-busting cultivars

Over the past several decades anthropogenic and other stresses together with the climatic fluctuations both natural and imposed by man have taken a toll on biodiversity world over. A rapid decline is being observed across geographic and political barriers. J & K has not remained untouched. Home to rich floral and faunal diversity, this part of the country also harbors economically important plants of food, medicinal and other values. Others of lesser importance also abound the region. Parallel to these are the ones that have great nuisance index. The latter two categories are resistant or resilient and effectively compete with the sensitive plants under conditions of environmental extremities like urbanization, population explosion, and climate change. This seemingly negative aspect that leads to biodiversity erosion on one hand has a positive side to it on the other; that of greater waste land conversion. This competency is by virtue of their ability to sense, innovate and adapt to climatic fluctuations. A detailed investigation of these finer behavioral responses can lead to understanding and identification of stress-responsive genes and can serve as a potent tool in developing stress-tolerant crop cultivars. The presentation will focus on life-form strategies of few such taxa in response to environmental cues and their future prospects in developing stress-busting cultivars.

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IV
ABSTRACTS OF
ORAL / POSTER PRESENTATION

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SUB-SECTION – I
Algae, Bryophytes, Pteridophytes
and Gymnosperms

I-01 EXPLORING THE LIVELIHOOD GENERATING POTENTIAL OF PINE (*PINUS ROXBURGHII*) NEEDLES

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Key Words- Pine Needles, Bioenergy, Sustainable Development, Employment

Himalayan forests are destroyed annually due to wildfires. Pine (*Pinus roxburghii*) needles are highly inflammable which covers the forest floor, becomes the reason for such for the fires. These needles are rich in resin content which causes forest fires. In state of Uttarakhand, a company has developed a community-based business model to collect these needles and generate electricity from them. The aim is to prevent the forest fires, generate local employment, and improve the regions' erratic power supply. The Government of India has also taken some major steps for the same under 'Unnat Bharat Abhiyan'. The purpose of this paper is to address the methods of utilizing pine needles for social benefit by making pellets which can be used as fuel for domestic/industrial purposes.

I-02 STUDY OF BIO-ASSEMBLAGE RECORDED FROM HOLOCENE SEDIMENTS FOR UNDERSTANDING ENVIRONMENT OF DEPOSITION OF LOWER BENGAL BASIN, INDIA

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Keywords: Holocene; Lower Bengal basin; Bio-assemblage; Environment of deposition

Study of diverse biological remains of diverse eco-system including mangrove in the C¹⁴ dated Holocene sediments has generated rich data revealing the palaeoecological change and the phases of environment of deposition that occurred in the Lower Bengal basin, India. The successive phases of environment of deposition identified through bio

assemblage recovered from measured sections of the four locations viz. Kumirmari (KUI), Dakshin Harishpur (DHI, Taldi (TDI) and Canning (CNI) are mixed brackish water and fresh water tidal mangrove with regular inundation (Phase I), tidal mangrove with regular inundation (Phase II), *Phoenix* dominated mangrove upland (Phase III), swampy mangrove to tidal mangrove (Phase IV), brackish water mixed fresh water *Heritiera* forest (Phase V) and fresh water grassland to fresh water swampy condition (Phase VI).

I-03 STUDY ON THE CRYPTOGAMS OF THE HILLY REGION OF WEST BENGAL IN AN EX SITU GROWTH CHAMBER: A STEP TOWARDS THEIR CONSERVATION

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Keywords: Cryptogams, Growth chamber, Humidity, Temperature, Low cost.

Northern parts of West Bengal especially the hilly region contain rare and endangered plants. Among these plants, some plants are used as specimens for practical purposes. These plants are massively collected during student excursions. Other causes like soil degradation and environmental pollution these plants are facing serious threats in their natural habitat. A low-cost plant growth system has been developed to grow and study of those plants in ex situ condition. An area survey have been done to assess the periodic degradation of plants of Darjeeling district. Different types of cryptogams are taken from the area as model plants to grow in the system. The system is run by solar energy and maintained by some simple apparatus for maintaining temperature, humidity, light etc. The water source is used from the preserved rainwater throughout the year. The result of photosynthetic pigment content, dry weight and moisture content signifies the healthy condition of the plants inside the system. This process of acclimatizing cryptogams in a system could be a noble approach towards endangered plant conservation.

I-04 FILIFORM CYANOPHYTA FLORA FROM JUNNAR TEHSIL (PUNE DISTRICT) OF THE NORTHERN WESTERN GHATS OF MAHARASHTRA (INDIA)

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Keywords: Algae, Filiform, Cyanophyta, Junnar tehsil, Western Ghats

The Western Ghats is one of the 34th biodiversity hot spots with a rich combination of algal flora together with cyanophyta. Cyanophyta also known as Cyanobacteria are nitrogen fixing and photosynthetic autotrophic microorganisms. The significant contribution in the present day a food sources, fodder, biofuels, fish cultivation, medicines, and green manure. Among the algal diversity cyanophyta group is one of the ancient algal groups on the earth. It is cosmopolitan in distribution on the planet. To overcome the knowledge gap, the present research was carried out on the cyanophyta flora of the northern Western Ghats in Junnar tehsil (Pune district) of Maharashtra, India. The studied area's immeasurable cyanophyta specimen collections were conducted during pre-monsoon and post-monsoon. The most significant species of cyanophyta was found on soil, tree bark, and rock surfaces. A total of 107 filiform cyanophyta taxa were identified with the help of available literature. The highest number of cyanophyta were documented from Junnar tehsil with 20 Oscillatoria taxa. During the study, we documented filiform major cyanophyta taxa followed by 3, 4, 6, 8, 8, 8, 10, 10, 15 and 20 of Microcoleus, Gloeotrichia, Spirulina, Nostoc, Anabaena, Calothrix, Lyngbya, Phormidium, Scytonema and Oscillatoria respectively.

**I-05 DIVERSITY AMONG FRESH WATER EUGLENOIDE –
(TRACHELOMONASEHRENBURG, 1883) DIST. NASHIK (MH) INDIA**

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Keywords : Diversity, Fresh water algae, Trachelomonas, Euglenoide, Nashik.

Fourteen taxa of *Trachelomonas* were recorded by the author during investigation of the fresh water algae of different localities in and around the Nashik district. Taxa were identified in live conditions only. These unicellular green euglenoide are being reported from the first time from this locality. Most of the identifying taxa occur in dark green colour, stagnant water bodies, contaminated by animal pollution or decaying organic matter. These euglenoids were reported first time from this region.

**I-06 A NEW MULTILOCULAR FRUIT FROM THE DECCAN
INTERTRAPPEAN BEDS OF MOHGAON KALAN, M.P. INDIA**

Lina S. Konde

Keywords: *multilocularcapsular fruit*, inter-trappean beds of Mohgaonkalan.

The paper describes a multilocularcapsular fruit collected from the inter-trappean beds of Mohgaonkalan. The fruit is dicotyledonous, multilocular, multiseeded with axile placentation. Pericarp differentiated into epicarp, mesocarp and endocarp. Epicarp with epidermis followed by thin parenchymatous cells. Mesocarp with air cavities and parenchymatous cells. Endocarp having thick walled parenchymatous cells without intercellular spaces. It is multilocular and multi seeded with single seed in each locule with axile placentation. The fossil is compared with the living families Malvaceae, Pittosporaceae, Ochnaceae, Melastomaceae, Begoniaceae, Campanulaceae and Lythraceae and also with already described fossil multilocular fruits *Indocarpaintertrappea* (Jain, 1964), *Harrisocarponsahnii* (Chitaley and Nambudari, 1973), *Sahnicarponharrissi* (Chitaley and Patil, 1973),

Daberocarpongerhardii (Chitale and Sheikh, 1971), *Deccanocarponarnoldii* (Paradkar, 1975), *Wingospermocarponmohgaonse* (Sheikh and Kapgate, 1984), *Triloculocarponmahabalei* (Kapgate, 1982), *Burseraceocarponramanujami* (Adhao, 1986) *Gardoniocarponmohgaonse* and *Nicardocarponramanujami* (Chudiwale, 1990) and *Enigmocarponparijaii* (Sahni, 1943). It is evident from the study that the fossil fruit is referable to family Lythraceae but does not correlate with any of the living and fossil genus described earlier in toto. Therefore, it is placed under new form genus *Rodeocarponmohgaonse* gen. et sp. nov. the generic name being after the well known Geologist late Prof. K. P. Rode and specific name is after the locality Mohgaonkalan.

I-07 PETRIFIED UNILOCULAR FRUIT FROM THE DECCAN INTERTRAPPEAN BEDS OF MADHYA PRADESH INDIA

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Keywords:- Dicotfruit, Indehicent, unitegmic, Tiliaceae Deccan Intertrappean, M.P.India.

A well preserved dicot fruit was collected from Jamsavli (Lat 21°, 30' to 22°, 55' N and Long 78°, 15' to 79°, 20' E) in Chhindwara District, M.P. The fruit is hexagonal shape, without stalk. The fossil fruit is unilocular and is characterized by presence of unitegmic seed. The fruit is capsular and indehiscent. The fruit though shows some characters of the present day families like Amaranthaceae, Sapindaceae, Meliaceae, Menispermaceae, Tiliaceae, Burseraceae. It has close affinities with the members of the family Tiliaceae. It could not conclusively be traced to any particular genus but it broadly placed under Tiliaceae.

**I-08 POTENTIAL OF MICROALGAL OIL FROM *DUNALIELLA SALINA*
AS A FEEDSTOCK FOR BIODIESEL PRODUCTION**

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Keywords: *Dunaliellasalina*, Biodiesel, FAME, GC-MS, Blight and Dyer.

Green energy is safe to meet the global demand of fossil fuel and mitigate the greenhouse gases emission due to their use. This study discusses the prospects of halophilic microalgae *Dunaliellasalina* as a potential feedstock for biodiesel production. In this respect *D. salina* microalgal strain was obtained from the culture collection repository of Rajasthan University, Jaipur. It is cultured under controlled laboratory conditions. The biomass obtained at the end of exponential phase was 1.2g/1 dry wt. while the algal oil was about 23.3 % of the biomass. The algal oil was converted into biodiesel by trans esterification. Several types of the Fatty acid methyl esters (FAMES) formed were identified by GC/MS analysis. It is concluded that four major fatty acid palmitic acid (16:0), oleic acid (18:1), linolenic acid (18:3) and linoleic acid (18:2), which are found in microalgae, makes *D. salina* a promising feedstock for biodiesel production.

I-09 OCCURRENCE OF PERMANENT ALGAL BLOOMS IN TWO PONDS OF SASARAM AT DISTRICT ROHTAS WITH SPECIAL REFERENCE TO FACTORS RESPONSIBLE FOR ITS PRODUCTION

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Keywords: algal blooms, cyanobacteria, eutrophic, nitrate, phosphate

The aim of this research was to analyze the key mechanisms and responsible factors related to the harmful algal blooms in a shallow eutrophic pond Sasaram during the year 2019. The pond is regularly used for dumping of domestic solid wastes and waste water, regular dumping of domestic sewage, the pond has become highly eutrophic having dense algal blooms caused by cyanobacteria. High concentration of phosphate and nitrate were the two major factors to promote the growth of algae and cyanobacteria. Permanent cyanobacterial blooms were characterized. Good growth of *Anabaena* and *Mycrocystis* were observed during the course of study.

I-10 REPORT OF A FOSSIL MEGASPOROPHYLL WITH A PAIR OF OVULES FROM THE DECCAN INTERTRAPPEAN BEDS OF PUDIYAL MOHADA, TALUKA-JIWATI, DIST.- CHANDRAPUR, MAHARASHTRA, INDIA

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Keywords: *Megasporophyll, Deccan Intertrappean Beds, Pudiyal Mohada, Chandrapur*

The present paper describes a fossil megasporophyll with a pair of ovules from the Deccan Intertrappean beds of the Deccan Intertrappean Beds of Pudiyal Mohada, Taluka-Jiwati, Dist.-Chandrapur, Maharashtra, India. Two ovules are oppositely placed and are completely surrounded by an ovuliferous scale. Integument is multilayered and differentiated into three zones, viz., outer and inner soft, while middle is stony. Micropylar canal is narrow. It is compared with modern taxa of Cycadales and Coniferales with the families like Pinaceae, Taxodiaceae, Cupressaceae, Podocarpaceae, Cephalotaxaceae and Araucariaceae and also with earlier

described fossil ovules. It is evident from the study that present fossil megasporophyll resembles with *Coniferoovulites* with minor differences and hence named as *Coniferoovulitespudiyalii* sp. nov. I-11

PALAEOCLIMATIC CLUE OF CENTRAL INDIA DURING MAASTRICHTIAN PERIOD

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Keywords: - Megaflora, Diversity, Fossils, Deccan Intertrappean beds, Maastrichtian.

In the central India late Cretaceous or Tertiary system of volcanic rock formation is known as Deccan Traps. In peninsular region of India, these traps spread about a very large area of 5, 20,000 km covering almost all of Maharashtra, Madhya Pradesh, part of Gujarat and Andhra Pradesh marginally. In these beds, besides to all groups of plants, Ostracodes, Molluscus, fishes & other vertebrates flourished. The important fossiliferous localities of Maharashtra includes Malabar and Worli hills of Mumbai and Vidarbha region which includes Buldana, Amravati, Chandrapur, Kondhali, Mahurzari, Phutalatank, Takli and Sitabuldi near Nagpur; Nawargaon, Maragsur near Wardha; Jhargad, Sibla near Yeotmal. The fossil flora of this region has been treated as a single assemblage because many of the forms are common to these localities.

From the analysis of fossil flora of Vidarbha region the following habitats and climatic conditions can be suggested (i) Coastal or estuarine – *Sonnertioxylon*, *Palmocarpon*, *Arecoidocarpon*, *Cocos*. (ii) Mangrove and Saline habitat - indicated by *Acrostichum*, *Pandanaceoxylon*, *Palmoxylon*, *Viracarpon* and *Nipa*. (iii) Fresh water - indicated by fresh water algae. (iv) Marshy – Fungal forms which grew luxuriantly. *Acrostichum* and *Aeschynomea* plant of marshy habitat. (v) Terrestrial and upland- indicated by conifers and other arborescent angiosperms. (a) The wet Evergreen to Semi-evergreen forest: - Conifers, *Cocos*, *Aeschynomene*, *Elaeocarpus*, and *Ailanthus*. (b) Dry deciduous forest – *Phoenix* (*Palmoxylon* spp.), *Grewia*, *Anacardioxylon*, and *Ebenoxylon*.

SUB-SECTION-II

Mycology, Plant Pathology and Microbiology

II-01 EFFECT OF BIOCHAR ON AGRICULTURE AND MYCORRHIZA

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Keywords: biochar, pyrolysis, feedstocks, soil, crop productivity

Abstract

Biochar is a carbon rich material produced from the pyrolysis of biomass., obtained from forestry wastes, animal manures and crop residues which are the best feedstocks. A brief summary provides on the effect of biochar on soil and crop productivity. Biochar is produced through pyrolysis. carbonization and hydrothermal carbonization of various feedstocks. Its incorporation in soil affects the physical and chemical properties which gives a new approach to achieve biological, agricultural and environmental benefits. In earlier studies researchers found it as an effective soil amendment tool as its application comprehend a new approach and has a great significance in increasing carbon storage, improving soil nutrient, soil fertility, crop productivity and maintaining the balance of soil ecosystem by their bio- physical interactions. The combined application of biochar and AMF had a significantly positive impact on spinach plant growth, root morphological traits, physiological properties and soil enzymatic activities.

II-02 STUDY OF GROWTH AND CULTIVATION OF OYSTER MUSHROOM

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Keywords: Cultivation, Mushroom, Oyster, Substrate, Technique.

Abstract

Mushrooms are the fruiting bodies of some members of a lower group of plants known as fungi. Mushrooms are popular for their delicacy and flavor. They are excellent source of vitamins, Proteins and Minerals. They are good source of Vitamin B, folic acid, the body building vitamin, useful in anemic condition. With increasing population, food demand problems in developing and under developed country, mushroom can play an

important role to enrich human diet particularly in India where a large section of population are vegetarians. It is an ideal means of recycling agro waste which are available abundantly. Oyster Mushroom Cultivation is most commonly cultivated mushroom in India.

The steps involved in cultivating Oyster mushrooms are substrate preparation, spawning of substrate, Incubation, fruiting and harvesting. The complete process takes 20 - 30 days to get a good and healthy yield. The main objective of this paper is to investigate the easily acceptable and low cost technique of Oyster mushroom cultivation.

II-03 DIVERSITY OF WILD EDIBLE MACROFUNGI FROM DISTRICT AYODHYA, UTTAR PRADESH, INDIA

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Abstract

Keywords: Diversity, Macrofungi, Mycoflora, Mushroom, Wild Edible, Ayodhya

Macrofungi is one of the important mycoflora which has highest economic importance regarding to the other Fungi. Macrofungi may have properties with edible and medicinal values. The present study deals with the status of edible macrofungal diversity in Ayodhya district of Uttar Pradesh. A running survey was undertaken during June 2021- June 2022 (One Year) in different sites of study area. A total number of 270 Mycofloral sample were collected which belong to 62 edible Species of 19 family. Highest number of macrofungi belongs to family Agaricaceae (19) followed by Tricholomataceae (09), Lycoperdaceae (05), Pleurotaceae (05) and Pluteaceae (05) whereas the only one edible macrofungi belongs to family Albaratrellaceae, Amanitaceae, Cantharellaceae, Coprinaceae, Fomitopsidaceae, Meripilaceae, Polyporaceae, Sparassidiaceae and Tuberaceae followed by family Auriculariaceae, Hygrophoraceae, Lentinaceae, Psathyrellaceae and Russulaceae with two edible macrofungi. Diversity assessment was done by different indexes Shannon's Index, Simpson's Index, Inverted Berger-Parker Dominance Index, Margalef's Richness Index, Evenness Index. The results of diversity indices indicate the highest species richness of study area. The edibility of diversified macrofungi may become an important economic and nutritional source for local tribes and villagers.

**II-04 ANTIBACTERIAL ACTIVITY OF ENDOPHYTIC FUNGUS
CHAETOMIUM JODHAPURANS ISOLATED FROM MEDICINAL PLANT
TRIDAX PROCUMBENS (L.)**

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Abstract

Keywords: *Chaetomiumjodhapurans*, *Tridaxprocumbens* Medicinal plant, Antibacterial Activity.

Tridaxprocumbens (L.) is very promising medicinal plant used against several ailments since ancient times. Endophytes are the plant-associated microorganisms that live within the living tissues of their host plants without causing any harm to them. They stimulate the production of secondary metabolites with diverse range of biological activities. In the present investigation endophytic fungus *Chaetomiumjodhapurans* was isolated from healthy plant parts of *Tridaxprocumbens* (L.) The isolate was cultivated on potato dextrose broth for 3 weeks and aqueous extract was analyzed for antibacterial activity against five bacterial strains i.e. *Staphylococcus aureus* (ATCC-6538), *Klebsiella pneumonia* (ATCC- 4352), *Escherichia coli* (ATCC-8739), *Streptococcus pneumonia*(ATCC-6303) and *Salmonella typhimurium*(ATCC-14028).The aqueous extract (25 ul) of endophytic fungus *Chaetomiumjodhapurans* showed the broad spectrum activity against five pathogenic bacteria.

II-05 KNOWLEDGE AND DOCUMENTATION OF WILD EDIBLE AND NON-EDIBLE MUSHROOMS USED BY THE LOCAL COMMUNITIES IN KHUNTI DISTRICT OF JHARKHAND

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Abstract

Keywords: Mushroom, Nutritious, Edible, Jharkhand.

The word **mushroom** is used for fungi and moulds in French. Since ancient times, mushrooms have been regarded as a special kind of nutritious food. The forest provides large and diverse options to the villagers in the form of varieties of wild edible and non edible mushrooms. They are rich in protein and have high medicinal value. The wild edible mushrooms are very important in food security of tribal group throughout the Jharkhand. The aim of this study is to produce a prior mushrooms checklist based on the collection and document the edible and non edible mushroom from Khunti district of Jharkhand.

II-06 STUDIES ON SOME WOOD INHABITING POLYPORES FROM SATARA DISTRICT (M.S).

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Abstract

Keywords: Satara, Polypore, White rot.

The goal of the current study was to catalogue the diversity and distribution of polypores in Satara District Maharashtra located in the Western Ghats of India. Throughout the duration of the investigation, the study was conducted between Jan 2019 to Aug 2022. From the different location 7 polypore species from 6 genera were identified. Out of 7 there were 5 annual species and 2 perennial species. White rot was found to be much more prevalent than brown rot polypores when reviewing the reported rot features.

II-07 ISOLATION OF CRYPTOCOCCUS NEOFORMANS FROM PIGEON DROPPINGS IN BHOPAL, INDIA

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Abstract

Keywords: Cryptococcus neo formans, Cryptococcosis, Pigeon droppings, Bhopal.

Cryptococcus neoformans is an opportunistic human pathogen that causes cryptococcosis, a life-threatening infection that is usually manifested as meningoencephalitis mainly in immune compromised patients.

Objective: The objective of this study was to evaluate the presence of Cryptococcus neoformans in Bhopal, India. Materials and methods: hundred samples of pigeon droppings were collected from 7 different regions in Bhopal. Each sample was suspended 1:10 in saline solution and then cultured in Staib's medium with biophenyl and chloramphenicol. Identification of C. neoformans was performed on the basis of melanin synthesis on bird seed agar medium, presence of a capsule in India ink preparation, urease production on urea agar medium, and ability to grow at 37°C. An assimilation test was also used to confirm C. neoformans.

Results: Out of the 100 samples, 70 (69%) were positive for C. neoformans. The highest frequency of C. neoformans observed from pigeon droppings was found 86.8% from the site 2 (Nadra Bus Stand, Bhopal & Moti Masjid Bhopal) and the lowest frequency was obtained for samples from sites 3, and 6, (Durga mandir Bhopal & Saifia Science college Bhopal).

Conclusion: Our study showed the presence of C. neoformans in an urban environmental sources at places with a large population in Bhopal.

II-08 MYCORRHIZAL INOCULATION OF MICROPROPAGATED LEUCAENA LEUCOCEPHALA USED IN REFORESTATION PROGRAMS

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Abstract

Keywords: Micropropagation, Arbuscular mycorrhiza fungi(AMF),
Leucaenaleucocephala, Reforestation

Among techniques of plant biotechnology, micropropagation is often cited as the most successful example which has become an important commercial industry. However, during acclimatization stage plants are subjected to severe environmental stresses which results in poor growth and very low survival of micropropagated plants. Due to their economic and ecological importance, the leguminous trees constitute a significant component of forest vegetation. Mycorrhizal fungi are normally an integral part of most plants under field conditions. Mycorrhizal association is formed by nearly all plants which are currently micropropagated. The effect of mycorrhizal inoculation during *ex vitro* hardening stage on growth and survival of micropropagated plants was studied using *Leucaenaleucocephala* as test plant. *Ex vitro* inoculation with Arbuscular Mycorrhizal Fungus (AMF) *Glomus macrocarpum* plays an important role in improved growth, establishment, nutrient status as well as survival of micropropagated plants. Plants inoculated with *Glomus macrocarpum* showed significant increase in all plant growth parameters. Root length, shoot length, number of leaves, plant biomass significantly increased due to mycorrhizal inoculation. Percent survival was also considerably influenced by mycorrhizalinoculation. After 150 days, the survival percent was zero in uninoculated control as compared to 90% in mycorrhizal plants. An early inoculation of micropropagated plants with AM fungi will ensure improved growth and survival of micropropagated forest trees during nursery stage to be used in reforestation programs.

**II-09 EFFECT OF PASSAGE ON THE EMERGENCE OF CARBENDAZIM
RESISTANCE IN THE SCLEROTIUMROLFSII SACC. CAUSING TUBER
ROT OF SWEET POTATO.**

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Abstract

Keywords: MIC, *Sclerotiumrolfsii*, Passage, Tuber, Sweetpotato, etc.

Twenty isolates were isolated from the samples of tuber rot of Sweet potato, were gathered from various locations in the Kolhapur, Ratnagiri, Satara, Pune, Jalgaon, Sangli, and Solapur districts of the Maharashtra state. The sensitivity of 20 *Sclerotiumrolfsii* isolates to carbendazim was tested one by one. In vitro and in vivo tests revealed differences in the MIC of carbendazim for the isolates. SR-10 isolation from Rahimatpur was found to be very resistant and tolerated 500 ug/ml concentration of Carbendazim, SR- 5 isolate from Kadve location was found to be more susceptible and tolerated 10ug/ml concentration of carbendazim. Carbendazim resistance in *Sclerotiumrolfsii*Sacc. Was significantly induced when in vitro sensitive isolate (SR-5) was cultivated on the drug continuously for eight passages. Tuber rot of the sweet potato is caused by carbendazim continuous treatment, which raised the percentage of infection in *Sclerotiumrolfsii* Sacc. Use of the alternate medications Kocide and Carbendazim at the fourth passage, Aliette and Nacopper at the third passage, and Benofit at the first passage all effectively prevented the spread of pathogens to the sweet potato tuber. Benofit, Aliette, and carbendazim together totally stopped the infection at the first passage. When combined with carbendazim, nacopper inhibited pathogen infection at the fourth passage, while Kocide stopped infection at the third passage. The conclusion drawn from continuous passage is that a pathogen may become resistant to a single fungicide if it is applied continuously. A different passage shown that the best results for fungicide resistance in pathogens can be obtained by using fungicides in a different way. Application of two or more fungicides in combination can produce the best results in the treatment of diseases, according to mixture passage (*in vitro* and *in vivo*).

**II-10 A TRADITIONAL METHOD OF PROCESSING AND
FERMENTATION OF INDIGENOUS FISH PRODUCT OF ASSAM**

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Abstract

Keywords: Traditional, fermented, Shidol.

Shidol is a popular fermented fish product of Assam. It is a yellowish, pasty and solid fermented product of the fish *Puntius* spp. Shidol is extensively consumed by the people of Assam, particularly the Bengalee community and ethnic people. Shidol is consumed after preparing *Shidol Chutney* or *Shidol Curry* locally called as *Bharta*, which is believed to have anti-malarial activity. In present study, a survey has been conducted in Bangalee and ethnic community inhabited parts of Assam and data relating to traditional method of processing and fermentation have been obtained. An approach has been made to prepare and practice the processing and fermentation method of this fish product in vivo. A few prominent steps in processing and fermentation are collection of raw fishes, descaling, de-gutting and washing, semi-drying in the sun, packing in oil-processed closed earthen pot and incubation on the ground for 3-4 months. Awareness campaign relating to its utility and popularization of this fermented fish product has been made.

II-11 APPLICATION OF NANOPARTICLES TO REGULATE THE PATHOGEN HARMFULNESS

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Abstract

Keywords: Nanotechnology, Nano-pesticides, Disease management.

The backbone of a nation's economy is agriculture, which has risen in recent years along with the use of herbicides and insecticides. However, in the current situation, agricultural approaches are concerned about the widespread use of chemical pesticides used to control microorganisms and insects because these approaches are not only harmful for the environment and plants but it also reduces crop yield in many agriculturally fragile locations, significantly due to the diseases caused by plant pests and pathogens after a certain period of time. Farmers are also facing numerous difficulties as a result of the rising demand for food supply. Therefore, to combat with such an alarming situation, a strict dynamic approach should be used with cutting-edge technology that incorporates smart materials with biological elements for sustainable distribution with prolonged efficiency to curb these diseases. Nanotechnology provides a straightforward solution to the issues with disease management. The creation of innovative nanocomposites for better disease control can reduce the spread of resilient, persistent pathogens and the damage caused by the diseases and hence reduces the agricultural losses.

**II-12 FUNGAL ENDOPHYTIC ISOLATES ASSOCIATED WITH
*EULOPHIA NUDA LINDL. (ORCHIDACEAE).***

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Abstract

Keywords: *Eulophianuda* Lindl., anticancerous, anti-diabetic, and anti-inflammatory

Orchids with diverse floral traits and minute non-endospermic seeds require fungal association for germination and growth. Thus mycological studies have a prime role in orchids' life span. The studied taxon, *Eulophianuda* Lindl. is widely used in the tribal areas of Maharashtra for various therapeutical uses. The secondary metabolites secreted by the orchid possess an anticancerous, anti-diabetic, and anti-inflammatory property which seems to be a probable consequence of successful association with their symbiotic fungal partners. The study basically is emphasized on isolation of endophytes from the leaf tissues of the taxon. The evaluated reports reveal that most of the endophytic fungi belong to the division Ascomycota, which may have better adaptations to colonize the internal tissues of their host plants.

**II-13 MYCOPATHOLOGICAL STUDIES OF POST-HARVEST DISEASES
OF *SOLANUM TUBEROSUM* (POTATO) OF AMRAVATI REGION**

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Abstract

Keywords: *Solanumtuberosum*, Post-harvest diseases.

Solanumtuberosum (Potato) family Solanaceae is an important vegetable tuber use for various vegetable and food product in our region. But it is observed that most of the potato get destroyed in stored condition and it get rotten or become useless for its economic use, so that the screening of the potato tubers in stored condition was performed during July 2017 to February 2018 and it is observed that tubers get infected by various

pathogens such as *Fusariumoxysporum*, *Rhizopusstolonifer*, *Phomaexigua*, *Rhizoctoniasolani*etc. In order to confirm the pathogenesity of the fungus, the Koch postulates methods was carried out and above fungi were found is causing diseases to the *Solanumtuberosum* (Potato). A cultural study of pathogens was carried out and it is investigated that these pathogenic fungi were the effect of secondary inoculums as they were not observed in fresh potato tubers. Various control measures are suggested to prevent the post-harvest diseases of this tuber.

II-14 AN ENZYMATIC MYCOREMEDIAL APPROACH FOR DEGRADATION OF ANTHRAQUINONE DYES

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Abstract

Keywords : Anthraquinone , Enzymes, Environment , Mycoremediation

Synthetic dyes are widely utilised in the textile, paper, leather, plastic, pharmaceutical, cosmetic, culinary, and other industries and they use dyes like azo, anthraquinone, sulphur, triarylmethaneand phthalocyanine. Anthraquinone(AQ) dyes, the second abundant class of dyes having complex stable structures, xenobiotic nature, thermal resilience and photostability making them difficult to degrade. The primary enzymes generated by dye decolorizing microorganisms for bioremediation procedures include laccase, peroxidases, tyrosinasereductase, lignin peroxidase, and veratryl alcohol oxidase. Enzyme-based biological degradation is a promising and innovative technique to catalyse or metabolise the pollutantinto nontoxic formswhich are environmental friendly, inexpensive and can be considered as molecular weapon for bioremediation of AQ dyes.

II-15 ANTIMICROBIAL POTENTIAL OF SOME IMMUNO-MODULATOR PLANTS

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Abstract

Keywords: *Tinospora*, *Phyllanthus*, Antibacterial, Kirby-bauer, Phytochemicals

Botanical immunomodulators are substances of plant origin which stimulates or suppress the components of immune system. Immune function modulation with plants and their medicinal products as a therapeutic agent has emerged as a modern approach. In the present study antibacterial activity of Leaves of some immunomodulator plants such as *Tinosporacordifolia*, *Phyllanthusemblica*, *Asparagus racemosus*, *Withaniasomnifera* and *Allium sativum* was tested against some human pathogenic bacteria viz. *E. coli*, *Salmonella typhi*, *Klebsiellapneumoniae* and *Enterobacteraerogenes* procured from IMTECH, Chandigarh. Disc diffusion method was used to determine the antimicrobial activity of different leaves extracts (Aqueous, Ethanol, Chloroform and Petroleum Ether). Ciprofloxacin was used as positive control whereas DMSO and water as negative controls. All the extracts exhibited significant antibacterial activity and highest activity was observed in chloroform extract of *Tinosporacordifolia* leaves against *E. aerogenes*. Ethanolic extract of leaves of *Asparagus racemosus* and *Allium sativum* were found highly effective against *S.typhi*. Phytochemical analysis for all the leaves extract was also done. The study revealed that all the plants tested are not only known for their immune booster properties but also possess significant antibacterial activities.

**II-16 THE STUDY OF FUNGAL AND ANGIOSPERMIC PLANT
BIODIVERSITY OF AMBESHWAR SACRED GROOVE OF AMBA FROM
WESTERN GHATS OF MAHARASHTRA**

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Abstract

Keywords: *Angiospermic* plant, Western Ghats of Maharashtra, Ambeshwar

Sacred Groves are woodland that has historically been kept safe by being associated with religion. Tree groves that have unique religious significance within a specific culture are known as sacred groves or sacred woodlands Throughout India, there are numerous sacred groves that are guarded. Approximately 9750 sacred groves are present all over India. These forest zones were not recognized by any of the regulations in effect prior to 2002. However, the Wildlife Protection Act of 1972 was amended in 2002 to include Sacred Groves in its purview.

The biodiversity of the flora in the Ambeshwar sacred woodlands close to Kolhapur is described in the current research. Ambeshwar Sacred Grove is in Amba and is called after the 400-year-old temple devoted to the deity Ambeshwar (Lord Shiva). The people honor the god as their local deity and protect the biodiversity within the sacred grove because they still follow to the ancient practices of worshipping the god. A study of the floristic and how the natives use it is also included. It displays a wide variety of fungi and angiosperm plants. Forty-five species of angiospermic plants and fifteen species of fungi were discovered.

Sacred groves were kept up by the neighbourhood communities, and hunting and logging were strictly forbidden inside these patches. While the majority of these sacred figures are connected to regional Hindu deities, there are also documented sacred trees. It falls under in-situ conservation in terms of current conservation techniques. The ancient conservation practice is in threat even if man is reaching a modern period and is knowledgeable about numerous scientific conservation strategies the majority of the species used were found in the sacred groves. The deterioration of the plants was on the rise as a result of the locals using the sacred grove for their daily needs, and it is believed that many of the unique and endangered plants would become extinct if this trend keeps up.

II-17 GEO-MYCOFLORA OF NAUBATPUR

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Abstract

Keywords: Geo–mycoflora, fertility, soil fungi & crop.

Naubatpur is situated about 25 K.M. away from Patna Junction Railway station, 150 meter above the mean sea level between 25.5026° N & 84.9635° E, where average rain fall is 1100 mm, atmospheric temperature fluctuation were recorded between 05° C up to 42° C. Most of the fertile land is naturally available around the Naubatpur; almost all types of crops are grown easily. It happens only due to geo-mycoflora existing in soil and observed frequently within this locality. Most of the members of Deuteromycetes were prominently available in the soil. Trychoderma was observed as beneficial fungi, whereas Rhizoctonia is most dangerous to underground crop. Entire class members of Deuteromycetese were recognized as ante foliar fungi but in soil these fungi are responsible for optimum fertility.

II-18 PHOSPHATE SOLUBILIZING ACTIVITY OF BACTERIA ISOLATED FROM DIFFERENT CROP SOILS OF PADDY RHIZOSPHERE OF GONDIA DISTRICT OF MAHARASHTRA

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Abstract

Keywords: Phosphate Solubilizing Bacteria, PSB, Rhizosphere Soil, Rice, *Pseudomonas* sp., *Bacillus* sp., *Rhizobium* sp. and *Klebsiellasp.*

Phosphorus is one of the primary nutrient elements essential for the plant growth. A laboratory study was conducted to isolate, identify and characterize the phosphate solubilizing bacteria from the rhizosphere soil of rice plant in the Gondia Region (India). *Pseudomonas* sp., *Bacillus* sp., *Rhizobium* sp. and *Klebsiella* sp. were found to be efficient in phosphate solubilization based on their ability to form clear zone on Pikovskaya's agar medium. Isolated bacterial isolates can be used as PSB inoculants and considered as potential biofertilizer for the sustainable rice cultivation system.

SUB-SECTION-III
Angiosperms: Floristics, Biodiversity
and Ethnobotany

III-01 BIODIVERSITY OF AQUATIC FLORA IN WEST SINGHBHUM DISTRICT OF JHARKHAND

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Abstract

Keywords: Aquatic plant, West Singhbhum, Water loving, Biodiversity.

The present paper deals about the range of vegetation with reference to aquatic plant in west singhbhum area of Jharkhand Aquatic plants form footing of limnetic habitat occupying different ecological niche in aquatic environment. The present work deals about aquatic plants

III-02 FORMULATION AND EVALUATION OF HERBAL ANTI- DANDRUFF SHAMPOO WITH *CARICA PAPAYA* LEAVES EXTRACT

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Abstract

Keywords: *Carica papaya* leaves, anti-dandruff shampoo, herbal formulation, anti-fungal activity, *Malassezia furfur*, evaluation parameters

The study was undertaken to formulate and evaluate herbal anti-dandruff shampoo containing ethanolic extract of *Carica papaya* leaves. The shampoo was formulated by incorporating 1.8 % and 2% concentrations of *Carica papaya* leaves extract and subjected to various quality tests including, physical appearance, pH, solid content percentage, surface tension, dirt dispersion, foam height, skin irritancy and *in-vitro* antidandruff activity.

The anti-dandruff shampoo with *Carica papaya* leaves extract at 1.8 % and 2 % concentrations exhibited anti-*Malassezia* activity and passed the quality tests. We suggest that *Carica papaya* leaves anti-dandruff shampoo serve as potential herbal anti-dandruff candidate for dandruff management.

III-03 AN EFFICIENT IN VITRO REGENERATION AND EX VITRO ROOTING OF *VINCETOXICUMSPIRALE*: A THREATENED MEDICINAL CLIMBER

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Abstract

Keywords: *Vincetoxicumspirale*

Vincetoxicumspirale (Forssk.) D.Z.Li[synonym = *Blyttiaspiralis* (Forssk.) D.V.Field & J.R.I.Wood, *Pentatropisspiralis* (Forssk.) Decne.] is a perennial medicinal climber of family Apocynaceae. Various constraints, viz. edible nature of young seeds/twigs, reduced seed germination, drought sensitive seedlings and widespread habitat destruction/fragmentation categorized this species as threatened. Thus, alternative propagation methods are highly desired for conservation of this taxon. This abstract highlight an efficient indirect organogenesis system using leaf explants collected from a field grown mature plant of *V. spirale*. For callus induction, MS medium supplemented with 2, 4-D 2.0 mg L⁻¹ was found optimum. Proliferation of callus was most appropriate on MS + 2, 4-D 1.0 mg L⁻¹ + Kin 0.5 mg L⁻¹. Multiple green leafy shoots were differentiated from proliferative callus on MS + BAP 1.0 mg L⁻¹. Shoots were further amplified on MS medium using auxin-cytokinins synergism, i.e. BAP 0.5 mg L⁻¹ + Kin 0.25 mg L⁻¹ + IAA 0.1 mg L⁻¹. On this medium, the maximum numbers of shoots (25.58 ± 1.58 per culture bottle) were formed with an average length of 6.23 ± 1.03 cm. In vitro regenerated shoots were rooted ex vitro and concurrently acclimatized in a greenhouse. About 75% shoots rooted ex vitro, when pulse-treated with NAA 300 mg L⁻¹ for 3 minutes. About 70% of rooted plantlets were survived in the greenhouse. The calluses of Non-Regenerative (NR) and Regenerative (R) types were employed to compare the expressions of different proteins in two different conditions using SDS-PAGE. The total protein content of NR and R callus was determined using Bradford method. For staining and visualization of bands, the silver staining method was slightly modified and used. These protein profiles showed a considerable difference in number of protein bands as well as intensity of their expression, which might be responsible for their non-regenerative and regenerative nature.

**III-04 CONSERVATION OF ENDANGERED SPECIES OF BUTEA
MONOSPERMA VAR LUTEA (WITT) MAHESHWARI**

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Abstract

Keywords: Yellow Palash, Golden Butea, Micropropagation, Embryo Rescue, *In vitro* Multiplication, Plant Tissue Culture

Butea monospermavarlutea (Witt) Maheshwari also known as 'Yellow Palash' or 'Golden *Butea*' is a rare and endangered species of family Fabaceae. Golden *Butea* found its use in Ayurvedic, Unani and Siddha medicine for varying health problems. All the plant parts have varying uses. Golden *Butea* has been included in IUCN Red list of threatened species. The aim of present studies is to revive golden plant by plant biotechnology methods. We have adopted micro-propagation and embryo rescue methods of plant tissue culture technique. *In vitro* multiplication is the best method for rescuing and reintroducing this endangered species in the surrounding localities of Nagpur district.

**III-05 INVESTIGATION OF AQUATIC PLANTS BIODIVERSITY OF
SELECTED LAKES OF JAWAHAR NAGAR OF BHANDARA DISTRICT,
MAHARASHTRA, INDIA.**

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Abstract

Keywords: Aquatic, Free Floating Submerged, Marshy.

The present investigation was aimed to study the aquatic plants of three Lakes of Jawahar-nagar of Bhandara district of Maharashtra. Bhandara district is famous for Lakes and Water bodies. There are several lakes in and around Jawaharnagar. Various Lakes of Jawahar-nagar were surveyed during the study period, but only three Lakes were selected namely Thana Lake, Propex Lake and Sahapur Lake. These Lakes are

Situated near ordnance factory of Jawaharnagar. The emerged, free-floating and submerged Macrophytes have always been considered important in long term monitoring and assessment of water quality in aquatic ecosystems, as they are very sensitive to the water pollution. Altogether Thirty species of Aquatic and marshy plants belonging to different Taxonomic groups were identified in the present investigation.

III-06 STUDY OF MORPHOLOGICAL CHARACTERISTICS OF SCOPARIADULCIS – A WIDELY USED MEDICINAL PLANT OF ASSAM, INDIA

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Abstract

Keywords: *Scopariadulcis*, Morphology, Medicinal plants

Scopariadulcis Linn (Family- Scrophulariaceae) is commonly known as 'sweet broom weed' which is distributed through out the tropical and sub tropical regions of the world. *Scopariadulcis* is a branched herb with wiry stems and grows upto 1m tall. This plant has numerous medicinal applications such as kidney stones, diabetes, stomach ailments, urinary disorders, jaundice etc. Morphological characters and root shoot ratio of *Scopariadulcis* was studied during the present investigations. Two different sites were selected (Moranhat and Sepon). The maximum height of plants (46.96cm), length of root (20.97cm), inflorescence (5.33cm) was found in Moranhat. The maximum length of shoot (29.93cm), number of leaves (37.33cm), branches (17.33cm), flowers per inflorescence (5.66cm) was found.

III-07 SURVEY ON DIVERSITY OF EXOTIC MEDICINAL PLANT SPECIES IN NASIK DISTRICT OF MAHARASHTRA, INDIA.

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Abstract

Keywords: Diversity, Exotic, medicinal plants, Nasik District.

In the current paper, 32 exotic medicinal plants belongs to 21 families and 27 genera that were found in various locations throughout the Nasik district are reported. Some of them have since become a part of our native flora. For centuries, tribal people, bhagat and Vaidyas have used various plant parts to make crude medicines. The goal of the current investigation is to list the medicinal plants that are used by tribal people as well as their therapeutic applications.

III-08 EVALUATION OF PHYTOCHEMICALS FROM HENNA PLANT (LAWSONIA INERMIS L.), AND THEIR POTENTIAL ROLE AGAINST DENGUE INFECTION.

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Abstract

Keywords: Henna plant, in vivo, in vitro, secondary metabolite analysis, HPLC analysis, KEGG analysis, docking, NS1 protein, Dengue.

Henna plants contain a rich repertoire of phytochemicals, making it commercially and medicinally important. In this study, secondary metabolic assays, HPLC and KEGG pathway analysis validate the abundant presence of these phytochemicals, especially in *in vitro* plants. Further, when the common phytochemicals of the plant were docked against NS1 protein, necessary for dengue virus replication, phytochemicals belonging to the category of flavonoids and terpenoids, docked with amino-acids that directly hindered protein activity, inhibiting viral replication, proving *in vitro* plants (with higher accumulation of these phytochemicals) to serve as an effective solution in treatment of the disease, with less side effects.

**III-09 STUDY OF SOME THERAPEUTIC PLANTS FOR SKIN DISEASES
USED BY RURAL OR TRIBAL PEOPLE OF KUMARDUNGI BLOCK OF
WEST SINGHBHUM JHARKHAND INDIA.**

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Abstract

Keywords: Medicinal plants, skin diseases, West Singhbhum Kumardungi, tribes.

The present paper on the native knowledge and Ethnomedicinal uses of fifteen (15) plant species belong to 13 families used by tribal people of West Singhbhum Jharkhand India. Which are being used for cure of skin diseases by the tribal people. All 30 species have been arranged alphabetically with their botanical name, local name, family, used part and their medicinal value. The ethanobotanical survey was carried out during the month of June 2021 to August 2022 at in different session repeatedly according to its flowering and fruiting time. The collected plant specimen were identified with the help of many reference books. such as Odisha Volume I-VI, "Glossary of Indian medicinal plants". These treaties of Indian medicinal plant of Volume I-VI, "Indian medicinal plants". These 15 therapeutic plant species frequently used for the treatment of skin diseases such as ringworm, acene, leprosy etc. The ethanobotanical uses medicinal value of these therapeutic plants species has been collected from village headman vadyas, Kaviraj aged tribal people. And differentiated from announced literatures.

**III-10 ETHNOBOTANICAL STUDY ON WILD EDIBLE PLANTS
TRADITIONALLY USED BY LOCAL PEOPLE OF DAMOH DISTRICT
MADHYA PRADESH, INDIA.**

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Abstract

Keywords: Ethnobotany, Local people, Traditional knowledge, Wild edible plants

The traditional knowledge on wild edible plants has been shown in many studies a worrying decline throughout the last few decades. Therefore,

the first aim of this study was to document the population knowledge on wild edible plants among the local people. The second objective was to assess the traditional knowledge of our informants according to their socio-economic status. The present study provides information about wild edible plants of 24 plant species belonging 15 genera of 13 families. In the present study, we have highlighted the usage of some plants with importance for future biomedical studies and studies regarding their safety and efficacy will yield some useful clues for health care workers.

III-11 QUALITATIVE PHYTOCHEMICAL ANALYSIS OF FIVE MEDICINAL PLANTS USED IN ANEMIA IN JHARKHAND, INDIA

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Abstract

Keyword: Phytochemical, Bark, Soxhlet apparatus, solvent extraction, Anemia.

The present study reports the qualitative phytochemical analysis of bark of five medicinal plants viz *Saraca asoca*(Roxb.) De.Wild., *Shorea robusta* (Roxb.ex.Gaertn.f.), *Tectona grandis* Linn., *Terminalia arjuna* Roxb. and *Tinospora cordifolia* (Willd.) Miers ex Hook.F., used to cure anemia. Anemia described as the condition where the number of RBC decreased in blood. Qualitative phytochemical analysis (alkaloids, flavinoids, glycosides, carbohydrate, saponin, protein, tannin, phenol and iron) was carried out by the standard methods. Soxhlet apparatus was used for the solvent extraction. Our result confirmed the presence of eight major classes of Phytochemical ie alkaloids, flavinoids, glycosides, carbohydrate, saponin, protein, tannin, phenol and Spot test qualitatively showed that all five plants contain iron. These preliminary studies indicate that there is urgent need of intensive and quantitative phytochemical study of these plants for treatment of Anemia.

III-12 MICROMORPHOLOGICAL TAXONOMIC VARIATIONS IN LEAF AND ITS SYSTEMATIC IMPLICATIONS IN *TEPHROSIA* PERS.

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Abstract

Keywords: *Tephrosia*, Micromorphology, Systematics, Taxonomic variations, Trichomes

Micromorphology is the study of the microscopic characters like epidermal cells, stomata and trichomes etc. Micromorphological characters give us enhanced criterion to understand the taxonomical variations as they are more reliable as compared to morphological characters, to identify the genera at species level. The present study was aimed to find out the differences in foliar micromorphology of *Tephrosiapurpurea* (L.)Pers. and *T. falciformis* Ramaswami and to prepare an identification key on the basis of foliar micromorphological characters for easy identification and confirmation of species.

Micromorphological characters such as type, size, density, frequency, stomatal index, size of subsidiary cells; trichomes and glands; numbers, shape, size and nature of epidermal wall were studied and compared in two selected species of *Tephrosia*. In *T. purpurea* epidermis was glabrous and trichomes found only on the lower epidermis. Trichome density and length of simple trichomes were varied in the amphitrichomatic species on both leaf surfaces, whereas in *T. falciformis* both the surfaces were densely hairy which justify its xeric habitat. Trichomes were both glandular and non-glandular type.

III-13 IMPACT OF ALIEN FLORA & ITS INVASION FOUND IN VADODA RANGE FOREST, MUKTAINAGAR, MS, INDIA

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Abstract

Keywords: Alien, Invasive, Exotic, Indigenous.

Alien plants are non-native, come from some other regions which also known as exotic and new to a specific area or location. These new

plants destroy the existing biodiversity & affect the indigenous flora. Some alien species has tendency to causes damage to the existing environment, economy & human health. Those species which has a power to spread in such degree known as invasive species. In present study efforts were taken to make a comprehensive list of Invasive, alien plants of Vododa Range forest, Muktainagar with information of family, habit, nativity etc. From this study it was found that more than 70% flora found in forest is exotic. Among these dicotyledons contribute more than monocotyledon. Vegetation includes total 74% alien species under 32 families. Among 12 different geographical regions, the majority of invasive plants reported from Tropical Africa (30%) with 25 species. Habit wise analysis shows that about 55.04% of species are herbs, 17.5% are shrubs & 20.27% are trees & 9.45% are climbers. *Cassia uniflora* is the highly noxious plant which is found everywhere. Besides, *Hyptissuaveolens*, *Altenathera*, *Tridaxprocumbens*, *Lantana camera*, *Triampheta*, *Apluda*, *Alycicarpusetc.* are some noxious species found during the study.

III-14 ETHNIC FERMENTED FOODS AND BEVERAGES: A KEY TO WOMEN'S ECONOMIC EMPOWERMENT IN MANIPUR.

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Abstract

Keywords: Women, fermented food, preparation, economic empowerment.

In Manipur, a region in Northeastern India, foraging food resources from the wild when they are in abundance and using them for later sustenance is a common sustainable practice undertaken mainly by women folks. Besides that, women play a crucial role in contributing to value addition by processing such raw materials into more nutritional and beneficial products that are consumed when unavailable. In addition, the women sell their produce in local markets which in turn enables them economically and thus more empowered. An attempt will be made to discuss such ethnic food preparation, processing and trading which help in women's economic empowerment.

**III-15 IN SITU ANDEX SITU CONSERVATION OF LAND BIODIVERSITY
AND SUSTAINABILITY**

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Abstract

Keywords: - Biodiversity, Development, In-Situ Conservation, Ex-Situ Conservation.

Humans have been directly or indirectly dependent on biodiversity for sustenance to a considerable extent. However, increasing population pressure and developmental activities have led to large scale depletion of the natural resources. Conservation is the protection, preservation, management, or restoration of wildlife and natural resources such as forests and water. Through the conservation of biodiversity and the survival of many species and habitats which are threatened due to human activities can be ensured. There is an urgent need, not only to manage and conserve the biotic wealth, but also restore the degraded ecosystems.

**III-16 FLORISTIC DIVERSITY AND PHYTOSOCIOLOGY OF WEEDS IN
RICE CROP FIELDS IN VILLAGE- BARELA, DISTRICT- MUNGELI,
CHHATTISGARH**

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Abstract

Keywords: phytosociology of weed flora, Barela in Mungeli District, Chhattisgarh

The information and knowledge about diversity and distribution of weeds play a significant role in weed management programme. The present study deals the diversity and phytosociology of weed flora in rice fields of village Barela in Mungeli District, Chhattisgarh. For this quantitative parameters like frequency, density, abundance and importance value index (IVI) was calculated. It was found that rice crop fields were infested

with 55 weeds belonging 16 families. Of these 31 weeds under 25 genera, 13 families belonged to dicot and 24 species under 18 genera, 03 families to monocot families. The weed flora was found to be dominated by species of family Cyperaceae and Poaceae . On the basis of Importance Value Index, it was recorded that the ten most dominant weeds were ***Echinochloacolona*** (L.) Link, ***Cyperusdifformis*** L., ***Fimbristylismiliacea*** (L.) Vahl, ***Alternantheratenella*** Colla and ***Cyperusiria*** L. ***Ammanniabaccifera*** L., ***Commelinabenghalensis*** L., ***Paspalumscrobiculatum*** L., ***Ludwigiaperennis*** Burm.f and ***Cynodondactylon***(L.).

III-17 ANTAGONISTIC STUDY OF SOME IMPORTANT MEDICINAL PLANT USING BY TRADITIONAL HEALER

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Abstract

Keywords: Antagonistic, Medicinal Plant, Traditional Healer

Traditional Medicine is the one of the best culture in India. That country having number of Aurveda research in herbal medicine field. India is having different State likewise Maharashtra is one of the most popular to traditional medicine by Healer in different villages or local Vaidus or Hakim. The present study Some located traditional healer going to use some medicinal Herbs or trees part to make a Medicine treated many disease for local people but when that goes to many problem Facing to healers we focus them to antagonistic study of some medicinal plant by using traditional healer. It observed that many Plant Material Hygiene or content of Secondary Metabolite to recover the many Disease of Human being to Direct or indirect using technique by Healers. On the other hand fulfill the purpose complete Analyzing the methods and using compositions to prevent the accurate dose for people.

III-18 SACRED PLANTS FROM ANCIENT TO MODERN ERA : TRADITIONAL WORSHIPPING TOWARDS PLANTS CONSERVATION

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Abstract

Keywords: Ancient beliefs - Plants conservation - Sacred plants - Traditional worshipping.

Plants occupy an important place in Indian Mythology. Since time immemorial plants have played an important role in human civilization. Plants are integral part of Indian life and culture and worshipped among various tribes in India. These sacred plants are used in variety of ceremonies in various ways throughout the year by the people of study area. Furthermore, these plants are considered as sacred due to their medicinal, aesthetic and natural qualities. Thus, our ancestors linked various God and Goddess with several plants for their conservation and named as sacred plants. These ancient beliefs show the human relation with plants which are also helpful in the conservation of plant species for their valuable qualities.

III-19 A REVIEW ON AROMATIC PLANT SPECIES

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Abstract

Keywords: Aromatic, Oil, Antioxidant, Flowers, Cosmetics

Aromatic plants are often used as natural medicines because of their remedial and inherent pharmacological properties. These plants are from a numerically large group of economically important plants. Aromatic plants are mainly exploited for essential oil extraction for applications in industries,

for example, in cosmetics, flavoring and fragrance, spices, pesticides, repellents and herbal beverages. These plants possess odorous volatile substances which occur as essential oil, gum exudate, balsam and oleoresin in one or more parts, namely, root, wood, bark, stem, foliage, flower and fruit. The characteristic aroma is due to a variety of complex chemical compounds. Aromatic plants are those that contain aromatic compounds – basically essential oils that are volatile at room temperature. Many plant extracts have been reported to contain antioxidants that scavenge free radicals produced due to radiation exposure, thus imparting radioprotective efficacy. It is a well-known fact that radiation is a powerful cytotoxic agent. Aromatic plants possess odorous volatile substances which occur as essential oil, gum exudate, balsam and oleoresin in one or more parts, namely, root, wood, bark, stem, foliage, flower and fruit.

The characteristic aroma is due to a variety of complex chemical compounds. Aromatic plants possess odorous volatile substances which occur as essential oil, gum exudate, balsam and oleoresin in one or more parts, namely, root, wood, bark, stem, foliage, flower and fruit. The characteristic aroma is due to a variety of complex chemical compounds.

III-20 INVASIVE ALIEN FLORA OF CHITTAURGARH DISTRICT, SOUTH RAJASTHAN

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Abstract

Keywords: Wildlife sanctuary, angiospermic diversity, alien species, invasive, habitat

Invasion by the alien plant species were increased rapidly throughout the world during the present century and responsible for the homogenization of floras which causes a substantial threat to biodiversity and ecological integrity of native habitats and ecosystems (Booth et al., 2003; Hulme, 2003). It also becomes a threat to endangered or threatened plant species around the world (Pimentel et al., 2005). The present study brought to light catalogue of invasive alien species in the flora of Chittaurgarh district with background information on family and nativity. Total 32 invasive alien species belonging to 19 families were documented. It was prepared based on history, species origin and field observations. Central America (56.67%) and South Africa (19.16%) contribute maximum proportion to the invasive alien flora of Chittaurgarh.

**III-21 ANGIOSPERMIC FLORA OF SITAMATA WILDLIFE SANCTUARY,
RAJASTHAN WITH SPECIAL REFERENCE TO INVASIVE ALIEN
FLORA**

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Abstract

Keywords: Angiosperms, habitats, invasive, sitamata wildlife sanctuary.

The Study was conducted in Sitamata Wildlife sanctuary from 2017 to 2021. 305 species of Angiosperms belonging to 88 families were documented. Out of these 233(82.95%) species were Dicots belonging to 73 families and remaining 72(17.05%) species were monocots belonging to 15 families. In case of invasive alien plants, a total 24 species belonging to 13 families represent 7.86% of the total angiospermic flora of this sanctuary. Invasive plants and animals are the second largest threat to natural ecosystems after destruction of natural habitats by human beings. Lantana camara listed among the 10 worst weeds of the world, grows well in open, degraded land and invades forest plantations and riparian zones. Its allelopathic effect interrupts the regeneration process of native species by inhibiting the seed germination and growth.

**III-22 TWO NEW ADDITIONS TO THE FLORA OF YAVATMAL
DISTRICT (M.S.)INDIA**

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Abstract

Key words: New, Addition, Boraginaceae, Acanthaceae, Yavatmal District.

The present communication deals with an addition of two new plant species of flowering plant *Heliotropium indicum* L. (Boraginaceae) and *Ecbolium viride* var. *chandrasedkariana* Remadevi & Binojk. (Acanthaceae) to the Yavatmal District flora of Maharashtra State. Updated nomenclature, name of the family, locality, colored photograph in habitat and description are provided for both species.

**III-23 ETHNOMEDICINAL VALUE OF PTEROCARPUS
SANTALINUS L. F. AND ITS CONSERVATION THROUGH MICRO-
PROPAGATION.**

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Abstract

Keywords: Micro propagation, *Pterocarpussantalinus*, ethnomedicinal value, Traditional uses. Red sanders.

Pterocarpussantalinus popularly known as Red Sanders is an endemic species confined to Southern part of Eastern Ghats of India especially in Odisha & Andhra Pradesh and it is listed as an endangered plant species

on the IUCN red data list as a result of the exploitation of its wood and essential oil. The heartwood of red sanders has high demand for its economic importance to use in treatment of human ailments, domestic purposes, making furniture, and coloring agent for textile, cosmetic industry, medicine & food. Present paper aims to provide collective pieces of information of the study of micro propagation technique used for cultivation, traditional uses, and ethnomedicinal value of *P. santalinus*, with an intuition for promoting future research to explore its pharmaceutical potential as a therapeutic agent against modern maladies. Ethnomedicinal studies are of the important cost to find simultaneous drugs from local medicinal plant resource. Odisha and Andhra Pradesh tribes use red sanders for primary health care. In alarming day this plant are extinct due to natural & artificial causes & micro propagation is the only way to producing more plant late in limited time period.

III-24 AN ETHNOBOTANICAL INVENTORY OF ANTI-DIABETIC PLANTS OF SOUTHERN ASSAM, INDIA.

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Abstract

Keywords: Diabetes mellitus, ethnomedicinal, herbal practitioners

Diabetes mellitus is a very common and prevalent disease which affects millions of people across the world. The management of diabetes is a global concern until now and successful treatment is not yet been achieved. However, various ethnomedicinal herbs have been utilized for treating diabetes. In current investigation, an ethnobotanical investigation was carried out to document medicinal plants traditionally utilized for management of diabetes in Southern Assam of India. Extensive field surveys were conducted in the study area and ethnobotanical information of plants were collected by interviews and discussions with elderly people, traditional healers and herbal practitioners. The present study reported a total of 43 species distributed in 38 genera belonging to 29 families. Different parts of the plant including leaf, flower, fruit, seeds, rhizome, stem, bark, bulb and whole plant were utilized for herbal preparations for treating diabetes. The findings of this work would provide the data on further exploration and validation of the active principles of medicinal plants for formulation of anti-diabetic drugs.

**III-25 FLORISTIC DIVERSITY AND PHENOLOGICAL BEHAVIOUR OF
PADDY FIELD WEEDS OF SEEPAT AND ADJOINING AREA, DISTRICT
– BILASPUR, CHHATTISGARH**

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Abstract

Keywords :- Paddy weeds, Phenograms, Floristic, Chhattisgarh.

Present study deals with survey of floristic diversity and phenological behaviour of paddy fields weeds of Seepat and adjoining area. An unwanted plant which is harmful to formers and crop is called weed, for this study, study area was divided in four site Khaira, Seepat, Mopka and Lagra. In present findings we reported 48 weeds from 100 quadrat combining for 4 study sites. Three distinct categories may be allotted to the weeds, i.e., broad-leaved, grasses and sedges. The information and knowledge about floristic analysis of weeds play a significant role in weed management. Phenologically, seasonal behaviour showed two aspects – Rainy season aspect and Winter season aspect.

III-26 SAFFLOWER OIL : A POTENT MOISTURIZING AGENT

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Abstract

Keywords: Safflower Oil, *Carthamus tinctorius*, polyunsaturated acid, Moisturizing cream.

Improper balance of water content of the stratum corneum and skin surface lipids leads to the dry skin and other skin problems. Moisturizers provides a non-volatile residual film which retains moisture and makes the skin soft. Vegetable oil is composed of essential fatty acids, which enhance skin hydration, improves suppleness and regenerate the skin.

Safflower seed oil is a rich source of polyunsaturated fatty acids (52.65%) and monounsaturated fatty acid (24.79%) which was determined by Gas Chromatography. Moisturizing cream with 3% of safflower seed oil exhibited excellent moisturizing property. The product was evaluated for its efficacy and stability.

III-27 STUDY OF AVENUE PLANTATION: ITS EFFECT ON ENVIRONMENT IN METRO CITIES

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Abstract

Trees and shrubs play a vital role in maintaining an ecological balance and improving livelihood of peoples. This paper presents the study of different plant species that has planted in Nagpur city along the roadside, dividers and bridges.

Plants are allied with people's physical and mental health, urban plantation is concerned chiefly with environmental improvement, removal of atmospheric pollutants, controlling noise pollution and microclimatic modification, carbon sequestration soil stabilization, prevention of soil erosion and groundwater recharge. Nowadays, urban plantation is considered the basic prerequisite for improving the quality of life in highly dense metropolis and developing suburban areas.

**III-28 COMPARATIVE STUDY ON ANTIBIOGRAM OF
ACALYPHAINDICAL., PHYLLANTHUS NIRURIL AND EUPHORBIA
HIRTAL. AGAINST BACTERIAL PATHOGENS**

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Abstract

Keywords : Antibioqram, Ethanomedicinal, Antimicrobial

Three plants species belonging to the family Eurphobiaceae are evaluated for antibacterial activity outcome are *Acalyphaindical.*, *Phyllanthusniruril*, *Euphorbia hirtal* of Dalma range of East Singhbhum, Jharkhand. The powdered leaf material of these three selected plants were extracted with methanol and solvent extract were evaporated for dryness with the help of rotary evaporator. Remaining dry residue was dissolved in methanol, ethanol, acetone, distilled water, and then leaf sample is applied for antibacterial action. Antimicrobial potential of these three plants are evaluated by bacteria *staphylococcus aureus* and *Escherichia coli*.

**III-29 EXPLOITATION, AND CONSERVATION OF CRITICALLY
ENDANGERED TRADITIONAL MEDICINAL PLANTS FROM
AURANGABAD (MS).**

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Abstract

Keywords: Inhabitants, folk tales, ethano-medico, ethno-veterinary, extinction etc.

Aurangabad district, soul of Marathwada region forms a part of Maharashtra state (India). It covers forest all over the district, around

4.35% area is covered with forest. Inhabitants in this area particularly the tribal like Bhil, Banjara, Thakur, Aundh etc. and rural people still dwell in and depend on the agricultural and remaining piece of surrounding forests for their needs like shelter, food, fuel, fodder, medicine, animal treatment and farm implements. The tribal people and ethnic races have developed their own cultures customs, religious rights, legends, myth, and folk tales, songs, food and medicinal practices. Many wild and cultivated plants play a very important and vital role among these cultures and these relationships have evolved over generations of experience and practices by transmission of knowledge. The modern civilization which is penetrating into most regions of the district still holds primitive societies. The consequent divorcement of aboriginal people from dependence upon their vegetal environment for the necessities of life has been set in motion resulting in the disintegration of knowledge of plants and their properties. There appears a steady decline in human expertise capable of recognizing the medicinal plants.

In present investigation authentic knowledge regarding the various uses of plants have been gathered by adopting different knowledge transmission methods. During this investigation, ethano-medico botanical and ethno-veterinary plants data was gathered by interviewing tribals, Bhagats (Tribal Vaidyas) Vaidyas, Hakims, village men, even farmers, milkman, senior citizens and knowledgeable men etc.

Some plant species have got better potential value as per medicinal point of view some of these are *Acacia catechu*, *Abrus precatorius*, *Alangium salvifolium*, *Curculigo orchoides*, *Diospyros melanoxylon*, *Gloriosa superba*, *Gymnema sylvestre*, *Leptadenia reticulata*, *Manilkara hexandra*, *Mimusops elengi*, *Psoralea corylifolia* etc. Besides these many species are useful for food, fodder, fuel and aromatic purposes.

Due to more exploitation and excess utility of plants these plant species are in the verge of extinction. As per the evaluation of the latest IUCN Red list categories, overexploitation is the main threat for its depletion. Such 23 traditional medicinal plants tried to conserve by in-situ and ex-situ methods. The plants are too protected by Tissue culture technique and maintaining forest gardens.

**III-30 CULTIVATION AND CONSERVATION OF WILD FRUITS AND
VEGETABLE OF MANIPUR: A PERSPECTIVE FOR WOMEN
EMPOWERMENT**

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Abstract

Keywords: Wild fruits, vegetables, nutrition, women empowerment, tribal women, cultivation, conservation

The tribal and other local women especially the older age groups have highly specialized knowledge of the use of wild vegetables and fruits for various purposes apart from daily consumption as dietary component. These are important to them financially as the only source of income in nearby local markets apart from the well-being and food security of their households. Researchers need to put efforts towards identifying, inventorying and domesticating wild fruits and vegetables for ease of availability, and taking steps towards their conservation. Local bodies and state government need to incentivise the production of wild fruits and vegetables in order to encourage their cultivation by tribal and local women. The current study focuses on the above-mentioned aspects related to women empowerment.

**III-31 AN APPROACH TO EXAMINE PLANT NEMATODE
INTERACTION: A CROSS TALK BETWEEN *MOMORDICA
CHARANTIA.L.* AND *MELOIDOGYNE INCOGNITA***

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Abstract

Keywords: Root Knot Nematode, Bitter Gourd.

The world's recent rapid surge in population growth is becoming one of the primary obstacles to ensuring a sufficient supply of food. Nematodes that parasitize plants are among the plant pathogens that cause the most harm in the globe. Among nematodes, Root-knot nematodes are

known to parasitize almost all species of higher plants. They are economically significant parasites.

They are the most prevalent and harmful plant parasitic nematodes and can infect more than three thousand different plant species. So, to minimize the huge gap between agricultural production and the requirements of the developing global population, significant research is being done on the molecular mechanisms behind plant-nematode interactions and effective approaches should be identified to control plant parasitic nematode. Several conventional and non-conventional strategies are used to manage the nematode which are very crucial for sustainable agriculture and food security

**III-32 AN ETHNO-MEDICINAL SURVEY OF PLANTS USED IN
RHEUMATOID ARTHRITIS TREATMENT PRACTICED BY
TRADITIONAL HEALERS OF SURGANA TEHSIL, NASHIK (MS)**

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Abstract

Keyword: Ethnomedicine, Folk medicine, Rheumatism arthritis.

Arthritis is one of the leading causes of disability among millions of people in India. Rheumatoid arthritis is a chronic inflammatory disease of the joints characterized by a specific plan of destruction for bones and joints. Ethnomedicine is a term that is frequently used interchangeably with folk medicines. Rheumatoid arthritis is a long-term autoimmune condition that affects more than one's joints. The illness can harm a variety of body organs in certain patients, including the skin, eyes, lungs, heart, and blood vessels. Arthritis, generally inflammation of joints is a one of the oldest known diseases occurring almost in all age groups. In India, more than about 20% of total population is suffering from arthritis. Many arthritic patients may not have reported to be arthritic as they may not have detected their problem of arthritis due to illiteracy, poverty and unaffordability for medical check-ups. The use of alternative therapies, such as medicinal herbs, is on the rise because of many side effects and toxicities associated with the synthetic drugs. Herbal medications for the treatment of rheumatism arthritis are an alternate and efficient means of treating chronic illnesses with few or no health risks. The present paper reveals about different plants species belonging

to different families being utilized in rheumatoid arthritis. The aim of this study is to provide the knowledge about plants used in rheumatoid arthritis treatment by local people reside in Surgana region. Available data suggests that the extracts of most of these herbs or compounds derived from them may provide a safe and effective adjunctive therapeutic approach for the treatment of arthritis. This study shows a high degree of ethnobotanical novelty in traditional folk medicine among the aboriginal people. Further pharmacological studies of these plants may provide some important drugs for the treating common rheumatoid arthritis disorders.

III-33 STUDY OF MEDICINAL PLANTS WITH RESPECT TO THEIR USES FROM PATNADEVI FOREST IN CHALISGAON TALUKA

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Abstract

Keywords : Medicinal plants, endangered, threatened, vulnerable.

A list of 12 endangered, critically endangered, threatened, vulnerable and least concerned species of medicinal plants of Patnadevi forest in Chalisgaon Taluka, Maharashtra are given in the paper. These are *Mangifera indica*, *Ocimum sanctum*, *Pongamia pinnata*, *Calotropis gigantea*, *Hibiscus cannabinus*, *Butea monosperma*, *Terminalia bellirica*, *Abrus precatorius*, *Ficus racemosa*, *Terminalia arjuna*, *Bauhinia racemosa*, *Aegle marmelos*. These plants and their parts have more medicinal values. These plants & their various parts like root, bark, stem, leaf, seed, fruits which produce leaf juice, leaf extract, leaf decoction, fruit juice, fruit decoction, seed oil use for medicinal purpose. Their mode of taking orally or externally also described in this research paper. The study will help to know how these medicinal plants are beneficial as a preventive control measures against infection. During last few decades there is a growing interest in the medicinal plants not only in India but throughout the world. Therefore well planned extensive and intensive search of medicinal plants is very useful in tracing the new drug plants.

III-34 SURVEY ON ANGIOSPERMIC TREES IN SAKKARDARA REGION OF NAGPUR CITY, NAGPUR DISTRICT, MAHARASHTRA

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Abstract

Keywords- Survey, Sakkardara, Fabaceae, *Polyalthialongifolia*, Nagpur.

Nagpur also called as Orange city is naturally blessed with lots of natural greenery. Conservation strategies, plantation programs, Go-green concepts all have contributed to increase the greenery of Nagpur region despite different developmental projects. Nagpur is the most prominent district of Eastern Maharashtra, lying between latitude 23° 35' and 21° 44' and longitude 78° 15' and 79° 40' East has an area of 9930 sq km. A survey was conducted from January 2022 to March 2022 for angiospermic trees in Sakkardara region of Nagpur city. The survey revealed a total number of 44 genera with 48 species under 20 families. In the area under study, Fabaceae was found to be dominant and *Polyalthialongifolia* was the most frequently occurring plant among a number of trees.

III-35 A STUDY ON ETHNOBOTANICAL KNOWLEDGE OF PLANTS AND THEIR USES BY THE TRIBALS OF JHARKHAND

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Abstract

Keywords: Ethnobotany, Forest produce, Indigenous Knowledge, Jharkhand.

Forest produce including Non-timber Forest Products (NTFPs) are important components of forest ecosystem having vast potential to address poverty issues for the marginalized, forest dependent communities, by facilitating livelihood options, including food security, income, health and sustainable human development. People living around forests depend on these forest produces as their primary source of income, food, nutrition, and medicine. The tribal inhabitants from this area collect different non- timber forest products based on their

ethnobotanical knowledge acquired from their ancient culture and ethnic practices. The present study reviews the indigenous knowledge (IK) and various ethnobotanical uses of plant resources of by the people of Jharkhand. It has been found that these indigenous knowledge systems are being used in a wide range for food, medicine, agriculture, and other miscellaneous uses. Plants also hold cultural, spiritual and ceremonial significance. The information gathered from these Ethnobotanical surveys can be utilized to improve the economy of the tribes by organizing the systematic collection of forest products and establishing cottage industries based on these forest products. Conservation of biodiversity is always linked with such tradition hence such study helps in developing strategy in this direction also.

III-36 PHYTOCHEMICAL SCREENING OF FIVE EXTENSIVELY USED PLANT SPECIES OF CAESALPINACEAE FAMILY FOR THE PRESENCE OF SECONDARY METABOLITES TO TREAT SKIN INFECTION

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Abstract

Keywords: Phytochemical Screening, traditional medicine, skin infections, Secondary metabolites.

Phytochemical screening of some common plants belonging to family Caesalpinaceae, used in traditional medicine for the treatment of various skin infection or disorders. Phytochemical screening is a technique in which aqueous and organic extracts are prepared from various parts of the plant samples (leaves, bark, roots, stem, flowers, fruits, etc.) which are the source of secondary metabolites. The plants extracts of *Senna alata* (L.)Roxb., *Cassia fistula* L., *Senna alexandrina* Mill., *Senna occidentalis*(L.) Link. and *Senna tora* (L.)Roxb. are screened for the presence of secondary metabolites. In the present paper it was observed that the secondary metabolites which are essential for the treatment of skin infections are found in abundant. Hence, the plants can be further investigated for the new drug development.

III -37 FLORA OF EASTERN MADHYA PRADESH

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Abstract

Keywords : Madhya Pradesh, Medicinal plants, Cereals family, Timberplants

Eastern Madhya Pradesh is a very rich region in India for floral diversity and dense forest. Food, Fodder, Fuel, Timbers, Candy nuts and Medicines were easily found since its origin. Residing people and their rituals were found closely related with associated Jungle and Floral Territories. Newly cereals are grown for food, family *Poaceae* were found responsible for carbohydrates yielding cereals, whereas family *Leguminosae* were completely responsible for pulses and *Amaranthaceae*, *Cruciferae*, *Solanaceae*, *Malvaceae*, *Cucurbitaceae* were for grown and fresh vegetables. Timber like *Shorea robusta*, *Dalbergia*, *Tectonagrandis*, *Salmaliamalabarica*, *Madhuca-Indica*, *T.arjuna*, *T.chebula*, *T.bellirica*, *Moringaoleifera*, *MangiferaIndica*, *AzadiractaIndica*, *Syzygium* were found in abundant amount, finally medicine yield plants like *Ocimum*, *Tinospora*, *Catharanthus*, *Aegle marmelos*, and different types of non-flowering plants, some of them were oil producing plants.

III-38 CASSIA UNIFLORA MILL. A NEW ENTRY IN THE REALM OF INVASIVE FLORA OF INDIA AND ITS EFFECT ON LOCAL BIODIVERSITY

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Abstract

Keywords: *Cassia uniflora*; invasion; biodiversity; phytosociological studies

Central India is facing problem of invasion of *Cassia uniflora* Mill. in almost all kind of habitats. We analysed effect of this invader in sites like forest, wasteland and protected area with reference to biodiversity. Phytosociological studies revealed heavy infestation of *Cassia uniflora* at site II and site III. Maximum value for Margalef's index of richness and Shannon's index of diversity was revealed in site III and lowest in site I. Simpson's index of dominance was found higher for site I and lower was recorded for site III.

SUB-SECTION -IV

**Angiosperms: Development
and Reproductive Biology**

**IV-01 POLLEN STRUCTURE IN SELECTED SPECIES OF MAHARAJA
KRISHNAKUMASINHJI BHAVNAGAR UNIVERSITY, BHAVNAGAR
DISTRICT, GUJARAT STATE, INDIA**

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Abstract

Keywords- Pollen structure, shape, Palynology, Bhavnagar

Palynology- scientific discipline concerned with study of plant pollen. Pollens are male reproductive cells in plants, tiny grains produced by stamens of flower. Pollen represents the land flora and can be used in different disciplines. Pollen used to determine pollination mechanisms, therapeutic activity and source zone of pollinators. The present investigation deals with the study for pollen taxa of 20 species of MKB University, Bhavnagar, Gujarat, India. The pollen of these families has variation in morphological characters viz, shape, attachment of filament, type of pollen and ornamentation. This study provides Palynological data of pollen taxa, which will helpful in future.

**IV-02 NATURAL REGENERATION OF SOME DRY DECIDUOUS MIXED
FORESTS OF NAORARADEHI WILD LIFE SANCTUARY, SAGAR
(MADHYA PRADESH)**

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Abstract

Keywords: Natural regeneration, forest trees, species, *Tectonagrandis*, ecosystem, biodiversity

Natural regeneration of dry deciduous forest trees in Naoradehi sanctuary of Sagar, along with percentage distribution of area in Mohali, Singhpur, NaoradehiSarrah and Dongargown sites have been studied. A very high density of sampling and coppices growth of *Tectonagrandis* and its associates indicate and extremely good regeneration at the initial

stages. Natural regeneration and behavior of tree species is characterized by their population structure with in the ecosystem. Forest are dense heterogeneous, having great biodiversity of species in sites.

**IV-03 POLLEN- STIGMA INTERACTION OF *SESBANIASESBAN* (L.)
MERR. WITH REFERENCE TO ESTERASE AND PEROXIDASE
EXPRESSION**

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Abstract

Keywords: *Sesbaniasesban*, stigma receptivity, esterase, peroxidase

The present study indicates the stigma receptivity in terms of *in vivopollen* germination of *Sesbaniasesban*(L.) Merr. (Papilionaceae) a root nodules forming plant, with a view to find out the stigma receptive period and correlation of stigma receptivity with the activity of esterase and peroxidase on stigmatic surface in order to establish information about reproduction as a basis for fertilization and plant breeding programme. Flowers open at 14.00 hrs to 15.00 hrs. Anther dehisces by longitudinal slits just before flower opening. The non- specific esterase and peroxidase are present densely all over the stigmatic head. Stigma showed maximum receptivity (84%) with mean pollen tube of 585µm after 1 hr of anthesis. Conspicuous presence of esterase and peroxidase was observed during higher receptive period. Prominent presence of peroxidase enzyme was also observed after 3hrs of flower opening (185 oxygen bubbles/minute by using hydrogen peroxide) during maximum receptive period of stigma. Thus this study indicates good examples of sustainability and food security.

IV-04 THE COMPARATIVE STUDY IN SEED VIABILITY OF *BUTEA MONOSPERMA (LAM.) TAUB.* VARIETIES IN GONDIA DISTRICT OF EAST VIDARBHA.

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Abstract

Keywords: Butea monosperma, conservation, seed viability.

Butea monosperma flowered with different colors like saffron, yellow and white. Saffron is very common wherever, yellow and white are uncommon. B. monosperma (Lam.) Taub. var. lutea (Witt.) produces yellow flowers, which is differs from B. monosperma var. monosperma. This variety is important due to its beautiful yellow bloom and distribute in dry, deciduous forest and paddy field region in east Vidarbha. It is observed that numbers of individual of var. lutea are very less as compared to individuals of var. monosperma. Comparative in vitro seed viability method has been studied for conservation of very rare and globally endangered variety.

SUB-SECTION V

Plant Physiology and Biochemistry

V-01 MINERAL ANALYSIS OF STABLE MUTANTS OF KALA JIRGA RICE LANDRACE FROM MAHARASHTRA

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Abstract

Keywords: Kala Jirga, Non basmati aromatic rice, mutation, mineral analysis.

Rice (*Oryzasativa* L.) is used as the staple food all over the world and aromatic and non aromatic rice cultivars are commonly used for consumption. Kala Jirga rice landrace is commonly grown in Kolhapur district of Maharashtra which is well known for its taste and aroma. A mutation breeding was initiated in Kala Jirga rice landrace for qualitative and quantitative improvement by using one physical (γ -rays) and two chemical (EMS and SA) mutagens with three different doses/concentrations. A total of 24 putative mutants were identified from M₂ generations and out of 24 putative mutants 15 mutants showed true to type behavior in M₃ and M₄ generation. Seeds of stable mutants from M₄ generation were used to estimate mineral content. Variation in mineral content was reported in all the stable mutants compared with control. Nitrogen, Calcium, protein and ash content (%) was enhanced by two folds in mutants derived from EMS 0.8% and 1.2% and 100Gy gamma rays treatments respectively while Magnesium content (%) was enhanced by three folds and Prosperous content (%) by four folds in mutants obtained from 200 Gy gamma rays and EMS 1.2 % treatment respectively. Boron and Nitrate content (ppm) was enhanced by three folds in mutants derived from EMS 1.0% and 200 Gy gamma rays treatments respectively while Zinc and Manganese content (ppm) was enhanced by four and six folds in mutants derived from EMS 1.2 % treatments. Slight variation in Sodium, Ferrous, Copper and Molybdenum content was noticed in some mutants compared with control. Mutants with higher mineral content can be used to provide proper nutrition. EMS 0.8 and 1.2% treatments were found to be most efficient for alteration in mineral content among the mutagenic treatments.

V-02 EXOGENOUS APPLICATION OF HOMOBRASSINOLIDE AND SALICYLIC ACID ON GROWTH OF CATHARANTHUSPUSILLUS L. UNDER CADMIUM STRESS

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Abstract

Keywords: *Catharanthuspusillus* L. Growth parameters, Homobrassinolide, Salicylic acid and Cadmium stress.

The increase in anthropogenic activities in recent times contaminates the ecosystem with high loads of heavy metals. Cadmium (Cd) is non-essential heavy metal known to suppress the growth and development of plant species. *Catharanthuspusillus* an annual herb was selected to evaluate the cadmium (Cd) stress in a pot experiment. The plant under stress was exogenously applied with plant growth regulators (PGR's) i.e. Homobrassinolide (HBL) and Salicylic acid (SA) to mitigate the effect of heavy metal. The foliar spray of eight different combinations (T1 – T8) of HBL and SA were given to test plants. The physical growth parameters (shoot biomass, root biomass, total leaf area, average leaf area, fresh and dry weight of biomass) were recorded for the test plant under Cd stress at different time intervals. The treated test plants growth parameters and development were significantly enhanced compared to control plants (C1 and C2). The individual treatment of HBL and SA along with combination of HBL+SA such as T6, T7 and T8 improved the growth of test plant compared with T2. It can be concluded that HBL and SA could play a positive role in the vegetative growth, and alleviate the Cd stress.

V-03 HALOTOLERANT PGPB STAPHYLOCOCCUS SCIURI ET101 PROTECTS PHOTOSYNTHESIS THROUGH ACTIVATION OF REDOX DISSIPATION PATHWAYS IN LYCOPERSICONESCULENTUM

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Abstract

Keywords: Alternative oxidase (AOX), antioxidants, cyclic electron flow(CEF), photorespiration, photosynthesis

The role of halotolerant plant growth promoting bacteria *Staphylococcus sciuri* ET101 in protection of photosynthesis in tomato plants during salinity stress was evaluated by analysing changes in antioxidant defense

and activation of redox dissipation pathways. Inoculation of *S. sciuri*ET101 significantly enhanced growth with significantly higher photosynthetic rates under normal and salinity stress. Further, increased expression of antioxidant genes for efficient ROS detoxification and less oxidative damage was observed due to dissipation of excess redox. Results indicated that the isolate *S. sciuri*ET101 has potential for protecting photosynthesis in tomato plants under salinity stress through activation of redox dissipation pathways.

**V-04 EFFECT OF DROUGHT STRESS ON THE MORPHOLOGY OF
GROUNDNUT (*ARACHIS HYPOGAEA* L.) U.**

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Abstract

Keywords: Groundnut (*Arachishypogaea* L.) Drought tolerance; Growth; Morphology: Water stress

Drought stress is the most important factor and ever-growing problem limiting groundnut (*Arachishypogaea* L.) productivity worldwide. The present study was undertaken to ascertain the morphological responses of a groundnut cultivar K-3, under different water stress regimes characterized as control, mild, moderate and severe stress represented by 100, 75, 50 and 25% soil moisture levels respectively for eight days. Root length increased over control at mild, moderate stress treatments and inhibited at severe stress conditions on all days of sampling. Severe stress treatments had caused significant inhibition in shoot growth on day-4 and 8. The fresh and dry weights of roots and leaves and leaf area decreased over control in all stress treatments except under mild stress on day-4. The changes in these parameters were dependent on stress severity and duration

**V-05 NUTRITIONAL POTENTIAL AND PHYTO CHEMICAL
INVESTIGATIONS OF ENHYDRA FLUCTUANS LOUR**

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Abstract

Keywords: *Enhydra fluctuans* Lour. (Asteraceae), phytoconstituents

Enhydra fluctuans Lour. (Asteraceae) is a marshy herb belonging to northeast India where, it is consumed as saag (green vegetable), particularly for its nutritional and therapeutic importance. Although it is used traditionally to treat a variety of diseases and is reported to possess anti-inflammatory, cytotoxic, hepatoprotective, anti-ulcer, and anthelmintic activities; scientifically it has not been investigated for some of its uses and phytoconstituents. The plant possesses nutritional value including- β -carotene, saponins, cholesterol, glucoside, ninhydrin, and so on. So, the present study aimed to carry out a preliminary phytochemical investigation of phytoconstituents and standardization of the active phytoconstituents in the plant extract using chemical markers.

**V-06 PHYTOCHEMICAL, ANTIOXIDANT AND IN- VITROHEMOLYTIC
ACTIVITY OF UNCONVENTIONAL LEGUME, CANAVALIAROSEA OF
COASTAL SAND DUNES OF INDIA**

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Abstract

Keywords: Antioxidant, *C. rosea*, Erythrocytes, Hemolytic activity,
Phytochemical analysis

Canavaliarosea is an important legume plant with several medicinal uses in folk and traditional medicinal system which is also used as food by some tribes which is less explored. The methanol and aqueous extracts of *C. rosea* were screened for its phytochemical, antioxidant and in-

vitro hemolytic activity. The sample parts (leaf, pod and seed) showed good antioxidant activity in both methanolic and aqueous extracts due to the presence of phenolics and flavonoid contents in them. *In-vitro* hemolytic activity was performed by spectrophotometer method. Extracts exhibited low to mild hemolytic effect towards human erythrocytes. Results indicated that aqueous extract of *C. rosea* at dose 50 µg/ml possess minimum hemolytic activity 2.53±0.05% in Leaf, 1.1±0.1% in Pod, 2.43±0.02% in Seed whereas at dose 200 µg/ml possess highest hemolytic activity 8.21±0.09% in Leaf, 4.36±0.11% in Pod, 8.1±0.1% in Seed. Hemolytic percentage was found to be increasing with increase in dose.

Phytochemical screening of the plant sample parts showed the presence of various metabolites like phytosterols, glycosides, carbohydrates, phenolic compounds, saponins, alkaloids, flavonoids and tannins. The wild bean *C. rosea* is rich in phytochemicals, thus should be exploited more as a medicinal proteinaceous food. This can also be used as a potential ingredient to formulate nutraceutical products for medicinal and veterinary applications. *In vivo* antioxidant activities of this beneficial wild bean along with the aspects of nutritional quality such as food efficiency ratio, net protein retention, protein retention efficiency, true digestibility, biological value need to be investigated further.

**V-07 FIRST REPORT ON PHYTOCHEMICAL ANALYSIS AND ANTI-
OXIDANT EVALUATION OF WISSADULA CONTRACTA (LINK) R.E.FR: A
DISTINCTIVE ADVENTIVE SHRUB**

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Abstract

Keywords: *Wissadulacontracta*, ABTS, DPPH, Phenolics, Flavonoids, FRAP.

Wissadulacontracta (Link) R. E. Fr (garden escape) belongs to the Malvaceae family. It is native to Tropical America and Mexico, and generally grown in shady habitations. A distinct natural population of *W. contracta* were observed in Dharwad, Karnataka. The dried powdered

leaves were used as an antidote against snakebites. The plant were collected, dried, and powered for evaluation. It is the first report on the phytochemical and antioxidant evaluation of different morphological parts viz., leaf, stem, root, and seed of *W. contracta*, aqueous and methanolic extracts were used for analysis. Phytochemical studies were carried out by quantitative analysis of phenolics and flavonoids whereas, antioxidant activity was determined using 2,2 diphenyl-1- picrylhydrazyl (DPPH), ABTS (2,2'-azino-bis(3- ethylbenzothiazoline-6-sulfonic acid)) and ferric-reducing antioxidant power (FRAP) assays. The highest total phenolic content was observed in aqueous leaf extract (7.76 ± 0.01 mg/g DW), while total flavonoid content was found in leaf methanolic extract (11.56 ± 0.036 mg/g DW). Aqueous leaf extract of *W. contracta* shows the highest antioxidant potential as compared to others studied, i.e., FRAP (9.02 ± 0.008 mM/g DW), DPPH and ABTS radical scavenging activity were 40.48% and 57.58% respectively. This is the first report of phytochemical and antioxidant and, it reveals that dried leaf aqueous extract shows virtuous antioxidant activity. Further studies will be carried out, to evaluate its various biological activities.

V-08 DIFFERENTIAL EFFECTS OF EMS, GAMMA RAYS AND ELECTRON BEAM ON BIOLOGICAL PARAMETERS OF KALBHAT AND BLACK RICE

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Abstract

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Keywords: Kalbhat, Black rice, Lethality. Chlorophyll deficient sectors, chromosomal abnormality, pollen sterility

Kalbhat and black rice non basmati aromatic rice landraces (*Oryzasativa* L.) are famous for good aroma, beta carotene content and antioxidant properties as well as good cooking grain quality. For the induction of mutations, one chemical mutagen Ethyl methanesulphonate (EMS) and two physical (gamma rays and electron beam) radiation were used with three different concentrations and doses, respectively. For each treatment, 500 seeds were used. In M₁ generation, seed germination (%),

lethality (%), chromosomal abnormality (%), chlorophyll deficient sector (%), pollen sterility (%), and plant survival were determined. Maximum lethality % was determined in 300 Gy electron beam treatment from both the cultivars while chlorophyll deficient sector %

was observed maximum in moderate dose of gamma rays and electron beam treatments. Highest chromosomal abnormality % was reported in Kalbhat cultivar under EMS 1.2 % treatment while in Black rice it was highest under 100 Gy electron beam treatment. Highest pollen sterility was found in 300 Gy gamma rays treatment in Kalbhat cultivar while in black rice 300 Gy electron beam. Differential response of both cultivars against EMS, Gamma rays and Electron beam treatment was observed and higher concentration or dose of EMS, gamma rays and electron beam are proved to be most effective for induction of changes in biological parameters.

V-09 STUDIES ON BETA-CAROTENE CONTENT FROM STABLE MUTANTS OF KALA JIRGA RICE LANDRACE FROM MAHARASHTRA

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Abstract

Key words: Kala Jirga, Non basmati aromatic rice, mutation, Beta carotene.

Rice (*Oryzasativa* L.) is used as the staple food all over the world and aromatic and non aromatic rice cultivars are commonly used for consumption. Kala Jirga rice landrace is commonly grown in Kolhapur district of Maharashtra which is well known for its taste and aroma. In tropical Asia vitamin A deficiency is a significant dietary issue which has an impact on the rod cells of the retina, healthy immune system function and several other physiological activities in the human body. A mutation breeding was launched in Kala Jirga rice landrace for qualitative and quantitative improvement by using one physical (γ -rays) and two chemical (EMS and SA) mutagens with three different doses/concentrations. A total of 25 putative mutants were identified from M₂ generations and out of 24 putative mutants 15 mutants showed true to type behavior in M₃ and M₄ generation. Seeds of stable mutants from M₄ generation were used to estimate beta carotene content. The β -carotene content was ranged between 35.19 to 1685.19 μ g/g in different mutants derived from

EMS, SA and gamma rays treatments. The maximum amount of BC content was recorded in EM-3 mutant (1685.19 µg/g) obtained from EMS 0.8% treatment, followed by DF-A (412.96 µg/g) mutant from 100 Gy of γ-rays doses, EM-1 mutant (409.04 µg/g) from EMS 0.8% of treatment. Mutants with higher beta carotene content can be used to overcome vitamin A deficiency issue. EMS 0.8% treatment was found to be most efficient for enhancement of beta carotene content among the mutagenic treatments.

V-10 INFLUENCE OF DIFFERENT PH LEVELS ON GROWTH AND SPORULATION OF FIVE SPECIES OF APLOSPORELLA SPEG.

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Abstract

Keywords: *aplosporella* sp., pH levels,

The differential activity of the ions of a medium at different pH levels affect growth and reproduction of fungi profoundly. In general, fungi tolerate a wide range of pH. But range for maximum growth is narrower and varies with different fungi and even their own strains. The maintenance of an optimal pH for fungal growth is an important factor in nutritional studies. Such factors which may change the pH growth curve include temperature, time of harvest and nitrogen sources. The effect of metabolic activities also complete pH results particularly in poorly buffered media. Therefore, growth and metabolic activities of fungi are influenced considerably by the hydrogen-ion-concentrations of the medium apart for the composition of the substrate. Keeping in view the importance of pH, the present experiment was carried out with five isolates of *Aplosporella*.

**V-11 OPTIMIZATION OF BIODIESEL PRODUCTION FROM KARANJ
OIL OBTAINED FROM PONGAMIAPINNATA L.**

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Abstract

Keywords: Biodiesel, bioenergy, *Pongamiapinnata*L., transesterification, Karanja oil.

At the present time biodiesel are the most promising source of energy as it is renewable and can accomplished the rising energy demand. *Pongamiapinnata* L.is an evergreen tree of family *Fabaceae* sub family *Papilionaceae*, has been recognized as a potential source of biodiesel prepared from the oil obtained from its seeds. In the present work, biodiesel fuel was prepared by alkaline-catalyzed esterification of high free fatty acids present in *Pongamia* oil. Optimum alkaline-catalyzed trans-esterification was achieved using 1% NaOH as a solid alkaline catalyst with a methanol-to-oil ratio of 1:6, temperature at 60°C. The yield of methyl esters from Karanja oil under the optimal condition was 92 Fuel properties of the biodiesel obtained by transesterification were tested and found to meet the ASTM specifications.

**V-12 PHYSICOCHEMICAL AND PHYTOCHEMICAL INVESTIGATION
OF THE STEM BARK OF *ALBIZIA LEBBECK* (L.) BENTH**

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Abstract

Keywords: *AlbiziaLebbeck*, secondary metabolites, cosmeceutical product, skincare

The present study was themed to the Physicochemical and Phytochemical investigation of the stem bark of *AlbiziaLebbeck* L. Benth. The powdered drug was extracted using six different solvents viz. water,

ethanol, isopropyl alcohol, acetone, chloroform, and petroleum ether. Phytochemical investigation of this plant revealed the presence of secondary metabolites which were predominantly found in aqueous and ethanolic extract followed by acetone, isopropyl alcohol, chloroform, and petroleum ether fractions. Thus, various Physicochemical and Phytochemical characteristics observed in this study may help in standardization, identification, and carrying further research in skin care preparations.

V-13 COLOR ANALYSIS ON PLANT BASED BIOCOLORANT FOR FORTIFICATION

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Abstract

Keywords : Biocolorants, chroma, hue angle, fortification

The artificial or synthetic colors used in foodstuffs are found to possess negative health benefits. As such, search for natural based colorant are receiving greater attention recently. In the present study, fruits from *Mangifera indica* L., *Manilkara zapota* L., *Solanum lycopersicum* L., rhizome from *Curcuma longa* L., flowers from *Cassia auriculata* L. and *Hibiscus rosa-sinensis* L., tubers from *Dacus carota* L. and *Beta vulgaris* L. were selected for color analysis owing to the natural colors they harbor. The colors extracted from the selected samples were subjected to color measurements such as L* (lightness), a* (red/ green coordinate), b* (yellow/ blue coordinate) and calculated C (chroma) and H° (hue angle) values for their characteristic visibility and capability of imparting colors in foodstuffs they are associated with.

**V-14 STUDIES ON DECOLOURIZATION OF TEXTILE DYES WITH
IMMOBILIZED LACCASE PRODUCED BY FUNGAL STRAINS**

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Abstract

Keywords: Immobilized laccase enzyme, *Pleurotuspulmonarius*, *Bartalinia sp. MM101*, *Rhizopusoryzae*, *Trametes hirsute*, Reactive Red M8B, and Reactive Green 19.

Potable water is becoming the scarcest commodity in the world. Rapid industrialization is leading to heavy water pollution and thereby causes further depletion in the availability of water. However, proper pollution abatement technologies can surely address this problem positively. Biotechnological approaches are becoming the newer tools to solve the problems of water pollution. Present investigation was taken up for production, immobilization of laccase enzyme from fungal strains namely *Pleurotuspulmonarius*, *Bartalinia sp. MM101*, *Rhizopusoryzae* and the reference strain *Trametes hirsute*. Also decolorization of textile dyes were studied from immobilized laccase enzyme. Reactive Red M8B, Reactive Green 19 and effluent showed significant difference in percent decolorization with more than 30% decolorization in Reactive Red M8B and effluent and more than 55% decolorization of Reactive Green 19 dyes upon immobilization of the crude enzyme for 3 mg of protein immobilized on 100 ml of 2% Sodium Alginate. Two-way ANOVA analysis reflect that the treatment of Reactive Red M8B, Reactive Green 19 and effluent shows significant difference whereas the difference amongst four organisms is insignificant.

**V-15 XANTHINE OXIDASE INHIBITORY ACTIVITY OF CERTAIN
FRUITS AND SEEDS – IMPLICATION IN THE TREATMENT OF GOUT
DISEASE**

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Abstract

Keywords: Xanthine oxidase inhibition activity, *Ficus carica*, *Phoenix dactylifera*, michaelis-menten graph and kinetic parameters

The extracts of *Prunus domestica*, *Rubus fruticosus*, *Ficus carica* and *Phoenix dactylifera* were screened for xanthine oxidase inhibitory activity. Among all the extracts tested, the water extracts of *Ficus carica* fruits and *Phoenix dactylifera* showed maximum XO inhibition activity with an IC₅₀ value of 18.74 and 21.63 µg/ml respectively. While the standard used was allopurinol showed an IC₅₀ value of 10.28 µg/ml. Therefore, the water extracts of the two fruits were almost equally potential with that of Allopurinol. The michaelis-menten graph and the lineweaver-Burk plots were established with the obtained data for the determination of V_{max} and K_m. The V_{max} and K_m for the enzyme (control without extracts) were 0.1942 µmoles/ml/min and 19.569 µM respectively. The *P. dactylifera* extracts showed V_{max} and K_m values respectively 0.1332 µmoles/ml/min and 33.726 µM. Whereas, *F. carica* and *P. domestica* extracts showed V_{max} and K_m values as 0.1283 µmoles/ml/min and 24.172 µM & 0.1825 µmoles/ml/min and 32.733 µM respectively for the two extracts. Subsequently secondary plots were also established for the effective determination of K_i, the inhibitor constant. The K_i values obtained were 49.14, 7.56 and 8.39 µM respectively for *P. domestica*, *F. carica* and *P. dactylifera* extracts. All the extracts tested showed mixed inhibition pattern.

The results obtained displayed remarkable xanthine oxidase inhibitory activity of all the extracts suggesting for exploration as natural alternative to the synthetic compounds and find immense application in biopharmaceutical industries.

V-16 INFLUENCE OF PROFUSE COLOR LIGHT EMITTING DIODE (LED) ON THE GROWTH OF HORSE GRAM (*MACROTYLOMA UNIFLORUM*.(LAM.) – A PILOT STUDY

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Abstract

Keywords: Light, LED, color light, horse gram, plant growth

Light is the driving energy for photosynthesis. It's an essential signal to mediate downstream gene expression of substrate metabolism. It helps the plant to acclimatize itself to the environmental fluctuations. Light Emitting Diodes (LEDs) are eco friendly due to their low power consumption, high light efficiency and low heat output. The current study aims to supplement natural light with an artificial source and to study its effects. In the present study, various colors of light emitting diodes(9W) are used to study the growth of horse gram (*Macrotylomauniflorum (Lam)*). This study showed positive results for the plants grown in pink, green and yellow color lights.

V-17 INHIBITION OF *CORYNEBACTERIUM DIPHTHERIAE* USING PHYTOCHEMICALS FROM *ANDROGRAPHIS PANICULATA* USING IN SILICO METHOD

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Abstract

Keywords- *Andrographispaniculata*, Diphtheria toxin, Autodock, Bisandrographolide and phytochemicals

In silico methods are being used for the identification of drug molecules against a variety of diseases. This reduces the time and resources required for drug design in comparison to conventional methods. The current research uses this approach to identify the phyto-derived drugs from *Andrographispaniculata* for the treatment of diphtheria. To conduct the study, eighteen bioactive molecules from the plant were obtained and were docked against diphtheria toxin. Molecular docking, visualization,

and ADMET analysis narrowed down the search for a potent drug to bisandrographolide. Thus, further modification of this compound can be used to examine their effectiveness against diphtheria.

**V-18 PHYTOCHEMICAL AND PHARMACOLOGICAL EVALUATION
OF CORDIA DICHOTOMA FORSTFOR ITS
ANTI-INFLAMMATORY ACTIVITY**

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Abstract

Keywords: Cordia dichotoma, antioxidant, anti-inflammatory, alkaloids, bhokar, lasoda

Cordia dichotoma, has long been utilized in society as culinary and for its medicinal properties. The aim of this study is to evaluate the Cordia dichotoma roots with respect to its morphology, microscopy, physicochemical characters, chemical constituents and medicinal properties. The findings of qualitative and quantitative studies suggest that the plant contains secondary metabolites such as carbohydrates, proteins, tannins, flavonoids, steroids and alkaloids. This makes the plant versatile for its medicinal properties. The plant extract is evaluated for the toxicity profile and pharmacological studies. Results revealed that root extract is safe and shows significant antioxidant properties and anti-inflammatory effect.

**V-19 BETA-CAROTENE ANALYSIS FROM AJARA GHANSAL MUTANT
LINES DEVELOPED THROUGH EMS, SA AND GAMMA RAYS**

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Abstract

Key words - Ajara Ghansal, EMS, SA, Gamma rays, vitamin-A and beta-carotene.

Ajara Ghansal [*Oryza sativa* (L.)] is a local non-basmati aromatic rice landrace grown mostly in Ajara, Southern part of Kolhapur district of Maharashtra. It is well known for its nutrition, taste and unique aroma and has great demand in Indian markets. It has main drawbacks in cultivation, which are low yield, tallness, long maturity and lodging at the time of maturity. Considering these problems mutation breeding program was initiated to create genetic variability with high nutritional values (beta-carotene). For induction of mutation, Ethyl methanesulphonate (EMS), Sodium Azide (SA) and Gamma rays with three different concentrations were used. From M₂ generation, total 56 putative mutants were selected. In M₃ generation, out of 56, a total of 25 putative mutants showed true to type behavior. In the M₃ and M₄ generation, stable expression of mutants was confirmed. From M₄ generation seeds, beta-carotene content was estimated. The beta-carotene is a precursor for the synthesis of vitamin-A and vitamin-A is essential for cellular health and vision. In this study, highest beta-carotene content (239.51µg/g dry seeds weight) was estimated in mutants derived from EMS (1.2%) and Gamma rays 150Gy treatments. 0.006%) mutant and lowest (33.02 µg/g dry seeds weight) was reported in mutant developed from EMS (1.0%) treatment compared with control (45.99 µg/g dry seeds weight). Mutants derived from Gamma rays and Sodium Azide treatments reported higher amount of beta-carotene content (53.40 -239.51µg/g dry seeds weight) compared with control (45.99 µg/g dry seeds weight). The higher beta-carotene containing mutants will be helpful to overcome vitamin-A deficiency. For the induction of higher beta-carotene containing mutants SA 0.006% treatment was found to be most effective.

V-20 STUDIES ON ANTINUTRITIONAL FACTORS IN CHICKPEA(*CICER ARIETINUM*): EFFECT OF HEAT TREATMENT AND GERMINATION

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Abstract

Key words: Chickpea, Trypsin inhibitors, antinutritional factors and mutagenesis.

Chickpea (*Cicer arietinum*) is one of the important pulse species of India. It is widely grown in the arid and semiarid regions of Gujarat, Maharashtra, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Karnataka and Haryana. Chickpea possesses a great amount of antinutritional factor like trypsin inhibitors. Trypsin inhibitor assays were carried out to find out the trypsin inhibitor activity among seven viable mutants of Chickpea which were developed by induced mutation. The pertinent studies of seven viable mutants of Chickpea have indicated considerable variation regarding TI level. The lowest TI (272.7 TIU/min/gm meal) could be recorded in Dwarf mutant, while the Linear leaflet mutant revealed the highest TI content (476.45 TIU/min/gm meal). The electrophoretic profiles of trypsin inhibitors on X-rays film revealed 3 to 7 isoinhibitors in different viable mutants and micromutants of chickpea. The mutants showing reduced trypsin inhibitor bands were quantitatively estimated. The lowest TI activity (187.98 TIU) was observed in B₆ mutant, which was evolved by the 0.15% EMS treatment. To nullify trypsin inhibitor activity in chickpea seeds, so as to use it in diet, the heat treatment and germination studies have been tried in some of its mutant lines. The processing method involving heat treatment almost eliminated trypsin inhibitor activity while soaking and germination partly removed the activity.

V-21 EVALUATION OF SYNERGETIC EFFECT OF AQUEOUS SOLUTION OF PARACETAMOL AND AZITHROMYCIN ON THE MERISTEMATIC ROOT TIP CELLS OF *LATHYRUSSATIVUS L.*

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Abstract

Keywords: *Lathyrussativus L.*, Mitotic index, genotoxicity

Chromosome and chromatid damages in the root meristem cells of Lathyrus, In the present project the *Lathyrussativus L.* has been used as test system for the detection of genotoxicity as terms of MI(Mitotic index) and chromosomal abnormalities (CA).The lathyrus test system is a standardized for monitoring of cytogenotoxicity and well known for its simplicity and reliability. *Lathyrussativus L.* is easily available throughtout the year low cost and the root tip *Lathyrussativus* is large in size and easily visible the genotoxicity.*Lathyrussativus L.* is suitable for genotoxic studies because: (i) the root growth dynamics is very sensible to pollutants , (ii) the mitotic phases are very clear in the lathyrus; (iii) it has stable chromosome number and stable karyotype; (iv) ther is a clear and fast response to the genotoxic substances; and (v) spontaneous chromosomal damages occur rarely. In this study we describe various chromosome and chromatid damages in the root meristem cells of Lathyrus which represent biomarkers for different type of environmental pollution.

V-22 FORMULATION AND EVALUATION OF ARTOCARPUSHETERO - PHYLLUS LEAVES OINTMENT

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Abstract

Keywords: Jackfruit, Antifungal activity, *Candida albicans*, *Artocarpusheterophyllus*

The present work is formulation and evaluation of ointment of *Artocarpusheterophyllus* leaf extract. The aqueous extract was prepared

by maceration method. Preliminary phytochemical screening of aqueous extract showed presence of various secondary metabolites such as carbohydrates, tannins, saponins and flavonoids. The antifungal activity of aqueous extract was done against *Candida albicans* using agar diffusion methods with different concentrations. The minimum inhibitory concentrations were calculated with different concentrations. The ointment was prepared with water removable base. The formulation were evaluated for their physicochemical parameters like appearance, colour, odour, pH, viscosity, spreadability, washability, stability. Amongst all the concentrations of aqueous extract, 200mg/ml was found to be most effective as it has shown more zone of inhibition against *candida albicans* as compared to other three concentrations.

V-23 LAMIACEAE ESSENTIAL OILS: AN OVERVIEW OF PHYTOCHEMICAL ANALYSIS AND BIOACTIVITY STUDIES

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Abstract

Keywords: Aromatic plants; essential oil; GC-MS, antioxidant; antimicrobial activity

The *Lamiaceae* family is one of the most diverse aromatic plant families in context of ethnomedicine due its potential therapeutic effects. Some of the *Lamiaceae* species like mint, rosemary, basil, sage, oregano and thyme are used for the treatment of dermatitis, bronchitis, gastric, and inflammations. The GC-MS analysis of *Lamiaceae* species revealed oxygenated monoterpenes (Eucalyptol, menthone, menthol, and carvone) as the major fraction in different *Lamiaceae* essential oils followed by monoterpene hydrocarbons. This study provides an overview of phytochemical composition, antimicrobial and antioxidant activity of the *Lamiaceae* family which could be used in food and pharmaceutical industry.

V-24 ISOLATION AND CHARACTERIZATION OF SECONDARY METABOLITES FROM *Dictyoarthriniumquadratum* BY GC- MS.

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Abstract

Keywords: *Dictyoarthriniumquadratum*, GC-MS, Ethyl acetate, Dichloromethane, Chloroform and Hexane.

The majority of fungi, known as saprophytic fungi, thrive on decomposing organic waste. These fascinating fungi are living creatures that easily manufacture a variety of natural chemicals known as secondary metabolites. The structure and purposes of these chemicals are extremely varied. *Dictyoarthriniumquadratum* was isolated and identified for the characterization of novel bioactive compounds. In order to separate bioactive components by GC-MS, the isolated fungus was extracted using a number of solvents with varying polarities, including ethyl acetate, dichloromethane, chloroform, and hexane. 2- ethyl hexanol; Napthalene; cyclohexane, hexyl; Benzophenone; Adipic acid, methyl octyl ester; tetradecene, triacontanoic acid etc. while chloroform extract of *D. quadratum* produced Pentanoic acid, 5- hydroxy-, 2,4-di- t-butylphenyl ester; Cyclononasiloxane, octadecamethyl-; 1- Nonadecene; 3- octadecene was identified from different saprophytic fungi. Therefore, the primary goal of the research is to use GC-MS to identify the presence of bioactive chemicals in saprophytic fungus.

V-25 STUDY OF AMINO ACIDS OF SEED EXTRACT OF ASH GOURD (KUMHADA)

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Abstract

Keywords: Ash Gourd, Ninhydrin, n-butanol, acetic acid.

The present paper deals with the detection of amino acids in the seed extracts Ash Gourd. Ash Gourd is a good source of medicines and proteins. Its fruits and pulp are used as petha mithai and seeds of ash gourd are treating asthma, constipation, colic, diabetes diseases etc. 5 g of germinated

seeds were grinded in 25ml. of 80% alcohol in mortar and pestle. The tissue homogenate was centrifuged at 7000rpm for 15 min. After centrifugation the supernatant was filtered and evaporated on water bath followed by addition of 1ml of distilled water to the dried filtrate. Now a drop of extract was spotted slowly to the chromatographic paper which was placed in chromatographic jar containing solvent (n- butanol: acetic acid: water- 4:1:5) for its movement. When the solvent reached near the top, the paper was taken out from the jar, dried and sprayed uniformly 0.1% ninhydrin with the help of atomizer. The paper was dried in an oven at 90°C for 5 minutes. Coloured spots of amino acids appeared on the chromatogram and the identification of the amino acids was confirmed with their R_f values. On the basis of R_f value and colour, five amino acids namely Leucine, valine, ornithin, Arginine and phenylalanine were detected in the seed extract of Ash Gourd.

V-26 STUDY OF ANTHOCYANINS OF FLOWER EXTRACTS OF MOMORDICA CHARANTIA (CUCURBITACEAE)

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Abstract

Keywords: Momordicacharantia., Forestall Conc. and Formic Acid Conc.

The present communication deals with the detection of anthocyanin safflower extract of Momordicacharantia. Anthocyanins are glycosidic pigments usually found essential constituents of flower petals or coloured leaves. They are antioxidant, antiviral and antimutagenicity and play important role in biological system. 2.00 g of flower petals of Momordicacharantia DC were dissolved in 2M HCl in a test tube and heated 100°C for 5 mts. The solution was cooled and washed with ethyl acetate to remove the flavonoids followed by filtration. The filtrate was further heated with amyl alcohol at 80°C for 5 mts followed by filtration. The filtrate contained anthocyanin so the filtrate was spotted on What man's filter no1 and was placed in the chromatographic jar for separation of anthocyanins by using the solvents:

1. Forestall conc - HCl.CH₃COOH.H₂O - 3:6:1
2. Formic acid conc - HCl.HCOOH.H₂O - 2:5:3

The coloured spots appeared on the chromatogram indicated anthocyanin. From the colour of the individual spot, anthocyanins were differentiated and detected. The Rf value of the marked spots was noted and different anthocyanins were confirmed by comparing the respective Rf value. The results confirmed three types of anthocyanin namely *cynidin*, *peonidin* and *petunidin*.

V-27 EVALUATION OF ANTI-INFLAMMATORY ACTIVITY OF LEAF EXTRACT OF BRACHYSTELMA SPECIES.

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Abstract

Keywords: Anti-inflammatory activity, leaf extract, Brachystelma species, paws edema

The genus *Brachystelma* belongs to family apocynaceae and commonly called as hanuman batata or 'Gailya'. It grows on hilly region and grass platue, tuber and leaves are edible, nutritious it possess medicinal property; due to the dual significance in traditional system of medicine the three species of genus *Brachystelmaedulis* and *B. naoroji* and *B. malvensis* selected for present investigation. The focus of this study was to investigate anti-inflammatory activity of the leaves extract of *Brachystelma*. Male Wistar rats (weight range: 150-300gms) were used for the study. The anti-inflammatory activity was evaluated using carrageenan (0.1ml, 1% w/v, 0.9% saline solution) and formalin- induced paw edema models in Wistar albino rats. The anti-inflammatory activity was found to be dose dependent in carrageenan-induced paw edema model. The leaves extract has shown significant anti-inflammatory activity in *B.naoroji* than the *B.edulis* and least significant in *B.malvensis*. The results of present study demonstrate that leaves extract of *B.naoroji* possess significant ($P < 0.05$) anti-inflammatory potential.

**V-28 ISOLATION, CHARACTERIZATION & PURIFICATION OF LATEX
PROTEASE OF EUPHORBIA LEUCOCEPHALA**

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Abstract

Keywords: Cysteine proteases, dialysis, PMSF inhibitor, Column Chromatography.

The E. leucocephala in present study reveals that two enzymes, cysteine and serine in the latex. The pH optima (3 and 8), temperature optima (30°C and 50°C) and their chemical behavior towards inhibitor and activator is studied. Latex proteases inhibited by HgCl₂ and PMSF at specific concentrations. However, reducing agents such as cysteine- HCl and β- mercaptoethanol enhance the activity. In elution profile of 1: 3 acetone fraction three peaks were found, and highest in fraction number 33, 34 and 37. Activity profile of the eluted fraction was shown maximum in fraction number 33 in 65% saturation while acetone fraction number 34 indicates the highest proteolytic activity. This is the first report on this plant regarding isolation and purification of proteolytic activity of Euphorbia leucocephala.

SUB-SECTION - VI
Ecology and Environmental Botany

VI-01 WATER QUALITY STUDIES ON FOX SAGAR LAKE WITH REFERENCE TO POLLUTION

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Abstract

Keywords: Water quality, Fox Sagar Lake, Pollution and Algae

Fox Sagar Lake, also JeedimetlaCheruvu or KottaCheruvu, is the fifth largest lake, spread over 2 km², in Hyderabad, India. It is located in Jeedimetla near Kompally, Hyderabad. The water samples from the surface were collected from the three sampling stations every month in polythene cans for a period of 2 years from June 2013 to May 2015. Water samples were collected in separate 250 ml glass bottles (BOD bottles) for the estimation of dissolved oxygen. The water was alkaline in Fox sagar lake. Carbonates and dissolved oxygen were recorded in low concentration Organic matter, COD, phosphates and nitrates were recorded in high concentration. Four groups of algae were recorded in the lake i.e., Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Bacillariophyceae influenced by silicates and dissolved oxygen. On the basis of both physico-chemical and biological characteristics the lake is polluted and eutrophic.

VI-02 A BAD MASTER 'FOREST FIRE' ECOLOGICAL EFFECTS ON THE PLANT DYNAMICS WITH REFERENCE TO TROPICAL DRY DECIDUOUS FOREST, CENTRAL INDIA

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Abstract

Keywords: Tropical dry deciduous, Forest fire, Remote sensing

In an anthropogenic era, forest fire events are dramatically increased and are one of the major threats to forests across the globe over the twenty-first century. In India, strong summers, intense drought, and high fuel load in dry deciduous forests make it the most sensitive forest type for a

forest fire. Nearly, 36.91% of forests in India are highly prone to frequent fires whose tangible loss is Rs.440 crores annually. The present study approaches to quantifying the potential impact of forest fire with remote sensing techniques, by which we better predict & prevent forest fire events and the consequences they may have on Indian dry deciduous forests which cover 34.80% of the total forest cover in India.

VI-03 AWARENESS AMONG FARMERS OF BHANDARA DISTRICT ABOUT SOIL AND WATER ANALYSIS FOR AGRICULTURE PURPOSE.

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Abstract

Keywords: Awareness, Analysis, Farmers, Technology, Scientific guidance

The present investigation was undertaken in Bhandara district of Maharashtra region. The random sampling of Fifty farmers from rural Bhandara was done based on number of respondent who had awareness about analysis of soil and water for better production in the field of agriculture. The result shows that very few farmers have awareness about the beneficial aspects of soil and water analysis for better crop production. Twenty percent farmers of Bhandara rural have awareness about soil and water analysis, these farmers adopted the advanced technology for better uptake of minerals nutrients from soil and water. On the other hand seventy five percent of farmers are Unaware about Benefits of Soil and water analysis. These respondents reported the hurdles while utilizing the technology which limited the extent of their adoption to this technology. These points are needed to be considered for the future study based on farmers reporting the Understanding of soil testing is difficult, Delay in getting the test reports on time, Difficulty in following test based fertilizer recommendation, no certainty in yield gain and have not proper and scientific guidance.

**VI-04 EFFECT OF CEMENT DUST POLLUTION OF BIOMASS AND
PRIMARY PRODUCTIVITY OF CAJANUS CAJAN L.**

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Abstract

Keywords: Cement Dust, Biomass, Primary Productivity, *Cajanuscajan* L.

The study area was confined to the *Cajanuscajan* L. situated in the prevailing wind direction of Kalyanpur Cement Limited, Banjari, Rohtas, Bihar (24°57' North Latitude and 84° East Longitude) 200 km south of Patna, Bihar to assess the effect of cement dust pollution on biomass and primary productivity of *Cajanuscajan* L. Dust load was estimated by dust jar method. On the basis of dust load control and polluted sites were selected. Biomass was estimated by harvest methods at the interval of 30 days till maturity of the plant. The primary productivity was calculated from the difference between the biomass value of successive sampling date (Misra, 1968). The biomass and primary productivity were found to be higher at each sampling date of the control *Cajanuscajan* L. than polluted one. A maximum reduction of 23.01% of total biomass was recorded at the age of 210 days due to cement dust pollution.

**VI-05 “TASSAR FARMING; AN ADDITIONAL FINANCIAL SUPPORT OF
THE PEOPLE OF BHAGAMUNDA REGION OF KEONJHAR, ODISHA”**

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Abstract

Keyword:- silk worm, cocoon, Terminalia sp., DFSL, Biodegradable.

Bhagamunda area of the Keonjhar district of Odisha is enriched with various flora and fauna. Due to its geographical structure this area is fully covered with dense forest. Shorea robusta, Terminalia arjuna, Terminalia tomentosa, Madhuca indica are the dominant tree species

found in this region. Due to the high availability of these tree species the people of this region adopted Tassar Farming as an additional income. Tassar silkworm i.e, *Antheraea mylitta* feeds on *Terminalia arjuna* and *Terminalia tomentosa*. The wild variety of Tassar cocoon is known as “Modol” feeds on *Shorea robusta*. The primary cultivation is rice but the people of this area getting benefits by doing both rice and tassar farming simultaneously. Tassar farming means the lifecycle of a silkworm i.e, from larval stage to cocoon stage. The whole process consists of different stages like-Grainage, DFLS collection and distribution, rearing, Mounting, cocoon harvesting, cocoon marketing. In this farming the farmers are getting benefited till the end product of the cocoon. For ex. if a farmers taking 100 DFLS then he will be earned up to 10-15000 Rs as cocoon form within 3 months. After selling the cocoon in the market or any TRCS the it will be processing for making yarn. Tassar silk park is a hub centre of making tassar silk yarn, clothes and various silk products situated at this region. The women are working here for various purposes i.e, making yarn, different silk clothes and other silk products that directly give them financial support. The amount of reeling silk yarn is 6000@kg. The average value of a women reelers is 10000 @month. After reeling the dead pupae comes to outside of the cocoon. The pupae are dried, crushed and used as biofertilizer, fish food, and the pupae oil is used as medicinal purposes. So in the Tassar Farming there are no waste products. Each and every part of the silkworm and cocoon is biodegradable and reusable.

VI-06 SEA WATER & COASTAL SOIL ANALYSIS FROM SELECTED COSTAL AREAS OF BHAVNAGAR DISTRICT, GUJARAT, INDIA

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Abstract

Keywords: Qualitative Analysis, Seawater, Coastal area Soil, Abiotic factor

Gujarat State having coastal area around 1600 km. Bhavnagar is situated on the Gulf of Khambhat. Quality of Sea Water depends on coastal diversity about soil quality, that also affects diversity of plants. Sea water analysis is performed for parameters such as pH,

Temperature, Electrical Conductivity, Salinity, TDS, Acidity, Alkalinity, Chloride, Total Hardness, Calcium, Magnesium, DO, BOD, COD; coastal area soil subjected for soil analysis parameter such as pH, Temperature, EC, Salinity, Chloride, Calcium, Magnesium, Soil texture, moisture, porosity & buffering capacity, Water holding Capacity, Organic Carbon. Result gives scenario for impact on seawater and coastal - tidal region soil.

VI-07 EFFECT OF PARTICULATE POLLUTANT ON BIOMASS AND PRIMARY PRODUCTIVITY OF AN OIL YIELDING PLANT

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Abstract

The study area was confined to an oil yielding plant i.e. *Brassica campestris* L. situated in the prevailing wind direction of cement dust polluted area of Kalyanpur Cement Limited, Banjari, Rohtas, Bihar (24°57' North latitude and 84° East longitude) 200 km south of Patna to assess the effect of particulate pollutant i.e. cement dust pollution on biomass and primary productivity of *Brassica campestris* L. Dust load was estimated by dust jar method. On the basis of dust load control and polluted sites were selected. Biomass was estimated by harvest methods at the interval of 15 days till maturity of the plant. The primary productivity was calculated by the difference between the biomass value of successive sampling dates (Misra, 1968). The biomass and primary productivity shoot and root of *Brassica campestris* L. were higher at each sampling date on control than polluted sites. A maximum reduction of 37.61% of total biomass was recorded at the age of 90 days.

VI-08 AQUA CULTURE IN WATER LOGGED AREA OF BIHAR

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Abstract

Keywords: Aquaculture, aquatic plants, potable water and water logged area and remedial solutions.

Most of the water logged areas in Bihar were created by the forceful flow of river and also due to irregular flow of river is the main cause of breakdown of river banks or embankments of particular riverine belt, especially in north Bihar were found suitable for aquaculture. Most of the big and small rivers are coming out from Himalayan origin. This has been collecting a huge amount of rain water from its catchment area since the origin. Flood inundated areas have not been properly utilized. This resource can be utilized and made fruitful for global use to mankind by using simple practice of aquaculture. *Euryale ferox*(L), *Trapanatans*(L), *Nelumbonucifera* (L), *Nymphaea alba* (L), *Azollasps*(L), *Eichhorniacrassipes*(L), *Pistia stratiotes* (L) and some other aquatic plants are responsible for making contaminated water into potable water for betterment of human life as well as to the crop.

VI-09 REVIEW ON MUNICIPAL SOLID WASTE MANAGEMENT IN INDIA

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Abstract

Keywords: Waste generation, Municipal solid waste, Toxicity, Pollutants

Rapid Increase in urbanization and per capita income lead to high rate of Municipal Solid Waste generation. Its management is a worldwide phenomenon. It is a big challenge all over the world for human beings. Therefore, the present article was undertaken to find out the problems and prospects of Municipal solid waste Management. These wastes may

cause a potential hazard to human health or environment. In India Solid waste management is still unscientifically and collection efficiency in India is around 70% in some states while same is almost 100% in the developed countries. Even today, large portion of solid waste is dumped indiscriminately on outskirts of towns or cities without any prior treatment. In Indian cities, solid waste generation rate is continuously goes on increasing day by day by day is of serious concern. Per capita MSW generation in various cities of the India 43 million tones out of which about 12 million tones are treated, and 31 million tones are dumped in landfill sites. As compared to metropolitan cities in India as well as in Maharashtra, amount of Municipal solid waste (MSW) generation is the highest in Mumbai followed by Pune and Thane. This leads to groundwater contamination and increase in air pollution due to leachate percolation and release of gases respectively. This research survey describes about current status of municipal solid waste management in national and international level.

VI-10 IMPACT OF AIR POLLUTION ON PLANT GROWTH AND VIABILITY OF POLLEN GRAINS IN CHAPRA TOWN, DISTRICT SARAN BIHAR INDIA.

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Abstract

Keywords: - Air pollution, Flora, pollen viability, Plant growth

Automobile emissions give a lot of atmospheric pollution. Pollutants impact adversely on the growth and the pollen viability of the vegetation of Chapra town. Objective of this research work was to examine pollen viability and the plant growth in some angiosperms. Polluted and Controlled sites were selected. Analytical study was done. The result showed that Plants come from contaminated area reveals stagnation, chlorosis and discoloration on plant parts. Plants growing in the polluted area the Pollen viability was seen to be decreased in comparison to controlled area.

VI-11 MORPHOLOGICAL STUDIES OF MITE-INDUCED LEAF GALLS OF *MICROCOS PANICULATA* L.

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Abstract

Keywords:- *Eriophyes* sp., leaf galls, *Microcospaniculata* L., Mite, Morphology

Microcospaniculata L. belongs to the family of Tiliaceae and is a small-deciduous tree. It is found in the Northeastern parts of India, Western Ghats, and the Andaman Islands. The plant shows a broad range of medicinal properties. The Eriophyid mite penetrates the young leaves of *Microcospaniculata* inducing hypertrophy and hyperplasia in the parenchymatous tissue resulting in the formation of green galls of various sizes and shapes. The leaves of plants bearing galls were collected from infested plants grown in the different locations of Kolhapur and Sindhudurg districts of Maharashtra state for morphological and disease incidence study. The survey was carried out in 2020-2021, and 2021-2022 in different months (June-August and October-November). Two types of leaf galls were identified on this plant, one: close ovule-shaped pouch gall and another: finger-like projection-shaped profuse gall. Both galls are caused by *Eriophyes* sp. (Acarina). The galls on the leaves were observed under a dissecting microscope and the morphology of gall- infested leaves of *M. paniculata* L. was assessed. The maximum number of galls and infestation percentage (92%) were observed at Patgaon tehsil and Kerle tehsil district Kolhapur. The lowest number of galls and infestation percentage (64%) were observed at Phaye tehsil Bhudargad district Kolhapur among studied areas. In this present investigation, different morphological and histopathological aspects of leaf galls will be presented.

**VI-12 STANDING CROP BIOMASS AND PRIMARY PRODUCTIVITY OF
CAJANUS CAJAN L. OF NALANDA DISTRICT, BIHAR**

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Abstract

Key words: Biomass, Primary productivity, *Cajanuscajan* L.

The present study deals with Standing Crop Biomass and Primary Productivity of *Cajanuscajan* L. of Nalanda District, Bihar. The study area was confined to the agricultural field of Rahui, Nalanda, Bihar which is about 70 km south east from Patna (25° 27' north latitude and 85° 56' east longitude). It is situated in the middle Gangetic plain. It is approximately 47 m above the Mean Sea Level. Studies made on standing crop biomass and primary productivity of two varieties of *Cajanuscajan* L. i.e. Bahar and Pant 9. The field observations and samplings were carried out at interval of 30 days over a period of 240 days from 4th week of June 2020 to 1st week of February 2021.

**VI-13 ENVIRONMENT IMPACT AND SUSTAINABLE DEVELOPMENT
AND SIGNIFICANCE OF PLANTS IN SCIENCE**

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Abstract

Keywords: Plantation, Plants, smart city, Environment, Vegetation.

The current piece work of focus on importance of plants in our life as well as our environment balance. Nagpur is metro city in the world and present development is one of greatest part to improve our cities urban structure In our environment plants play very important role to balance our vegetational structure. Day by day plantations are must our smart cities development and it is good for surrounding human health. In

present condition increasing of pollution like air pollution, noise pollution, water pollution in metro cities is dangerous for people health. Its increasing pollution graph due to environmental, climatic and atmospheric change is dangerous for people as well as growing urbanization. Environmental pollutants refer to the contamination of ecosystem and the surrounding atmosphere by different forms of pollutants (Chemicals and energies). Plants improve the live ability of our cities for countless reasons. However, for many years plantation canopy in our urban areas has been decreasing. Large mature plant which reach the end of their lives are often replaced with smaller species Increasing level of trees and plants reduce our city pollution as well as oxygen level.

VI-14 IMPACT OF STONE CRUSHER DUST POLLUTION ON BIOMASS AND PRIMARY PRODUCTIVITY OF *HELIANTHUS ANNUUS L.*

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Abstract

Keywords: Biomass, Primary Productivity, Stone Crusher, *Helianthus annuusL*

The study area was confined to the *Helianthus annuusL.* situated in the prevailing wind direction of stone crusher area of Karwandia, Rohtas, Bihar to assess the impact of stone crusher dust on biomass and primary productivity of *Helianthus annuusL.* Dust load was estimated by dust jar method. On the basis of dust load control and polluted sites were selected. Biomass was estimated by harvest methods at the interval of 15 days till maturity of the plant. The primary productivity was calculated from the difference between the biomass value of successive sampling date (Misra, 1968). The biomass and primary productivity were found higher at each sampling date of the control *Helianthus annuusL.* than polluted one. A maximum reduction of 37.31% of total biomass was recorded at the age of 105 days.

**VI-15 STANDING CROP BIOMASS AND PRIMARY PRODUCTIVITY OF
A MAJOR CEREAL OF NALANDA DISTRICT, BIHAR**

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Abstract

Keywords: Biomass, Primary Productivity, *Oryzasativa* L. Nalanda, Bihar.

The present study deals with standing crop biomass and primary productivity of a major cereal i.e. *Oryzyssativa* varieties Suraj and Vijay growing in the agroclimatic region of Nalanda District, Bihar. The two varieties of *Oryzasativa* L. sown in the last week of July 2020. Biomass of the both varieties were estimated at the interval of 15 days till maturity of the plant i.e. 135 days by harvest method. The primary productivity was calculated from the difference between the biomass value of successive sampling date (Misra, 1968). Biomass and primary productivity of shoot and root of *Oryzasativa* L. varieties Suraj and Vijay were higher at each sampling date till 120 days. Biomass and primary productivity of *Oryzasativa* L. variety Suraj had more value in comparison of variety Vijay.

SUB-SECTION-VII

Plant Biotechnology and Tissue Culture

**VII-01 SCREENING OF CHLORELLA VULGARIS AND BOTRYOCOCCUS
BRAUNI FOR BIOFUELS PRODUCTION - PROSPECTIVES AND
PROJECTIONS FOR SUSTAINABLE LIVING**

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Abstract

Keywords: Biofuels, fossil fuels, ethanol, biodiesel, transesterification, *Chlorella vulgaris* and *Botryococcus brauni*

It is well known that there is a drastic depletion of fossil fuels is leading us to an anticipated global crisis. One of the alternate sources that do not challenge food security of the world is the use of algae. Several algae are photosynthetically efficient and have several advantages over fuel crops. Therefore, the present study aims at screen the algal species for lipid accumulation and biofuel production. Among them, *Chlorella vulgaris* and *Botryococcus brauni* showed lipid content of 18.1% and 17.6% were selected for further studies which upon optimized conditions increased lipid content to 25%(w/w). Therefore, *Chlorella vulgaris* and *Botryococcus brauni* showing lipid content of 19.2% and 18.4% were selected for further studies which upon optimized conditions increased lipid to 25%(w/w). Further the algal species were grown in low cost alternative media consisting of animal waste. It was found that media supplemented with 40% animal waste supported biomass production while 10% of media supplementation led to lipid accumulation in both strains. An average 5% lipid increase was obtained in the cultures when grown in formulated media. Hence it can be concluded that these algal species can be explored further for the large scale production of fuels.

**VII-02 PURIFICATION, CHARACTERIZATION AND EVALUATION OF
IN VITRO CYTOTOXICITY OF ANTHOCYANIN FROM THE FLOWERS
OF *IMPATIENS BALSAMINA* L.**

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Abstract

Keywords: Anthocyanin, cytotoxicity, *Impatiens balsamina*, purification.

Anthocyanins are naturally occurring flavonoids, are responsible for the flower colouration. *Impatiens* shows a wide range of variations in the flower colour. *Impatiens balsamina* (garden balsam) flowers was used against burn, warts, fractures, hair growth among tribals. Interestingly, the ethnic usage is not yet validated scientifically. In this scenario, the present study aims to purify anthocyanin from *Impatiens balsamina*, followed by the analysis of *in vitro* cytotoxicity in normal cell lines. The purified anthocyanins were balsaminonine-1, balsaminonine-2 and tribalsamonine. Percentage of cytotoxicity on 3T3 normal cells was 1.64 and 2.81% at 1000 µg/ml after 24 and 48h respectively. The doses from 31.25 to 1000 µg/ml of anthocyanin extract showed the viability percentage after 24h were 92.35- 98.52% and after 48 hours, was 90.81 to 97.19%. i.e., No significant cytotoxicity was observed. Thus, it is possible to suggests that the effect of the anthocyanin extract on the normal fibroblast cell was low or it shows a high cell viability percentage.

VII-03 AN *IN VITRO* MICROPROPAGATION AND GENETIC TRANSFORMATION IN *OXALIS CORNICULATA* BY USING *AGROBACTERIUM TUMEFACIENS* CARRYING AN EXPRESSION VECTOR PCAMBIA1301 .

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Abstract

Keywords: Micropropagation, *Agrobacterium tumefaciens*, vector pCAMBIA1301, *Oxalis corniculata*

Nodal explants from *O.corniculata* were inoculated into MS medium with various combinations and concentrations of Kn, BAP, NAA, IBA and IAA. Effective shoot regeneration was achieved by using MS medium with BAP (1.0mg/l) and in combination with NAA (0.5mg/l). The shoot regeneration frequency was found to be 96%. Phytohormones used in the combination of Kn (2.0mg/l) with NAA (0.5mg/l) has given maximum shoot length. *Agrobacterium*-mediated genetic transformation was established in *O.corniculata* by optimizing the parameters such as growth phase of A_{600nm} 0.17, infection period of 30 min, addition of acetosyringone in co-cultivation medium (400 µM) and cocultivation temperature of 22°C.

VII-04 GREEN SYNTHESIS OF SILVER NANO PARTICLES DERIEVED FROM LEAF EXTRACT OF *SYZYGIUM CUMINII* (SNSC) -TO EVALUATE ANTIBACTERIAL ACTIVITY.

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Abstract

Keywords: silver nanoparticles, *Syzygium cuminii*, antibacterial activity.

Synthesis of metals nanoparticles from the plant or plant extracts has emerged as an important alternative to the chemical method. The biological approach to the synthesis of nanoparticles has many

advantages such as non-elaborative process, no multiple purification steps, no need of intracellular synthesis and does not require maintenance of microbial cell cultures. Medicinal plants and green synthesis of silver nanoparticles (AgNPs) have proven to be good sources of agents effective in the treatment of various diseases. The present study focuses on the green synthesis of silver nanoparticles (AgNPs) from leaf extract of *Syzygium cumini* in order to evaluate the antibacterial properties.

The characterization was determined using UV-VIS spectroscopy, TEM, X ray diffraction and FTIR studies. Silver nanoparticles (AgNPs) showed absorption peak at 470 nm in aqueous medium in UV-VIS spectrum. TEM analysis shows the morphology of Silver Nano particles as a hexagonal matrix with average particle size of about 50nm. XRD analysis displays the crystalline structure of silver nanoparticles. FTIR analysis shows that amide groups present in proteins are dominant reducing agents and play an important role in the bio reduction of Ag⁺ ions to Ag⁰.

The synthesized silver nanoparticles from leaf extract of *Syzygium cumini* (SNSC) showed antibacterial activity against common clinical pathogens. Owing to the remarkable potential antibacterial activity against common pathogenic microorganisms, the synthesized AgNPs can have potential for development in medical applications in the future.

VII-05 PREPARATION AND CHARACTERIZATION OF BIOGENIC SILVER NANOPARTICLES USING STROBILANTHESCORDIFOLIA (VAHL) J. R. I. WOOD LEAVES AND ITS BIOLOGICAL APPLICATIONS

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Abstract

Keywords: Green synthesis, Characterization, Antibacterial, Antioxidant, Anti-inflammatory, Anti-diabetic, Anti-proliferative.

In the present study aqueous leaf extract of *Strobilanthes cordifolia* J.R.I.Wood was combined with silver nitrate to synthesis silver nanoparticles (AgNPs). The AgNPs was characterized using visible spectroscopy (UV), X-ray diffraction (XRD), fourier transform infrared spectrophotometer (FTIR), scanning electron microscope (SEM), energy

dispersive X-ray (EDaX), particle size analysis and transmission electron microscope (TEM). The UV spectrum absorption peak occurred at 438nm. The FTIR analysis of the AgNPs indicated the presence of functional groups such as aldehyde, alkenes and carboxylic acids. The crystalline structure of AgNPs was confirmed by XRD. The AgNPs have a spherical shape according to SEM. The AgNPs components composition was confirmed by EDaX. The particle size distribution of AgNPs is monodispersion in the range at 42.54nm. TEM demonstrated that the AgNPs size to be between 11.35- 34.90nm. The AgNPs exhibited good antibacterial against *Escherichia coli* and *Staphylococcus aureus*. The antioxidant activity of the AgNPs was represented by increased DPPH, ABTS and H₂O₂ activities. The antidiabetic activity of the AgNPs was indicated by the inhibition of α -amylase and α -glycosidase and anti-inflammatory highest albumin denaturation and HRBC membrane stabilization properties. Further, the AgNPs also significantly inhibited the MCF-7 cell lines. These results clearly suggest that the synthesized AgNPs using *S. cordifolia* leaves could have several potential biomedical applications.

VII-06 ZnO NANOPARTICLE SYNTHESIS, CHARACTERIZATION, DYE DEGRADATION AND BIOLOGICAL STUDIES ON *HARDWICKIABINATA* LEAF EXTRACT

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Abstract

Keywords: Characterization, Antibacterial, Antioxidant, Anti-inflammatory, Anti-proliferative.

The green nanoparticles (NPs) have attracted significant research attention for its inborn properties. Here, *Hardwickiabinata* leaves extract using synthesis zinc acetate NP was confirmed by colour change in green to pale white precipitate. ZnO-NPs were evaluated using a UV-Vis spectrophotometer (UV) at 365 nm confirms the synthesis of Hb-ZnO NPs. FTIR analysis was able to demonstrate the existence of several functional groups like carboxylic acids, amine, anhydrides and alcohol. XRD findings support ZnO-NPs as crystalline structure. SEM data confirmed their synthesis ZnO NPs as spherical in shape. According to

TEM findings, particles with a size range 25 nm and spherical shaped structures. *Staphylococcus aureus* (13 mm) shows high inhibition compared to other bacterial strains. Antioxidant shows DPPH (59.83%), ABTS (55.43%), hydroxyl radical (55.86) and albumin denaturation (63.48 %), HRBC membrane stabilization (64.79%). Human cancer A431 cell line was treated with 65% of inhibition and HepG2 with 66.86% of inhibition to evaluate the cytotoxicity of synthesised ZnO-NPs. These findings it should be noted that synthesis NPs can be utilized for a variety of global biomedical applications in the future.

VII-07 SILK REINFORCED WITH GRAPHENE FOR ENHANCED PROPERTIES.

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Abstract

Keywords: FTIR, Graphene, Larva, Mechanical properties, Tasar Silk.

Graphene has become a useful nanomaterial due to its exceptional high tensile strength. Aim of this study was to enhanced the properties of Tarar silk with the reinforcement of graphene. In this, we report mechanically enhanced silk directly collected by feeding *Antheraea mylitta* D. larval silkworms with graphene. Raman spectroscopy confirmed that fed graphene were incorporated into the silk fibers, whereas the others went into the excrement of silkworms. FTIR spectroscopy study indicated that addition of graphene hindered the conformation transition of silk fibroin from random coil and α -helix to β -sheet, which may contribute to increased elongation. The successful production of these graphene-incorporated Tasar silks by feeding graphene coated leaves may open up possibilities for the large-scale production of high-strength silk fibers.

VII-08 THE USE OF NANOTECHNOLOGY TO DETERMINE THE ANTI-AGING PROPERTY OF GLYCINE MAX (SOYA)

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Abstract

Key words: Nanotechnology, Antioxidant, Daidzein

The newest and most cutting-edge technology currently available is the inclusion of nanotechnology into cosmetics. Nanoscale chemicals are used for improved UV protection and deeper skin penetration. Soya contains isoflavones, genistein and daidzein which are potential antioxidants. Soya seeds were extracted using methanol. Soya microspheres and nanospheres were prepared and checked for their stability, efficacy. Size of Soya seed extract microspheres and PEG nanospheres were 1-3 micro metres and of 100-130 nm respectively. Particles were further used in cosmetic formulation and their anti-aging effect was detected using Corneometer. Results confirmed anti-aging effect through skin hydration mechanism.

VII-09 EFFECT OF DIFFERENT PHYTOHORMONES ON MULTIPLICATION OF SHOOTS FROM DIFFERENT EXPLANTS (NODAL SEGMENTS, INTERNODAL SEGMENTS AND AXILLARY BUDS) AND IN VITRO CLONAL PROPAGATION IN DALBERGIA SISSOO – A PRECIOUS TIMBER PLANT IN INDIA

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Abstract

Keywords: Morphogenetic studies, Tissue culture, micropropagation, callus, clones, Dalbergia sissoo.

Dalbergia sissoo is an important timber plant having the great economic importance. It is in high demand economically. Hence tissue culture

technique is the need of hours. In this study, a standard procedure was developed for rapid multiplication of *Dalbergia sissoo* through axillary bud proliferation, nodal & internodal explants were collected from different clones and were sterilized with 0.1% mercuric chloride for 15 min. In few clones, maximum response of 95.35% was recorded. The nodal parts of stem gave mass proliferation of callus with 2,4-D (1.1mg/l) and BAP (1.1 mg/l) within in 2-3 weeks. The internodal (soft) parts of stem gave more mass proliferation of callus with 2,4-D (1.1 mg/l) and BAP (5.5 mg/l). With the combination of 2,4-D (1.1mg/l) and BAP (5.5mg/l) the shoot apices swell up and became fleshy in 15 to 17 days. The multiple shoot formation from the different explants is observed. The plantlets were acclimatized and successfully grown on the field.

Abbreviations: BAP- 6-Benzylaminopurine, 2,4-D- 2,4 Dichlorophenoxyacetic acid, MS – Murashige and Skoog medium.

VII-10 GREEN SYNTHESIZED ZNO NANOPARTICLES AND THEIR ANTIBACTERIAL AND ANTIOXIDANT ACTIVITIES

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Abstract

Keywords: Antibacterial activity, Antioxidant activity, Green synthesis, *Madhuca longifolia*, ZnO nanoparticles.

In place of the conventional synthesis process of NPs, bio-mediated synthesis of ZnO NPs is a promising alternative. The present study reports the biological synthesis of ZnO NPs. *Madhuca longifolia* (M-ZnO NPs) plants' leave extract were used to synthesize ZnO NPs and characterized by UV-vis, XRD, SEM, and FTIR spectroscopy. The crystalline nature of ZnO NPs was confirmed by XRD and size was confirmed by SEM analysis. FTIR spectra showed functional groups involved in the synthesis of ZnO NPs. The antioxidant activity of green ZnO NPs was assessed by scavenging free radicals of DPPH with different concentrations. The antibacterial assay of ZnO NPs were performed against some Gram-positive and negative bacteria by the agar well diffusion method. The current study demonstrated that ZnO NPs have significant antioxidant and antibacterial activity. Therefore, the study reveals a simple, efficient, cost-effective, and eco-friendly green synthesis approach for the synthesis of multifunctional ZnO nanoparticles.

VII-11 PHYTOCHEMICAL ANALYSIS OF CYATHODIUM CAVERNARUMKUNZE.AND IT'S BIOLOGICAL POTENTIALITIES

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Abstract

Keywords: *Cyathodium cavernarum*, Phenols, Flavonoids, Phytochemicals, Antioxidants, Antidiabetics

Bryophytes are rich in beneficial components, such as sugars, sugar alcohols, amino acids, fatty acids, aliphatic compounds, flavonoids, and phenolic substances, but more research is needed to determine the medical usefulness of certain species or compounds. Preliminary qualitative and quantitative analysis of the thalloid liverwort *C. cavernarum* reveals the presence and higher concentration of flavonoids. DPPH and reducing power assays demonstrated dose-dependent inhibition relative to standards, with an IC₅₀ of 159.14 µg/ml. *Cyathodium cavernarum* exhibited a significant alpha-amylase inhibitory activity (162.91 µg/ml). The findings indicate the possible production of beneficial natural antioxidants. Using a chloroform extract, the present investigation demonstrated the extraordinary antioxidant and anti-diabetic therapeutic potential of *C. cavernarum*. It suggests the possibility of extracting beneficial antioxidants from the plant.

VII-12 BIOFORTIFICATION OF OYSTER MUSHROOM THROUGH BIO-ELEMENT FOR MINERAL RICH FOOD

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Abstract

Keywords: Bio-fortification, Mushroom, bio-elements, Nutraceutical, Metabolites

Mushroom has high culinary value along with medicinal properties. Oyster myceliums have ability of bio-elements absorption from its growth substrate. Therefore supplementation or bio-fortification of the substrate with biological active element would substantially increase the viable and functional metabolites of oyster mushroom. Bio-fortification with bio-

element like selenium plays major metabolic function in human cells like thyroid hormones metabolism, antioxidant defense, reproduction etc. Thus bio-element of nutraceutical importance would increase; on the other hand oyster mushrooms have high mineral content which may boost the production of quality mushroom with enriched bio-elements.

VII-13 HPLC ANALYSIS OF PETROLEUM ETHER EXTRACT FROM *DUMORTIERA HIRSUTA* (SW.) NEES. AND ITS BIOLOGICAL POTENTIALITIES

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Abstract

Keywords: *D. hirsuta*, polyphenols, antioxidant, antimicrobial, HPLC.

Plants are a rich source of various phytochemicals that cannot be synthesised in a laboratory. Based on the traditional uses of various phytochemicals, they were isolated from plants that can be used in the modern drug industry. Compared to higher plants, bryophytes are less explored in the fields of taxonomy, phytochemistry, and molecular biology etc. Ethanomedicinal use of these plants also points out the therapeutic potential and phytochemical importance. Qualitative and quantitative analysis of the thalloid liverwort *D. hirsuta* reveals the presence and higher concentration of polyphenols in the petroleum ether extract. DPPH, ABTS, FRAP, and the reducing power assay showed a dose dependent potentiality, and the IC₅₀ value of DPPH was shown to be 120.25g/ml. Petroleum ether extract of *D. hirsuta* showed a remarkable inhibition on *Staphylococcus aureus* (11mm) compared to other bacterial strains. This antibacterial and antioxidant activity may be due to the synergistic activity of flavonoids like quercetin, kaempferol, etc., and its presence was confirmed by HPLC.

**VII-14 INDUCTION OF CALLUS IN *DESMODIUM GANGETICUM* (L.) DC
BY VARIOUS CONCENTRATIONS OF AUXINS**

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Abstract

Keywords: *Desmodium gangeticum*, Callus induction, Explants.

Desmodium gangeticum (L.) DC is important medicinal plant. It is sub-erect, under-shrub with irregular angled, branched woody stem. Leaves - unifoliate/trifoliate. Flowers- small, pink -purple color. Tissue culture regeneration system is used for rapid multiplication and for genetic improvement. In the present investigation, an efficient protocol for callus induction of *D. gangeticum* is developed. The stem and leaf explants was inoculated with basal cut surface down on MS medium supplemented with 0.25, 0.5, 0.75, 1 mg/l IAA, NAA and 2,4- D for callus induction. The better and profuse callus induction was found in MS medium supplemented with 0.5mg/l 2, 4-D.

SUB-SECTION VIII

Plant Cytogenetics and Molecular Biology

**VIII-01 ASSESSMENT OF GENOTOXIC POTENTIAL OF AQUEOUS
EXTRACTS OF CIPROFLOXACIN IN THE MERISTEMATIC ROOT TIP
CELLS OF *ALLIUM CEPA* L.**

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Abstract

Keywords : *Genotoxic, Mitotic Index, Chromosomal Abnormalities, Ciprofloxacin*

The present research paper reports the genotoxic potential of aqueous solution of Ciprofloxacin on the mitotic index (MI) and Chromosomal abnormalities (CA) in the meristematic root tip cells of *Allium cepa* L. Ciprofloxacin is a fluoroquinolone antibiotic used to treat a number of bacterial infections like bone and joint infections, intra abdominal infections (IAI), certain types of infectious diarrhea, respiratory tract infections (RTI), skin infections, typhoid fever and urinary tract infections (UTI) etc. Ciprofloxacin may be used orally, used as eye and ear drops as well as intravenously.

In this investigation, Ciprofloxacin is dissolved in distilled water to get a mother solution which was further diluted to different concentration such as 0.1%, 0.05%, 0.025%, 0.012% by adding required quantity of distilled water. The root tips of *Allium cepa* L were treated with different concentrations viz. 0.1%, 0.05%, 0.025%, 0.012% and also with distilled water for control for four hours at room temperature. The treated and control root tips were fixed in freshly prepared 1:3 aceto-butanol and squashed in freshly prepared 2% aceto- carmine solution.

Our study revealed that the solution of Ciprofloxacin had mito-depressive activity and had potential to induced a variety of chromosomal abnormalities (CA) such as stickiness, bridges, fragments, laggards, micronuclei, binucleate and disturbed metaphase/anaphase/telophase.

The frequency of cell division (MI) and Chromosomal abnormalities (CA) were in different mitotic stages of cell division in each treatment. The results showed that Ciprofloxacin solution significantly depressed the mitotic index from 14.5 ± 0.96 to 08.57 ± 1.07 in comparison to control i.e. 19.13 ± 0.07 . However, the frequency of CA was gradually induced with increasing concentration of Ciprofloxacin which was recorded up to 4.21%.

The above parameters showed a linear correlation with doses of Ciprofloxacin concentration. The gradation of chromosomal abnormalities was recorded as stickiness > fragment > disturbed-metaphase/anaphase/telophase > bridge > laggards > micronuclei > binucleate.

VIII-02 RNA-SEQ DIFFERENTIAL EXPRESSION ANALYSIS IN VITRO AND IN VIVO SYSTEMS OF HEMIGRAPHIS ALTERNATA

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Abstract

Keywords: RNA Seq, In vitro, In vivo, Differential expression, Genetic homogeneity

High resolution transcriptome datasets for in vitro regeneration provided the way to understand the underlying molecular mechanisms that regulate the development under in vitro condition. *Hemigraphis alternata*, belongs to the family Acanthaceae was selected for in vitro regeneration to study differentially expressed genes during in vitro development. The plants obtained from in vitro system and in vivo were subjected to morphological and molecular analysis. The transcriptome information provided here will form the foundation for epigenetic control of in vitro plant development at a molecular level. The RNA Seq data along with the differential expression profile will be a great goal to construct a regulatory network for in vitro regeneration.

**VIII-03 GAS CHROMATOGRAPHY-MASS SPECTROPHOTO- METRY
ANALYSIS OF BIO ACTIVE COMPOUNDS OF RHIZOMES
OF ACORUS CALAMUS AND ITS EFFECT ON HUMAN NERVOUS
SYSTEM -A CASE STUDY IN DALMA WILD LIFE SANCTUARY, EAST
SINGHBHUM, JHARKHAND**

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Abstract

Keywords: *Acorouscalamus*L., GC-MS, analysis, asarone, neuro protective.

Acorouscalamus is a perennial, semi aquatic and aromatic medicinal herb exist in both temperate and sub temperate region with sharp pointed, long erect leaves. *Acorouscalamus* is a well-known herb with useful bio active properties in indigenous medicines for centuries in India. The main objective of this work first to search the chemical components in *Acorouscalamus* L. was identified by gas chromatography-mass spectrophotometry. The plant has wide applications as a herbal medicine since its rhizome exhibits neuro protective activities such as anticonvulsant, antidepressant, antihypertensive etc. The GC-MS analysis for investigation of the compound present in the hexane, ethyl acetate and methanolic extract of *Acorouscalamus* L. rhizome suggested presence of alpha asarone, beta asarone, gammaasarone, benzene,1,2,4-trimethoxy-5-propenyl, 5-hydroxymethyl furfural and many more have been reported to be responsible for neuro protective activity. The case study was conducted by selecting three patients randomly by visiting local herbal practitioners and being administered different dosage of rhizome of *Acorouscalamus*. These patients are of different age group who were suffering from different neurological problems. The method of administration and dosage of plant product differ from patient to patient by certain courses and duration it was found that the treatment was successful for all the cases.

**VIII-04 STUDY OF GENETIC DIVERSITY IN RICE (ORYZA SATIVA L.)
GENOTYPES UNDER DIRECT SEEDED CONDITION BY USING
PRINCIPAL COMPONENT ANALYSIS**

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Abstract

Keywords: PCA, genetic diversity, K-clustering, DSR

The present investigation was carried out to assess the genetic diversity by using principal component analysis for yield and yield contributing traits in thirty-two genotypes of rice under direct seeded condition (DSR). The experiment was conducted at Dr. Rajendra Prasad Central Agricultural University, Pusa, Bihar in randomized block design with three replications. The results revealed that first four component axes had eigen values ≥ 1.0 , representing a cumulative variability of 76.86 %. Principal component analysis (PCA) indicate that four components (PC1 to PC4) accounted for about 76.86% of the total variation present among all the traits. Out of total principal components PC1, PC2, PC3 and PC4 with values 33.781%, 19.02%, 13.859% and 10.206% respectively, contributed more to the total variation. The first principal component had high positive loading for 15 traits out of 17. Similarly, second and third principal component had 7 traits each, fourth component with 6 traits had high positive loadings which contributed more to the diversity. Genotypes in cluster V showed higher mean performance for most of the yield attributing traits. Therefore, selection of parents for different traits would be effective from this cluster. Thus, result of the present study could be exploited in planning and execution of future breeding programme in rice under direct seeded condition.

**VIII-05 EVALUATING CYTOTOXIC EFFECTS ON ACARICIDE ON
*ALLIUM CEPAL***

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Abstract

Keywords: Propargite 57% EC, *Allium cepa* test, Cytotoxicity indicators, exposure, recovery

Propargite 57% EC used at an approved dose of 500ml/200l to control red spider mite infestation at Tea Gardens, was evaluated for cytotoxic effects using the *Allium cepa* test. Cytotoxicity indicators include changes in root growth, changes in mitotic index and appearance of chromosomal aberrations, both during and post exposure. Marked reduction in root growth observed both during exposure and recovery. Initial exposure induced duration dependent reduction in mitotic activity, which remained low post recovery. However, chromosomal aberrations were not noted. The results indicate low-moderate cytotoxicity of Propargite. Thus the acaricide should be used rationally in restricted doses for crop protection.

**VIII-06 IN-SILICO MOLECULAR DOCKING IN SCREENING OF ANTI-
DIABETIC THERAPEUTICS FROM RUMEX VESICARIUS L**

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Abstract

Keywords: Docking, DPP4, *Rumex vesicarius*, Diabetes mellitus.

Just a few drugs are approved for the care of infectious patients, considering the global epidemic of type-2 diabetes mellitus (T2DM) infection and the lack of adequate treatment alternatives for diabetics. Newer anti-diabetic drugs with novel modes of action are desperately needed, as are measures to minimize attrition in the early stages of drug production. Anti-bacterial and Antioxidant activities of *Rumex vesicarius* were performed. So far there is no in silico anti-diabetic study report

against the DPP4, so this paper is aimed to report the in silico docking of phytochemicals present in this plant against target DPP4. In silico anti-T2DM lead prioritization was performed on a set of known compounds from *Rumex esicaris*. The docking of DPP4 with selected 12 phytochemical molecules were performed by using Autodock 4. In the present study, 12 compounds (Apigenin, Chrysophanol, Emodin, Physcion, Catechin, Epicatechin, Luteolin, quercetin, Rhein, tetramethylene_sulfone, alloaromadendrene and cis-Limonene oxide) were docked into DPP4 and out of twelve, one compound, Chrysophanol indicated high binding score (-8.99 kcal/mol) and the residues VAL:558, ARG:560, LYS:512,554 GLN:527, ASN:562, ASP:545, ALA:564, ILE:529, THR:565, MET:509, PRO:510, LEU:561 PHE:559 were might play important roles in binding with these compound. Following some invivo and in-vitro developmental phases, as well as additional tests to confirm their efficacy and safety as a proper and adequate medicine against DPP4, with no health risks.

**VIII-07 AN ELUCIDATION OF THE MOLECULAR AND BIOCHEMICAL
FRAMEWORK OF AN ENDANGERED MANGROVE-
HERITIERA FOMES BUCH. HAM.**

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Abstract

Keywords: *Heritiera*, protein, restriction digestion, Sundarbans

Since 1950s, the population of the Sundarbans mangroves declined drastically from 50% to 80% due to coastal development, emphasizing on rice farming and shrimp aquaculture. *Heritierafomes*Buch. Ham., is one such ethnomedicinally important mangrove facing the risk of extinction in upcoming years. Hence, this work focuses on enlightening the biochemical and molecular parameters of this plant by performing restriction digestion and protein profiling where differential banding patterns were observed, also the plant was found to possess significant antioxidative properties. These findings might help researchers to delimit between species followed by DNA barcoding, thus paving ways to conserve this specimen.

**VIII-08 INCREASING EFFECTS OF CHEMICAL MUTAGENS ON THE
LEAF GROWTH AND PHYSIOECOLOGICAL FEATURES**

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Abstract

Keywords: Culinary spice, quality, sodium azide, growth, physioecological parameter

Coriander is regularly used as culinary spice and to prevent food poisoning. To fulfil the demand in low cost, production should increase with increase the quality. The aim of this study was to discern the increase in the growth of leaves and physioecological parameters by mutagenesis. Seeds of *Coriandrum sativum* L. were treated with sodium azide at different grades (0.5%, 1%, 1.5%, 2%) and allow them to grow. Highest growth of plants was observed at 1.5% of sodium azide concentration which shows that increasing mutagenic concentration significantly influences the growth in plant parts. But highest value of physioecological parameters were found at 1% concentration while at 2% the value decreases dramatically. This shows that high mutagenic concentration is detrimental for the physiological conditions of the plants. Thus the premeditated optimum concentration can create an innovative change in the desirable attributes.

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