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BSPCCAS-2024

XXXIV Annual Conference of
Indian Association for Angiosperm Taxonomy
and
International Seminar on

Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics

BSPCCAS-2024

November 23–25, 2024

Abstract Book

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जैवप्रौद्योगिकी विभाग
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In collaboration with
Botanical Survey of India
Kolkata

Organized by
Department of Life Science
and Bioinformatics
Assam University, Silchar

Knowledge Partner
Rabindranath Tagore
University, Hojai, Assam

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International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]"

November 23–25, 2024

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of Indian Association for Angiosperm Taxonomy &
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Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics

[BSPCCAS-2024]

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Assam University
(A Central University)
Silchar 788011, Assam, India

MESSAGE

It gives me immense pleasure to extend my heartfelt congratulations to the Department of Life Science and Bioinformatics, Assam University, Silchar for their commendable effort in preparing the "Abstract Volume" of the **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**,"

Angiosperm taxonomy plays a pivotal role in understanding plant diversity, evolution, and ecology. This conference provides a valuable platform for addressing modern issues and challenges in plant systematics, showcasing interdisciplinary approaches to key topics like taxonomy, floristics, endemism, and plant conservation.

The publication of this Abstract Volume is a significant milestone, offering insights that will benefit the scientific community and foster research collaborations. I express my sincere appreciation to the Organizing Committee and contributors for their hard work, which stands as a testament to the importance of integrating traditional knowledge with modern techniques in plant systematics.

It is a great pleasure to welcome all the delegates and participants to this conference. On behalf of Assam University, I extend my best wishes for the success of this International Conference and its associated publications. I am convinced that it will inspire meaningful discussions and innovative research in the field of Angiosperm taxonomy.

Date : 12.11.2024

Vice-Chancellor

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The Indian Association for Angiosperm Taxonomy (IAAT)

(Established: 1991)

Dr. Usha Yadav
President

MESSAGE

Taxonomy is the mother branch of biology and progress of biology depends on it. Basic research lays the foundation for applied research. Knowing the plants, their ecology, and uses is important in human progress. Taxonomists explore and document biodiversity- a biological capital of great importance. Plant taxonomists play a crucial role in correct identification and documentation of traditional knowledge associated with plants. In addition to food, fodder, shelter and oxygen, plants provide drugs for kwon and also new diseases. Taxonomists along with their basic research should be able to guide common people in cultivation, extraction of biochemicals, essential oils and development of other products.

Indian Association for Angiosperm Taxonomy (IAAT) is the largest taxonomic association of India. IAAT aims to promote Angiosperm Taxonomy. Association publishes 'Rheedea', also runs library at Calicut University. Each year two gold medals are given to two life-members of the association in recognition of their significant contribution. IAAT plays an important role in the advancement of taxonomic studies in India.

I appreciate the efforts taken by the Department of Life-sciences and Bioinformatics, Assam University, Silchar for hosting XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy. This conference will provide a platform for researchers to discuss and understand the basic and applied aspects of Angiosperm Taxonomy.

Usyadav

Usha Yadav
President IAAT

ए.ए. माओ
निदेशक
A. A. Mao
Director

सत्यमेव जयते

भारत सरकार
पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय
भारतीय वनस्पति सर्वेक्षण
GOVERNMENT OF INDIA
MINISTRY OF ENVIRONMENT, FOREST
& CLIMATE CHANGE
BOTANICAL SURVEY OF INDIA

MESSAGE

It is a matter of immense pleasure that the Department of Life Science and Bioinformatics, Assam University, Silchar, is organizing the **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**," from 23rd to 25th November 2024.

Being the premier institution dedicated for floristic research and plant taxonomy in India, Botanical Survey of India recognizes the great importance and significance of this event. Conferences like these provide a crucial platform for presenting the results and discussing the advancements in plant systematics, biodiversity conservation and related fields. The themes selected for this seminar will surely inspire cross cutting research and encourage collaboration among experts, scholars, and students alike.

I extend my heartfelt congratulations to the Department of Life Science and Bioinformatics, AUS and commend the organizers for their dedication and diligence. I wish all participants a fruitful and inspiring exchange of ideas that will contribute to the advancement of plant science.

(A. A. Mao)
Director

सी.जी.ओ कॉमप्लेक्स, तृतीय एम.एम.ओ भवन, ब्लॉक-एक (पाँचवा तल),डी एफ ब्लॉक, सेक्टर 1, साल्ट लेक सिटी, कोलकाता-700 064 फोन : 033-2334496
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MESSAGE

It's my pleasure to see that Department of Life Science & Bioinformatics, Assam University Silchar is organizing International Conference on **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**,". Though I had a plan of organizing atleast four International conference from School of Life Sciences of Assam University during my tenure as Dean of School of Life Sciences, I could have only one in November 2023. Because only 09 months after taking over the charge of Dean, I had to move to Rabindranath Tagore University taking the responsibility of Vice Chancellor.

Although initial planning of present conference was made by me along with the Organizing Secretary, Dr. Debjyoti Bhattacharyya, it is so good to see that the activities have been taken forward even in my absence by the young faculty members of the Department of Life Science under the active leadership of the Head of the Department.

I am happy that Assam University has made Rabindranath Tagore University a knowledge partner of the conference and as part of Rabindranath Tagore University we have tried to contribute academically a little for the conference.

I believe the conference will be able to reach a new height because of excellent deliberations from the experts of the field.

I extend hearty welcome to all who have joined us in this conference.

I congratulate all the young faculty members of Department of Life Science for their active efforts in making the conference happen.

Prof. Manabendra Dutta Choudhury

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सिलचर-788011
असम, भारत

ASSAM UNIVERSITY
(A Central University)
Silchar - 788011
Assam, India

MESSAGE

I am delighted that the **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**," is going to be organized by the Department of Life Science and Bioinformatics, Assam University, Silchar from 23rd to 25th November 2024. It promises to be a significant platform for the exchange of knowledge and ideas in the field of angiosperm systematics.

Seminars like this play a crucial role in advancing our understanding of plant science by bringing together experts, scholars, and researchers from across the country and abroad. Such collaborations enrich the academic community and promote new research that addresses the pressing challenges of plant systematics, taxonomy, and biodiversity conservation.

I extend my sincere gratitude to the organizers for their praiseworthy initiative and warmly welcome all delegates and participants who will be contributing to this important event. I wish the conference a great success and looking forward to the fruitful discussions that will surely help for the advancement of plant science and its practical uses for the benefit of all.

With best regards,

Dr. Pradosh Kiran Nath
Registrar & Patron – BSPCCAS-2024

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11 November 2024

MESSAGE

It gives me immense pleasure to inform that the Department of Life Science and Bioinformatics, Assam University, Silchar, India is organizing the XXXIV Annual Conference of the Indian Association for Angiosperm Taxonomy and International Seminar on 'Botanical Symphony–Perspectives and Current Challenges in Angiosperm Systematics' (BSPCCAS 2024) from 23-25 November, 2024. IAAT, the largest association of taxonomists in India, was founded in 1990 with the aim of advancing the science of angiosperm taxonomy and to provide a common platform for purposeful exchange of ideas.

More than 150 delegates from both India and abroad are participating in the three-day deliberations. Original research papers from taxonomy, both classical and modern, are put under six major themes: 1). Floristics, Plant Diversity & Conservation, 2). Nomenclature, Revision & Monograph, 3). Biosystematics, Applied Taxonomy& Phylogeny, 4). Ethnobotany, Indian Knowledge System (IKS) & Bioprospectation, 5). Medicinal Plants & Drug Discovery, and 6). Digitization & Database.

I am sure that the outcome of this 3-day conference will help to establish collaborations and to update our knowledge of the current trends of research in angiosperm taxonomy. I express my sincere appreciation to Dr. Debjyoti Bhattacharyya and his team for their painstaking efforts in organizing this conference.

Dr. Santhosh Nampy

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ASSAM UNIVERSITY
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Assam, India

MESSAGE

It is a great privilege to convey my best wishes to the Department of Life Science and Bioinformatics, Assam University, Silchar for organizing the **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**" from 23rd to 25th November 2024.

This event is a vital platform for sharing knowledge and addressing key challenges in angiosperm taxonomy and plant conservation. The conference's focus on themes such as floristics, ethnobotany, and medicinal plants will encourage important discussions and collaborations, pushing forward advancements in plant science.

I warmly welcome all participants and extend my sincere appreciation to the organizing team. I am hopeful that the seminar will inspire valuable research and be a great success.

With best regards,

Prof. Pranab Behari Mazumder
Dean, School of Life Sciences &
Chief Convenor – BSPCCAS-2024

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ASSAM UNIVERSITY
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MESSAGE

I take immense pride in hosting the **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**" from 23rd to 25th November 2024. It is a pleasure to welcome you all to this esteemed occasion, organized by the Department of Life Science and Bioinformatics, Assam University, Silchar.

Plant taxonomy forms the cornerstone of botanical science. As essential components of our ecosystem, plants play a crucial role in maintaining ecological balance, and their diversity remains a captivating field of study. The discovery of new species enriches our understanding of biodiversity and its intricate connections. However, increasing urbanization and industrial activities have negatively impacted plant ecosystems, necessitating urgent attention and conservation efforts.

This conference offers a wonderful platform for exchanging ideas, with experts from around the globe, sharing the latest advancements in plant taxonomy. I hope this three-day international event will inspire and enrich young minds, opening new avenues for research and conservation.

I ardently request all the speakers, participants, delegates, students, organizers and other stakeholders for their active involvement to make this event a grand success.

With best regards,

Anirudha Giri
Head, Department of Life Science & Bioinformatics &
Chairperson – BSPCCAS-2024

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ASSAM UNIVERSITY
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Assam, India

MESSAGE

It is a matter of great honour to me that the Department of Life Science and Bioinformatics, Assam University, Silchar, has been entrusted with organizing the **XXXIV Annual Conference of Indian Association for Angiosperm Taxonomy (IAAT) and International Seminar on "Botanical Symphony - Perspectives and Current Challenges in Angiosperm Systematics [BSPCCAS 2024]**," scheduled to be held from 23rd to 25th November 2024.

This conference offers an invaluable opportunity to delve into the latest research and developments in angiosperm taxonomy and related fields, which are vital for the advancement of botanical sciences and their role in societal development. It will provide a platform for discussions on the key themes such as 'Floristics, Plant Diversity & Conservation', 'Nomenclature, Revision & Monograph', 'Biosystematics, Applied Taxonomy & Phylogeny', 'Ethnobotany, Indian Knowledge System (IKS) & Bioprospectation', 'Medicinal Plants & Drug Discovery' and 'Digitization & Database'. These topics will boost the reciprocation of ideas and expertise, benefiting students, scholars and scientists. The collaborative discussions are expected to foster innovation and strengthen research in plant systematics and its applications.

We are privileged to host distinguished taxonomists and botanists from India and abroad at this prestigious academic meet. I cordially welcome all the dignitaries and esteemed participants, research scholars, students, other stakeholders as well as respected scientists and professors across the country. I hope this three-day seminar fulfils its scientific objectives and proves to be a fruitful experience for all.

With warm wishes for the grand success of this International Seminar.

Bhattacharyya

Dr. Debjyoti Bhattacharyya
Associate Professor, Department of Life Science & Bioinformatics
Organizing Secretary - BSPCCAS-2024

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ASSAM UNIVERSITY, SILCHAR

Established in 1994, Assam University (A Central University) offers an extensive range of undergraduate and postgraduate programmes in the field of humanities, social sciences, material and natural sciences, information technology and management studies.

The University is situated in southern part of Assam (Barak Valley) at Silchar which is the main campus with a satellite campus at Diphu in Karbi Anglong district. Surrounded by picturesque hillocks and vast wetlands, the University with its 600 acre huge areas in the midst of dense green forests offers a suitable academic environment for teaching and learning.

Assam University, Silchar was established with the aims to boost higher education in the then remote region of North-eastern part of the country especially in the state of Assam and also to support socio-economic and cultural development of the region by offering outstanding educational and research opportunities to students from diverse communities and backgrounds. The university also welcomes students from various regions of the country as well as from abroad. Assam University also brings together faculty and staffs from different parts of the country for creating a harmonious environment.

DEPARTMENT OF LIFE SCIENCE AND BIOINFORMATICS

Department of Life Science and Bioinformatics, one of the flagship departments of Assam University, Silchar was established in 1996 which offers a two-year Masters program in Life Science and Bioinformatics as well as Ph.D. program. Bioinformatics Centre and Biotech Hub are affiliated with the department and the former offers a one year Post Graduate Diploma in Bioinformatics (PGDBI) course.

The department has been recognized as the potential Centre of Excellence under the Special Assistance Programme (SAP) by UGC and FIST by DST. Many research projects funded by DBT, DST, UGC, TAI, ICAR, and MOEF have been undertaken by the faculty members. Most of the faculty members have undergone specialized training at different renowned institutions and research laboratories across the world.

The department also has a Central Herbarium which was established in 1998. Later, it was assigned and indexed as 'AUSCH' by Index Herbariorum in 2023. It houses specimens mostly collected from northeastern India particularly from Barak Valley of Assam and Tripura.

ABOUT CENTRAL HERBARIUM OF ASSAM UNIVERSITY, SILCHAR (AUSCH)

The Central Herbarium of Assam University, Silchar located in and maintained by the Department of Life Science & Bioinformatics, Assam University, Silchar. It was established in the year 1998 and has recently been assigned and indexed by Index Herbariorum with the acronym 'AUSCH' which has glorified the herbarium in global perspective. Presently, AUSCH houses about 4100 accessioned specimens with a total of about 8000 plant specimens representing Bryophytes, Pteridophytes and Seed Plants (Gymnosperms and Angiosperms) collected not only from Barak valley region of Assam but also from Manipur and Tripura states of India. Specimens mainly belong to Angiosperms (7291 taxa), Pteridophytes (448 taxa), Bryophytes (230 taxa) and Fungi/lichen (2 taxa). Among the Angiosperms, family Poaceae under Monocot has the highest number of specimens representing three states viz. Assam (Barak Valley), Manipur and Tripura. Among Dicot, Asteraceae has the highest representation. The oldest herbarium specimen deposited in AUSCH dates back to 1995. The herbarium also houses three Type sheets. It occupies the third position in terms of housed herbarium sheets out of the five acronymized herbaria of the state Assam. It represents sole of its kind in the entire region of southern part of northeastern region of India. Moreover, it serves as a sole repository of plant specimens for workers dealing with plant-based research particularly plant taxonomy and medicinal plant research.

ABOUT IAAT

Established in 1990, Indian Association for Angiosperm Taxonomy (IAAT) is the largest taxonomic association in India. Headquarter of IAAT is located at the Department of Botany, Calicut University, Calicut, Kerala. Comprising of about 1000 life members, IAAT aims to promote Angiosperm Taxonomy not only in India but also in the world by fostering research and collaboration among angiosperm taxonomists and by providing a platform for scientific discussions and knowledge exchange. It advocates the conservation of angiosperm species and their habitats through scientific research and guidance for policy making. Additionally, the Association publishes the journal "Rheedea" which showcases original research contributions, proceedings and other scholarly works. The Association also runs a library at the Calicut University named after Late Prof. V.V. Sivarajan with a collection of over 2000 books. Each year, two gold medals (Y. D. Tiagi and V. V. Sivarajan Gold Medals) are presented to distinguished life members of the Association for their significant contributions to the field of Angiosperm Taxonomy. In addition, Prof. Chavali Kameswara Rao Endowment Lecture is held during the annual conference of the IAAT. Apart from these, ten different awards are inducted for the young researchers for their research contributions in different disciplines. IAAT plays a pivotal role in advancing taxonomic studies in India by contributing significant role to botanical science and conservation of angiosperms.

CONTENTS

KEYNOTE LECTURE

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Morpho-taxonomy and molecular intrusion!

P. Venu[1] & M. Sanjappa[2]

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Morpho-taxonomy concerning angiosperms has taken a retreat in several universities/ colleges in the last three decades. Its teaching was neglected in various courses and taxonomists were deprived of job opportunities where they were due. This keynote address reiterates the importance of taxonomy in biodiversity documentation and its sustainable utilization. It has also explained how molecular taxonomy grew at the cost of morpho-taxonomy and how molecular taxonomists are preferred over morpho-taxonomists in all recruitments. It also emphasizes that molecular taxonomists who are bereft of a basic taxonomy background cannot handle explorations, enumerations, revisions and floras independently. Further, quite a few limitations with molecular approaches and phylogenetic analyses are illustrated. There is more convolutedness in experimentation and circumambulation in data processing in the evaluation of different taxa for relationships. Researchers don't figure out the characterization and circumscription of the taxa they investigate but blindly go by machine dictates. In the name of monophyly, both lumpers and splitters were done of different genera destroying the earlier 'established feel' in taxonomists. It is concluded that our recruitments should focus on morpho-taxonomists with some element of experience in molecular taxonomy and not vice versa. Our molecular approaches should be situation-specific as needs arise and, more precisely, when taxonomic issues identified as complexes based on morpho-taxonomy are rightly recognized for molecular study for better clarity/resolution.

Keywords: Chloroplast DNA, cladistics, herbaria, morpho-taxonomy, nuclear DNA, phylogenetic analysis.

PLENARY LECTURE 1

Innovative and Analytical Approach

Kanchi N. Gandhi

Harvard University Herbaria
Cambridge, MA, USA

Innovative and analytical thinking needs to be promoted among the younger generation. Recently, the process of oxygenic Photosynthesis was found in *Navifusa majensis* C.F. Demoulin & al., a Bluegreen-Algal (aka Cyano-Bacterial) fossil species estimated to be at least 1.75 billion years. Were photosynthesis and cellular aerobic respiration exclusive only to Cyanobacteria? For a few millennia, humanity has been dependent upon this oxygenic photosynthetic process not only to cultivate crops but also for their own cellular aerobic respiration. However, escalating human population density and ever declining land-availability for agriculture challenge the conventional method of growing crops. Adopting a food system based entirely on electro-agriculture (electro-ag) framework, proposed by an American team of bioengineers, that combines CO_2 electrolysis with biological systems, would not only enhance food production efficiency but also could reduce agricultural land use by >80%. Such reduced land use accompanied by increased food productivity would be beneficial to many countries. This process might also promote ecosystem restoration and natural carbon sequestration. What is the mechanism triggering the "Corpse Flower" (*Amorphophallus titanum* (Becc.) Becc.) to emit its rotten smell? The "thermogenesis" process, discovered by an American team, might also occur in *Aristolochia* and *Rafflesia* flowers. While perennial plants transfer their resources from wilting flowers to their roots and corms for later use (i.e., reuse the salvaged resources to promote new flowering in the next season), wilted leaves, because of dehydration, seem to keep their resources intact and regain their form upon hydration. Anatomy of "spiny" outgrowths found on stems and leaves of several species remains unknown, e.g., *Cnicus* species, *Smilax* species. Regarding global warming, a team of Australian researchers found that even reaching net-zero carbon emission will not stop the global warming problem, and the Earth's climate will continue to become warmer for many more centuries.

Keywords: *Amorphophallus titanum* (Becc.) Becc., electro-agriculture, *Navifusa majensis* C.F. Demoulin & al., spine, thermogenesis, wilting, zero-emission

PLENARY LECTURE 2

Morphology in the age of phylogenomics

Arun K. Pandey

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Morphology is one of the oldest and most classical disciplines in the biological sciences. Since the inception of biological studies, morphology has been the primary source of information for describing and classifying species. It provides valuable data to understand the evolution of living organisms.In early 1990s when molecular systematics developed explosively, morphology in systematics suffered. As a consequence, morphology received progressively lesser attention, resulting in a noticeable crisis of morphological approaches toward phylogenetic systematics. Although the morphology is not being routinely used for reconstruction of phylogenetic trees but the evolution may be better understood using morphological traits. To infer the phylogenetic relationships of the extant taxa, the fossil data is based entirely on morphology.

The integration of phylogenomics with morphological data has proven beneficial for estimating evolutionary relationships. Modern studies increasingly utilize both molecular and morphological partitions to enhance phylogenetic inference. For instance, combining these datasets can improve accuracy in reconstructing evolutionary trees by addressing incongruences between different types of data. Recent meta-analyses have shown that while molecular datasets often dominate due to their size—sometimes encompassing millions of characters—morphological data still hold significant value, particularly when analysing fossil taxa. Morphological characters can influence phylogenetic outcomes even when they are outnumbered by molecular data.

Morphological concepts are being used in plant evo-devo (evolutionary developmental biology) and other disciplines of plant biology, and therefore plant morphology is relevant to all of these disciplines. Morphology is a rich source of comparative data, but we must learn to evaluate it in a modern biological context. Deep morphology, or structural plant biology in a wider sense, offers a modern program of understanding organismic shape and form.Morphological data are indispensable for reconstruction of phenotypic ground patterns and character evolution, and only a holistic approach incorporating all major subdisciplines of evolutionary biology may ultimately result in a deep understanding of the evolutionary processes in plants. In conclusion, while molecular techniques have transformed phylogenetics, integrating morphological data remains essential for a comprehensive understanding of evolutionary processes. As we advance in both genomic technologies and morphological analysis techniques, a balanced approach that values both datasets will be crucial for reconstructing the complexities of life's history on Earth.

Keywords: Character reconstruction, genomic age, morphological phylogenetics, morpho evo-devo, tree of life.

PLENARY LECTURE 3

Plant invasion in north-eastern states and its impact on native flora

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The North East Indian states (NER) are exceptionally rich in plant biodiversity, sustaining the environment and the socio-economic prospects. The increasing anthropogenic disturbances are gradually reshaping the vegetation structure and composition of the native flora by encroachment of invasive alien plants (IAPs) which not only worsen loss of natural habitat but also pose a great challenge for biodiversity conservation. The efficient dispersal mechanisms of IAPs are reinforced with its complex process of allelochemicals, rapid growth rate, higher seed production are great challenges to the restoration ecologists.

Taxonomic Inventory of alien flora on selected states of Northeast revealed 336 alien plant species from Sikkim Himalayas & West Bengal; 163 alien plant species from Mizoram; 186 alien plant species from Tripura; 131 alien plant species from Arunachal Pradesh, Manipur & Nagaland. Characterization revealed that, members from Asteraceae (61%), are dominating among the invasive species while 56% of species belongs to Annuals and 36% species are perennials. 85% of the invasive species have been introduces to the system unintentionally. A case study in Mizoram revealed that the herb layer of disturbed habitats has the lowest value of Shannon diversity index (H'=1.897). *Ageratina adenophora, Ageratum conyzoides, Ageratina riparia, Chromolaena odorata, Lantana camara, Mikania micrantha, Parthenium hysterophorus* were observed as the most noxious invasive alien plants in the protected areas of northeast which invaded up to 3350m. Based on their percentage of frequency and status of importance value index (IVI) the neo-invasive species that were identified were *Ageratum houstonianum, Anthemis cotula, Erigeron karvinskianus, Hyptis suaveolens* etc. Interestingly *Ageratina, Ageratum, Chromolaena, Lantana* and *Miikania* were also reported to have ethno-botanical uses and a potential source of nutrients in the vermicompost pits.

MaxEnt-driven habitat suitability model in protected areas of Mizoram exhibited that the current spatial range of *Chromolaena odorata* occupies 15.37% of geographical areas deemed suitable for varying degrees of invasion. Projections for 2050 and 2070

anticipated an expansion of suitable habitats up to 34.37% of the total geographical area of Mizoram, specifically under RCP 2.6 in 2070 in comparison with its present distribution. Similar models were also been prepared for *Anthemis cotula* L., *Erigeron canadensis* L., *Hyptis suaveolens* (L.) Poit. in other states of Northeast too.

Workshops involving the local stakeholders preferably forest officials, students, NGOs and nature enthusiasts will definitely create awareness. Dependency of local population on invasive species should be explored for the sustainable utilization as bioprospecting resources. A policy or strategy to link harvesting of useful invasive species with livelihood generation is need of the hour.

Keywords: Alien plants, invasive species, Mizoram, native species, neo-invasive, Tripura.

LEAD LECTURES

LEAD LECTURE 1

Molecular markers and regional biodiversity

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The application of molecular markers has provided new insights into species identification, revealing genetic diversity and clarifying species boundaries that were previously undetected through traditional morphological methods.Sri Lanka andIndia, both biodiversity hotspots, share numerous plant species with complex evolutionary histories shaped by their geological and climatic connections. Phylogenetic reconstruction using molecular data has been instrumental in defining species limits—crucial for classification and informed conservation efforts. Molecular evidence has led to the reclassification of many plant species, genera, and families, often resulting in the merging or splitting of taxa. Research on groups such as *Piper, Impatiens, Salacia* and orchids underscores the necessity of collaborative research between these two nations. Such taxonomic revisions are essential for ensuring accuracy in conservation strategies, ecological studies, and the sustainable utilization of plant resources.

Keywords: Conservation, phylogenetics, species complexes, taxonomy.

LEAD LECTURE 2

Legume crops phylogeny and genetic diversity for science and breeding

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The Fabaceae family, or Leguminosae, is one of the most extensive and diverse plant families, ranking third in size among flowering plants with approximately 800 genera and 20,000 species, following only Orchidaceae and Asteraceae. Members of this family are found worldwide and exhibit a vast range of life forms, including arctic alpine herbs, temperate and tropical shrubs, drought-tolerant annuals, and towering tropical trees. While some legumes are weeds in cereal farming, others are significant grain crops known as pulses, which, along with forage legumes, are the central focus of this review.

Economically, legumes are second only to the grass family (Poaceae) as crop plants. Grain legumes make up 27% of global crop production and contribute 33% of human dietary protein, while forage legumes are essential for animal feed. The Fabaceae family is traditionally divided into three main subfamilies: Caesalpinioideae, Mimosoideae, and Papilionoideae, with Papilionoideae including the majority of key food and feed crops. Many of the primary grain legumes were among the earliest domesticated plants, with domestication paralleling that of cereals: soybean in China; faba bean, lentil, chickpea, and pea in the Near East; cowpeas and bambara groundnut in Africa; soybean and mungbeans in East Asia; pigeonpea and various grams in South Asia; and common bean, lima bean, scarlet runner bean, tepary bean, and lupin in the Americas.

The significance of legumes is also reflected in the extensive ex situ germplasm collections, with over a million accessions stored worldwide. A thorough understanding of Fabaceae's phylogenetic relationships is crucial for studying the origins and diversification of this economically and ecologically essential plant family. This review aims to synthesize insights into the phylogenetic and genetic diversity of legumes to better understand the origins, domestication, and future potential of these crops in both science and agriculture.

Keywords: Breeding, crop wild relatives, genomics, legumes, phylogeny.

LEAD LECTURE 3

Role of plant taxonomy and traditional ecological knowledge in ecosystem restoration

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The UN Decade on Ecosystem Restoration runs from 2021 to 2030. It defines ecosystem restoration as "the process of halting and reversing degradation, resulting in improved ecosystem services and recovered biodiversity". It can be linked with the Target 2 of Kunming-Montreal Global Biodiversity Framework. Determining reference ecosystem is a central component of ecological restoration. Knowledge from different sources of practicing plant taxonomy has the potential for quality ecological restoration initiatives. Naming and identification are two major taxonomic services. The Flora, Revisions, Manuals and Checklists are different taxonomic products. One can get primary knowledge about plants occurring in a particular area from these resources. Herbaria, botanic gardens and arboreta are important institutions for practicing plant taxonomy. When ecosystems are degraded or destroyed, historical herbarium collections may provide valuable and useful information regarding species, their distribution in time and space. The consultation of historical collections may therefore be an essential step toward reconstructing the species composition of forests that no longer exist. Botanical gardens and arboreta of a particular area give a picture of the plants adapted and growing in that particular land type or habitat. In addition to practicing taxonomic knowledge the traditional ecological knowledge (TEK) has its role in developing reference ecosystem, particularly when historical information is not available. Plant taxonomy always had a broad range of end-users. Its constituencies are increasing and restoration of ecosystem is not out of it. Considering the broader audiences, the taxonomists are to develop user friendly, field oriented products.

Keywords: Arboretum, Biodiversity, Botanic Garden, Flora, Herbarium.

LEAD LECTURE 4

Convention on Biological Diversity and Taxonomy

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The Convention on Biological Diversity is an outcome of the "Rio Convention", commonly known as "Earth Summit", held in Rio de Janeiro, Brazil in 1992 under the auspices of the United Nations. Consequently, the CBD entered into force in December 1993 and has been now ratified by 200 nations. It is the first global treaty to provide a legal frame work for biodiversity conservation with established three main goals as such i) the conservation of biological diversity, ii) the sustainable use of its components and iii) the fair and equitable sharing of benefits arising from the use of genetic resources. The member governments are required to create and enforce national strategies and action plans to conserve, protect and enhance biological diversity. They also required to undertake action to implement the thematic work programmes on ecosystems and a range of cross-cutting issues which have been established to take forward the provisions of the Convention. Later by using provisions of the Convention, Cartagena Protocol on biosafety and Nagoya Protocol for access to genetic resources and benefit sharing were adopted and came into force during September 2003 and October 2014 respectively as part of implementation strategies.

As the global communities and various national governments work together and spent billions of rupees on conservation of biological diversity but unfortunately species are facing extinction risks that led to reassess the problems exist in the ground situation. While analyzing the strategy, the experts felt that addressing the basic issues vizi) what are to be conserved?, ii) why are they to be conserved?, iii) how are they to be conserved? and iv) where are they to be conserved? etc could enhance viable populations of RET species and for that the subject "Taxonomy" has to be revived nationally, regionally and globally. The governments of the world that recognized the CBD have affirmed the existence of a taxonomic impediment to sound management and conservation biodiversity. Removal of this impediment is a crucial, rate-determining step in the proper implementation of the Conventions objectives. Therefore, Global Taxonomic Initiative (GTI) with the aim of shortening

the distance between discovery and delivery was jointly proposed by Environment Australia and Smithsonian Institution (USA) during 1998 which was later approved by CoP. The UNEP and GEF were the global partners of the programme to fund for strengthening the infrastructure and human resources for taxonomy. The taxonomic institutions and individual experts covering the subjects of plants, animals, microbes etc. can make use of the facilities to improve our taxonomic capacity in line with the 21st century's expectations.

Keywords: CBD, conservation, GTI, Earth Summit, taxonomic impediment.

LEAD LECTURE 5

Exquisite orchids of Western Ghats: conservation and sustainable utilisation

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Orchids are one of the very natural, distinctive and advanced groups of flowering plants exhibiting an incredible range of diversity in size, shape, structure and number of flowers which grow up to an elevation of 5000 m. Because of their long spikes, numerous colours and flower shapes and longevity, orchids have earned sixth place in the global floriculture industry. Orchids, a diverse group of flowering plants belonging to the Orchidaceae family are one of the most widely distributed plants in nature. It is observed that many of the orchids are still confined to their natural habitats, but some are vanishing in a rapid manner probably due to indiscriminate collection, habitat loss, anthropogenic activities, global climate change and urbanization. Orchids make up the second largest family of flowering plants on the planet comprising 705 genera, 29481 species and more than 2 lakhs man-made hybrids. Orchids represent one of the most commercially important plants in the world. Apart from its cut flower value orchids are used for herbal medicine and for producing pharmaceutical products. In India, orchids have been known right from Vedic period as plants of medicinal value. In India, 1256 taxa under 155 genera have been reported of which 307 species are endemic to India. The orchid rich regions in India are Eastern Himalaya, Western Himalaya, Western Ghats and the Andaman and Nicobar Islands. A large number of Indian orchids are highly ornamental and are in great demand that their natural population are constantly under heavy collection pressure. The Western Ghats region of India harbours about 307 species in 80 genera. The ideal climatic conditions prevailing in the Western Ghats provide suitable habitat for the orchids. The Kerala region of the Western Ghats is a repository of orchids with more than 270 species in 72 genera of which some of them are used by the tribal communities to treat various illnesses. Important epiphytic genera reported from this region include *Aerides, Bulbophyllum, Dendrobium, Eria, Oberonia, Luisia, Smithsonia, Vanda, Vanilla* and terrestrial genera include *Habenaria, Liparis, Eulophia, Paphiopedilum, Phaius, Brachycorythis, Geodorum, Ipsea, Satyrium* etc.

As part of orchid conservation programme, embryo and tissue culture protocols were standardised for the mass multiplication of some of the rare and exquisite orchids of Western Ghats. Embryo/ tissue culture mediated propagation for mass propagation and short term and long term preservation are the important non conventional methods for the effective preservation of orchids The regenerated established seedlings of selected species were successfully reintroduced into its natural habitats in the Western Ghats *viz*. Agasthyamala Biosphere Reserve, Ponmudi, and Silent Valley National Park in Kerala with high survival rate.

Majority of the orchid species reported from this region are rare or with very attractive flowers and most of the species has the potential for hybridization for the production of outstanding hybrids. Indian orchids may be available from a subtropical warmer or subtropical colder zone. Hybridisation of an orchid of the warmer zone with colder zone may increase its heat tolerance and adaptability. Western Ghats orchids are seldom used for hybridisation. A few orchid hybrids were produced from Jawaharlal Nehru Topical Botanic Garden and Research Institute (JNTBGRI), Palode Thiruvananthapuram, Kerala using Western Ghats orchids. This includes the first *Paphiopedilum* hybrid produced in India by crossing *Paphiopedilum druryi* and *Paphiopedilum exul* and named as *Paphiopedilum* MS Valiyathan. The hybridization potential of exquisite orchids of Western Ghats with other beautiful orchids available in India especially from North East region can also be used for hybridization and production of novel hybrids for the benefit of the cut flower industry.

Keywords: Cut flower, exquisite, hybridisation, Orchidaceae, Western Ghats,

LEAD LECTURE 6

Unraveling the structural features of extrafloral nectaries that undergo developmental changes to facilitate nectar secretion in an ant-plant *Clerodendrum chinense* (Osbeck). Mabb.

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Extrafloral nectaries (EFNs) are nectar-secreting structures present on both vegetative as well as reproductive parts and provide indirect defense against herbivore attacks by recruiting aggressive ants and other insects, but not involved in pollination process. Although morphoanatomical study of EFNs has been carried out to limited extent but the spatio-temporal dynamics of the complete metabolic machinery required for nectar production remains elusive. *Clerodendrum chinense* is an ant-guarded herb possessing a patelliform-shaped nectary gland clustered at the lamina base and also in the exterior calyx surface. In this study, we have used an integrated histochemical, ultrastructural, metabolic and enzymatic activity approaches to check and compare the complete metabolic machinery required for nectar production in both foliar and calyx nectaries. Both the nectarines secrete nectar in a developmentally programmed manner, with younger nectaries secreting more than the older senescent ones. Histochemical staining showed the nectariferous tissue as the metabolically active region while the intermediate layer was found to be lipid-rich, which may act as a barrier and regulate the water flow in the nectar. Ultrastructural study showed a large number of mitochondria in the nectariferous region, indicating their activeness in nectar synthesis and secretion; degradation of starch were also evident supplying pre-nectar sugars. Metabolite analysis showedthe presence of three main sugars *viz*. glucose, fructose and sucrose along with substantial amounts of organic acids and traces of free amino acids in bothtypes of nectaries. In situ histolocalization study showed increased invertase activity in the nectary tissue confers high metabolic activity in the nectariferous tissue region, which corresponds to higher nectar secretion. This study provides a complete portrayal of cell physiological machinery involved in the nectar secretion which eventually advances our knowledge of both its physiological and ecological functions.

Keywords: Ant-plant, extrafloral nectary, indirect defense, intermediate layer, nectar, nectariferous tissue, patelliform nectaries.

INVITED LECTURES

INVITED LECTURE 1

Trees having historical background in Manipur, Northeastern India

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A tree recounts a story, and history unfurls before your eyes. The idea is extraordinary and there are numerous ideas about the historical backdrop of trees. Manipur, one of the Northeastern States of Indian subcontinent, has the trees having historical background. In this report, nine living historical trees currently remains, were recorded as: Konthoujam Lairembi (*Ficus religiosa* L. family Moraceae) at Sagoltongba Mayai Leikai Konthoujam during Nongda Lairen Pakhangba (33-154 AD) and a boat (Hiyang) of Konthoujam Lairembi made up of *Toona ciliata* M. Roem. Family: Meliaceae); Khoriphaba (*Artocarpus heterophyllus* Lam.) during Nongda Lairen Pakhangba (33-154 AD) at Phoijing, Nambol; Pureiromba Khongnang (*F. religiosa* L.) since during the King Meidingu Urakonthouba (568-658 AD) at Palace gate, Imphal; Khongnang hogaibi (*F. religiosa* L.) at Wahengbam Leikai, Imphal during the king Meidingu Tubi Charairongba (1697-1709); Sati Khongnang (*F. religiosa* L.) at Mayang Imphal during the reign of king Meidingu Tubi Charairongba (1697-1709); Meikibi Khongnang (Nungbi Meikibi) a banyan tree (*F. religiosa* L.) at Mayang Imphal Konchak Maning Leikai during the same year of Sati Khonang; Potsangbam Khongnang Lai Ahal (*F. religiosa* L.) and Potsangbam Khongnang Lai Manao (*F. benghalensis* L.) at Kha Potsangbam; Changing Lairembi, Yureipambi (*Wrightia arborea* (Dennst.) Mabb., family Apocynaceae. Some of the sculptures (7 nos.) made up of *A. heterophyllus* Lam. of Lord Vishnu during the king Bhagyachandra (1780 AD) are also remarkable. The above-mentioned trees are regarded and treated as Gods a symbol of conservation by the Meitei community of Manipur from time immemorial and recorded highest (6) by *Ficus religiosa* L., and one each in case of *F. benghalensis* L., *A. heterophyllus* Lam. and *Wrightia arborea* (Dennst.) Mabb. respectively and sculptures of God (7) by *A. heterophyllus* Lam and sculptures of boat by *Toona ciliata* M. Roem.

Keywords: Trees, historical background, live trees currently available, sculptures, conservation.

INVITED LECTURE 2

Endangered medicinal plants in the foot hills of Eastern Himalayas with special reference to their cultivation, management & marketing strategies as sustainable crops

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Mostly the different medicinal plants are being procured in the market from wild/ natural habitat. This trend is dangerous and a treat to the nature for disturbing the bio-diversity. The men who collect those medicinal plants/herbs don't maintain the "sustainable collection" limit and resulting the existence of the numerous species become threatened and endangered.

Both nationally and globally, AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha & Homeopathy) system is dependent on uninterrupted availability of plant based raw materials.

Viable alternatives are to protect the - i) Natural habitat of Medicinal plants, (ii) Local plant Bio-diversity (iii) Maintainance of Germplasm, (iv) To procure in the market commercially, augmentation of organized cultivation is urgently required which cultivation of the sustainable/alternative crops to protect the endangered plant species.

II tier and III tier market survey, scientific selection of the area and crops were done properly.

Medicinal plants like *Rawoulfia serpentina, Withania somnifera, Piper longum, Piper nigrum, Acorus calamus* were selected for the commercial exploitation considering the marketability after so many trials in the lower and foothills of Eastern Himalayas (below 600 metres altitude). Considering the high altitude upto 2200 metres plants like *Swertia chirayata, Nardastachys jatamanshi, Berberies aristata, Taxus baccata, Digitalis purpurea, Aconitum* were also selected.

Details of Cultivation method, conservation and multiplication of QPM (quality planting materials), cost norms, NMMP subsidy and profitability have been worked out. A promising positive result has been established.

Keywords: Eastern Himalaya, medicinal plants, marketing strategies, sustainable crop.

INVITED LECTURE 3

Future of herbaria in digital world

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More than 400 million plant specimens are kept in more than 3000 herbaria worldwide for the purpose of identifying and discovering new species. Botanists worldwide resolve about 400,000 species out of more than a million botanical names. In the twentieth century in particular, technological advancements have greatly benefited botanists. Fast-speed travel by air, rail, and road has made it possible to quickly study specimens in a variety of herbaria. Later, particularly in the last forty years, the development of personal computers and their daily growing capabilities made it possible to create and store massive databases as well as to easily communicate and share them with others at virtually no cost. In support of these, the digital photography revolution of the past 20 years has proven to be an extremely useful tool for botanists and everyone else. Combining all herbaria into one is now feasible due to growing capacity for cloud computing and digital storage. This is becoming a "meta herbarium" notion. Now that we can take and preserve digital photos of plants, many people are starting to question whether we really need to keep hundreds of herbaria. There is currently discussion about this issue.

Keywords: Metaherbarium, digital specimen, open access

INVITED LECTURE 4

Ethnobotany to drug discovery: Today and tomorrow

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Ethnobotany is the study of plants used by primitive and aboriginal people. Ethnomedico botany is a part of ethnobotany that deals with the medicine of botanical origin of the traditional societies and is the connecting link between past and present. Ethnopharmacology is an interdisciplinary scientific approach to searching for biologically active substances used in traditional culture for health care. According to WHO about 80% of the world's population depends on herbal medicines for primary health care. Plant based medicines are now recognized as alternative health care which are considered to be safe in terms of adverse side effects due to the use of synthetic drugs. Moreover, they are cost effective. Interventions of modern and sophisticated techniques reveal that medicinal plants are endowed with rich phytochemicals and will play a promising role as potent healing agents for curing life-threatening human diseases like cancer, AIDS and so on. Nowadays, interest has been focused on search of plant-based biomolecules with a view to transferring traditional medicinal knowledge to modern phytochemical technology to venture new drug discovery.

Keywords: AIDS, drug discovery, ethnobotany, ethnopharmacology.

INVITED LECTURE 5

Habit forms, Distribution and Phytogeographical Affinities of Indian *Piper* species (Piperaceae)

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The genus *Piper* is well recognized in the world among the various plant groups due to its commercially well-known species which are mostly used for medicine, spices and masticatory. It is considered as one of the most taxonomically difficult genera of Angiosperm due to its large interspeific variations and microscopic flowers born in spikes. Consisting of nearly 2000 species worldwide, the genus is purely distributed throughout the pantropical region of the world. In India although more than 100 species are reported, only about 70 species are presently known with certainty mostly from the two distinct distributional centers *i.e.* the north east India with its eastern Himalaya and the Western Ghats. Particularly the tropical and subtropical forests of the northeast region and Western Ghats show high diversity of Piper species. Although Piper in India are generally recognized as climbing species, three distinct habit forms are recorded with some intermediate types. The three distinct habit forms are climbers, creepers and the erect species. The climbers can again be subdivided into two distinct groups - low climbing and tall climbing species.

The phytogeographical analysis clearly indicated that almost 60% species are endemic to the country with maximum in north east region. About 30% species are found in Indian subcontinent including Bangladesh, Myanmar, Bhutan and Nepal. A few species are extended their distribution to either Indo-China or Indo-Malayan region.

Keywords: Conservation, distribution, diversity, endemism, habits, phytogeography, *Piper*.

INVITED LECTURE 6

Implementation of numerical taxonomy on Bengal Asclepiads: Enlight in the light of APG-IV (2016)

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Family Asclepiadaceae s.l. is represented by 36 genera, 72 species and 1 variety distributed throughout the West Bengal. The sample set of 83 morphological characters comparatively for a sample of 18 species belonging to 15 genera under this family. The characters cover variation among the species in gross vegetative, reproductive and pollinarium morphology respectively. Similarity matrixes (SM) were prepared using 39 binary state characters (SC) and 44 multistate characters (MC) by correlation of the co-efficient method. Based on this similarity matrix (SM) the dendrogram were constructed by UPGMA method. The result shows that two major groups are recognized in this treatment, the first group comprises the representative genera of Periplocoideae subfamily and second group represent the subfamily Asclepiadoideae. The sub-familial and tribal concept of this family is taxonomically sound according to APG-IV (2016). The representative of sub-tribe also separated well but Tylophorinae sub-tribe has designated as monophyletic line with the members of Marsdenieae tribe.

Keywords: APG-IV (2016), Asclepidaceae s.l., dendrogram, morphology.

INVITED LECTURE 7

Research in Ethnobotany: The Indian Scenario

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The present study encompasses an elaborate discussion on the status of Indian ethnobotanical work done over the last seven decades in the milieu of global research. Ethnobotany, a main branch of ethnobiology, embodies various aspects of traditional knowledge related to sustainable utilization, judicious management and conservation of phytoresources. It deals with the study of age-old and natural relationships between people of a culture and plants in its environment. A perusal of literature on Indian ethnobotany highlights that the past works in India are very much descriptive, merely documenting the plant species used for various purposes by the ethnic communities. Such type of research work in Indian ethnobotany is still continuing with documentation employing no statistical analysis by the quantitative indices used globally in ethnobotany. However, in the recent past, the application of quantitative indices has been noticed in a limited number of ethnobotanical works done by Indian scientists. It is indeed a good indication of Indian ethnobotany research. Over the last few decades, ethnobotanists worldwide have been using appropriate quantitative indices to analyze the collected data for more objectivity in their research carried out in the fields of sustainable utilization, bioprospecting, and conservation of plant resources at local as well as regional level. Many research papers have been published on the bioprospecting of natural products from different parts of the world, where the quantitative ethnobotanical approach played an instrumental role in selecting the ethnobotanical lead or clue. The present scenario of Indian research exhibits carelessness or meager attention toward some vital areas of ethnobotany, such as ethnoecology, ethnoarchaeobotany, linguistics, arts, and culture. A voluminous database of ethnobotanical knowledge has already been accumulated in India and it should be compiled in a digitalized form after analyzing the data using appropriate statistical indices. Finally, specific major gaps in research on the ethnobotany of India have been elucidated and they have been properly discussed in the present-day global context.

Keywords: Bioprospecting, conservation, ethnobotany, Indian perspective, phytoresources.

INVITED LECTURE 8

Genus *Rotala* L. (Lythraceae) of India

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Rotala L. is a highly diverse genus in the Lythraceae family, consisting of 55 species mainly distributed across tropical and subtropical regions, especially in Asia. South Asia stands out as a significant hotspot for species diversity, with 38 species found in the region. Initially, the genus *Ammannia* was considered broader and included *Rotala* as a subgenus, but later studies distinguished the two genera based on differences in fruit dehiscence and pericarp structure, with recent phylogenetic research confirming that they belong to separate clades (Maurin & al., 2021). The genus' taxonomy was first comprehensively addressed by Cook (1979) using secondary data and in India, it was initially documented by C.B. Clarke in the Flora of British India, later studied by Joseph & Sivarajan (1989) for Peninsular India. However, Koehne's (1903) sectional classification has not been widely adopted. Currently, India is home to 36 species of *Rotala*, 25 of which are endemic to the country. Since the earlier studies, 17 new species have been described and two species have been newly recorded for the region. Four species—*R. andamanensis, R. rubra, R. subrotunda* and *R. vasudevanii*—are known from only single collections, with *R. cookii* and *R. vasudevanii* assessed as Critically Endangered and Possibly Extinct. The genus displays significant phenotypic plasticity, with flowers exhibiting varying numbers of petals (tri-, tetra-, and penta-merous) within a single individual. Moreover, cryptic morphological traits complicate species identification, prompting the need for detailed micro- and macro-morphological studies. Further research incorporating phylogenetic insights is essential to clarify species relationships within the genus.

Keywords: Ammannia, distribution, India, Lythraceae, *Rotala*, taxonomy.

INVITED LECTURE 9

From roots to remedies: Unveiling potent anticancer compounds through bioactivity-guided isolation of medicinal plants

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Medicinal plants are an invaluable source of bioactive compounds with immense therapeutic potential, especially in cancer treatment. The current study outlines the bioactivity-guided isolation to discover and characterize new anticancer compounds from traditional medicinal plants. We systematically identified promising plant species from different biodiversity rich areas of India, extracted and fractionated bioactive compounds by integrating ethnobotanical knowledge with advanced analytical methods. We screened these fractions for anticancer activity across various cancer cell lines. Using advanced chromatographic and spectroscopic techniques, we isolated and determined the structures of active compounds. In vitro and insilico studies revealed that several isolated compounds demonstrate potent anticancer properties, with few compounds significantly inhibiting cancer cell proliferation while sparing normal cells. Our results highlight the effectiveness of bioactivity-guided isolation in drug discovery, offering a pathway to novel, targeted anticancer therapies. This presentation will delve into our methodologies, key findings, and future research directions, emphasizing the crucial role of natural products in oncology drug development and the importance of preserving biodiversity as a reservoir for therapeutic innovation.

Keywords: Bioprospecting, cancer, drug apoptosis, medicinal plants.

INVITED LECTURE 10

Monitoring 'pulse' of the plants in Anthropocene: Reimagining relevance of botanic gardens in phenology research

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In an era of Anthropocene, the world is currently confronted with twin crises of biodiversity loss and climate change. Globally, recent climate warming trends and extreme weather events are leading to unprecedented environmental changes, including drastic declines in biodiversity and ecosystems services. One such widely recognized impacts of ongoing climate change on biodiversity is the significant shifts reported in plant phenology across the world. The phenology refers to the annual timing of various seasonal events in the lifecycle of biological organisms. Botanic gardens – the premier centers of taxonomic research – are reimagining their role and relevance to address contemporary challenges of global environmental change. Being the rich repositories of live plant collections, botanic gardens have recently emerged as the suitable sites for monitoring phenological 'pulse' of the plants. It is in this backdrop that the present talk summarizes the findings of recent phenological studies conducted at Kashmir University Botanic Garden (KUBG). A standardized protocol was used for systematic monitoring of vegetative and reproductive phenophases of the plants growing at the KUBG. The illustrated plant phenological calendars have been prepared, which can severe as scientific baseline for future assessment and monitoring. The direction and duration of phenological shifts in the plants monitored for multiple years at the KUBG will be discussed. The results of a comparative phenology experiment using the twigs of selected arboreal plants (trees and shrubs) under in-situ and different controlled conditions will be showcased. Using a case study of model geophyte (*Sternbergia vernalis*), the opportunities and challenges of integrating multiple data sources in phenology research, such as long-term field observations, repeat dated-photographs, and herbarium records will be highlighted. Looking ahead, current knowledge gaps and future avenues in the area of plant phenology will be discussed, with relevance for taxonomy in particular and global change research in general.

Keywords: Biodiversity, botanic gardens, climate change, phenology, plants.

INVITED LECTURE 11

Taxonomic revision of the genus *Vaccinium* L. (Ericaceae: Vaccinioideae) in India

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The genus *Vaccinium* L. ss. (excluding closely related *Agapetes* D. Don ex G. Don) with about 140 species under 33 sections (Sleumer 1941; Mabberley 2008; Panda & Sanjappa in Sanjappa & Sastry 2014; Panda & Sanjappa in Mao & al. 2023) is well-known to plant systematists due to its recent evolutionary significance, polyphyletic nature, species delimitation problem with *Agapetes* D. Don ex G. Don, diversity in flowering-phenology, habitat-range and recent ethnomedicinal rising potentialities in herbal drug discovery. However, 450 – 500 spp. are reported by several other workers (POWO 2024; WFO 2024; Zhidkin & Matveeva 2022; Vander Kloet & Dickinson 2009; Ruizheng & P.F. Stevens 2005), even recent times due to inclusion of several *Agapetes* spp. and synonyms of accepted *Vaccinium* spp. in it. Members are almost cosmopolitan in distribution, reported to occur in America, Europe, SE Africa & Madagascar, tropical Asia. In India, 30 taxa (26 species, 01 subspecies and 03 varieties) are reported to occur in Eastern Himalaya (Sikkim, Darjeeling in West Bengal & Arunachal Pradesh), North Eastern States (Meghalaya, Manipur, Mizoram & Nagaland) and hill tops of South western Ghats (Tamil Nadu & Kerala). As a result of taxonomic revision under 'Flora of India Project', MoEF&CC, Botanical Survey of India, extensive field visits and herbarium consultations in Indian Herbaria (CAL, BSIS, ASSAM, BSHC, DD, ARUN, APFH, BSD, MH) and abroad (K, BM: cibachrome images!) were made. Members are mostly epiphytic on trees, occasionally drooping from rock crevices and very rarely grown in loose rocky soil. Present paper embodies detailed field and herbarium specimens-based exomorphological diversity, new species, new records, recollection and rediscovery from remote areas, ethnobotanical-ITKs including societal impacts, global distribution and current status including conservation measures. This work also includes diversity in leaf-anatomy and pollen morphology of some taxa of *Vaccinium* L.

Keywords: Ericaceae, exomorphological diversity, India, revision, *Vaccinium*.

INVITED LECTURE 12

Angiosperm taxonomy and Ethnobotany: Exploratory Opportunities in the Arunachal Himalayan Region of India

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The Arunachal Himalayan Region of India is one among the top 12 Global Biodiversity Hotspot endowed with rich heritage of endemic flora and faunal elements of cultural, economic, evolutionary and ecological significance to the region. This region is also exceptionally rich in ethnic and cultural diversity with over 25 constitutionally recognized tribes are reported to be found in variety of agroclimatic zone covering different altitudinal gradient spanning over 27 districts of Arunachal Pradesh. State has a rich and intriguing vegetation pattern due to unique phytogeographical position, undulating terrain, steep mountainous ranges, and deep valleys, along with abroad range of climate and soil types. These factors have all contributed to the establishment of diverse ecological habitats which defines the endemism range of floristic elements in the region. State has been reported with presence of more than 5000 species of angiosperm, 25 species of gymnosperm and 656 species of pteridophytes. In the last 20 years from 2003 onwards till 2023, the Plant Systematics and Ethnobotanical Research Laboratory, Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh has conducted taxonomic studies on selected angiosperm families and reported 58 species of Aroid flora and 78 species of Gesneriaceae flora found distributed along different altitudinal gradient in Arunachal Himalaya. Our exploratory activities have yielded 4 new species of Araceae, 01 new species of Ginseng (Araliaceae) and 8 new species of Gesneriaceae while 7 species of gesneriads have been reported as new records for the flora of India. Given the habitat diversity, richness and representativeness of the floral elements in the state, more new species of angiosperms could be expected if consistent endeavours are made towards further exploratory activities with renewed focus and enthusiasm. The cross-cultural ethnobotanical studies conducted on 6 indigenous tribal communities of Arunachal Pradesh since 2003 – 2023 have yielded 302 species of ethnomedicinal plants used by the Tai Khamti tribe, 341 ethnobotanical species from the Mishmi, 283 species from Tagin, 160 species from Galo, 206 species from Apatani and 240 species reported

from the Nyishi, while more than 320 species of ethnobotanically significant plants have been reported from Monpa tribe of Arunachal Pradesh. There are another 20 indigenous tribal communities of Arunachal Pradesh whose ethnobotanical heritages are yet to be documented in the scientific literatures. Further exploratory activities could unveil more economically and culturally significant ethnobotanical species from Arunachal Himalaya that could ensure sustainable community development and livelihood in the mountain region.

Keywords: Angiosperm taxonomy, ethnobotany, indigenous tribes, Arunachal Himalayas, exploratory activities, opportunities.

INVITED LECTURE 13

Authentication of True Cinnamon – Need for trade regulation and promotion

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Humans have been using spices for ages. In the early days, spices were used to mask the unpleasant taste and odour of food and later to add flavour and fragrance. After the black pepper, Cinnamon has been the most sought-after spice in the world for many millennia. Since the beginning, there have been demands for quality spices, but the inadequate supply paved the way for adulteration with cheap materials. Cinnamon is the bark originally obtained from *Cinnamomum verum* J. Presl. It has been the most important spice used in many food products. Since *C. verum* is native to Sri Lanka, it is commonly called 'Ceylon cinnamon'. Due to high demand but scanty production and supply of Ceylon cinnamon, many morphologically identical Cinnamomum species are traded in the name of Cinnamon. This leads to many health concerns as the substitutes/adulterants contain a harmful compound, coumarin. This article highlights the necessity of authentication and trade regulation for true Cinnamon.

Keywords: Authentication, Ceylon Cinnamon, *Cinnamomum verum*, Coumarin, Cinnamaldehyde, trade regulation.

INVITED LECTURE 14

Significance of botanical inventory and typification in plant taxonomy

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With highly diverse geographical conditions in the vast stretches of lofty Himalayans, table-lands and plateaus in the Vindhyan ranges and the Western and Eastern Ghats, the deep valleys and foothills of Assam, Central Indian highlands, the alluvial planes of North and the Lower terrains of Southern India, the Indian region exhibits a variety of flora and forest types within a confine for which perhaps no similar example exists in any other country of the world. The "Flora" of a location is determined by the floristic elements that are already present; on the contrary, a 'Flora' always provides an aid to search the authentic candidates of the region. In this context, the main aim of a floristic work is to recognize the species growing in a particular area and to provide support for identification of the floristic elements in the form of taxonomic keys, supplemented by description of taxa. Besides, habitat data, data on phenology (mainly flowering and fruiting time period) and altitudinal information are almost integral part of a floristic study. The floristic study is usually associated with supportive specimens details. The specimen support against the existence of a taxon in an area is fundamental for Flora. Practically many studies, including the recent ones, contradict each other in reporting the occurrence of a particular species in a particular region. It is sometimes noted that a large number of species or taxa that one study records for the area are absent from subsequent investigations. Due to the absence of recent collections, many taxa are often omitted in many literatures. The lack of thorough field exploration reports makes it difficult to identify species extinction, especially in plants. It has frequently happened that certain species that were mistakenly proclaimed extinct have been found again after thorough searches. Furthermore, without evidence on wrong identity of specimen(s), exclusion of any taxon is also unwarranted. Furthermore, the overall number of species found in a given area is significantly impacted by the uneven treatment of cultivated and horticultural aspects. In this direction documenting the floristic diversity of a region is always critical. Major difficulty in recognition of species/taxa in a flora is

the difference in interpretation/opinion and is largely due to the absence of a 'Flora' compiled through a revisionary approach.

Of course, at any level, a taxon's circumscription is important and vital. In this direction, for precise application of names as well to stabilize the names, typification is essential. It needs expertise and overall taxonomic knowledge of the concerned group. However, in general floristic work the 'number of taxa' often does not permit to recognize and to link ideal specimen to the concerned name. On the contrary, revisionary or monographic work with limited number of taxa well agrees with the typification process. In depth knowledge on the concerned taxon (and name) throughout life history since its birth provides opportunity to link the type. However, nowadays recognition of a type for a name often appears as 'typification syndrome'. Typification performed without comprehensive knowledge on that particular plant group, often results obscurity, leading to the misapplication of names. Present day such examples are not uncommon.

In the present communication 'Sikkim Flora' is considered an example in this direction. This Himalayan tiny state harbours nearly 5900 flowering plant species on just 7096 km^2 of land area (nearly 32% Indian angiosperm flora in 0.2% geographical area of the country). The consequences of floristic research as well as nomenclatural issues are discussed.

Keywords: Circumscription, Himalaya, ICN, monograph, nomenclatural type, revision.

INVITED LECTURE 15

Arunachal Pradesh - a floristic review with special emphasis on grasses

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The state of Arunachal Pradesh in Eastern Himalaya with an area of 83,743 sq. km. is the largest amongst the states of Northeast India, a region renowned for its unique biodiversity within the Eastern Himalayan Hotspot. With its lush landscapes spanning tropical lowlands to alpine highlands, Arunachal Pradesh is home to an exceptionally rich variety of flora, including a high proportion of endemic and rare species. Arunachal Pradesh supports approximately 23.52% of the country's flowering plants, positioning it as a botanical treasure trove in India and contributing significantly to global biodiversity, especially in terms of orchid diversity. Noteworthy genera, such as Rhododendron and Impatiens, showcase remarkable diversity and endemism within the region.

Geographically, the area ranges from 200 m to 7756 m and is diversified with planes, hills, valleys and rivers. Heavy monsoon showers are received about year round from February to the mid of November. Due to continuous rainfall and varied topographic conditions there is a huge diversity of the grass (Fam. Poaceae) in the state. In Arunachal Pradesh the family Poaceae is represented by 82 genera and 216 species and ranks third after Orchidaceae and Rubiceae. In view of a survey the present paper deals with the diversity and phyto-geographical affinity of grasses to Arunachal Pradesh and its neighboring areas.

Keywords: Arunachal Pradesh, grass diversity, Poaceae, phyto-geographical affinity.

INVITED LECTURE 16

Bridging policy and science: Role of scientific authorities to CITES and CITES-NDF analysis

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The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments. There are 184 member countries/ parties, and India has been a party to the convention since 1976. More than 40,900 species are protected by CITES from over-exploitation through international trade, including approximately 6,610 species of animal and 34,310 species of plant. The CITES Scientific Authority is a national body providing scientific advice as outlined in Article IX of the Convention. A Scientific Authority is tasked with offering technical and scientific guidance to its Management Authority, particularly regarding the potential impact of exporting or introducing a specimen from the sea on the species' survival in the wild. This assessment is based on a determination referred to as 'Non-detriment Findings' (NDFs). The Botanical Survey of India (BSI) is a leading taxonomic research organization in the country under the Ministry of Environment, Forest and Climate Change and is recognized as one of the designated Scientific Authorities to the CITES. Over the past few years, BSI has carried out NDFs for several highly exported and commercially important species *viz*., *Aquilaria malaccensis* Lam., *Dalbergia latifolia* Roxb., *D. sissoo* DC., *Pterocarpus santalinus* L.f. These studies significantly influence the country's export, monitoring, and conservation policies related to these species, which are closely linked to the livelihoods of the country's people. The presentation will discuss the involvement of Scientific Authorities in CITES and provide an overview of CITES-NDF analysis, including some case studies.

Keywords: Aquilaria, CITES, Dalbergia, non-detriment findings, *Pterocarpus*, scientific authority.

INVITED LECTURE 17

Schizocarp morphology, anatomy and its significance in taxonomy of the family Apiaceae

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The family Apiaceae (Umbelliferae), commonly known as the Celery, Parsley, or Carrot family, is one of the largest and most diverse plant families, encompassing approximately 466 genera and 3,820 species globally. The family exhibits a cosmopolitan distribution, with a notable presence in subtropical and temperate regions, particularly temperate Eurasia and North America. In India, Apiaceae is represented by 71 genera and 249 species, of which 26 genera, 48 species, and one variety occur along the fringes of the Western Ghats.

Apiaceae is an important family both economically and medicinally corresponding to its phytochemical importance. Most of the members of Apiaceae are used for different purpose such as nutrition, beverages, spices, staining, fragrances and industrial uses. Apiaceae is an identical family with a number of uniform characters, making family-level identification an easy process. Although generic identification is still easier, species delimitation with these uniform vegetative characters becomes the biggest hurdle. The extremely small size of the flower, fruit, and seed, along with their near identical characters, often leads to taxonomic problems and incorrect species level identification. However, the very minute micromorphological and anatomical characteristics of schizocarpic fruits, such as, the presence and absence of wings, number of vittae, presence and absence of rib oil ducts, etc. aid in specific delimitation. Hence, fruit anatomical characters in Apiaceae is crucial in understanding the taxonomic complexity among the taxa. The present paper highlights the taxonomic significance of fruit micromorphology and anatomy within the family Apiaceae, with a particular focus on the taxa in the Western Ghats.

Keywords: Anatomy, Apiaceae, micromorphology, SEM, taxonomy.

INVITED LECTURE 18

Bioinspiration from Dispersal of Winged Diaspores

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Dispersal, a key stage in the life cycle of plants, is a physical process in which the progenies are carried from the location of mother plant to far away distances. Dispersal is linked to the sustenance, migration and diversification of species and maintenance of biodiversity. To achieve this, diaspores (dispersal units) are evolved in plants with a great diversity and complexity of structures to assist movement by intrinsic energy sources (*e.g.*, explosion) or by biotic or environmental carriers. In nature, dispersal is brought about by various agents such as wind, animals, water, gravity, glaciers and mechanical propulsion. For wind dispersal, specialized or non-specialized flight mechanisms are very common in flowering plants. Presence of membranous wings, fluffy hairs or light-weight seeds enhances dispersal potential. Wings of diaspores (seeds or fruits) facilitate a slow rate of descent and to float and fly more time in the atmosphere. They undergo descent patterns such as gliding, straying, rocking, spinning and autorotation while dispersal. The wings in diaspores are variously developed from structures such as ovary, hypanthium, perianth, bracts and integuments. These structures undergo various transformations in morphology and structure that produce various types of aerodynamic behavior during dispersal. The mechanism of dispersal and dispersal capabilities of diaspores are less understood in majority of the plants. Biodiversity offers three fundamental sources of inspiration to the modern science, *viz.*, chemicals, genes and designs. Biomimetics is a general term for adaptations of organic processes and products used in technology. The prototypes from nature are used for technical solutions and construction by designers and engineers. A detailed understanding of the aerodynamic mechanism of the dispersal in the winged diaspores may act as sources for bioprospecting of natural designs, a promising area in biomimetics, including aeronautical engineering.

Keywords: Aerodynamics, bioinspiration, biomimetics, bioprospecting, wind dispersal, winged seeds.

MEDAL AND ENDOWMENT LECTURES

Y.D. TIAGI MEDAL AWARD LECTURE

Plants in the tribal life of Arunachal Pradesh with special reference to Tangsa community

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Arunachal Pradesh is the easternmost North-east Indian state of India with nearly 90 % forest cover. The entire population of the state has been recorded as Scheduled Tribe and, so far, Govt. of India recognized 26 distinct tribes. At the same time these represented by at least 110 subtribes. They practice unique languages, cultures, dresses, and foods. While distribution of some tribes is very restricted, some others live in two or more districts.

Though Christianity is invading deeply in these societies but the larger proportion of the population believe in their traditional religions, – mostly, animism. They do believe in many spirits and deities. Recently a new religion, Rangfrah, is increasing its impact. However, *Donyi-Polo* (Sun & Moon) remains the major religion in other parts of the state. And, most of their festivals are linked to different seasons, harvests, etc. Use of different plants in their festivals is also significant, and are deeply rooted in their traditions.

Most of them are non-vegetarians and eats most of the animals including any type of birds, mutton, beef, pork, buff etc.. Mithun (*Bos frontalis*) is the semi-domesticated animal is very much integrated in their culture and its meat is served during festivals and celebrations.

They prefer boiled preparations. Lai Patta (*Brassica juncea*) is the most preferred vegetable. Use of naturally growing aromatic plants including *Zanthoxylum rhetsa, Zanthoxylum aromaticum, Houttuynia cordata* etc. are their favourites. They collect numerous wild plants from the surrounding vegetation and consume in sufficient amount. They are having some special preparations too! Apatanisof Ziro Vally prepare the famous 'Pikey-pila', mostly with young bamboo-shoot and dried-smoked pork. However, now-a-days some people do not have time for collection from nature, instead turning to local markets. So, now, many of these wild-edible-plants (WEP) are regularly marketed in town areas.

There are numerous rivers and streams in the lower part of Arunachal Pradesh where they use plants for stupefying fishes. In addition to fishing, including hunting, equipment are mostly made of bamboos. Different species of bamboos have great role in their life, from food to utensils, and making houses and ornamentation too!

Tangsa is one small tribal community, with numerous sub-tribes, living mainly in the Changlang district of Arunachal Pradesh and few villages in the Tinsukia district of Assam. The region represents the outer hills of Patkai range. Folklores reveal their migration from Mongolia, through the Yunan Province of South-West China and finally reached here via Myanmar. They do not use any script for writing. Richer people generally living on upper regions of hills and others used land for cultivation in lower valleys. They produce a special type of tea in bamboo and roast it. This Phalap is consumed almost by all except the children. They take tea in bamboo cups and in bottle-gourd shells.

Their stilt-houses are generally constructed 4–5 m above the ground. Mostly with wooden or bamboo walls and floors, thatched with leaves of *Salacca secunda* and *Livistona jenkinsiana*. Bamboos play great roll in their life. While the main pillars of the houses are made up of timbers, the skeleton, walls and floors are with different forms of bamboos.

Tangsa people mostly depends on forests for their survival. For food they use different parts of WEPs which include leafy twigs, tubers, rhizomes, bulbs, inflorescence, flowers, ripe and green fruits, and seeds. When someone fell sick they collect medicinal herbs, prepare their own traditional medicines for a wide range of diseases and rarely visit a hospital. Most of the vessels for domestic uses are made of the fruit-shell of *Lagenaria siceraria* (bottle-gourd), cooking utensils with wood or bamboo, bamboo-water pipes, etc. The use of *Phrynium pubinerve* leaves for packing and offering food. For similar other purposes leaves of *Macaranga* sp. and *Amomum* spp. leaves are also in use. So, for their survival and livelihood they are completely dependent on natural forest products from their surroundings.

Though they are mostly animist, but in every religious rituals they use different types of plants. In wedding ceremony the grains of *Setaria italica* are carried by the bride while leaving her father's house as they believe that in doing so she will be highly productive and that her offsprings will grow like the numerous seeds of this foxtail-millet.

This shows that the traditional knowledge of Tangsas is good enough for their normal survival in the forested habitat. But, not only Tangsas, present generations of all these communities are coming out en-mass for higher education, thanks to Ramakrishna Mission and Christian Missionaries, taking up research, participating in all-India and state administration and even going abroad for their better understanding of global science and culture. The contribution of Arunachal University, established on 4th February 1984, now the Rajiv Gandhi University (Central), becomes the main flag carrier for their upliftment. Now, some other government and private institutes are also contributing immensely to these people who were previously completely forest-dwellers and even head-hunters!

Keywords: Arunachal Pradesh, ethnobotany, natural resources, Tangsa tribe, traditional knowledge.

PROF. V.V. SIVARAJAN GOLD MEDAL AWARD LECTURE

Unveiling *Aeschynanthus* (Gesneriaceae)

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Gesneriaceae are a medium-sized plant family with around 3500 species spread across 151 genera, and has roughly a third of its distribution in the Neotropics and two-thirds in the Paleotropics, with a few exceptions in Europe and the southern hemisphere (Weber & al., 2013). The members exhibit a wide range of habit diversity ranging from perennial herbs to small trees or climbers to epiphytes. With 24 genera and over 150 species, Gesneriaceae contribute to the richness of Indian flora (GRC, 2024). The taxonomic and molecular studies of South Indian Gesneriaceae were accounted recently from our research.

Aeschynanthus is the largest epiphytic genus of the family, encompassing 181 species globally. The species range extends from Sri Lanka through India, Nepal, Bhutan, Bangladesh, southern China, South East Asia to the Solomon Islands (GRC, 2024). The genus is frequently referred to as 'lipstick plants' or 'blushworts' perhaps referring to the blushing red flowers. With its trailing stems adorned with glossy, dark green leaves, creating a lush and cascading appearance and vibrant, tubular flowers, the genus makes an ideal choice for hanging baskets or elevated planters.

Aeschynanthus is characterised by its epiphytic adaptation, including fleshy leaves and tiny, long-appendaged seeds prone to wind dispersal. The flowers are protandrous and have characteristics associated with ornithophily, including brightly coloured, tubular corolla, and the production of copious nectar. C.B. Clarke (1884) in Hooker's Flora of British India provided an account of Aeschynanthus in India, and included 23 species. Bhattacharyya and Goel (2014) reported 26 species in India. Many species were subsequently merged resulting in a decrease in the number of species. Sinha and Datta (2016) reported 16 species from the Northeast India, while Möller & al. (2017) recorded 15 species in India, and suggested additional work in this genus. The extent of variations in vegetatative as well as floral features in many taxa often pose problems in taxonomic delimitation.

The seed characters are significant for the infrageneric classification of the genus. Bentham (1876) had taken a pioneering step towards the sectional classification and recognized four sections. Clarke (1883), Schlechter (1923), and Wang (1984) each

contribute additional section to the genus. In a recent classification, Mendum & al. (2000) recognized two groups and seven sections.

We had undertaken an integrative taxonomic approach involving molecular (both Amplicon and Sanger sequencing), micromorphological and palynological studies of the genus in India. The extent of variation within taxa was studied by extensive field observations and by consulting major herbaria in India (ARUN, CAL, CALI, D, MH) and abroad (BM, E, K). The programme was financially supported by Science Engineering Research Board (New Delhi), The Gesneriad Society (USA), International Association for Plant Taxonomy (Bratislava, Slovakia) and Sibbald Trust (Royal Botanic Gardens, Edinburgh). There are 20 species in India, including four endemics. The Northeastern region of India is home to about 90% of the distribution of this genus. Despite favourable habitat and climatic conditions being present in the southern part of India, this area has poor representation of the genus, with only one species, *Aeschynanthus perrottetii* A. DC.

Gesneriaceae research team at the Department of Botany, University of Calicut, has undertaken an integrative approach to unravel the life history of Indian gesneriads by focusing on morphological, and molecular characterization. Additionally, research is being done on the anatomy, cytology, floral ontogeny, seed micromorphology, and palynology. This approach will facilitate interpreting changes in a phylogenetic and biogeographical context, enhancing the understanding of the evolutionary pressures that drive significant variations.

Keywords: *Aeschynanthus*, Gesneriaceae, integrative approach, paleotropics, taxonomy.

PROF. KAMESWARA RAO ENDOWMENT LECTURE

Diversity in Vigna and its potential use in pulse crop improvement

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Plant breeding techniques and wild relatives of crop plants have been fruitfully utilized for increased yields and to solve many problems associated with quality, quantity, diseases and insect resistance and harvest. Utilization of wild species is one method designed to introduce additional germplasm into cultivated varieties. Exploration of species related to crop plants requires the integration of many disciplines. Expertise in the field of botany, taxonomy, cytology, genetics, ecology, plant breeding and biochemistry greatly increase the probability of eventual success in crop improvement. Therefore, an understanding of gene centers, centers for diversity, and species relationships are essential for utilization of wild germplasm. Although great effort may be required, wild species have contributed germplasm to several crops with great economic rewards.

Genus Vigna Salvi first published in 1824, worldwide represented by about 106 species, is widely distributed in Tropics and Subtropics extending to China. Genus has a very strange taxonomic history. Major problems have always been in generic delimitation between it and closely related genera like Phaseolus L. and Dolichos L. The genus *Vigna* is divided into 8 subgenera. Similarly, *Vigna* being a heterogenous group, with 18 cultivated species, a good infrageneric and infraspecific classification is necessary. In India, the genus is represented by about 25 species (including one cultivated), 2 subspecies and 8 varieties. Correct taxonomic identity is basic to good science. Correct identification, classification & documentation of plant genetic sources (PGR) is an integral part of PGR management. More than 25% of wild species accessions in gene banks are either mis-identified or not identified at all. Mothbean (*V. aconitifolia*), adzukibean (*V. angularis*), blackgram (*V. mungo*), Greengram (*V. radiata*), ricebean (*V. umbellata*) and cowpea (*V. unguiculata*) are important pulse crops in India.*Vigna* species are an important source of proteins, vegetables, fodder and useful in soil enrichment. The wild relatives are the treasure house of genes that could not pass through domestication bottlenecks – MYMV, pod number, seeds/pod, clusters/plant etc. MYMV resistance was transferred from *V. sublobata* type II to *V. radiata* in the early 80's but the identity of the source material is not clear.

Characters currently being used for determination of taxa are habit, trichome, flower size, seed weight, length of hilum, length of keel pocket etc., however, diagnostic characters for species delimitation include habit, shape of seed & hilum, aril, orientation of pods, shape of stipule, shape of style beak, diameter of standard, length of keel pocket, seed testa etc. *Vigna* being economically very important genus with wild close relatives of *V. aconitifolia, V. mungo, V. radiata* and *V. umbellata*, there is need for critical field survey, exploration of wild species in various parts of the country, germplasm collection, documentation of intraspecific variations and their conservation in National Gene Banks (NBPGRI). Genetic diversity, patterns of variations, documentation of the better agronomic types has great significance in breeding and crop improvement.

Variations in morphological and agronomic traits in *Vigna* e.g. Mungbean yellow mosaic virus (MYMV) resistance, number of pods per plant, pod length, 100 seed weight, fruit setting capacity, flowering period, maturity, shattering of pods, number of pods bearing peduncles, plant height, number of primary branches, length of branch, nodulation, leafiness are some of the important agronomic characters for plant breeder in crop improvement. Pod length, pods per plant, seeds per pod and seed weight are some of the important agronomic yields enhancing traits for *Vigna* crops. Patterns of variations at population level are of significance in crop breeding programs. Collection and establishment of the core collections of Indian *Vigna* species has considerable standing in future.

Importance of *Vigna* species in India, their taxonomy and classification, diagnostic characters in species delimitation and identification, relationship, traits of agronomic importance, need for exploration, conservation, utilization and role and responsibilities of taxonomists towards *Vigna* crop improvement is provided in the lecture.

Keywords: Agronomic traits, conservation, crop improvement, diagnostic characters, taxonomy, Vigna.

PROF. A. K. PANDEY AWARD FOR REVISIONARY STUDIES

Taxonomic revision of the family Heliotropiaceae Schard. in India

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In conventional classifications, the representatives of Heliotropiaceae Schrad. were included under Boraginaceae (s.l.) Juss. as subfamily Heliotropioideae Schrad.. But recentphylogenetic studies suggest the recognition of the family Heliotropiaceae Schrad. comprising four genera *Heliotropium* Tourn. ex. L., *Euploca* Nutt., *Ixorhea* Fenzl and *Myrioups* Small. The family includes *c.* 450 species worldwide. The members are mostly distributed along the tropical and temperate regions of the world. Heliotropiaceae is recognized by their scorpioid cyme, five stamens adnate to the corolla tube, anthers included, style terminal, conical, with a basal ring-shaped stigmatic head, and apex sterile, fruits separating into one to four nutlets. In India, the family Heliotropiaceae is represented by two genera *Euploca* Nutt. and *Heliotropium* Tourn. ex. L. with *c.* 18 species. In this study, Heliotropiaceae is taxonomically revised in India. Entire morphological variations occurring within the family is considered, nomenclature updated, diagnostic key to all species provided, along with their distribution in India.

Keywords: Heliotropiaceae, nomenclature, revision, taxonomy.

PROF. SANTHOSH NAMPY IAAT YOUNG SCIENTIST AWARD

SNA-OP-01

Taxonomic status of Indian Rose-mallow *Hibiscus* (Hibisceae: Malvaceae)

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Hibiscus L. or Rose-Mallow is the most diverse genus of Malvaceae Juss. having 437 species worldwide. In India, it is represented by 33 species and one sub-species accompanied in 10 sections; of which four species are considered to be Endemic. Section *Furcaria* is the largest section represented by nine species. The present study highlights the status of Indian *Hibiscus* in the view of morphology, distribution, nomenclature, interrelationship, and correct identity. *H. hoshiarpurensis* T. K. Paul & M.P. Nayar and *H. sreenarayanianus* Anil Kumar & Ravi so far have not been recollected after their discovery and show taxonomic consequences for their correct identification. Several Indian floras and revisions treated *H. ovalifolius* (Forssk.) Vahl a closely allied species of *H. micranthus* L.f. however, it is wrongly interpreted and is a distinct element of Sect. Trichospermum. The protologue and type specimens of *H. sreenarayanianus* match exactly with the *H. physaloides* Guill. & Perr., *H. hoshiarpurensis* represented by only type specimen, shows close affinities with *H. mastersianus* Hiern. So far identified *H. trinonum* L. is a composition of two distinct species namely *H. tridactylites* Lindl. and *H. verdcourtii* Craven. *H. caesius* Garcke is neotypified because of the unavailability of any original material associated with protologue. Sparsely reported *H. heterophyllus* Griff. and *H. glanduliferus* Craib are cultivated as ornamental plants from Southern to Northern India. The present work will highlight the taxonomy, nomenclature, classification, and status of Indian Hibiscus which will form a baseline for further systematic studies including phylogeny, ecology, bioprospecting and horticulture.

Keywords: Azanza, endemism, Ketmia, Malvoideae, variation.

SNA-OP-02

Systematics, biogeography, and character evolution of the genus *Henckelia* Spreng. (Gesneriaceae) with special focus on the acaulescent species

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The genus *Henckelia* (Gesneriaceae), containing ca. 82 species, Northeast and South India, Sri Lanka, Myanmar, Nepal, Bhutan, southern China, northern Vietnam, northern Laos and northern Thailand. Although the genus is well delimited, the members generally fall under two groups, plants predominantly caulescent, with internodes and leaves in whorls of 2 or 3, and orthocarpic capsules dehiscing along both upper and lower suture and plants predominantly acaulescent, with leaves in basal rosette and plagiocarpic capsules opening along the upper suture only. Here I present a fossil-calibrated, molecular phylogeny of Henckelia based on nuclear ribosomal DNA (ITS) and chloroplast DNA regions (trnL-F). Within this framework, we examine character evolution in habitat, phyllotaxy, fruit nature, shape and dehiscence. Also tried to infer the ancestral area and biogeographic history of the genus with the available data. The molecular phylogeny suggests that the genus Henckelia is monophyletic. When all the acaulescent species forms a separate clade, the caulescent species are splitted in to two separate clade and interestingly, one clade is formed by the caulescent species found only in India, the separated acaulescent clade is sister to the other clade of the caulescent which contain the species found in other regions. Biogeographic reconstructions suggest the Gesneriaceae originated in the region of modern-day Central America and Andean South America during the early Palaeocene, Gesneriaceae arrival into the Old World probably occurred through a long-distance dispersal event from the Americas around 60 Mya. The genus *Henckelia* originated in the Chinese region around 25 Mya. The evolution of some of the morphological characters were traced in the genus *Henckelia*.

Keywords: Acaulescent, biogeography, Gesneriaceae, *Henckelia*.

SNA-OP-03

New distributional records to the flora of Nashik district, Maharashtra, India

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The present floristic study was carried out on basaltic plateaus from remote area Nashik district. These plateaus are part of Satmala-Chandwad Hill range which is an integral part of Northern Western Ghats. Studied plateaus were dry for 08-10 months while moist only for 02-04 months in a year. Average rainfall on these plateaus is 800 to 1000 mm. The climate of these plateaus is dry throughout the year except during the south west monsoon season. In spite of adverse climatic conditions, these plateaus harbour many taxa. It is may be due the diverse microhabitats were present on these plateaus which support the good vegetation. The present paper gives a checklist of ninety five taxa, which are new distributional record to the flora of Nashik district. Voucher specimens were collected from study area and herbariums were deposited to ACS college Chandwad herbarium.

Keywords: Distribution, floristic, plateaus, Satmala Hills.

DR. A. K. PRADEEP YOUNG RESEARCHER AWARD

AKPR-OP-01

Nilgiri Biosphere Reserve in India boasts an array of attractive *Impatiens*, making it a haven for botanical enthusiasts

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The family Balsaminaceae was established by A. Richard in 1822. In 'Genera Plantarum' Bentham and Hooker treated it as tribe, 'Balsamineae' under the family Geraniaceae. *Impatiens* L. (Balsaminaceae) is one of the largest genera of angiosperms comprising over *c.* 1200 species. In India, the genus is represented by more than 323 taxa, mainly distributed in the Eastern Himalayas, the neighbouring North-Eastern States and the Western Ghats. There are *c.* 130 species of wild balsams distributed in the 5 zones of the Western Ghats of which 80% are endangered. In Nilgiri Biosphere Reserve, it has ca. 55 taxa of which *c.* 48 are endemic, *c.* 12 are strictly endemic to NBR; which occupy various forest types and habitats. It has 7 different sections; sect. Scapigerae where *I. laticornis* has done rediscovery and *I. neo-orchioides* is described as new to science from Nilgiris and is distributed in an altitude range between 600–2300 m; Sect. Epiphyticae which adds beauty to the host trees, altitude range 900–2200 m; Sect. Annuae range between 5–1800 m; Sect. Microsepalae from 10–1800 m; Sect. Tomentosae found in evergreen hill sholas, from 1200–2000 m; Sect. Sub-Umbellatae from 1000–2000 m; Sect. Racemosae ranges 700–2000 m. These species adapted wide range of elevations and show morphological variations. The present study aims to document and conserve the threatened Impatiens from the study area.

Keywords: Endemic species, new species, Nilgiris, rediscovery, wild balsams, Western Ghats.

AKPR-OP-02

Unveiling the enigmatic world of *Impatiens* of Western Himalayas: Exploring species diversity and endemism

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Impatiens Riv. ex L. (Balsaminaceae) commonly known as 'balsams' is among the largest, diverse and complex genus of angiosperms with more than 1000 species, most of which are distributed in Africa, SE Asia and India. In India, the genus is represented by *c.* 280 species. The Western Ghats and Himalayas are the hotspots of this genus with very high endemism. Taxonomic study of balsams solely based on herbarium collections has been greatly hampered as many of the distinguishing floral characters like colour of corolla, shape of lower sepal and spur are often untraceable in herbarium specimens. These difficulties often lead to errors in delimiting the species and thus owing to these difficulties in identification of Impatiens it has been refereed as 'a terror to botanists' by Sir J.D. Hooker. Impatiens in the Western Himalaya comprises 38 species, half of which are endemic and one third of these endemics are only known from century old herbarium records with incomplete descriptions. Infact, a few species are solely known by their century old British collections, mainly types e.g. *I. reidii* Hook.f. and *I. vexillaria* Hook.f. Based on our extensive field surveysfrom 2018-24 in the Western Himalayan region(Jammu Kashmir, Himachal Pradesh and Uttarakhand) covering different habitats and altitudinal ranges (700–4500 m elevation)we present here species diversity of Impatiensin Western Himalaya. Species morphology, endemism, habitat preferences and change in composition of the species along altitudinal gradients has also been discussed.

Keywords: Balsam, endemism, Western Himalaya, taxonomy.

AKPR-OP-03

Ecology and prey composition of the carnivorous *Utricularia malabarica* (Lentibulariaceae)

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Utricularia L. (bladderworts, Lentibulariaceae) is the second largest genus among carnivorous plants. Complex suction traps are the main feature of the bladderworts. *Utricularia* trap contents have frequently been used to define its diet, despite this, little is known about the prey spectrum of the genus. The endemic terrestrial carnivorous bladderwort, *Utricularia malabarica* Janarth. & A.N. Henry, from northern Kerala, was studied to determine the species assemblage present in traps. Information on the ecology and trap content of this species has not been reported yet. The main environmental factors that favour or limit its growth were analysed. The present study focuses on a detailed survey of soil and water quality parameters, including pH, temperature, N, P, K, Na, Mg, Ca, S, Fe, etc. of U. malabarica collected from three sampling sites. A comprehensive analysis of the prey composition was conducted by collecting and examining traps from each sampling site.

Keywords: Bladderworts, carnivorous plants, ecophysiology, Lentibulariaceae, prey spectra.

AKPR-OP-04

The Genus *Ipomoea* L. (Convolvulaceae) – the Present Status in Karnataka

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A study on the genus *Ipomoea* in Karnataka is presented. The taxonomy of *Ipomoea* is quite a difficult and being challenging topic for the researchers due to its great morphological variations with regard to leaf and flower characteristics. Therefore, many species of genus are being confused, misidentified and that may lead to misreport. A total of 34 species of Ipomoea has been documented so far, however due to our extensive survey for the genus Ipomoea in the state, the present study has come across two new putative species of Ipomoea, which are to be investigated through experimental taxonomy. The species of the genus are commonly called as 'Morning Glory' plants, having high species diversity, remarkable taxonomic distribution and huge phenotypic variation. The species are mostly characterized by their annual or perennial climbing habit, milky latex, alternate leaves, campanulate or hypocrateriform, plicate corolla, unequal stamens, adnate filaments, bicarpellary ovary, spinulose pollen grains and capsule fruit. Most species are of terrestrial forms with some exceptions, having aquatic nature. The current study provides the present status of the genus and artificial key to all the species reported from Karnataka. In addition, notes on distribution, diversity, illustrations and photoplates have also been included. A total of 36 species, in which 31 species,1 subspecies, 1 variety, 1 forma and 2 new putative species of our study are being recorded. The data reveals a concrete information on the genus Ipomoea of Convolvulaceae in a systematic manner, which may help the taxonomists.

Keywords: Convolvulaceae, *Ipomoea*, species diversity, artificial key, 2 putative species.

AKPR-OP-05

Molecular phylogeny and phylogeography of selected *Miliusa* Lesch. ex A. DC. Species in Indian context

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The genus *Miliusa* Lesch. ex A. DC. belongs to the family Annonaceae with Austro-Asiatic distribution. In India, *Miliusa* is represented by 25 species and 1 variety, with Western Ghats showing a high degree of endemism. The distribution pattern shows that W. Ghats abodes 16 species, of which 11 are endemic. Tamil Nadu and Northeast India house 11 and 4 species, respectively. Andaman and Nicobar Islands harbour 5 species, of which 2 are endemic. Nine *Miliusa* species were collected from different areas of the W. Ghats of Kerala and Tamil Nadu. The genomic DNA was isolated following the CTAB protocol. The Bayesian phylogenetic analyses were performed based on four combined cpDNA datasets (psbA-trnH spacer, trnL-F spacer, trnL intron, and matK). The ingroup consists of 41 species of Miliusa, of which 13 accessions (9 species) are newly sequenced, and the remaining species were sampled from NCBI GenBank. Outgroups consist of 2 species (*Huberantha cerasoides* and *H. stuhlmannii*). Two major clades (PP = 1) were obtained, with one comprising of mainland Southeast Asian and Indian species and another with species largely from maritime Southeast Asian Islands and Islands east of Wallace Line. Notably, the newly sequenced *Miliusa* species formed a single clade along with other Indian Miliusa species, suggesting a strong monophyletic origin of Indian Miliusa species (PP = 1). Historical biogeographic analyses showed that Indo-China is most likely the Centre of Origin for the most recent common ancestor of the *Miliusa*.

Keywords: Annonaceae, Bayesian phylogeny, Chloroplast DNA, Historical biogeography, *Miliusa*.

AKPR-OP-06

Intricacies in the Inflorescence Architecture of *Arundinella* (Poaceae)

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Grasses are an exceptional group among the angiosperms. Their floral organisation is distinct from that of the other flowering plants. Sometimes, the standard botanical terms might find themselves inadequate to define grass structures. The situation in question happens quite frequently with regard to the inflorescence of grasses. The current study aims to explain the complex details in the basic framework of inflorescence in the genus *Arundinella*. In general, the genus is considered as having panicles. Although the membersexhibit a spectrum of variations across interspecific and intraspecific levels. It can vary from tight, cylindrical ones to extremely lax forms. For instance, *A. spicata* can be easily distinguished by its cylindrical inflorescence; at the same time, plants like *A. pumila* and *A. ciliatashows* a vast range of variations in inflorescence organization. Interestingly, this could end up in appearance like quite distinct individuals.The intention of this work is to provide a detailed analysis of the basic structure and variations in the inflorescence patterns of *Arundinella*.

Keywords: Grasses, Morphology, Species delimitation, Spikelet, Variations.

AKPR-OP-07

Ethnobotanical resource used in traditional Ethnocrafts among the Sherdukpen tribe of Arunachal Pradesh

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Present study documents traditional ethnocraft products, technology and knowledge system of the Sherdukpen tribe residing in Shergaon and Rupa circles of West Kameng district of Arunachal Pradesh, India. The study unveils 9 angiosperm species primarily used for crafting 20 types of ethnocraft products crafted by the rural artisans. Some of the ethnocraft products were found to be utilitarian in nature, but unique to the community that help in securing rural livelihood. These ethnocraft products also symbolize and portray traditional cultural expression and community identity of the Sherdukpen. IPR protection in the form of GI tag has been felt essential to protect and promote the unique creativity knowledge, skills and innovative technology of the rural artisans.

Keyword: Angiosperm species, artisans, creativity, cultural identity, livelihood, rural, skills, Sherdukpen Tribe, traditional ethnocraft.

AKPR-OP-08

Diversity of Orchids in Sringeri Forest Region of Chikkamagaluru District, Karnataka

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Orchids are an intrinsic components of forest ecosystems that contribute to a high proportion of plant diversity. It has been well documented that 48% of Orchid flora of the Karnataka State and 33% of Orchids of Western Ghats is found in Sringeri Forest Region making this area a microcenter for orchid diversity. The aim of this study was to investigate the diversity of Orchids in the part of Western Ghats i.e. Sringeri Forest Region, Chikkamagaluru, Karnataka by Random Sampling Method. About 14 localities in Sringeri Forest Region were extensively surveyed during 2022-2024. The data revealed the presence of 27 species of Orchids belonging to 21 genera in which most of them were epiphytic, with one terrestrial and mycoheterotropic. Among the different species, largest number belonged to the genus *Dendrobium* followed by *Oberonin, Bulbophyllum* and other genera with one species each. In addition, notes on habitat, distribution, phenology, population status were recorded.

Keywords: Orchid Diversity, Random Sampling Method, Sringeri Forest Region, Western Ghats.

AKPR-OP-09

Floral diversity in the vicinity of glacial lakes in Western Himalaya, India

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The Western Himalayas, renowned for their diverse ecosystems and distinctive geographical features, host a variety of glacial lakes that provide essential habitats for numerous flora and fauna. The environment of these glacial lakes creates unique ecological niches, where species have adapted to the harsh and fluctuating conditions. This study examines the floristic composition, ecological roles, and conservation challenges of vegetation around these glacial lakes. Through comprehensive field surveys and data analysis, we have documented 81 plant species in the vicinity of these lakes, highlighting their ecological significance. Our findings reveal a rich diversity of plant life, including several rare and endemic species, underscoring the critical ecological importance of these aquatic ecosystems. Specimens were identified using the latest flora and monographs and were cross-referenced with authentic specimens from various herbaria. Fieldwork was conducted from early May to late October, as the area is inaccessible for the rest of the year due to severe snowfall. The study identified 54 genera across 27 families. Dicots were the predominant group, with 76 species (93.8%), while Monocots were represented by 5 species (6.17%). The Asteraceae family was the most diverse, with 17 species across 9 genera, followed by Rosaceae with 7 species and 5 genera. Dominant genera in terms of species richness included Saussurea (7 species), Bistorta, Carex, Argentina, and Primula (3 species each). Herbaceous plants were predominant, with 78 species (96.2%), while shrubs accounted for 3.7% of the flora. This research enhances our understanding of high-altitude biodiversity and underscores the need for sustainable management practices to safeguard the unique floral heritage of the Western Himalaya's glacial lakes.

Keywords: Alpine lakes, glacial flora, herbaceous, high altitude, Western Himalaya.

AKPR-OP-10

Endemic Zingiberaceae in India: Distribution, Conservation Status, and Strategies for Sustainable Management

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The family Zingiberaceae Martinov, is one of the major families under Monocotyledons, commonly known for their ecological, economical and medicinal significance. This family comprising approximately 57 genera and ca. 1300 taxadistributed throughout tropical Africa, Asia, and the Americas. In India, this family consists of 23 genera and 232 taxa, of which 134taxa are endemic. Notably, the genus Hedychium J. Koenig features the highest number i.e., 28 endemic taxa, while the genus *Hornstedtia* Juss., *Kaempferia* L., and *Plagiostachys* Ridl. have the least number of endemic taxa represented by only one species. The distribution of endemic taxa is more concentrated in Western Ghats and North Eastern region of India. Biogeographically India harbours a total 4 hotspot regions, *viz*. Western Ghat (and Sri Lanka), Himalayas, Indo-Burma and Sundaland (Nicobar Island). This study focuses on checking the current endemic status of all taxa belong to Zingiberaceae, examining their distribution patterns and conservation significance. This research underscores the importance of preserving Zingiberaceae diversity in the face of environmental challenges, ultimately contributing to biodiversity conservation and supporting local communities reliant on these plants.

Keywords: Conservation, endemic taxa, Zingiberaceae.

AKPR-OP-11

Exploring the Grass Flora of Indian Eastern Himalaya

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The Eastern Himalaya with varied geomorphic history and ubiquitous topographic features facilitates the region's rich biological diversity and ecological structure. The Indian part of it includes Arunachal Pradesh, Sikkim and West Bengal (Darjeeling and Kalimpong districts). Poaceae being the most dominant family of flowering plants in the whole Indian Himalayan Region (IHR) likewise overrule the floristic elements of Indian Eastern Himalaya (hereafter IEH) with around 763 species.

The extensive study of grass flora of IEH for the past six years resulted in inclusions and exclusions of many grass elements from this region. The most notable contribution is the discovery of a novel species, Arundinella namprikensis sp. nov. from Sikkim Himalaya. The revision of the genus *Axonopus* P. Beauv. has been done for the country and A. fissifolius was found to be a new entrant to two states, *viz*. Sikkim and Meghalaya. The finding of this species in Sikkim leads to its addition to the entire IEH. Additionally, two species, namely *Eragrostis tenuifolia* (A.Rich.) Hochst. ex Steud. and *Poa calliopsis* Litv. ex Ovcz. are now recorded as part of IEH flora. *Lolium multiflorum* Lam. has been added to the flora of Sikkim. Further floristic explorations in Arunachal Pradesh have resulted in identification of three species, namely *Brachypodium pinnatum* (L.) P. Beauv., *Cymbopogon khasianus* (Hack.) Stapf ex Bor and *E. tenuifolia* as new entities for the state flora. In the absence of any representative specimen, five species have been provisionally excluded from the Flora of Sikkim until supplementary specimens are discovered within the state's boundary. In a similar vein, *A. fissifolius* has been removed from present-day Uttar Pradesh, as has *E. tenuifolia* from both Bihar and Uttar Pradesh.

The taxonomy of aforementioned discovered taxa has been discussed along with their line drawings, microphotographs and easy identification keys.

Keywords: Excluded taxa, IEH, new entrant, Northeast India, Poaceae.

AKPR-OP-12

An analysis of the significance of morphology in the aerodynamics of the winged diaspores of the flowering plants of South India

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An object's aerodynamic behaviour is the way it moves in the air and is influenced by the flow of air around it. Winged diaspores produced by plants perform different aerodynamic behaviours such asautorotation, gliding, straying, undulating or tumbling motionsduring wind dispersal. During a study on the winged diaspores of the flowering plants of South India, diverse morphologies and geometries of wings were identified as responsible for their specific aerodynamics. The present study aims to analyze the significance of the geometry of wings and the morphology of diaspores in their aerodynamic behaviour and biomimetic applications. Morphological and experimental studies were conducted on selected winged diaspores, which differed in their geometry, and the results were analysed statistically to find out the relationship of morphological variables to their aerodynamic behaviour. The results demonstrate that the configuration and distribution of weight on the wings and the location of the centre of mass determine the type of motion during descent. Wing loading, fold angle, curvature, and aspect ratio are the major geometrical parameters which show significant relationships with different aerodynamic behaviours in them for producing a minimal descent rate during falling. This information will aid in the development and validation of an inflow model for various bioinspired techniques. The performance levels of various structures have been enhanced beyond those observed in nature by combining these design strategies of winged diaspores.This indicates that theimplementationof aerodynamic potential demands stable and efficient geometric configurations that direct the flow of the surrounding air.

Keywords: Geometry, morphology, plant architecture, wind dispersal, winged seeds.

AKPR-OP-13

Taxonomy and conservation of genus *Rotala* (Lythraceae) in Indian-subcontinent

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The genus *Rotala* L. (Lythraceae), an aquatic or amphiphyte herb exhibits remarkable diversity, inhabiting unique ecological habitats, distributed in tropical and subtropical countries, mostly Old World tropical and few species distributed in New World. Rotalacan be distinguished from other Lythraceae members by solitary or racemose inflorescence, scabrate to verrucate pollen, and 2–4 valved, transversely striated capsules. Nonetheless, within the genus, species can be recognized by morphological characters like monomorphic or dimorphic (heterostylous/homostylous) flowers, calyx appendages, nectary glands, and their type, seed, and seed coat nature. About 55 species of Rotalaare recognized currently with South Asia as the probable centre of diversity. Studying the taxonomy of the genus has been challenging due to its inter and intra-specific variations. Micro- and macromorphological analyses of Rotala species on the Indian subcontinent were conducted to resolve and revise their taxonomy. As a result, about 28 species are recognized from the Indian subcontinent nearly 75 % of species are endemic to the Indian subcontinent with high endemicity in Peninsular India.

The IUCN status of Rotalaspecies was assessed with updated taxonomic data. The suitable habitats, conservation hotspots, and their range shifts were identified using Species Distribution Modeling (SDM) which aids in conservation actions on the specialized habitats that support the diversity of Rotala. The current study emphasises a taxonomic revision of the genus Rotala in the Indian subcontinent, highlighting its diversity and taxonomic novelties, including a key for species identification, descriptions, notes on variations, nomenclature, distribution, niche preferences, and conservation.

Keywords: Conservation, diversity, macrophyte, Rotala, South Asia.

SM. & MR. ALMEIDA AWARD IN PLANT NOMENCLATURE

SMA-OP-01

Nomenclature notes on some names of the genus *Euonymus* L. (Celastraceae: Celastroideae)

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The *Euonymus* L. (1753: 197) is one of the largest genera within the Celastraceae family, comprising 145 species (POWO, 2024). Its range extends across temperate, subtropical, and partially tropical regions, including Northern and Central America, Northern Africa, Europe, Northern Australia, and Southern, Eastern, and Southeastern Asia. In India, the genus *Euonymus* L. is represented by *c.* 34 taxa, including 29 species, 1 subspecies, and 4 varieties (A.A. Mao & S.S. Dash, 2020). The distribution of *Euonymus* L. is primarily concentrated in Peninsular India and the Indian Himalayan region, where 10 of its 34 taxa are endemic, with 8 taxa specifically confined to the Western Ghats. Morphologically, Euonymus can be distinguished from other genera in the Celastraceae family by its conic or ovoid winter buds, prominent 4 to 5-locular disc, the presence of two or more ovules per cell, and its fruit, which may be slightly or deeply lobed, ovate, globose, and occasionally winged or echinate. The present communication aims to elucidate the reason for recognizing *E. acutangulus* Wight as the currently accepted name, in contrast to the widely recognized *E. angulatus* Wight. Additionally, it presents a new combination based on *E. glaucus* Turcz., which was previously regarded as a heterotypic synonym of *E. angulatus* Wight., and offers notes on typification of four names of *Euonymus*.

Keywords: Celastraceae, *Euonymus*, India, nomenclature, typification.

SMA-OP-02

Wallich Catalogue number 3769

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In 1821, Wallich while exploring the Indian subcontinent have made significant collections and had come up with many novelties. Among that one collection was numbered 3769 which had gatherings from different localities, and was identified as *Sporobolus* R. Br., this collection was initially divided into two gatherings one from Rajmahal hills of Jharkhand & another from the Munger hills of Bihar, it was only in the later stages of writing the catalogue realised that there was another gathering from Shivpur of Nepal. Though it wasn't mentioned anywhere in the validations of these gatherings done by Thwaites & Hooker in 1889 & 1896 respectively. Hence, in the present communication all the ambiguities around the taxonomy, nomenclature and distribution of the taxa published over the Wallich collection no. 3769 will be discussed.

Keywords: *Agrostis* L., distribution, Eastern Himalaya India, Nepal, Sino-Himalaya, revision, *Sporobolus* R. Br.

SMA-OP-03

Nomenclatural commentaries on some names in the genus *Gymnosporia* (Celastraceae)

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Gymnosporia (Wight & Arn.) Benth. & Hook. f. is one of the thorny genera belonging to the family Celastraceae, comprising of approximately 118 taxa distributed in the old-world countries. The genus is presently classified into eight sections. In India, 18 species and 3 varieties have been so far reported. While revising the genus *Gymnosporia* with respect to Indian region, we identified several nomenclatural problems which required certain amendments. One of the amendments is choosing a suitable lectotype for a name, superseding the previous neotypification, due to the existence of the original material. Another is on providing a correct name for a taxon which was superfluous illegitimate till date. In addition, conservation of a superfluous illegitimate name is discussed here. These serious nomenclatural rectifications attempt to overcome nomenclatural instability.

Keywords: Amendment, illegitimate, superfluous.

SMA-OP-04

Typification and taxonomic clarifications in the tribe Urticeae (Urticaceae) in India

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The entire family Urticaceae is mistakenly assumed to consist of only stinging plants. However, among the six tribes within the family, the actual stinging nettles are restricted to the tribe Urticeae. The nettles have stinging trichomes on stem, petiole, leaf, or inflorescences that inflict pain on contact. Few taxa are deceiving in appearance with inconspicuous stinging hairs apparently appearing harmless. The group is also characterized by 4-parted female tepals, one pair always larger than the other, partially enclosing the ovary, staminodes absent and laterally compressed achenes. At present the tribe consist of 11 genera namely *Dendrocnide* Miq., *Discocnide* Chew., *Girardinia* Gaudich., *Gyrotaenia* Griseb., *Hesperocnide* Torr., *Laportea* Gaudich., *Nanocnide* Blume, *Obetia* Gaudich., *Urera* Gaudich., *Urtica* Tourn. ex L. and *Zhengyia* T. Deng, D. G .Zhang & H. Sun with 191 species. The two monotypic genera of the tribe are *Discocnide* and *Zhengyia* whereas the largest and widespread common nettle is *Urtica*. In India, the tribe is represented by only four genera, namely, *Dendrocnide*, *Girardinia*, *Laportea* and *Urtica*. The present study discusses about the typification required in the tribe Urticeae to bring about stability in application of name in accordance with ICN. Two correct names and four synonyms are typified here, which includes five lectotype, one epiptype, and one second-step neotype designation.

Keywords: India, taxonomy, typification, Urticeae, Urticaceae.

DR. R. S. RAO AWARD

RSR-OP-01

Floristic diversity of Achampet Forest division of Telangana State

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The Achampet forest division belongs to Amarabad Tiger reserve circle. Phytosociological study was conducted in the study site by applying quadrat method. Quadrats of 31.6m × 31.6m were laid out for tree species, two nested quadrats with the size of 3m × 3m were laid out for shrubs, saplings, climbers, 1m × 1m for herbs, grasses and seedlings as nested quadrats at North-East and South-West direction. Total 15 plots were laid out across the division in different compartments which has covered different forest types. A total of 54 tree species and 330 individuals were noticed in the study area of 1.5 ha of land. The IVI ranges from 1.14 to 61.60 and the top 3 species based on the IVI values were, Albizia amara (61.60), *Chloroxylon swietenia* (17.30), *Holoptelea integrifolia* (15.78) belongs to family Leguminosae, Meliaceae and Ulmaceae respectively. There were 164 individuals in total for saplings, shrubs, and climbers. In those 2 climbers, 15 saplings, and 11 shrubs were noticed. The IVI ranges from 2.28 to 31.02 and thetop 3 species based on the IVI values were *Helicteres isora* (31.02), *Catunaregam spinosa* (8.21), *Albizia amara* (6.38), belongs to family Malvaceae, Rubiaceae, Ulmaceae respectively. There were 1186 individuals in total for grasses, herbs and seedlings in those 12 grasses, 31 herbs and 27 seedlings were noticed. The IVI ranges from 0.89 to 15.67 and the top 3 species based on the IVI values were, *Hyptis suaveolens* (15.67), *Cynodon dactylon* (12.12), *Brachiaria ramosa* (10.85), belongs to family Lamiaceae, Poaceae, Poaceae respectively.

Keywords: Amarabad Tiger Reserve, floristic diversity, IVI.

RSR-OP-02

Threat Assessment in Indian Myrtaceae: A Case Study of Two *Eugenia* Spp.

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Myrtaceae, the 'Myrtle family' is considered as an important plant family in India in terms of endemism and economic importance. Eugenia is considered to be one of the largest genera in this family holding 25 taxa all over India, including 21 endemics, that are predominantly distributed in Western Ghats. Data from different herbaria and literature suggest many of them shows narrow distributions, pointing a high chance for population reduction in near future due to various natural and anthropogenic threats. The IUCN red list is providing information on the population status, distributional trends and threats of species for implementing proper actions for biodiversity conservation in both global and regional aspects. The list is maintained by the contributions of accessors from various countries based on the guidelines of IUCN. It is high time to remind that a comprehensive threat assessment of Indian Myrtaceae is still remaining inadequate. The current work is analysing the risk of extinction of *E. seithurensis* and *E. shettyana* that are endemic to Southern Western Ghats, India. Both are being assessed for the first time in global aspects. To assign the red list categories, parameters such as EOO and AOO are measured based on available occurrence data from various sources. According to the assessment, both species are coming under Threatened categories, highlighting the need for initiation of conservational activities.

Keywords: Area of occupancy, conservation, endemism, extend of occurrence, IUCN, Red list.

RSR-OP-03

Distribution and conservation status assessment of *Ixora* L. section *Chlamydanthus* Brem. (Rubiaceae) in India

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Ixora L. is the third largest and most fascinating genus of the Rubiaceae family, with 561 species worldwide. It is found throughout the Pacific islands, Madagascar, America, Asia, and tropical Africa, with tropical Asia having the highest species diversity. In India, 53 species belong to the genus; the majority are located in the Northeast (*c.* 18 species), South India (*c.* 26 species), and the Andaman and Nicobar Islands (*c.* 12 species). Bremekamp (1937, 1938, 1940) parted *Ixora* into three subgenera and recognized 20 sections and the Indian species belong to six sections.

Section *Chlamydanthus* is distinguished by its larger bracts, bracteoles, and calyx lobes and corymbose or sub-capitate and sub-sessile or shortly pedunculate inflorescence. The section is distributed in India and the western part of the Malay Archipelago and represented in India by 11 species. Here, we evaluated the conservation status of the species in this section using the IUCN Criteria as part of the ongoing study on Ixora in India. Every species' range of distribution is examined, and suitable conservation measures are recommended for the threatened categories of species.

Keywords: Conservation, endemism, IUCN, threatened species.

RSR-OP-04

Diversity, distribution and conservation of selected *Ixora* sp. in Southern districts of Kerala

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The family Rubiaceae, one of the five largest flowering plant families with 650 genera and over 1200 species, is primarily found in tropical regions. The genus *Ixora* L. is the third largest and most species-rich of the family Rubiaceae, which comprises 572 species in the world and is mostly found in South India. As part of the diversity assessment, the continuous field exploration at the species level was recorded. Out of the 52 species, 19 species and 1 variety are distributed in the southern region; 11 are endemic to India, and 4 are endemic to Kerala.

The present study documented the diversity, distribution, and conservation of 10 species of *Ixora*, such as *Ixora coccinea, I. nigricans, I. brachiata, I. malabarica, I. agasthyamalayana, I. lavanya, I. johnsonii, I. polyantha, I. elongata* and *I. ravikumarii*. Ten of the 20 species are located in the southern part of Kerala, with three of them falling under the IUCN threat category andshowing huge morphological variations, as seen in *Ixora coccinea, I. nigricans* and *I. johnsonii*. Certain species, such as *Ixora coccinea, I. nigricans, I. brachiata* and *I. malabarica* are widespread. Some species, such as *Ixora elongata* and *I. ravikumarii* exhibit a less widespread distribution pattern. Some species, like *Ixora johnsonii, I. agasthyamalayana, I. polyantha* and *I. lavanya* are exclusive tospecific forest patches. We prepared the Herbarium specimens according to standard procedures and deposited them in TBGT.

Gather the stem cuttings, root cuttings, and fruits for processing using various germination techniques. The collected fruits of *I. brachiata, I. malabarica, I. agasthyamalayana, I. johnsonii* and *I. polyantha* were analyzed through moisture content, viability, various germination studies, and scarification techniques like hotwater treatment, soaking method, acid treatment, and also Ga3 method. We treated the collected stem cuttings of *I. agasthyamalayana, I. johnsonii* and *I. polyantha* with three root-regulating hormones in different concentrations: Indole Acetic Acid (IAA), Indole Butyric Acid (IBA), and Naphthalene Acetic Acid (NAA). We introduced the germinated seedlings into the nursery before moving them to the ex-situ conservatory.

Keywords: Conservation, diversity, distribution, Ixora.

PROF. K. S. MANILAL AWARD

KSMA-OP-01

Taxonomy of *Thespis* DC. (Asteraceae)

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Thespis DC. (Eschenbachiinae-Astereae-Asteraceae) is represented by four species, of which *Thespis thakeri* J.J. Sharma and Nagar is restricted to India (Gujarat), *Thespis integrifolia* Gagnep. and *Thespis tonkinensis* Gagnep. are restricted to Vietnam while *Thespis divaricta* DC. is found in the Indian subcontinent and south-east Asia. *Thespis* genera has been always a challenging taxon from taxonomic point of view owing to its close resemblance with *Cotula* and *Eschenbachia*. Thus, the present work gives a critical insight into the resembling genera and the existing species of *Thespis* in context of the newly described species of *T. thakeri*.

Keywords: Asteraceae, India, Southeast Asia, taxonomy, *Thespsis*.

KSMA-OP-02

A taxonomic revision of the genus *Tetrataenium* (Apiaceae) in the Western Ghats with two new species and three typifications

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The genus *Tetrataenium* comprises 22 taxa in the World, and the native range of this genus is Türkiye to Central Asia and Indo-China. In India, the genus is represented by 11 species, among these, 8 species are reported from the Western Ghats. Tetrataenium comprises pubescent to sub-glabrous perennials with 1–2 pinnatisect or ternatisect leaves with ovate to broadly ovate or ovate-oblong leaflets, persistent or caducous bracts with few to several linear bracteoles, dorsally compressed mericarps with filiform, approximately equidistant dorsal ribs and winged marginal ribs, and 1–3 vallecular vittae and 2–6 commissural vittae.

This paper discusses the taxonomy of *Tetrataenium* in the Western Ghats, covering habitat, phenology, distribution, conservation status, typification, and schizocarp micromorphology *via* SEM analysis. Two new taxa from Kerala and Maharashtra are described. *Heracleum dalgadianum* S.M. Almeida is transferred to *Tetrataenium* and a new combination, *Tetrataenium dalgadianum* (S.M. Almeida) C. Rekha & Manudev, is proposed. Lectotypes are designated for three names. *Tetrataenium candolleanum* is reinstated as a distinct species, while *T. aquilegifolium* is reduced as a heterotypic synonym of *T. grande*. The conservation status of all endemic species in the Western Ghats is also assessed using IUCN guidelines.

Keywords: *Comb. nov.*, endemism, *Heracleum dalgadianum*, IUCN, *Sp.nov.*, reinstatement, synonymisation.

KSMA-OP-03

Taxonomic studies on the subtribe Anthistiriinae (Poaceae: Andropogoneae) in southern Peninsular India

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A comprehensive taxonomic study on the subtribe Anthistiriinae (Andropogoneae: Poaceae) in southern Peninsular India is presented here. The present work deals with 17 species belonging to 6 genera. The genera recognized under Anthistiriinae from southern Peninsular India are *Agenium* Nees, *Heteropogon* Pers., *Iseilema* Andersson, *Parahyparrhenia* A. Camus, *Pseudanthistiria* (Hack.) Hook. f. and *Themeda* Forssk. Nomenclature of each taxon is updated with Shenzhen Code (Turland & al. 2018) using relevant taxonomic literature as well as by examining type specimens. Three new synonyms were recognized. Among the 17 species, 5 species were assessed as endemic to India. Lectotypes were designated for 14 names. The protologue of *Iseilema prostratum* (L.) Andersson was amended and a new combination *Agenium* Ritchie (Hook.f.) Drisya & Pradeep is proposed. Detailed morphology, illustrations, photoplates, taxonomic key for identification, nomenclature and notes on distribution are also provided.

Keywords: *Agenium, Heteropogon, Iseilema, Parahyparrhenia, Pseudanthistiria, Themeda*.

PROF. T. R. SAHU AWARD

TRSA-OP-01

Unravelling the medicinal importance of the genus *Bupleurum* L. (Apiaceae) in India: The present distributional status and study of its phytochemical constituents

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Bupleurum L., known as Chai Hu or Hare's ear is a perennial herbaceous genus in the parsley family, Apiaceae. Bupleurum has been used in Traditional Chinese Medicine for thousands of years to relieve numerous conditions and they are used as medicine in Japanese pharmacopoeia and in European pharmacopoeia, so they are considered as an economically important plant throughout the world. *Bupleurum* has been used as a liver tonic, with spleen and stomach toning properties and it is also traditionally been used to promote perspiration and treat fever associated with influenza, the common cold, malaria, and pneumonia. So far about 190 species are known in this genus, making it the second largest in diversity within the family Apiaceae. In India, the genus is represented by 21 species which are mainly distributed in Himalayan ranges. Even though the genus has widely accepted as a medicinal plant throughout the world, the Indian species were not yet studied for their medicinal importance and the potential chemical constituents were not yet identified. In India, a few species are used as traditional medicines by the tribal communities to treat common cold, fever and liver disorders. This work aims to study the present distributional status and to reveal the medicinal potential of six *Bupleurum* species in India and to study their phytochemical constituents using GC-MS analysis.

Keywords: Apiaceae, *Bupleurum*, distribution, phytochemistry, traditional medicine.

TRSA-OP-02

Analysis of phytochemicals and evaluation of phenolic contents and antioxidant activities of *Adhatoda vasica* Nees. leaf extract: An indigenous medicinal plant

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Adhatoda vasica belongs to the family Acanthaceae has been used in many herbal formulations. There is a booming business opportunity in herbal medicines market so it is important to tap the knowledge of our tribes in the area of herbal medicines. The present study was carried out to profile the qualitative phytochemical analysis, total phenolic content and antioxidant activity. Phytochemical screening were confirmed by the presence of alkaloids, flavonoids, glycosides, phenols, tannins and saponins. The aqueous leaves extract showed a total phenol content of about 125.62 mg GAE/g followed by the methanolic extract 54.37 mg GAE/g respectively. Antioxidant activities of methanol extract showed dose-dependent activity, which increased with an increase in the concentration of the extract. Methanolic leaves extract showed the highest free radical scavenging activity, with the IC50 value of 433.62 µg/ml where the IC50 value of aqueous leaves extract was found to be 460.29 µg/ml. The present investigation provides insights into the phytoconstituents and antioxidant activities of leaf extract of *Adhatoda vasica*, so it can be further subjected to purification of compounds that may act as an alternative for the current synthetic compounds that are used as pharmaceuticals.

Keywords: *Adhatoda vasica*, antioxidant, phytochemicals, total phenol.

TRSA-OP-03

Phytochemical and Anti-bacterial Properties of Stem Bark and Fruit of *Hydnocarpus pentandra* (Buch.-Ham.) Oken (Flacourtiaceae)

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The genus *Hydnocarpus*, belonging to the Flacourtiaceae family, is a primitive ethnomedicinal tree of South-East Asia. Many members of this family are widely used in traditional and tribal medicines. *Hydnocarpus* comprises about 43 species, among which *Hydnocarpus pentandra* (Buch. – Ham.) Oken is endemic to the Western Ghats (Ravikumar & Ved 2000). Scientific studies on this plant are limited; however, some biological activities, such as cytotoxicity, anti-microbial, and anti-larvicidal activity have been reported in recent times. The phytochemical study conducted here revealed the presence of almost all secondary metabolites in the methanolic extract of stem bark and fruit. Quantitative analysis was carried out to determine the phenol and flavonoid content in both the extracts. UV- VIS spectroscopy was used to determine the optical properties of the extracts, which were then further subjected to GC-MS analysis. Several common non-volatile compounds, including methyl palmitate, methyl stearate, linoleic acid methyl ester, and 9-octadecenoic acid methyl ester were detected in both extracts. In addition, some carboxylic acids with pronounced biological activity were also detected in the methanolic extracts. Antibacterial activity tests using the agar well diffusion method against Staphylococcus aureus and Escherichia coli showed lower activity compared to standard antibiotics. As a vulnerable and primitive ethnomedicinal tree, more detailed phyto-pharmacognostic studies should be conducted on different accessions from diverse habitats to determine whether any endophytes are associated with the release of active compounds.

Keywords: Agar well diffusion method, ethnomedicinal, GC-MS, *Hydnocarpus pentandra*, traditional knowledge, UV- VIS spectroscopy.

TRSA-OP-04

Phytochemical screening, green synthesis and effective antifungal activity evaluation of *Gmelina arborea* (Lamiaceae)-mediated ZnO nanoparticles against dandruff-causing fungus *Malassezia globosa*

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Fungal pathogens are increasing in prevalence and are capable of causing serious systemic and localized infections in humans. Although, there are several antifungal medications available, many pose safety and efficacy concerns. On the other hand, plants have historically been significant in healthcare, offering a wealth of potentialsafe treatments. The present study aims to document the ethnomedicinal knowledge of herbal remedies used to address fungal ailments among the Kattunaika community in Wayanad district of Kerala, India. In accordance with the documentation, *Gmelina arborea* Roxb. ex Sm., a fast-growing tree commonly known as 'white teak' belonging to the Lamiaceae family, has been recognized for its efficacy against 'Pityriasis capitis'. Pityriasis capitis or'dandruff' is a widespread dermatological condition caused by the fungus *Malassezia globosa*, affecting a substantial portion of the global population. The objectives of this work are to conduct phytochemical screening to quantify the major bioactive compounds and to assess the enhanced antifungal efficacy of Zinc oxide nanoparticles synthesized via green methods using leaf extracts of *G. arborea* against the dandruff-causing fungus *Malassezia globosa*. Various characterization techniques, including UV-Vis spectroscopy, FE-SEM, FTIR, and XRD, were employed to identify and confirm the chemical compounds, morphological features, functional groups, and crystallinity of the phytoconstituents present. Plant-based antimicrobials represent a largely untapped source of medicine, offering significant therapeutic potential while minimizing the side effects commonly associated with synthetic antimicrobials.

Keywords: Antifungal efficacy, ethnomedicinal knowledge, FE-SEM, FTIR, XR, fungal pathogens, *Gmelina arborea*, green methods, Kattunaika community, Pityriasis capitis, UV-Vis, zinc oxide nanoparticles.

PROF. S. R. YADAV AWARD

SRY-PP-01

Stem anatomy and development of interxylary phloem in *Mucuna gigantea* DC. (Fabaceae)

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The structure of the secondary xylem and the ontogeny of the Interxylary phloem are elucidated in detail for *Mucuna gigantea*. The young stems showed regular secondary growth like most of the eudicots, *i.e.*, several conjoint and collateral vascular bundles were joined and formed the vascular cambium. The vascular cambium was functionally bifacial and gaves rise to the secondary xylem centripetally and phloem centrifugally. Cortical cells show deposition of tannins, appearing as distinct patches due to heavy accumulation in a greater number of cells. Like several climbing genera, the structure of the secondary xylem exhibited the lianescent syndrome and it was composed of wide vessels enclosed by a sheath of lignified axial parenchyma, long gelatinous fibres, an abundance of axial parenchyma, and tall and multiseriate rays. Besides the normal secondary growth, the subfamily Papilionoidea (Fabaceae) is characterised by the presence of the cambial variant, a common anatomical adaptation in several species has also been observed in the present study. Abundance of axial parenchyma and formation of interxylary phloem is considered to enhance the hydraulic safety and photosynthetic conductivity respectively. As the stem diameter increased, the non-lignified axial parenchyma of the secondary xylem dedifferentiated into Interxylary phloem. The development of cambial variants in the stems is correlated with the climbing habit and its possible significance in relation to eco-physiological wood anatomy is discussed.

Keywords: Cambial variant, interxylary phloem, Lianescent syndrome, wood anatomy.

SRY-PP-02

Palynological studies in *Capparis* L. from Indian peninsula

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Capparis L. is the dominant genus of the family Capparaceae with 36 species found in India of which 23 are found to be growing in the Indian Peninsula. Leaves, inflorescence, flowers, and fruits are taxonomically important characters that delimit the taxa. However, micromorphological characters such as stomata, pollens, and trichomes play key roles in drawing interrelationships and evolution among the Caper. The present study deals with the pollen morphology of *Capparis* L. from peninsular India. A total of 15 species have been studied for palynology under light and scanning electron microscope. The pollens are classified according to the NPC system and quantitative dimensions. All pollens are tricolpate with varied exine stratification. The highest polar and equatorial length was observed in *C. grandiflora* (P = 2.61 ± 0.09; E = 3.20 ± 0.11), while lowest in *C. sepiaria* (P = 1.05 ± 0.04; E = 1.19 ± 0.05). The P/E ratio ranges from 0.69 to 0.96. The present study can be implemented for drawing evolution to support sectional classification and delimit the species.

Keywords: Caper, Deccan, micromorphology, ornamentation, Sodada.

SRY-PP-03

Studies on Ecological Niche Specialization and Conservation Status of the Grass Genus *Coelachne* R.Br. in India

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The members of Poaceae survive in almost all angiosperm habitats and they are adapted to the prevailing environmental conditions. Although, some grasses are specifically adapted to certain ecological niches. The present study was focused on a comparatively small grass genus *Coelachne* R.Br. of the subfamily Micrairoideae. The genus comprises 12 species, extending their distribution from tropical East Africa eastward to Japan and northern parts of Australia. In India, the genus is represented by 4 species and a variety, *viz*., *C. minuta* Bor, *C. perpusilla* (Arn. ex Steud.) Thwaites, *C. perpusilla* var. *nilagirica* V.Prakash & S.K.Jain, *C. simpliciuscula* (Wight & Arn. ex Steud.) Munro ex Benth. and *C. madayensis* Pramod & Pradeep, of which 3 taxa are endemic. The study analysed the ecological niches of various species of *Coelachne* using several key metrics such as Levins' Measure of Niche Breadth, Shannon's Diversity Index, and Schoener's D for niche overlap. These metrics provide insights into the adaptability of the species to different climatic conditions and the extent of their niche specialization. Detailed ecological study of the genus *C. madayensis*, and the conservation status assessment of the Indian species of *Coelachne* according to the IUCN criteria were also undertaken.

Keywords: Biodiversity, *Coelachne madayensis*, ecological niche, endemism, IUCN.

SRY-PP-04

Studies on the Diversity and Variability in Wing Structures of Selected Seeds and Fruits of South India

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The term 'diaspore' encompasses all dispersal structures or mechanisms that enable plants to spread and colonize new areas. Derived from the Greek word 'diaspora,' meaning 'scattering,' diaspores facilitate dispersal through biotic and abiotic means, supported by specialized seed morphological structures. These dispersal mechanisms include wind, water, animals, and mechanical forces, each tailored to specific adaptations. Specialized fruits like achenes, samaras, and nuts are designed for dispersal, often featuring adaptations such as wings, hairs, or hooks. The winged diaspores are dispersal units typically involving lightweight structures and mechanisms that enable them to be carried over long distances by wind and also by water currents. The anemochory seeds often have lightweight structures to enhance their buoyancy in the air and shows diversity in morphologies. These wings are originated from seeds, fruits, involucral bracts, infructescence, integument, or from sepals.A recent study in South India identified 186 species of winged diaspores from 26 families, highlighting six distinct flight behaviours. These diaspores vary significantly in wing orientation, origin, shape, size, and weight, reflecting their adaptation to various ecological niches. The present study analyses the diversity and variability of wing morphology and seed dispersal efficiency of few winged diaspores of South-India. The findings highlight the evolutionary significance of winged diaspores in enhancing reproductive success and resilience in diverse habitats, offering insights into the complex interplay between plant anatomy and environmental factors. Winged diaspores, have evolved to combat the effects of gravity and lengthen the flight period for anemochory. The diversity of wings on wind-dispersed seeds is a fascinating aspect of plant evolution, with various adaptations observed across different species.

Keywords: Anemochory, diaspores, morphology, wind dispersal, wing diversity.

SRY-PP-05

Occurrence of Genus *Ceropegia* from Nashik district, Maharashtra, India

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The genus *Ceropegia* belongs to the family Apocynaceae. It is known for its unique flowers often referred to as "lantern flowers" due to their shape. In India, particularly the Western Ghats, is a hotspot for *Ceropegia* species diversity, and the Nashik district in Maharashtra, which falls in this region, is home to several species of this genus. Many species of *Ceropegia* are under threat due to habitat destruction, overgrazing, and land-use changes. This is especially true in regions like the Western Ghats in India, where many *Ceropegia* species are endemic (native to a specific area) and grow in specialized ecological niches, The genus plays a role in biodiversity, as it often grows in unique ecosystems such as rocky plateaus or grasslands, and scrub forests, which are under threat in the region. Most species are herbaceous or semi-succulent climbers or creepers, but some are small shrubs or tuberous plants. The tubers help them survive in harsh conditions by storing water and nutrients. The Western Ghats, including Nashik, remain an important area for the study and conservation of *Ceropegia* species due to the region's high biodiversity. Some of the *Ceropegia* species that have been documented in and around the Nashik District such as *Ceropegia bulbosa* Roxb (Graham) Hook.f *C. anjanerica* Malpure, M.Y. Kamble & S.R. Yadav, *C. mahabalei* Hemadri & Ansari, *C. lawii* Hook.f., *C. hirsuta* Wight & Arn., *C. sahyadrica* Ansari & B.G. Kulk. var. *sahyadrica*, *C. vincifolia* Hook.

Keywords: Apocynaceae, *Ceropegia*, Nashik, Western Ghats.

SRY-PP-06

How to deal with the deceiving nature of Anaphalis? – a macro and micro-morphological and molecular study on Indian Himalayan *Anaphalis* as an aid to identification

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Anaphalis DC. is the largest genus in the tribe Gnaphalieae of family Asteraceae with *c.* 110 species throughout the world. The species distribution is mainly in tropical and sub-tropical or temperate Asia. More than 50% of *Anaphalis* spp. occurs in the Himalayan regions of Bhutan, Nepal, India and South western China. Hence, the Pan-Himalayan region is considered as the diversity centre for *Anaphalis*. Out of 35 Indian species of *Anaphalis*, 19 are found to be widely distributed from Western to Eastern Himalayan regions of India with an elevation ranging from 1,400 to 5,500m. With such a wide distribution, *Anaphalis* possesses a high level of morphological variation and vegetative plasticity which imposes a great challenge in species identification and delimitation. Hence, the present study is an attempt to ease the identification in Indian Himalayan species of *Anaphalis* utilising different evidences. Consecutive tours to several regions of the Indian Himalayas along with extensive literature survey and herbarium consultation are done to collect and generate data for this study. Detailed macro and micro-morphological characterization including SEM studies are performed. DNA sequence data are generated for multigene phylogenetic analysis. The study showed that shape of leaf base, cypsela features, capitula size, villous nature of the plant and presence or absence of glandular trichomes at some extents are found to be significant and stable to aim species identification. Whereas, the other floral characters are proved to be less significant while identifying species of Anaphalis. Utility of ITS along with ETS region for infrageneric circumscriptions in Anaphalis is found to be effective. The present poster has been prepared with an aim to portray the variable as well as stable macro- and micro-morphological characters of the Indian Himalayan *Anaphalis* for species-delimitation and their correlation with molecular phylogenetic data.

Keywords: Cypsela, Gnaphalieae, morphological variation, multigene, phylogeny, species delimitation.

SRY-PP-07

Ethnobotanical flora utilized by the Nyishi tribe of Arunachal Pradesh, India

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This study highlights the rich ethnobotanical knowledge of the Nyishi tribe in Arunachal Pradesh. The survey was conducted between 2022 and 2024 in the Papum Pare district of Arunachal Pradesh. A total of 100 informants were interviewed including farmers, herbalists, and vegetable vendors. A total of 200 plant species belonging to 72 families were documented. Based on the utilization the plants were categorized as fiber-yielding, bio-fence, dye-yielding, medicinal purposes, handicrafts, vegetables, and other household applications. To quantify the ethnobotanical knowledge, indices like the Cultural Importance Index (CII), Fidelity Level (FL), and Use Value (UV) were used, providing a detailed insight into the cultural and practical value of each plant. Many of these plants are also traded in local markets, supporting the economic development of the Nyishi community. The study underscores the depth of traditional plant knowledge within the tribe, emphasizing its preservation and potential for sustainable development. By documenting these practices, the research not only helps conserve traditional knowledge but also promotes the sustainable use of plant resources, benefiting both local communities and the broader ecosystem.

Keywords: Ethnobotany, quantitative analysis, Nyishi, Papumpare.

FR. ANTONY MUKKATH-PROF. K. S. MANILAL AWARD

FAMKSM-OP-01

A natural hybrid of *Euphorbia* from sandstone hills of Belagavi, India

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With over 2000 species, the sub-cosmopolitan genus *Euphorbia* is rich in morphological diversity and possesses several economic and medicinal values. Despite this, the evolutionary relationships and taxonomic identity of several Indian species remain obscure due to the paucity of molecular data on Indian taxa. One of the succulent species of *Euphorbia*, *E. belagaviensis* exhibits a narrowly restricted distribution in the Belagavi district of Karnataka, and its morphological characteristics like sterile female florets suggest a possible hybrid origin. The objective of this study was to evaluate the putative hybrid origin of the taxon and trace its parental lineages. A molecular phylogenetic approach, based on independently-inheriting nuclear ITS, and maternally-inheriting plastid (matK & ndhF) markers, was employed in combination with classical taxonomy to test the hypothesis. The polymorphic sites of the biparentally-inherited marker in *E. belagaviensis* were additive in nature and in consensus with either of the sympatric species, *E. antiquorum* and *E. gokakensis* (suspected parents), as expected in the initial generations of the hybrids. On the other hand, the polymorphic sites in the plastid markers matched the ones in *E. gokakensis* suggesting it tobe the maternal progenitor. *Euphorbia belagaviensis* was placed discordantly in the nuclear and cpDNA phylogenetic trees, wherein it clustered with *E. antiquorumin* the ITS tree while in the cpDNA tree, it nested well within the polytomic clade of *E. gokakensis* corroborating its hybrid derivation. The findings suggest *E. belagaviensis* emerged as a result of natural hybridization between *E. antiquorum* and *E. gokakensis*.

Keywords: Additive polymorphic sites, *Euphorbia*, India, ITS, maternal-inheritance, natural hybrid, ndhF, phylogeny, reticulate evolution.

FAMKSM-OP-02

Taxonomic significance of achene phytolith in genus *Cyperus* L. (Cyperaceae) in Kerala, India

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Phytoliths are silica particles deposited in the intracellular and extracellular locations of plant body, their characterization is essential in taxonomic and paleobotanical studies. Cyperaceae is an important phytolith accumulators in the clade Poales. The type genus *Cyperus* L. is taxonomically challenging due to its great diversity, highly reduced flowers and complex evolutionary patterns. In the current scenario *Cyperus* is treated in a broad sense containing all allied genera with the generic epithet *Cyperus*. Resulted in the accumulation of 79 subdivisional names within the taxa (Wim Huyghet. & al. 2010). In this background, as an additional parameter to solve taxonomic ambiguities, an attempt has been made to analyse the achene epidermal silica bodies present in the genus and compared it with other common sedges in Kerala. Phytoliths were extracted using the method of Lu and Liu (2003) and Dhooge (2005) with some modifications and the achene surface were studied under SEM analysis. 48 species belonging to 13 genera were analysed. Polygonal granulate with entire walls and polygonal psilate with sinuate anticlinal walls were identified as the characteristic morphotypes of the genus. The comparative study revealed that the achene phytoliths of *Cyperus* and its allied genera were similar and shows considerable variation with others. Similar but deeply articulated periclinal walls were seen in *Courtoisina* and less granulated anticlinal walls in *Lipocarpha*. The present study confirmed that the morphological pattern of achene including surface ornamentation and epidermal cell structures can be used as a baseline for taxonomic clarification in the identification of different genera and species. And seeks to bring the attention of researchers to the developments in sedge identification and classifications.

Keywords: *Cyperus*, Cyperaceae, Kerala, phytoliths, SEM studies.

FAMKSM-OP-03

Floral development, Pollen characters, and Stigma characters of endemic species *Jerdonia indica* Wight (Gesneriaceae) from Southern Western Ghats, India

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Jerdonia indica Wight, the only species in the genus *Jerdonia Wight* (Gesneriaceae: Didymocarpoideae: Trichosporeae: Jerdoniinae), is one of the nine basal Asiatic genera recognized by Weber (2004) and has significant biogeographical interest. It is an endangered stemless plant endemic to the moist rocky slopes of southwest India. Pollen characters, stigma characters, and floral developmental stages were analyzed with light (LM) and scanning electron microscopy (SEM). The study revealed the shape, size, axis measurements, and histochemistry of pollen and stigma. Stigma receptivity and pollen viability were evaluated at different stages during flower development. The floral development of *J. indica* has been studied to explore the developmental basis for the arrangement and differentiation patterns of floral organs, and the evolutionary relationship between the species and its allies in floral development.

Keywords: Endemic, floral development, *Jerdonia indica*, pollen, stigma.

FAMKSM-OP-04

Characterization of the anatomical adaptations of *Derris trifoliata* Lour. (Fabaceae) – A case study of Mangrove associated climber

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Mangrove forests are some of the world's most productive and significant ecological habitats. To survive and thrive in the high saline habitat they occupy, the plants associated with the mangrove ecosystem have evolved significant physiological, morphological, and anatomical adaptations. One of the widely distributed mangroves associated species *viz*. *Derris trifoliate* is climbing member of the Fabaceae. Under histological investigation, it has shown distinct anatomical adaptations that may have been developed for its survival in the salt-stressed environment. Variations in xylem vessel diameter, fibre wall thickness and proportion of the phloem within the stem are some of the commonly observed adaptations at the cellular level. The secondary xylem comprised of non-lignified parenchyma cells, dimorphic vessels, arranged solitarily as well as in radial multiples of 2-5 files and they were embedded in the ground mass of lignified tissues mostly composed of gelatinous fibres, lignified axial parenchyma, libriform fibres and tracheids. The presence of narrow vessel (particularly in radial multiples) may be associated with salinity stress. The rays were exclusively uniseriate and heterocellular in nature.

Keywords: Fibre tracheids, mangrove associated, salt-stress, vessel.

FAMKSM-OP-05

Comparative studies of aerial vegetative organs of four species of *Spermacoce*, Fam. Rubiaceae on basis of morpho-anatomical and phytochemical tests W.R.T. Aluminum accumulation found in south Chhotanagpur, Jharkhand

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Spermacoce is a small genus belonging to family Rubiaceae, sub-family Rubioideae, and tribe Spermacoceae. The genus comprises of herbs or low under-shrubs. Stems are prostate or erect, with quadrangular branches. Leaves are usually opposite with inter-petiolar stipules. The stipules form a ring-like structure around the stem and connect the two leaves. The leaves are sessile, with opposite and decussate phyllotaxy. The leaf shows variations in terms of the leaf blades. Flowers show diverse arrangement and are small or minute, arranged in solitary or axillary or terminal cymes or fascicles. They appear white with little purplish tint in some species.

The genus is known for showing affinity towards Aluminum. The present study was conducted to identify the regions of Aluminum accumulation occurring in the tissues and also to quantify the uptake. Using the morpho-anatomical characters and aluminum deposition, an attempt was made to prepare a key that can be used in plant identification.

Keywords: Accumulation, affinity, aluminum, morpho-anatomical.

PROF. M. SABU AWARD

MSA-OP-01

Modes of seed dispersal of lianas in Manipur, India: A morpho-taxonomic approach

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Lianas, the woody climbers, are important structural and functional components of tropical forests. They play a great role in contributing significant diversity to tropical forests. Lianas have a wide range of seed sizes and shapes with respective dispersal mechanisms. The dispersal mechanisms are carried out by special structures called diaspores, which act as dispersing units of fruits and seeds. In the present study, the types of fruit, seed shape, sizes, and diaspore types of 88 species of lianas have been studied along with respective dispersal mechanisms. An assessment of the dispersal strategies of 88 species of lianas has revealed that 45 species have dry dehiscent fruits: capsules in 17 species, follicles in 6 species, and pods/legumes in 22 species. 16 species have been found with dry indehiscent fruits: 10 species with samaras, 5 species with achenes, and a single species with nuts. 27 species have been recorded with fleshy indehiscent fruits: 23 species with berries and 4 species with drupes. Dispersal units (diaspores) are of different types. The dominant dispersal mode found in the study area was Zoochory occurring in 36 species (41 %) followed by Barochory in 28 species (31 %) and Anemochory in 24 species (27 %). Lianas are quite interesting life forms having different features, unlike other life forms. The morphology of the fruit and seed types is of high systematic significance in the study of dispersal mechanisms. The study of seed characters and their modes of dispersal can be important paradigms for the conservation and monitoring of liana species in the state.

Keywords: Diaspores, dispersal, taxonomy, woody climbers.

MSA-OP-02

Age Structure and Regeneration Dynamics of *Gluta travancorica* Bedd. in the Southern Western Ghats

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The study investigates the age structure and regeneration dynamics of *Gluta travancorica*, a narrowly endemic species of the Western Ghats belonging to the family Anacardiaceae. It focuses on the ecological processes influencing its survival and the threats it faces. Key elements such as seed dispersal mechanisms, age structure of trees, seedlings, saplings, basal area measurements, and soil properties were analysed to understand the species' population dynamics. Seed dispersal via barochory and hydrochory was found to play a crucial role in spatial distribution and maintaining genetic diversity. Basal area measurements indicated the species' dominance and ecological significance within its habitat, while soil analysis highlighted the influence of soil conditions on seedling establishment and growth. A significant finding of the study was a regeneration bottleneck at the pole stage, where competition for resources and environmental factors severely limited sapling survival.The research also underscores the significant threats posed by habitat fragmentation due to anthropogenic activities like logging, agriculture, and urbanization, which isolate populations and diminish genetic diversity. Additional threats include climate change, invasive species, and disease. The study advocates for comprehensive conservation strategies to address these challenges, such as expanding protected areas, encouraging sustainable land-use practices, and involving local communities in conservation efforts.These measures are vital for safeguarding *G. travancorica*, ensuring its long-term survival, in its natural habitat.

Keywords: Conservation, *Gluta travancorica*, pole-stage bottleneck, seed dispersal.

MSA-OP-03

Floristic diversity of Lakshadweep Islands

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The spectacular Lakshadweep archipelago is the smallest Union territory of India. This archipelago consists of 36 islands, 12 atolls, 3 reefs and 5 submerged sand banks in the Arabian Sea spread over area of about 32 km2. These islands are similar in floristic composition due to prevalence of similar type of soil, climate and rain fall in all these islands.

The present floristic study recorded 469 angiospermic taxa, based on the field surveys and published literature. The flora is represented by 300 genera under 92 families. These 469 taxa may be seggregated into 87 trees, 64 shrubs, 47 climbers and 271 herbs.The five endemic taxa arereported from Lakshadweep islands of which *Cyperus pachyrrhizus* var. *humeiis* endemic to Lakshadweep islands only. The five dominant families are *viz*. Fabaceae, Poaceae, Asteraceae, Malvaceae and Euphorbiaceae. The five dominant genera are *viz. Crotalaria, Cyperus, Euphorbia, Ipomoea* and *Phyllanthus*. The natural flora of Lakshadweep comprises of littoral or strand vegetation of aquatic angiosperms, the shore possesses creepers followed by few grasses. The islands are dominated by littoral species like *Clerodendrum inerme, Ipomoea pes-caprae, Launaea sarmentosa, Pemphis acidula, Scaevola taccada, Spinifex littoreus, Suriana maritima, Cordia subcordata, Guettarda speciosa, Artocarpus altilis, Colubrina asiatica, Thespesia populnea* etc.

Different developmental activities have deteriorated the ecosystems in the islands. Thus, urgent concerted efforts should be undertaken to conserve this comparatively pristine and fragile ecosystem.

Keywords: Coconut, floristic diversity, islands, Lakshadweep, vegetation.

MSA-OP-04

Community-Based Conservation of Mangroves in Cortalim, Goa: A Case Study of *Rhizophora mucronata* and *Kandelia candel*

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Mangrove ecosystems play a crucial role in coastal protection, biodiversity conservation, and carbon sequestration. This research focuses on the mangrove species *Rhizophora mucronata* and *Kandelia candel* in Cortalim, Goa, examining their ecological significance and the potential for community participation in conservation efforts. Through a comprehensive literature review, GIS mapping and field surveys, this paper assesses the suitability of these species for restoration initiatives while promoting community engagement as a strategy for enhancing mangrove conservation.

Keywords: Community participation, conservation, *Kandelia candel*, mangrove ecosystem, *Rhizophora mucronata*.

MSA-OP-05

The genus *Hedychium* J.Koenig (Zingiberaceae) – A highly potential wild ornamental from Ukhrul District, Manipur

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The main trait of ornamental plants is beauty. They are grown primarily for their beauty, for scent and decorative purposes. The term "wild" when applied to plant species refers to those that grows spontaneously in self-maintaining populations in natural or semi-natural ecosystems and can exist independently of direct human action. Ornamental plants are annual, biennial, and perennials and have a significant role in creating employment, developing economy at local and regional level. The present study aims about the wild ornamental species under the genus *Hedychium*. *Hedychium* is a herbaceous genus of flowering plants. Itis the largest genus of *Zingiberaceae* present in Ukhrul District, Manipur. Most of the species under this genus have- very large, colourful inflorescence and have a pleasant scent too. Their edible parts are also briefly discussed. Hence these plants can be documented and used as potential wild ornamental plants which are not only useful for human kind but also developed as plants enhanced with aesthetic values which directly or indirectly plays an important role in adding value to the economy of the region where it is grown.

Keywords: Aesthetic, edible, *Hedychium*, wild ornamental, *Zingiberaceae*.

MSA-OP-06

Diversity of *Bambusa* species in home gardens of Cachar district, its flowering and conservation

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The genus *Bambusa* is one of the important members of family Poaceae and is a rich source of income in Cachar district of Assam, India. Favourable climate and topography contributes cultivation and growth of Bambusa species luxuriously in home gardens of Cachar district. A field study had been carried out during October-2022 to September-2024 in the home gardens of Cachar district to investigate the diversity of Bambusa species, its flowering if any and its conservation. Five different species (*B. bambos* L., *B. tulda* Benth., *B. vulgaris* Schrad., *B. balcooa* Roxb. and *B. polymorpha* Munro) were observed to be grown in home gardens and groves. In general two species that is, *B. balcooa* and *B. polymorpha* are cultivated in home gardens. Interestingly, one of the species showed flowering during investigation period in Atalbasti, Cachar. Geotag photographs of the flowering clump had been clicked, samples were collected, studied in the laboratory, identified as *B. polymorpha* with the help of expert and submitted in the department of Botany, Cachar College, Silchar. As per report *B. polymorpha* flowers generally after 54 – 60 years of growth; however, as per local villagers the clump flowered after 10 years. In addition, the clump which flowers will die immediately with or without setting seeds. Besides, deforestation to fulfill the demand of various uses of bamboos in daily life and its products for contribution in developing economy of a region indicates that there is an urgent need to protect and conserve the species for sustainable development growth.

Keywords: *Bambusa polymorpha*, Cachar, conservation, diversity, flowering.

MSA-OP-07

Taxonomic studies on the genera *Pogostemon* and selected taxa of *Coleus* (Lamiaceae) in Western Ghats

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The Mint family, Lamiaceae is characterised by gamopetalous flowers, quadrangular stem and bilabiate corolla. It is the one of the largest plant families consisting of about 236 genera and 7173 species worldwide. *Pogostemon* (Lamiaceae) is a well-defined genus of the subfamily Pogostemonoideae with flowers having exerted stamens bearing monoliform hairs. The genus comprises of 80 species distributed mostly in moist to mesic forest or damp areas in South Tropical Africa, Tropical and sub tropical Asia to North West Pacific. More than 50 percentage of this genus are reported from India. Pogostemon in Western Ghats is represented by 22 species with 8 endemics. The genus *Coleus* (de Loureiro, 1790) comprising about 294 species worldwide is an old-world tropic and sub tropic herbs and shrubs with succulent stem and fleshy or tuberous root stock. They are characterized by funnel shaped calyx and bilipped corolla with much shorter upper lip. Congested spike-like head, flowers sessile or sub sessile, calyx with unequal lips, fruiting calyx with posterior lobes decurved or deflexed and concealing the throat after anthesis, corolla tube decurved with declinate stamens and confluent anthers are also the striking features of this genus. A revisionary study of these two genera in Western Ghats was carried out based on thorough field exploration, consistent careful observations of plant specimens and herbarium studies. Taxonomic problems relevant to these taxa were resolved resulting in four new synonyms, two lectotypes to the genus *Pogostemon* Desf. and resurrection of a name in genus *Coleus*. The study also highlighted the discovery of two species of *Coleus* new to science.

Keywords: Labiasssstae, Lamiaceae, Southern India, Western ghats.

MSA-OP-08

Compendium of the family Poaceae in Tripura: A morphological investigation

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The state Tripura of North-eastern India, exhibits a wide range of topographical features and diverse climatic conditions, including high hills, dense forests, extensive grasslands, and wetlands. The state is the third smallest state of the country (India) which covers an approximate geographical area of 10,486 sq. km. About 84% of the state's international boundary is shared with Bangladesh. Morpho-taxonomic studies on the family Poaceae in Tripura, India was started in 2014. Initially a family checklist was prepared that identified 116 species across 57 genera. During the present study, extensive and intensive field surveys were conducted to explore the grass diversity in the region. The research is based on fresh collections of specimens from various habitats in the region, their morpho-taxonomic analysis, and review of materials stored at various herbaria, as well as other genuine specimens. The study involved examining the habit, overall morphology, ligule, epidermal features, and floral parts such as glume, lemma, palea, lodicules, stamens, gynoecium, and caryopses (where possible) in grasses. This study reveals a total of 120 species and 67 genera under 13 tribes and 6 subfamilies from Tripura. Two species of bamboo have been collected in flowering state. The paper provides information on the variety of grasses and bamboos found in Tripura, including their updated nomenclature, description, Phenology, habitat, and their distribution. Conservation efforts need to be implemented for the protection of grasses and bamboos in Tripura, as they are experiencing habitat loss from human activities and natural disasters, as well as invasion by commercially valuable species and non-native weeds.

Keywords: Diversity, grasses, morphology, morpho-taxonomy, Northeastern India, Poaceae.

General Presentation (Oral)

THEME 1

Floristics, Plant Diversity & Conservation

T-1-OP-01

Genus *Eriocaulon* L. from Konkan and Western Ghats region of Maharashtra

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Genus *Eriocaulon* is commonly known as pipeworts. The genus *Eriocaulon* L. belongs to the family Eriocaulaceae and represented by about 489 species from New World, Europe, Tropical & Subtropical Old World to Russian Far East, America (POWO 2024). The first account of Indian species of the genus *Eriocaulon* was compiled by J.D. Hooker (1893), about 43 species were reported. In India, the genus *Eriocaulon* was studied by Fyson (1919, 1921, 1922), Ansari and Balakrishnan (2009), Darshetkar & al. (2021). Ansari and Balakrishnan (2009) reported 85 taxa of genus from India and about 54 species are endemic with the greatest concentration in peninsular India. Lakshminarasimhan (1996) reported about 67 taxa of genus from Maharashtra and about 20 species are endemic to India. In last 15 years, about 32 new species of genus Eriocaulon have been described from India by different workers.

During our floristic exploration from Konkan and Western Ghats region of Maharashtra, total 35 species of genus *Eriocaulon* were collected and another two species of the genus (i.e. *Eriocaulon rayatianum* Chandore, Borude & S.R.Yadav and *E. shrirangii* Chandore, Borude, Bhalekar, Madhav & Gosavi) have been described from Konkan region of Maharashtra. Out of 37 species of Eriocaulon, 26 species are endemic to India. Recently we also proposed a new geophytic species which was collected from Western Ghats region of Maharashtra.

Keywords: Endemism, Eriocaulaceae, monocots, Pipeworts, taxonomy.

T-1-OP-02

Floristic studies of Mangroves and its associate plants from Ratnagiri district of Maharashtra

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Mangroves are salt-tolerant trees and shrubs also are called halophytes and are adapted to live in harsh coastal conditions. Mangroves are the only trees that are capable of thriving in salt water. They form unique intertidal forests at the edge of land and sea. Mangroves are extremely important to the coastal ecosystems they inhabit. Physically, they serve as a buffer between marine and terrestrial communities and protect shorelines from damaging winds, waves and floods. Ratnagiri is a costal district in the state of Maharashtra, India. The district bounded by the Arabian Sea to the west and has long coastal line of about 237 km with five coastal tehsils *viz*. Rajapur, Ratnagiri, Guhagar, Dapoli and Mandangad. We have detailed survey of mangroves and their associate plants of five coastal tehsils of Ratnagiri and during this investigation of mangrove ecosystem, total 51 species were collected; out of which 17 species are typical mangroves and remaining 34 species are mangroves associate plants.

Keywords: Floristic, halophytes, Konkan, mangroves, Ratnagiri.

T-1-OP-03

Carpological studies of some endemic flowering plants of Konkan region of Maharashtra

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Carpology is branch of plant morphology dealing with structure of fruit and seeds. Seed is an important cradle plant life and it keeps the species surviving in the nature for generation together. Fruit morphology and structure of seed coat plays an important role for identification of numerous species. The Konkan region of the India is strip of land between the west coast and the Sahyadri mountain range that's runs parallel to the coast. Konkan is known for its unique and endemic plants. During our floristic exploration of Konkan region of Maharashtra, total 67 endemic flowering species were collected and studied fruit and seed morphology *viz*., shape, size, surface and colour etc. In this paper provided detailed description and photography of seeds and fruits of 67 endemic flowering plant species from Konkan region of Maharashtra.

Keywords: Angiosperms, endemism, fruits, Konkan, seeds.

T-1-OP-04

A study on the microclimatic features of habitats of endemic species in the Western Ghats

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The Western Ghats is an important centre of biodiversity due to its unique climatic and geographic features. The restricted distribution of endemic species is directly related to the microclimatic conditions prevailing in a particular habitat. About one-third of the species found in the Western Ghats are endemic. The microclimatic conditions present in various habitats of the Western Ghats favour the survival of endemic species. It includes temperature, light, atmospheric humidity, rainfall, and edaphic factors. These factors show reciprocal interactions, and therefore the combination of these factors alone provides suitable microclimatic conditions for the survival of endemic species. The current study is carried out at the Paithalmala hills of the southern Western Ghats and suggests the existence of high rainfall spread across the year, moderate temperature and high humidity prevailing in the area. The soil also has a critical role in maintaining biodiversity with the availability of various micro- and macronutrients, organic carbon, water-holding capacity, salinity, soil moisture, and soil pH. Any change in the climatic patterns, including rainfall distribution adversely affects the existence of the endemics in the Western Ghats.

Keywords: Edaphic factors, endemism, microclimate, Paithalmala, Western Ghats.

T-1-OP-05

Abandoned buildings and dilapidated walls as unique ecological habitats for urban flora in Kolkata, West Bengal, India

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A study on the habitat and ecology of the urban flora of Kolkata and its suburbs in West Bengal, India revealed that abandoned buildings and dilapidated masonry walls serve as a unique ecological habitat for the plants. A total of 38 species under34 genera and 24 families have been recorded. Mostly perennial and annual herbs have been found to colonize the walls along with some tree species and ferns. Prolific families were Asteraceae (4 spp.), Moraceae (4 spp.), Poaceae (3 spp.), Urticaceae (3 spp.), Cleomaceae (2 spp.), Euphorbiaceae (2 spp.), Rubiaceae (2 spp.) and Pteridaceae (2 spp.). The most abundant species found to grow on a wide range of wall-habitat are *Pilea microphylla, Lindenbergia indica* and *Pteris vittata*. Species diversity and distribution have been found different based upon age and substrate of wall, light exposure and moisture intensity. It has been observed that this wall flora comprises a remarkable assemblage of stress-tolerant plants which can withstand long period of drought and can thrive on a substrate devoid of proper nutrients. They have been found to possess deep penetrating roots entering into the cracks and crevices of the walls for obtaining water and nutrients for their assimilation. Most of the wall colonizers have been found to produce large number of seeds or reproductive propagules. Seeds of the herbaceous plants were mainly wind-dispersed (anemochorous) and those of trees were bird-disseminated (ornithochorous). Present study on the wall flora contributes significantly towards unraveling various enigma related to urban ecology and plant adaptation.

Keywords: Habitat & ecology, India, Kolkata, plant diversity, wall flora.

T-1-OP-06

Exploring the Diversity of *Ledebouria* in India: Taxonomic Changes and New Discoveries

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The genus *Ledebouria* Roth (Asparagaceae) includes three species found in India (POWO), specifically in the states of Maharashtra, Goa, Karnataka, and Telangana.

This paper examines the identity of Indian *Ledebouria* through morphological and molecular studies. Two taxa, namely, *Ledebouria hyderabadensis* Ramanna & al. and *Ledebouria karnatakensis* Punekar & Lakshminarasimhan, are reclassified as a variety and forma, respectively, of Ledebouria hyacinthina Roth.

Additionally, this paper introduces a new variety, *L. hyacinthina* var. *obtusata* S. Dutta, Chakral & al., described from Maharashtra.

Keywords: *Ledebouria*, molecular analysis, morphology, new taxa, taxonomy.

T-1-OP-07

How a Taxonomist be a Conservationist – the role of Taxonomist in Conservation of Biodiversity

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Without taxonomy there is no effective and scientific conservation of biodiversity. The biodiversity of an area is day by day disclosed through the continuous efforts of plant and animal taxonomist. The rate of species discoveries is many fold faster than ever (>8-fold, from about one in 1935–1939 to more than eight in 2005-2009) throughout the world even though the quality of descriptions are declined much. In the last 250 years taxonomists worldwide have described more than 1.2 million species. But even at this rate it will still take 4 or more centuries to describe the richness of our planet in full. Scientists have a better understanding of how many stars there are in the galaxy than how many species there are on Earth. Experts calculate that between 0.01 and 0.1% of all species become extinct each year. Recent studies estimate about eight million species on Earth, of which at least 15,000 are threatened with extinction. The baseline extinction rate is about one species per every one million species per year. Science described around 18,000 new plant and animal species yearly; this is equivalent to 49.3 species per day. The gap between the number of species described by scientists and the number of species that exist – the Linnaean shortfall can be decreased by increasing the effort of field taxonomists.

The taxonomic information are valuable for basic research and conservation efforts by providing suitable information in identifying different organisms to the general public and various conservation agencies. The information about the ecological niche and habitat specificity of each species is a prerequisite for designing various in situ conservation efforts. Identification of important and threatened plants and threatened habitat is easy for taxonomists. But it is meaningful in the field of conservation if it is transferred to the forest managers. Taxonomists must be able to provide details of the ecology of new species and RET species. Details about the reproductive mechanism, like pollinators, seed germination and host plants for some special plants are to be collected and given to the concerned authorities of conservation. Information like finding, distribution, habitat, growth, phenology, reproduction, seed dispersal and

seed germination are to be shared to the various conservation and rarity assessing agencies like IUCN.

Information regarding the Invasive Alien Species (IAS) are prime importance for their effective control in natural forests and Protected Areas (PAs). Earlier information is essential for different border authorities and agencies to detect, control and manage Invasive Alien Species. Misidentification of the species can lead to an unnatural disaster that may be irreversible. The field of taxonomy also helps to determine the growth and spread of different species of plants from one geographic area to another and helps in their control.

The conservation importance or biotic potentiality of an area depends on the floristic richness as number of plant species and the presence of endemic species. In many cases forest areas outside any protected areas are really rich in biodiversity. It is known to the people who study district or state floras and revision workers. They must be ready to share these information to conservation agencies like state forest departments. There are examples for the conversion of forest areas from the ownership of revenue departments to forest departments as protected areas as wildlife sanctuaries or National Parks for better conservation based on the involvements of plant and animal taxonomists. Plant taxonomist must be ready to undertake such studies and to be willing enough to extend their studies for the conservation of biodiversity.

It must be kept in mind that without plants plant taxonomist cannot exist.

Keywords: Biodiversity, conservation, role of Plant Taxonomist.

T-1-OP-08

Documentation on Non-Timber Forest Products, Haveri District, Karnataka

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Present work resulted a total of 64 species and 56 genera, belonging to 32 families were recorded yielding 67 non-timber forest-yielding products of 8 different categories namely, Food, fodder, cosmetics, dye-yielding, handicrafts, construction materials, exudates, biodiesel and green manure-yielding plants. Fabaceae is most dominant family represented with the highest number of 11 species. Habit-wise analysis shown that tree species are dominant with 35 species, followed by herbs (16), shrubs (10) and climbers (3). Proper collection, processing and marketing of NTFPs provides the self-employment to the people livelihoods. Conservation and management plans for sustainable utilization of these products is recommended to overcome the threat of habitat loss by anthropogenic activities.

Keywords: Haveri District, Karnataka NTFP, utilization.

T-1-OP-09

Riparian Flora of Haveri District, Karnataka

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The Haveri district is located in the central part and its transitional zone between the Western Ghats and Maidan region of the Karnataka state. The Riparian zones are most diverse, dynamic and complex habitats on the terrestrial portion of the planet. The present study on the riparian vegetation of Haveri district, resulted in a total of 307 species belonging to 232 genera of 74 families along the 4 rivers.The highest number of species were recorded from the Tungabhadra River 233 species. Followed by rivers Kumadwathi (181), Dharma (156) and Varada (149). Life form analysis among collected plants shows that herbaceous flora is dominant with 186 species it contributing about 61% of the total flora. Among 74 families, family Fabaceae represented the highest number with 36 species, it shares 12% of the total flora. Encroachment for agriculture, overgrazing, dumping of plastic waste, sand mining, invasive species and tourism are the threats to riparian vegetation. Therefore, conservation of these plants in the riparian zones has great importance for the betterment of future generations.

Keywords: Angiosperms, Dharma, diversity, Kumadwathi, rivers, Tungabhadra, Varada.

T-1-OP-10

Notes on extended distribution of some *Gentiana* in India

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Gentiana L., the largest genus of the family Gentianaceae, is represented by *c.* 341 species worldwide and largely distributed in the temperate and alpine regions of the world. In India, the genus is corresponded to about 73 species majority of which are distributed in the Himalayan region, specifically in the Eastern Himalaya. Under the present revisionary study of the genus in India several members are discovered in new locations which are geographically notable. *G. capitata* Buch.-Ham. ex D. Don, *G. decemfida* Buch.-Ham. ex D. Don, and *G. pedicellata* (D.Don) Griseb. were traced in Manipur, which extended their distribution to the extreme Northeast India. Notably, *G. doxiongshangensis* T.N.Ho, a member of G. Sect. Otophora Kusnezow has been located in north Sikkim and added to the state flora for the first time. The discovery of *G. capitata* and *G. pedicellata* in Manipur appears critical as it claims a continuous distribution from the Indian Himalayan Region (IHR) to the Northeast India. Besides, the taxonomic status of *G. decemfida* var. *aprica* is also discussed. The phytogeographical affinities of the aforementioned taxa are presented along with taxonomic notes, phenology and habitat ecology.

Keywords: *Gentiana* Sect. Chondrophyllae; *Gentiana* Sect. Otophora; Manipur, new report, phytogeography, Sikkim.

T-1-OP-11

The genus *Caltha* L. (Ranunculaceae) in India

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Caltha L., a small genus of the buttercup family Ranunculaceae occurs in both the Northern and Southern Hemispheres. This genus has 16 species worldwide, among which three species, namely *C. alba* Jacquem. ex Cambess., *C. palustris* L., *C. scaposa* Hook.f. & Thomson, and one variety, *i.e. C. palustris* var. *purpurea* Spare & C.E.C.Fisch. have been recorded in India. In the country, *C. palustris* and *C. scaposa* grow in both the Eastern and Western Himalayas, whereas, *C. palustris* var. *purpurea* is an endemic to Arunachal Pradesh. Recently *C. alba*, which was known from Iran, Afghanistan, Pakistan, and the Indian Western Himalaya (Himachal Pradesh, Kashmir, Ladakh and Uttarakhand), has been located in North Sikkim for the first time. This discovery constitutes a new distributional record of this unique species for the entire Eastern Himalayan Flora. In the present communication, in depth taxonomy of the Indian members of the genus is presented along with their phytogeographical affinities. Besides, phenology and habitat ecology are also discussed here in detail.

Keywords: Buttercup family, Eastern Himalaya, India, new report, phytogeography.

T-1-OP-12

Fifty new additions to the Legume flora of Birbhum District, West Bengal, India

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The present study deals with fifty new additions (31 wild and 19 planted /cultivated species) to the legume flora of Birbhum district, West Bengal which were not recorded earlier from the district. Among these additions, the subfamily Papilionoideae DC. comprises the largest group with 26 species, followed by Caesalpinioideae DC. (20 species), Cercidoideae LPWG (3), and Detarioideae Burmeist. (1). There are eighteen genera recorded for the first time from the district *viz*., *Adenanthera* L., *Brachypterum* (Wight &Arn.) Benth., *Brya* P. Br., *Calliandra* Benth., *Canavalia* DC., *Centrosema* (DC.) Benth., *Derris* Lour., *Dichrostachys* (DC.) Wight & Arn., *Flemingia* Roxb. ex W.T. Aiton, *Hardwickia* Roxb., *Leucaena* Benth., *Macroptilium* (Benth.) Urb., *Mezoneuron* Desf., *Neltuma* Raf., *Parkinsonia* L., *Phyllodium* Desv., *Polhillides* H. Ohashi & K. Ohashi, and *Rhynchosia* Lour. Moreover, one species, *Cassia roxburghii* DC. recorded as a new addition to the state flora (West Bengal), one monotypic genus *Hardwickia binata* Roxb., one endemic species of India *Grona brachystachya* (Graham ex. Benth.) H. Ohashi & K. Ohashi, one endemic species of West Bengal *Indigofera prostrate* Willd. and one endangered species *Pterocarpus santalinus* L. f. were documented from this district.

Keywords: Birbhum district, Fabaceae, fifty legume taxa, new additions.

T-1-OP-13

Morphological diversity of the genus *Torenia* L. (Linderniaceae) of Assam

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The present study comprises a detailed account of the morphological diversity of the genus *Torenia* L. found in Assam. The genus *Torenia* L. is found throughout the palaeotropics and is characterized by both rospermous seeds, a winged calyx, abaxial inner hairs in the locules of the ovary, poricidal dehiscence and spur-like filament projections on the stamens. Earlier this genus was placed in the family Scrophulariaceae in the clan Lindernieae. Molecular analyses recognized this group under a distinct family Linderniaceae. A total of eight species were recorded from different parts of the region and a key to genus along with detailed description and colored photo plates showing the diversity are provided.

Keywords: Assam, diversity, morphology, *Torenia*.

T-1-OP-14

An inquiry into the epiphytes associated with the genus *Dischidia* R. Br. occurring in Assam, India

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The present study is a documentation of the epiphytic envois associated with four species of *Dischidia* occurring in Assam. Investigation reveals 13 epiphytic species belonging to four vascular plant families associated with the members of *Dischidia*. Among the documented families two are pteridophytic (Aspleniaceae, Polypodiaceae) and two are angiosperms (Apocynaceae, Orchidaceae). Notably, epiphytic members of the family Orchidaceae dominantly associated with the species of *Dischidia* providing significant contribution towards the diversity of epiphytic flora in the study area. Understanding the epiphytic communities associated with the genus is crucial for conserving the unique habitat and ecology of the taxa.

Keywords: Apocynaceae, Assam, *Dischidia*, ecology, epiphyte.

T-1-OP-15

Status of floristic composition and impact of anthropogenic activities in Hawaipur and Komorakata reserve forest of Hojai District, Assam, India

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Anthropogenic pressure and urbanization are leading to decline in forest cover, biodiversity and biological sustainability. The study area is contiguous and falling under the elephant reserves. Present study investigates the floristic composition and assessment on degraded forest. Altogether, 165 plant species representing 95 genera and 55 families are recorded. Fern and allied are also recorded. Most of the forest part is dominated by trees and floor is also represented by herbs with patches of some seasonal aquatic habitat. The research aims to explore the change in floristic diversity. Remote sensing data is used to find out the degraded forest cover. *Shorea robusta* and *Tectona grandis* are planted on few patches.

Keywords: Anthropogenic, Hojai, impact on biodiversity Reserve Forest, remote sensing.

T-1-OP-16

Diversity of macrophytes in Sonbeel, Assam, India: a preliminary observation

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Wetlands are unique ecosystems where aquatic and terrestrial environments overlap and which support a diverse flora and fauna including various macrophytes. Wetlands occupy 1–5% of a country's land area. Macrophytes include free-floating to floating-leaved, emergent to submerged forms, along with macroalgae, mosses, ferns and seed-bearing plants. They are crucial ecologically and economically and adapted to various conditions including seasonal flooding. They also play a great role in maintaining wetland's overall health, contributing to water quality, creating habitats for other aquatic organisms and supporting human livelihoods. In this present study, macrophytes occurring in Sonbeel, Assam have been studied. Sonbeel, one of Assam's largest wetlands, is located in the Karimganj district of Barak Valley in Assam is notable for its distinct geography with vast area. As a crucial part of Assam's wetland network, Sonbeel helps in maintaining the region's hydrological balance, supporting the growth of diverse flora and fauna. A preliminary study has been done to explore the macrophytic vegetation of Sonbeel to assess their diversity, life-forms, phenology, distribution and abundance is presented here.

Keywords: Aquatic plants, Barak valley, conservation, diversity, wetland.

T-1-OP-17

Do exotic plants alter their functional traits along an invasion gradient? A case study of *Chromolaena odorata* (L.) R. M. King & H.Rob. and *Urena lobata* L. in Barak Valley, Northeast India

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Exotic plant species demonstrate considerable plasticity in their functional traits, enabling them to adapt to varying environmental conditions. Studying the functional traits of exotic invasive plants is vital for proper understanding of their ecological roles and also for predicting their impacts. However, research on the species-specific traits of invasive plants that contribute to their success is limited across the globe and particularly from Northeast India. The main objective of this study was to assess both the intra-specific and inter-specific trait differences in exotic *Chromolaena odorata* (L.) R. M. King & H. Rob. and *Urena lobata* L. across differently invaded habitats in Barak Valley, South Assam, located in Northeast India. Both the above-ground and the below-ground vegetative traits of these two species were assessed along the high, moderate and less invaded habitats. The variations in the plant traits indicated that both species adapt to different levels of habitat invasion, optimizing growth according to the level of disturbance. The study also recorded that *C. odorata* dominated the aboveground traits, indicating its allocation of resources towards growth, while *U. lobata* laid a stronger emphasis on root development. Both species displayed high plasticity in their phenotypic traits, allowing them to adjust to the varying levels of habitat disturbance. It could be concluded through the study that the success of invasive plants is influenced by their trait flexibility and habitat conditions. These adaptive traits enable the species to thrive across diverse environments, highlighting the role of functional traits in their invasion success. Understanding these trait differences are crucial for the management and impacts of invasive species in the region.

Keywords: Ecological adaptation, invasiveness, plasticity, vegetative traits.

THEME 2

Nomenclature, Revision & Monograph

T-2-OP-01

Taxonomic revision of the genus *Bulbostylis* Kunth (Abildgaardieae: Cyperaceae) in India

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Genus *Bulbostylis* Kunth popularly known as 'Hair Sedge' or 'Bearded Watergrass' belonging to family Cyperaceae Juss. with about 220 known species worldwide. In India the genus is represented by seven taxa (six species and one subspecies), of which three are endemic. Eligulate leaves, leaf sheaths with a pilose orifice, style base thickened and persistent as a distinct knob and often with ornamented nutlet are the distinguishing characters of *Bulbostylis* from rest of the sedge genera. Present study deals with current status of 'Indian Hair Sedges' in relation to taxonomy, nomenclature, distribution, nutlet micromorphology with, informative illustrations, photo-plates, and maps. Due to minute florets, polymorphism and devoid of prompt literature the genus has many taxonomic complications that are resolved. The thorough study also resulted in two new nomenclatural combinations, one new species as well as recollection of *B. thwaitesii* after a gap of 189 years.

Keywords: Abildgaardieae, morphology, old world, phenology, typification.

T-2-OP-02

Taxonomic notes on *Mallotus resinous* (Blanco) Merr. (Euphorbiaceae) Complex

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Mallotus Lour. is (Euphorbiaceae) is one of the diverse genera in Euphorbiaceae. The *Mallotus resinosus* (Blanco) Merr. is a taxonomically complex group having taxonomic consequences with some Indian species like *M. aureopunctatus* Dalzell and *M. stenanthus* Müll. Arg. After critical analysis of all three species, it is concluded that, they are distinct elements and not the same. Hence proposal is raised to resolving the complex of *M. resinosus* and the reinstatement of *M. aureopunctatus* and *M. stenanthus* by strong taxonomic evidence.

Keywords: Endemism, Kamala tree, phylogeny, Western Ghats.

T-2-OP-03

Preliminary studies on the family Asparagaceae Juss. in India

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The pantropical and cosmopolitan family Asparagaceae Juss. comprises 70–100 genera and *c.* 2500 species, especially diverse in the seasonally arid and arid tropics; it is a morphologically heterogenous family and includes many taxa traditionally placed in separate families as per the recent APG classification. The members of the family are generally herbs, climbers, shrubs or arborescent with woody anomalous secondary thickening, and regenerates by means of vegetative underground organs, such as rhizomes, bulbs, corms, tuberous roots or a woody caudex.

The family Asparagaceae was first proposed by de Jussieu (1789) and included 16 genera. These genera were often treated within the family Liliaceae by several authors (Kunth, 1850; Hutchinson, 1934; Melchior, 1964 and Cronquist, 1981). However, the status of the family Asparagaceae has been subject to review over the past two centuries. In India, the family is represented by 130 taxa, including 126 species, 02 subspecies and 02 varieties in 16 genera of these, 35 species endemic to various phytogeographical regions of India. Recently, many species from India have been described as new to science in the family Asparagaceae and the family contains many economically important plant species, however, the evolutionary history and relationships of the lineage remain poorly understood within the genus and between genera. Therefore, the family requires comprehensive taxonomic studies at national level to reaffirm the status of the novelties described in the past and also to understand the taxonomy and morphology of every taxon in the family. The present paper discusses the preliminary information about the family Asparagaceae in India.

Keywords: Asparagaceae, India.

T-2-OP-04

Agapetes D. Don ex G. Don (Ericaceae) in India

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The genus *Agapetes* D. Don ex G. Don of *Ericaceae* Juss. nom. consv. under Ericales Bercht. & J. Presl comprises ca. 114 spp. The species under the genus are distributed from Eastern Nepal to Vietnam and to the Malay Peninsula. In India, the genus is distributed in the Eastern Himalayas to NE India. The infrageneric classification of the genus exhibited 4 ser. and 7 subser. *viz.*, ser. *Agapetes* (23 spp., 12 var.) consists of subser. *Agapetes* (21 spp., 11 var.) and subser. *Parviflorae* Banik & Sanjappa. (2 spp., 1 var.), ser. *Graciles* Airy Shaw (19 spp.) consists of subser. *Graciles* (10 spp.) and subser. *Parvifoliae* Airy Shaw (9 spp.), ser. *Longifiles* Airy Shaw (5 spp.) consists of subser. *Longifiles* (3 spp.) and subser. *Subsessiles* Airy Shaw (2 spp.) and ser. *Pteryganthae* Airy Shaw (10 spp. 3 var.) making a total of 57 spp. 15 varieties for Flora of India. The study included specimens examined at K, BM and E during 2013 and 2016-2017 and the fieldwork conducted to date. Morphological characters are added to a few species along with designating types.

Keywords: *Graciles*, infrageneric, *Longifiles, Parviflorae, Pteryganthae*.

T-2-OP-05

Acanthaceae in Assam state, India

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Acanthaceae Juss. is the eighth largest angiosperm family and fifth largest dicotyledonous family in Assam, India. It is represented by *c.* 500 species in India and 98 species in Assam. To prepare a comprehensive document and to assess the plants belonging to Acanthaceae occurring in the region, floristic studies in Assam are being conducted by the author. A total of 123 species of the family Acanthaceae in the state have been documented through previous reports. Amongst them, uptill now, 40 spp. are documented by the author from their natural habitat, through field visits in different regions of Assam. Morpho-taxonomic investigation, phenology, distribution and updated nomenclature, etc. of the collected specimens were done. Two lectotypifications were made: a) *Staurogyne simonsii* (T.Anderson) Kuntze and b) *Thunbergia hawtayneana* Wall. *Phlogacanthus curviflorus* var. *menchanensis* Barnali Dutta & Borthakur was treated as a heterotypic synonym of *P. curviflorus* (Nees) Nees. Photographic documentations and identification keys of taxa are also given.

In this paper, morpho-taxonomic descriptions along with phenology, distribution and updated nomenclature and pollen morphology of the studied taxa of the members of Acanthaceae are presented.

Keywords: Checklist, distribution, floristics, North-eastern India, typification.

THEME 3

Biosystematics, Applied Taxonomy & Phylogeny

T-3-OP-01

The role of floral volatiles and morphology in luring pollinators of selected *Goniothalamus* Hook. f. & Thoms. species from the Western Ghats

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The genus *Goniothalamus* Hook. f. & Thoms. belongs to the family Annonaceae, and it comprises of 134 species that are inhabiting in the evergreen forests and are shrubs or treelets. The species *Goniothalamus cardiopetalus, G. wynaandensis* and *G. keralensis* native to the Western Ghats region, exhibit a range of floral characteristics that may reflect adaptations to specific pollinator groups. The main cues involved in pollinator attraction are visual and olfactory. Floral structure reveals that there is a dome shaped floral aperture is develops prominently during the pre-receptive phase of the flowering phenophase. During the floral anthesis, the petal colour of *Goniothalamus cardiopetalus* changes from pale green to yellowish pink, that of *G. wynaadensis* from pale green to yellow, and that of *G. keralensis* from greenish yellow to dark ivory tone. When anthesis advances in each species, the conical floral apertures are visible between the outer and inner petals. These apertures are used by pollinators to enter into the flower. The flower stigma displays a great number of anthers and a high sticky exudation in an attempt to attract pollinators. The flowers are highly fragrant with a pleasant fruity smell, and the HS-GC-MS analysis of the floral headspace volatiles revealed ethyl acetate as the major component. The relative amounts of the volatiles were calculated using peak areas, which were normalised as percentages. In addition, 30 minor constituents were also identified in the floral headspace volatiles. Fluorescent pigments are guiding pigments for pollinators to facilitate effective pollination, *Goniothalamus cardiopetalus, G. wynaadensis* and *G. keralensis* flowers showed characteristic fluorescence at 365 nm and 254 nm. *Carpophilus dimidiatus* (Coleoptera: Nitidulidae) have been identified as the major floral insect to these Goniothalamus sps. whereas a single specimen of Coleoptera: Elateridae was noticed in insects collected from *G. keralensis*. The chemical and plant-insect interaction among the selected *Goniothalamus* sps. flowers and the floral visitor is to be investigated in detail based on the volatiles and visual cues.

Keywords: Floral Morphology, floral visitor, fluorescence, HS-GC-MS.

T-3-OP-02

Influence of different floral traits in insect pollinated plant of *Cleome rutidosperma*

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Pollen is transferred to the stigma of flowering plants through biotic pollination, which necessitates animal interactions. Flowers have specific physical characteristics and provide rewards like nectar and pollen to attract visitors. Climate change and habitat alteration may forcefully change the reproductive traits in flowering plants. This might alter the behaviour of floral visitors and pollinators. This, if persist for longer periods, it would affect plant's efficacy of producing the same quality of character that it supposed to produce. In such instances, plant animal interactions would get affected, mostly negatively. In light of these facts, the present study experimented the change in major reproductive traits in flowering plants such as colour, shape, size and orientation of flowers. The aforementioned characters of *Cleome rutidosperma* were altered manually and observed rate of visitation of floral visitors. The flower found to offer pollen as well as nectar as floral rewards. In most cases, the rate of visitation in flowers with altered characters was significantly less. The result indicates that slight change in floral traits can affect the visitation rate.

Keywords: Breeding system, floral rewards, floral traits, fruit set, pollination pollinators.

T-3-OP-03

Microscopical study of leaves of family Fabaceae Lindl. and Moraceae Gaudich.

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This paper is based on the anatomical studies on the leaves of selected members of family Fabaceae Lindl. and Moraceae Gaudich. to elucidate various features that corelates these families and provide insights into their taxonomic relationships. The leaves of plants contain epidermis which have specialized cells such as guard cells that have special pores, called stomata. Stomata are microscopic pores that facilitate the gas exchange and water control. Various types of stomata are found in several plant species which is impossible to see through our naked eyes thus the microscopic study plays an important role to examine these cells. This paper gives insights into the internal structures observed in a transverse section of leaf and petiole such as epidermis, stomata, trichomes in all the selected families. The macromorphology of leaf such as phyllotaxy, leaf shape, leaf apex, leaf base and vein category has also been examined for the study.

Keywords: Fabaceae Lindl., Moraceae Gaudich., plant anatomy, plant taxonomy.

T-3-OP-04

Investigation on floral and seedling micromorphology of some members of Cleomaceae from West Bengal, India

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Cleome, the largest genus within the Cleomaceae family, is widely distributed across tropical and subtropical regions of the World. Several species under *Cleome* have been transferred to different genera due to recent nomenclatural changes. The members of Cleomaceae are taxonomically and economically valuable with medicinal importance. Floral micromorphological characters as epidermis shape with stomata and trichomes and anticlinal wall pattern were considered as useful characters for systematic studies. Morphology of seed and seedlings consist of limited characters which are valuable to delimit different taxa. The present investigation comprised of four species of *Cleome* with updated nomenclature which were collected from different regions of West Bengal. The shape of epidermal cells of sepals and petals varies from rectangular to hexagonal with straight and undulate anticlinal wall patterns. The seeds exhibit spherical space as cleft with horseshoe shaped ends as claw. The investigated taxa have epigeal, phanerocotylar germination pattern. Subsequent leaves of seedlings exhibit diverse micromorphological characters in epidermis and venation pattern. Several types of stomata and trichomes are found in different parts of flowers, and seedlings. These micromorphological characters of flower and seedlings are found useful to identify and estimate the phenetic relationships among the investigated taxa.

Keywords: *Cleome*, numerical analysis, paracotyledons, petal, sepal.

T-3-OP-05

Pollination Biology of *Aristolochia acuminata* Lam.: A case of plant-pollinator interaction

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Deceptive pollination mechanisms have been documented within the genus *Aristolochia*, wherein the pollination process intricately involves the temporary entrapment of pollinators. The floral and pollination biology of these plants are critical factors that significantly affect their reproductive efficacy. *Aristolochia acuminata*, a tropical species indigenous to India, presents a unique and scarcely studied model for investigating these biological interactions. The plant exhibits a distinctive reproductive strategy characterized by dichogamy, with flowers transitioning through discrete female and male phases. During the female phase, visiting insects are ensnared within the floral structure, facilitating pollination. *A. acuminata* is serviced by a solitary species of pollinator, highlighting a narrow pollination syndrome. Breeding experiments further elucidate that *A. acuminata* experiences pollen limitation, implying that natural pollination events do not deposit a sufficient quantity of pollen on the stigmas for optimal reproductive success. Despite this limitation, geitonogamous pollination experiments demonstrate that fruit sets can be achieved through the transfer of pollen between flowers on the same individual plant. However, the dichogamous nature of *A. acuminata* precludes autogamous self-pollination, rendering the species entirely reliant on its pollinators for successful fertilization. The dependency on external pollinators underscores the species' vulnerability, as these insects serve as the sole vector for effective pollen transfer to the stigmas, making the reproductive success of *A. acuminata* intricately linked to pollinator availability and behaviour.

Keywords: *Aristolochia*, deceptive pollination, pollen.

T-3-OP-06

Plant intelligence in Indian context

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Evidence suggests that plants can behave intelligently by exhibiting the ability to learn, make associations between environmental cues, engage in complex decisions about resource acquisition, memorize, and adapt in flexible ways. However, plant intelligence is a disputed concept in the scientific community. Reasons for lack of consensus can be traced back to the history of Asian mythology, philosophy and ecology. Plant intelligence thus constitutes a novel paradigm in the plant sciences. Therefore, the perspectives of scientists in plant-related disciplines need to be understood in order to gain insight into the current state and future development of this concept.

Keywords: Ecology, mythology, phenology, plant diversity, plant intelligence.

T-3-OP-07

Reproductive biology of *Datura innoxia* Mill.: An important medicinal plant of Tripura

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Datura innoxia is an important member of genus *Datura*. It is a ethnomedicinaly important roadside plant of Tripura. Its leaves, root and seeds have various traditional and pharmacological activities. The present study recorded different reproductive biology parameters of this species including floral morphology, floral visitors activities, pollen morphology, production, viability, germination, pollen: ovule ratio, stigma receptivity as well as breeding system. Night blooming flower *D. innoxia* open in between 5.00 to 6.30 pm. Flowers are take 24 to 25 days to convert into mature fruits. P/E ratio (1.14 ± 0.03) showing large size of pollen in *D. innoxia*. Pollen germination ratio is highest in 10% sucrose solution supplemented with 500 ppm boric acid. Pollen fertility was determined using Muinzing mixture (90 %), 2% Aceto-carmine (92%), Lecto phenol cotton blue (95 %) and viability was determined using TTC (72%) and FDA (84%) tests. The pollen: ovule ratio was showed facultative xenogamy in breeding system. Highest fruit set was recorded in natural autogamy condition. The present study showed no evidence of obligate apomixes.

Keywords: *Datura innoxia*, reproductive biology, Tripura.

T-3-OP-08

A study on the vascular system and its taxonomic significance of the genus *Dioscorea* in Western Ghats, India

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Systematic studies of the family Dioscoreaceae reveals that it has been initially conceived as a heterogeneous assemblage of plants by including five genera based on certain morphological attributes. However, all did not agree this concept and now the family is treated with monogeneric by having only one genus the *Dioscorea* Linn. Barring Ayensu's(1972) studies, it seems that no attention was given to the internal organization of vascular system of different organs of the species included in *Dioscorea*. In this background, anatomical studies were carried out on 17 species of *Dioscorea* belonging to Western Ghats to find out additional evidence for justifying the treatment of *Dioscorea* as unique and natural taxon under family Dioscoreaceae. The investigation examined vascular structures of the internodal segments which were subjected to paraffin wax infiltration, microtome sectioning and staining with Toluidine blue. Photomicrographs were prepared using Nikon microscope fitted with digital camera.

The stele comprises the two-stranded system of vascular tissues in all species examined. The outer system includes smaller, triangular or U-shaped strands, partially or totally ensheathed by sub-endodermoid sclerenchyma tissues. These outer vascular strands are called common bundles. The xylem elements are arranged in triangular outline with mostly three or occasionally less or more than three phloem units in each strand. The inner system of vascular strands known as cauline strands, which are elliptical in outline with median large metaxylem elements. The number of phloem units in different species fluctuates and these characters will be useful in establishing taxonomic identity of different species. The phloem units may be two inner and two outer strands, one inner and another outer; two inner and forming a ring of four in the outer portion of the vascular bundles. The metaphloem elements are unusually wide

in all species analyzed. The present investigation brought to light the unique patterns of vascular organization in the internodes of *Dioscorea*. The vascular system is neither eustelic type of dicotyledons nor atactostelic type of monocotyledons. Hence, the unique vascular pattern of *Dioscorea* is designated as Dioscoreacean stelar type and this type of stelar system so far not reported in any group of flowering plants. The disposition of phloem units in relation to xylem strands within the vascular bundles is proposed as Dioscorean pattern of phloem disposition. The new findings proved that the family Dioscoreaceae has distinct characters than other families and needs to be recognized separately. Therefore, our findings of the intermodal vascular system of the species of *Dioscorea* of Western Ghats have led to support the treatment of *Dioscorea* under unigeneric family status in the order Dioscoreals.

Keywords: Cauline bundles, common bundles, *Dioscorea*, vascular strands, Western Ghats.

T-3-OP-09

A comparative study on foliar and stem anatomy of certain species of *Dioscorea* L. occurring in Assam

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Taxonomically *Dioscorea* Linnaeus (Dioscoreaceae) is an interesting genus as it exhibits many dicotyledonous characters such as reticulate venation of the leaf, arrangement of vascular bundles in ring with pith, presence of pith ray and pericycle, absence of sheath at the leaf base, simultaneous type of pollen grain development and presence of a second rudimentary cotyledon in some of the species.

In this paper, 14 species of *Dioscorea* L. belonging to four sections *viz*. Combilium, Opsophyton, Lasiophyton and Enantiophyllum on the basis of their twining habit has been reported. In addition to morphology, microscopic features like foliar and stem anatomical characters have been incorporated for comparative study considering the striking features of these structures in the genus for proper taxonomic assessment. The foliar epidermal characters (i.e. trichomes and stomatal types), mid vein and foliar venation patterns and cell inclusions were found to be helpful in taxonomic delimitation. Variations in petiole anatomy were observed in the cross-sectional outline, presence or absence of hairs and wings, size of cortex, distributional pattern of sclerenchyma, number and relative position of vascular bundles, area covered by the ground parenchyma and presence or absence of crystals and tannins. In the mid-rib, collateral vascular bundles with adaxial xylem and abaxial phloem were clearly observed. The use of anatomical characters of stem and leaves were found to be useful for identification of different species of taxa in the absence of flowers and fruits.

Keywords: *Dioscorea*, foliar anatomy, stem anatomy.

T-3-OP-10

Molecular Revolution in Cyperaceae Taxonomy: A Review

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Molecular phylogenetics studies have significantly advanced our understanding of the evolutionary relationships within the Cyperaceae family, also known as sedges. The family Cyperaceae, comprising approximately 5,500 species, presents significant taxonomic challenges due to reduced floral morphology and complex inflorescences. Analysis of DNA sequence data from various conserved regions using molecular tools will likely to provide valuable insights into the family's systematics and evolution. DNA sequencing and phylogenetic reconstructions have clarified relationships, resolved generic boundaries. Key advances include establishing Mapanioideae as the sister clade and resolving Cyperoideae-Caricoideae relationships, generic rearrangements such as reclassifying Carex, Cyperus, and Eleocharis, and recognizing new genera. Molecular tools have also enabled species delimitation through DNA barcoding and phylogenetic approaches. This molecular revolution has provided a robust framework for Cyperaceae classification, conservation, and ecological research. This review gives a glimpse of major advances in Cyperaceae taxonomy highlighting molecular phylogenetics.

Keywords: Cyperaceae, molecular phylogenetics, molecular taxonomy, sedge, systematics.

T-3-OP-11

Evaluation of DNA Barcode of Ethno-Medicinally Important *Calotropis* sp. from Eastern India

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The presence of high demand for the ethno-medicinally important plant *Calotropis* R.Br. (Apocynaceae Juss.) in the trade market makes substitution or adulteration. For addressing this problem or accurate species identification within this genus, DNA barcoding methods are employed here. We investigated the species discriminating power of recommended barcode loci (*rbcL, matK, trnL-F* and *ITS*) and their combinations using distance-based (inter and intra-specific distances) and similarity-based (BM and BCM) analyses of available *Calotropis* species. In the present study, the BLAST identity rate is high for the recommended barcode region *rbcL*(99.66-99.86%) followed by *matK* (99.53- 99.76%), *trnL-F* (99.26-99.06%), and *ITS* (99.8%). A significant difference was found between inter and intraspecific distance in all the selected genes except *rbcL*. The BM and BCM approaches revealed the highest rate of correct identification with *ITS* in a single gene and *rbcL+ITS*, in a double gene. It is further confirmed that only *ITS* single gene separated the *Calotropis* species in phylogenetic analysis whereas other single locus and double locus (*rbcL+ITS*) have some ambiguity in discriminating the species properly. Therefore, we suggest that the *nrITS* gene is the suitable barcode for *Calotropis* species differentiation.

Keywords: Apocynaceae, *Calotropis* sp., DNA barcoding, ethno-medicinal, molecular authentication.

THEME 4

Ethnobotany, Indian Knowledge System (IKS) & Bioprospectation

T-4-OP-01

Thoh (*Arisaema utile*) and Phukjik (*Angiopteris indica*): History, Science and Indigenous knowledge on utilisation by Lachungpa and Lepcha communities in Sikkim Himalaya, India

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The relationship between plants and people is immemorial and is linked or associated with the strong interactions by indigenous communities with the plants. The indigenous knowledge about the plants used by people is the base of diverse developments including modern health practices. Therefore, the traditional knowledge about the utilisation of plant resources is crucial for human well-being and biodiversity conservation. Sikkim Himalayas, part of the Eastern Himalaya biodiversity hotspot harbours diverse plant species and associated indigenous knowledge. But over the years, the documentation and knowledge itself about the utilisation of plant bio-resources have been disappearing. The present study is part of the larger effort to quantify the wild plant bio-resources utilised at household and market levels and to unravel the traditional knowledge and practices associated with the wild plant bio-resources in Sikkim Himalaya. Thoh (*Arisaema utile*) and Phukjik (*Angiopteris indica*), are two traditionally important wild bio-resources utilised by the Lachunpa and Lepcha - the Indigenous communities of Sikkim Himalayas hold significant ethnobotanical context. The study was conducted in Lachung and Dzongu, North Sikkim, and data was generated through interviews using a semi-structured questionnaire. Traditionally, both species hold significant importance for subsistence livelihood but over the years the utilisation, Indigenous knowledge and traditional practices associated with the two species are vanishing slowly. The ethno-taxonomic study becomes relevant when Indigenous communities shed the traditional significance of plants used by them. Therefore, valuable traditional knowledge about the utilisation of plants needs to be documented to safeguard the conservation of plant diversity.

Keywords: Bio-resources, communities, Indigenous knowledge, Sikkim, wild plant.

T-4-OP-02

Traditional Use and Marketing Channel of Non-wood Forest Products (NWFPs) for Kani Tribes in Kerala

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The indigenous people of Kani have extensive knowledge of Non-wood Forest Products (NWFPS). The present work aimed to document the various NWFPs collected by the Kani tribe of Kerala. NWFPs have a tremendous deal of potential to generate widespread employment opportunities, which would aid in lowering poverty and boosting tribal people's sense of empowerment. Forests are a source of a wide variety of NWFPs, which are extremely beneficial to rural areas' development and livelihoods. The marketing channels for major NWFPs primarily consist of three types: local NWFPs collectors, Eco-Development Committees (EDC), and *Vana Samrakshana Samithies* (VSS). We aim to assess the market value of significant NWFPs across various markets and document the lowest and highest prices for these products. In this study, there exists a significant price difference between the local market and tribal cooperative society. To cite an example, *Litsea beddomei* Hook. f. fruit is priced at Rs. 40/kg by the local market and Rs. 120/kg by cooperative society. There is only one tribal cooperative society and 8 local markets for the collection and marketing of NWFPs in Thiruvananthapuram district, which is located at Nedumangad, Vithura, Aryanad, Kottur, Kuttichal, Kattakada, Parandode, Peringammala and Nanniyode. The tribal people faces a big issue with the low price offered for NTFPs on the local market. The study revealed that a total of 66 NTFPs were collected by the tribes in the study area. The NWFPs collected for trade include *Saraca asok*, *Asparagus racemosus, Tinospora caurdifolia, Bacopa monnierri, Piper longum, Hemidesmus indicus* and *Cyclea peltata* etc. Medicinal plants were among the most valuable NWFPs in the study area. Most of the NWFPs were used for medicinal purposes, and most of the NTFPs were used as ethnomedicine, and some were traded with the help of a “scheduled tribe cooperative society" and local market.

Keywords: Eco-Development Committee (EDC), Non-wood Forest Products (NTFPs), Vana Samrakshana Samithi (VSS).

T-4-OP-03

The study of ethno-medicinal plants used by the tribal communities inhabiting in and around Manas National Park of Assam

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Ethnomedicinal plants are those plants which are used by ethnic communities for healing and treating purpose and ethno medicine deals with the knowledge and practices that transmitted orally by these communities over centuries and evolved with human existence. The Bodoland Territorial Region (BTR) of Assam consists of five districts namely Kokrajhar, Chirang, Baksa, Tamulpur and Udalguri. The present study was mainly carried out in the fringe villages present near Manas National Park located in Baksa and Chirang district. The surveyed area mainly consists of people from different tribe and communities like Bodo, Koch-Rajbongshi, Bengali etc. Information was collected through interviews by various tools such as semi-structured questionnaires, personal interviews, group discussions, transect walk. Ethnobotanical information like the use of plants to treat common diseases, methods of preparation and ways of application, dosage, routes of administration were collected. The study revealed a wide diversity of ethanomedicinal plants occurring in the region indicating the richness of the floral diversity. The information gathered from different informants reveals a huge gap of knowledge among the youths which indicates the fading future of the rich past of traditional knowledge. A total of 82 species of plants with medicinal properties were reported which were mostly found in wild nature belonging to 45 families. Lamiaceae family with 9 (10.97 %) species had the highest number of species with medicinal use. Herbs with 36 (43.90 %) species were the most dominant group, climber with 6 (7.31%) species, 10 (12.19%) shrub species and 30 (36.58%) tree species. The depletion of traditional knowledge and destruction of habitat are alarming and documentation of such knowledge is a key to preserve as it will be a valuable asset for the upcoming days where people are drawn more towards busy and hectic life with unhealthy practices and preserved foods. With the fast growth the organic food and fresh air has become a luxury for those who lives in cities and it's the people of villages who have the treasure of knowledge and resources. The conservation of these species through protection of their habitat and documentation of traditional knowledge is the prime need of the hour for sustainable use of resources.

Keywords: Assam, Bodoland Territorial Council (BTR), ethnobotany, ethnomedicine, Manas National Park, sustainable use, traditional knowledge.

T-4-OP-04

Indigenous Traditional Knowledge of pest management in Darrang, Assam

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Indigenous traditional methods and practices for preparing insect repellent in Darrang District, Assam, represent a synthesis of local wisdom and ecological understanding passed down through generations. This study delves into the diverse array of traditional techniques employed by the people of Darrang to repel insects, by using locally available resources, such as aromatic plants, herbs, and household materials etc. Total 32 such indigenous methods and practices for 12 different pests are reported. These indigenous traditional methods of insect repellent preparations are passed by orally from generation to generation, however, many of such methods are also mentioned in ancient Indian Texts such as 'Kashyapa Samhita' and 'Brihat Samhita'. By elucidating these indigenous methods, this study not only sheds light on the intricate relationship between humans and their environment but also underscores the importance of preserving and revitalizing traditional knowledge systems for sustainable pest management and biodiversity conservation in Assam.

Keyword: IKS, insect repellant, pest management, traditional knowledge.

T-4-OP-05

Indigenous Medicinal plants used by the Ethnic groups of Hojai district, Assam, India

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The dependence and association of man with plant resources is an important aspect, as people use the wild plants to treat various types of diseases. Hojai district located in the floodplains of river Kopili and Yamuna in a geographical position of latitudes 25°55'0"– 25°58'0" N and longitudes 92°49'30"– 92°53'0" E. The study has been conducted in 2022 to assess the kinds of medicinal plants and their application in various diseases by the four ethnic groups of the district *viz*., Karbi, Manipuri, Dimasa and Nepali. Altogether 54 plants species have been recorded and identified and also their parts used with application methods were recorded in consultation with the herbal medicine practitioners from the rural areas of the district. Not all the plants were available in the wild; some were planted by the practitioners. As the fringe villagers cannot easily go to the hospitals, so they have been preferred to use the traditional medicine systems that are available near to them. Unfortunately these valuable gene pools have been gradually disappeared due to extreme anthropogenic activities and it needs conservation.

Keywords: Disease, ethnic tribes, herbal practitioner, traditional medicine.

T-4-OP-06

Ethnobotanical studies of Kalsubai-Harishchandragad Wildlife Sanctuary, Maharashtra, India

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The Kalsubai- Harishchandragad Wildlife Sanctuary is a protected area located in the Ahmednagar district of Maharashtra, India. The area covered by sanctuary is 36.87 square kilometers. The terrain of the sanctuary is hilly with rugged terrain and steep slopes. The vegetation of the sanctuary is tropical dry deciduous and scrub forests. The sanctuary is declared as a protected area in 1988 and efforts are continuously being made to preserve biodiversity and habitat. The floristic evaluation of plants of the sanctuary has been carried out and recorded near about of 600 species of 370 genera of 112 families. Number of species in flowering and fruiting in each season has also been noted.

The tribes of Kalsubai - Harishchandragad Wildlife Sanctuary area use conventional systems of medicine continuously, inherited from their ancestors. The main tribes of the area are Mahadeo Koli and Thakar. These tribes reside in hilly slopes of Sahyadri ranges.

The sanctuary has been surveyed to collect ethno-botanical information. The ethno-botanical information includes the use of plants as food, fodder, timber, medicine, veterinary medicine, for sacred purposes, fuel etc. Ethno-botanical data on 110 species belong to 96 genera and 51 families have been collected.

Keywords: Biodiversity, ethnobotany, KHWS.

T-4-OP-07

Ethnomedicinal plants in the valleys of Rajasthan, India

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Rajasthan, the largest state in India, has diverse physical environment which includes a long chain of hills, vast desert, plateaus, perennial streams and wetlands. The mountainous range of the state encompasses Aravallian and Vindhyan hill tracts with either 'V' or 'U' shaped valleys. The valleys harbor diverse plant species which are less studied floristically especially 'U'- shaped valleys in certain areas. The present study has been carried out in these valleys for documentation of medicinal herbs and their utility in the area. A number of field surveys were conducted during 2019-2023 in different seasons. The objective of the paper was to study the current status of flora of medicinal plants and indigenous knowledge about their uses. 113 medicinal plant species belonging to 53 families reported from the area, which have been used by the indigenous people to cure various ailments. A list of medicinal plant species along with their local name, family, habit, plant part/s and medicinal uses was reported in brief. Out of 113 plant species 52 were trees, 31 herbs including 3 pteridophytes, 27 shrubs and 3 climbers. The valleys support some critically endangered, endangered, threatened and locally rare plants like *Commiphora wightii*, *Chlorophytum borivilianum, Gloriosa superba, Costus speciosus, Sterculia urens* etc., have medicinal values. Also at a number of places the valleys form a special type of microclimate to support diverse medicinal plants which need effective care and proper conservation measures for their survival and long-term protection. Thus, it is important to conserve these habitats. Ethnomedicinal biodiversity centers for preservation, cultivation, experimentation and conservation of these important libraries of life may also be established. There is also a need to follow up with ethnomedicinal screening of the rural claims, by testing these ethnomedicinal recipes in their crude form.

Keywords: Biodiversity conservation, indigenous/rural people, medicinal plant diversity, valleys.

T-4-OP-08

Exploring indigenous knowledge on medicinal plants of Chhattisgarh

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Indian traditional lifestyle is oriented towards using indigenous herbal medicine. In the modern age chemical and pharmaceutical investigations have added a great deal of status to the use of medicinal plants by revealing the presence of active principles. The W.H.O. has emphasized the need for the utilization of the indigenous system of medicine based on the locally available medicinal plants in the developing countries.

Though India is a leading exporter in medicinal plant in the world but still there are some constraints in systemic identification, physical verification and adulterations. It is most appropriate at the present moment that the attention should be turned to the possible remedies to meet out the challenges and these may be discovered among indigenous labs of the state.

The young state of Chhattisgarh is rich in its natural resources, bio-wealth and indigenous knowledge. The indigenous people and tribal of the state have their own beliefs social taboos and their traditional way of use of the plants as natural medicines.

Chhattisgarh is one of the mega biodiversity states of India with over 44% of its total geographical area having lush green forests. It is also unique for its wildlife population with 3 national parks and 11wildlife sanctuaries and is home of more than 1525 medicinally important plant species. More than 1000 tribal /traditional healers are practicing the herbal traditional knowledge dating back to Ayurveda.

In the present paper efforts have been made to pool such indigenous knowledge on some medicinal plant resources of Chhattisgarh (India).

Keywords: Chhattisgarh, diversity, indigenous knowledge.

T-4-OP-09

Traditional formulations used in gynecological disorders by the people of Barak Valley

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India has been a hub of knowledge in all fields of science including medicine. The Indian medicine system is Ayurveda, a part of Atharva Veda. As we know, Vedas were scripted during 500 BC, until then for thousands of years the knowledge of 4 Vedas including Ayurveda was passed from teacher to disciples by memorization and oral transmission. Teachingand training in Ayurveda are much more advanced now. However, the ancient mode of practicing traditional medicine is still alive in rural areas, which lacks documentation. Local medicine men carry knowledge of herbal formulations effective in various disorders. Barak Valleyhas mostly remote and hilly areas where people depend on traditional medicine, as the modern medical facilities cannot reach them. Those herbal formulations are useful in gynecological disorders such as dysmenorrhea, infertility, menorrhagia, and irregular menstrual cycles and have lesser side effects in comparison to the steroidal substitute in modern gynecology. In the present study,we have performed field surveys to collect herbal formulations used by the ethnic tribes of Barak Valley in gynecological disorders and correlate their efficacy with updated ayurvedic literature as well as phytochemistry to find out a better alternative in such disorders for the greater benefit of the mankind.

Keywords: Ayurveda, Barak Valley, ethnic tribes, gynecological disorders, herbal formulations.

THEME 5

Medicinal Plants & Drug Discovery

T-5-OP-01

Taxonomic study of the genus *Salvias.* L. (Lamiaceae) in India with special reference to *in silico* studies of bioactive compounds

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The genus *Salvia* L. is the largest genus in the family Labiatae/Lamiaceae with more than 1000 species, indeed one of the largest genera in flowering plants, and cosmopolitan in distribution in the Indian region, the genus is primarily found in the Himalayas with almost 50 taxa (Nepal Bhutan Pakistan data added).The genus has been recently re-circumscribed based on robust phylogeny. The findings from the present revisionary studies of the genus in India also support the recently made re-circumscription of the genus, *i.e.* supports the subsuming of the genera *Meriandra* Benth. and *Perovskia* Kar. with *Salvia*. In this study, 24 species from India have been recorded from the political boundary of India and illustrations, color photoplates, distribution maps using QGIS 2.8 software, have been provided for the species. A key also provided to aid in identification of different taxa. The synoptic taxonomic overview of the genus, descriptions, correct names, comprehensive synonymy, range, phenology and SEM studies of nutlet morphology has been provided. The genus itself is famous for its medicinal properties evident by its name which originated from the word '*Salvus*' meaning 'to heal' referring to its medicinal usage since ancient times. In this context, a comprehensive list of bioactive compounds that have been screened from the Indian members of the genus has been presented in this work. A discussion on the results of *in silico* studies on important bioactive compounds found in these species has also been made to put emphasis on the medicinal potentiality of these species.

Keywords: Bioactive compounds, distribution, India, *in silico*, Lamiaceae, morphology, nutlet morphology, phenogeny, revision, *Salvia*, SEM, taxonomy.

T-5-OP-02

An appraisal of the Medicinal plants Resources in Kollam District, Kerala, India

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Medicinal plants are one of the tangible natural resources and important component of biodiversity, which plays a vital role in the health care management and progress of humankind. The plant diversity of Kerala is highly appreciated since long back especially the medicinal plant legacy. A survey had been conducted in the Kollam district for the documentation of these valuable resources covering diverse habitats such as forests, urban, rural & coastal areas and sacred groves. The study resulted in the documentation of 762 medicinal plants, including those used in Ayurveda, tribal and folk medicine like *Coscinium fenestratum, Heckeria subpeltata, Elaegnus kologa, Rotula aquatica, Persia macrantha, Steriospermum suaveolens, Trichopus zeylanicus* ssp. *travancoricus*, etc. The contribution of tribes 'Malapandaram and Kani' are precious and matchless. Extraction of NTFPs like *Canarium strictum, Coscinium fenestratum, Bambusa bambos, Garcinia gummi-gutta, Myristica malabarica, Vateria indica* etc. are a major source of income for the forest dependent communities of the district. Sacred groves also play a pivotal role in the conservation of medicinal plants in the district. A total of 168 sacred groves were enlisted in the district and recorded 174 medicinal plants. Mangroves and *Myristica* swamps are the important components in the ecosystems of Kollam district.

The intensive field study resulted in the generation of enormous field data on the medicinal plant wealth with a readily usable directory and check list as a reference tool for researchers, foresters and general public. This medicinal plant wealth is posing danger due to various anthropogenic activities such as construction, industries, destructive harvesting etc., causing their elimination and destruction of ecosystem. Invasion of exotic weeds are also responsible for their fast disappearance. Therefore, it is the time to implement strict control measures, otherwise these invaluable plant wealth cannot be retained for any kind of utilization.

Keywords: Folk medicine, herbal remedies, Kani, Malapandaram, medicinal plants, NTFP.

T-5-OP-03

Green synthesis of silver nanoparticles from *Kigelia africana* seeds extract and its antimicrobial activity

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Green synthesis involves the utilization of natural sources such as plant extracts, microbes, or other biological materials as reducing agents and stabilizers in the nanoparticle synthesis process. This approach not only offers eco-friendly routes for nanoparticle fabrication but also facilitates the production of nanoparticles with controlled size, shape, and stability.

Kigelia africana, also known as the sausage tree, is a semi-deciduous tree that has many uses in traditional medicine. It contains a variety of bioactive compounds, including iridoids, flavonoids, naphthoquinones, coumarins, terpenes, and terpenoids.

Objective of the present study are to synthesis of silver nanoparticles from seed extract of *Kigelia africana* and to study microbial activity.

A simple, safe, and one-step process is utilized for the synthesis of silver nanoparticles by using the *Kigelia africana* seed extract. SEM analysis revealed that nanoparticles were in the range of 40-135 nm and spherical. Synthesized nanoparticles showed antimicrobial activity which was investigated by agar well diffusion method against *Staphylococcus aureus* and *Escherichia coli*. Based on the observation of the study, the research methodology implemented was successfully able to synthesize AgNPs using the fruits of *Kigelia africana*.

Keywords: Antimicrobial activity, *Kigelia africana*, nanoparticle, SEM.

T-5-OP-04

Phytochemical analysis and anti-bacterial efficacy of *Cestrum nocturnum* L. against E. coli

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Jharkhand consists of 32 tribes and each tribe has its own culture and social structure. The tribes have been a part of the land for years before the main civilization and have survived relying on their own knowledge of medicines that has been within the tribes for generations.

In the present study, a brief survey was conducted on the uses of *Cestrum nocturnum* L., Fam. Solanaceae for various diseases in two villages of Khunti District, Jharkhand and the fidelity value was calculated. According to the tribal medicine practitioner, the plant extract is administered to typhoid patients. Hence, the leaves of *Cestrum nocturnum* L. were collected and investigated for its ash value, extractive value and total mixture content and was tested for preliminary phytochemical properties. The extract was subjected to qualitative phytochemical screening using standard procedures. Furthermore, different concentrations of the plant extract were used to study the anti-bacterial activity of the plant against *E. coli* bacteria.

Keywords: Anti-bacterial properties, ash value, extractive value, phytochemical analysis.

T-5-OP-05

Phytochemical and antidiabetic evaluation of *Bonnaya ruellioides* (Colsm.) Spreng. of Assam

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Bonnaya ruellioides (Colsm.) Spreng. is a herbaceous plant that belongs to the family Linderniaceae. It is an annual herb and grows primarily in the wet tropical biome. It is native to Tropical and Subtropical Asia. Ethnobotanical surveys conducted on *B. ruellioides* have reported that the plant possess therapeutic potential against various ailments. In the present study, the evaluation of *B. ruellioides* aqueous plant extract was carried out in order to validate the ethnobotanical reports scientifically. All the qualitative, quantitative, antioxidant and antidiabetic studies were conducted by following standard protocols. The qualitative phytochemical analysis revealed that the plant is rich in alkaloid, phenol, flavonoid and reducing sugar. The Total phenol and flavonoid content of the plant extract was found to be 36.9 ± 0.10 mg GAE/gm and 4.1 ± 3.08 mg GAE/gm. The DPPH and ABTS+ assay showed an IC50 value of 66.84 ± 3.89 and 122.63 ± 1.01. This revealed the antioxidant property of the plant. For the antidiabetic activity, the α-amylase and α-glucosidase inhibition assay was carried out. It was observed that the plant showed a significant potential against the enzyme's activity when compared to standard. Our present findings have exhibited significant therapeutic potential of *B. ruellioides* aqueous extract which might prove helpful in combating various ailments in the near future.

Keywords: Antidiabetic, antioxidant, *Bonnaya ruellioides*, phytochemical.

T-5-OP-06

Nutritional composition, phenolic content, and antioxidant activity of *Rivea hypocratiformis* (Desr.) Choisy

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Communities in the northern Western Ghats use *Rivea hypocratiformis* as an important source of leafy vegetables. This study evaluated the nutrients, phenolics, and antioxidant potential of the leaves. We measured the phenolic contents and antioxidant activities of four leaf extracts using different in vitro methods, and determined the individual phenolic compounds using HPLC. The proximate contents, *viz*., carbohydrates, proteins, lipids, crude fibre, moisture, and ash contents, were 14.09, 18.73, 3.35, 7.18, 12.7, and 3.49% of dry weight, respectively. Among the mineral elements, nitrogen content was the highest, followed by calcium, phosphorous, potassium, magnesium, iron, and zinc, while the heavy metals were below the permissible level. We found the levels of vitamins A and B to be 6.22 and 185.71 g/g. Moreover, we observed lower levels of anti-nutritional factors like phytic acid, saponins, and tannins. The leaves also possess high phenolic and flavonoid contents with potent antioxidant activity. High-performance liquid chromatogram analysis of the leaves revealed the presence of four polyphenols: caffeic acid, cinnamic acid, salicylic acid, and quercetin. Thus, this species should be considered as a good alternative to increase the diversity of vegetables consumed. Also, the safety and toxicity analysis of these leafy vegetables need to be extensively studied.

Keywords: Antioxidant activity, leafy vegetable, nutrients, phenolics, *Rivea hypocratiformis*.

T-5-OP-07

Ethnomedicinal plants used by the Dimasa tribe of Maibangsub-division, Assam, India

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The tribal and indigenous communities have relied on plants to treat various ailments since ancient times. However, due to modernization most of the traditional use of plants as a medicine is in jeopardy. This study aims to document the medicinal plants used by Dimasa tribe of Dima Hasao district, Assam. During survey a total of 58plant species belonging to 55 genera and 38 families were documented and it includes monocots, dicots and a fern (*Thelypteris parasitica* (L.) Tardieu.). Three ethnobotanical indices *viz.* use value, informant consensus factor and fidelity level were calculated to highlight the most frequently used species, consensus among the informants and their pivotal roles in traditional medicinal practices.

Keywords: Assam Dimasa, Dima-Hasao, ethnomedicine.

T-5-OP-08

Taxonomy, phytochemistry and pharmacology of *Begonia*, with special reference to Arunachal Pradesh

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The genus *Begonia* (Begoniaceae) is renowned for its ornamental and medicinal significance in tropical and subtropical regions. It comprises over 2,150 species, making it one of the most rapidly evolving plant genera. Evidence of long-distance dispersal, gene flow, and genetic bottlenecks, whole-genome duplication events, hybridization, and transposable elements contributed to Begonia's remarkable genetic diversity and adaptation to shady environments between 600 and 2,500 meters. So far a total of 51 species have been documented from the state of Arunachal Pradesh, India which includes 12 new species and 7 new records. These species belong to four sections, namely *Diploclinium, Parvibegonia, Platycentrum* and *Monophyllon*. Traditional medicinal uses of *Begonia* target respiratory, digestive, and dermatological ailments. Forty-one species of the globally known diversity are used medicinally, while 31 have undergone phytochemical and pharmacological studies. And 53 bioactive compounds are found in 13 of the species. These highlights Begonia's pharmaceutical potential. Further research is essential to unlock Begonia's full potential. As well as the Arunachal Pradesh's *Begonia* richness is still an underestimate where many areas still remains underexplored due to its difficult terrains.

Keywords: Begoniaceae, North-eastern India, phytochemicals, taxonomy.

T-5-OP-09

An *in silico* approach on potential antidiabetic plants found in Barak Valley

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The Barak Valley located in the southern region of Assam, India is rich in biodiversity, including many medicinal plants with potential therapeutic properties. These plants are traditionally used in various local health practices including the management of diabetes. In the present paper an attempt has been made to investigate the antidiabetic activities of some potential medicinal plants found in Barak valley and an *in silico* approach was made to study chemicals responsible for treatment of diabetes. *Gymnema sylvastre* (Gurmar), *Momordica charantia* (Bitter melon), *Syzygium cumini* (jamun), *Trigonella foenum-graecum* (Fenugreek), *Coccinia indica* (Ivy Gourd), *Moringa olefera* (Sajna). The insilico approach refers to using computational tools to predict and analyze the biological activity of plant compounds.It offers several benefits for studying the antidiabetic potential of medicinal plants. The medicinal plants of Barak Valley offer significant potential in managing diabetes due to their active compounds, many of which have been validated through traditional use and modern scientific studies. The in silico approach adds a layer of precision, allowing researchers to predict and optimize the efficacy of these compounds, making them promising candidates for developing new antidiabetic drugs.

Keywords: Antidiabetic, *in silico* potential, medicinal plants.

T-5-OP-10

Computational anticancer activity prediction of the identified metabolites form *Ricinus communis* L. targeting antiproliferation

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Ricinus communis which is commonly called a castor plant has traditionally been treasured for its medicinal values including antiinflammation, antioxidation and antimicrobial activities. However, recently, it has been focused on in regard to its application in cancer treatment, due to its bioactive metabolites that may attenuate the components of the cancer causing pathways. The present study explores the anticancer potential of *Ricinus communis* bark extract, focusing on its ability to inhibit cancer cell proliferation by targeting BRAF and EGFR pathways. The identification of the metabolites by Gas Chromatography Mass Spectrometry (GC-MS) showed extensive range of chemicals, while further phytochemical analyses such as Total Flavonoid Content (TFC), Total Phenolic Content (TPC)as well as antioxidant assays also demonstrated that the extract has an antioxidant activity which is often linked to anticancer effects. To complement these findings, in silico studies, including molecular docking, were conducted to evaluate the binding affinities of select metabolites with BRAF and EGFR active sites, suggesting potential inhibitory effects. ADMET analysis that was carried out for some of the best compounds gave the insights that were encouraging with regard to the pharmacokinetic and toxicity profiles supporting their potential as safe and effective anticancer agents. Taken together, this work illustrates the anticancer potential of the metabolites derived from *Ricinus communis* bark as BRAF and EGFR inhibitors and lays the groundwork for the investigation of their use as new cancer treatment drugs.

Keywords: Anticancer, antiproliferation, BRAF, EGF, *Ricinus communis*.

T-5-OP-11

In silico Screening of Bioactive Compounds from *Sesamum indicum* L. for RET, FGFR and RAF1 Inhibition in Hepatocellular Carcinoma

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Hepatocellular carcinoma (HCC) is the fifth most common cancer worldwide and the second leading cause of cancer-related deaths. Although a range of liver diseases are treated using both synthetic and plant-based therapies, treatments for HCC often come with significant side effects and the issue of drug resistance. Plant-derived compounds, known for their lower toxicity and protective qualities, present a potentially safer option for HCC therapy. This study aims to identify the most promising plant bioactive compounds for developing new therapeutic agents against HCC. A preliminary phytochemical investigation on *Sesamum indicum* L. encompassing qualitative and quantitative evaluations and an analysis of its antioxidant properties. Through LC-MS analysis, 81 metabolites were detected in the plant methanolic extract, several of which were recognized as bioactive compounds based on a literature review. HCC molecular targets RET, FGFR and RAF1 were selected based on the existing literature, and their 3D structures were retrieved from the RCSB Protein Data Bank (PDB, https://www.rcsb.org/). Ligand structures were sourced from the NCBI PubChem database (https://pubchem.ncbi.nlm.nih.gov/) and converted into the required format for molecular docking analysis. Molecular docking studies were performed using Molegro Virtual Docker (MVD) 6.0 to evaluate the interaction between the selected ligands and HCC targets. Among the compounds evaluated, Acteoside, exhibited the highest binding affinity for RET, FGFR and RAF1, outperforming the reference compounds. These results suggest that Acteoside holds significant inhibitory potential against critical targets in hepatocellular carcinoma (HCC), particularly RET, FGFR and RAF1, which are crucial in the dysregulated signaling pathways commonly associated with HCC. The docking scores and hydrogen bonding analysis support that Acteoside, derived from selected medicinal plants, could be a valuable lead compound for future therapeutic development in HCC.

Keywords: Acteoside, bioactive compound, Hepatocellular carcinoma (HCC), molecular docking, *Sesamum indicum* L.

T-5-OP-12

Antioxidant activity and phytochemical screening of *Dillenia indica* (L.)

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Dillenia indica (L). known as elephant apple, is a tropical plant traditionally used in many medicinal applications. Native ethnic communitiesuse fruits of this plant as seasonal food item, its bark and leaves as traditional medicine to cure number of ailments. In this study, leaves of *Dillenia indica* (DI) were collected and quantitatively assessed for the presence of phenolic and flavonoid content in it. Antioxidant activity assessed through antioxidant assays, revealed significant free radical scavenging potential in this plant. Metabolite profiling have been performed using advanced mass spectroscopy technique to assess the secondary metabolites present in the leaves of DI. *In-silico* analysis using Prediction of Activity Spectra for substances (PASS) have provided biological activies of the identified metabolites and molecular docking analysis of these metabolites against prominent targets have resulted as better affinity, predicting that the phytocompounds of this plant could have druglike properties in them. This study further suggests studied metabolites could be conducted for future in vitro and in-vivo studies.

Keywords: Antioxidant, bioactivity, *Dillenia indica* L., flavonoid, phenolic, phytocompounds.

T-5OP-13

Phytochemical study of *Gymnema sylvestre* and their climatic data collection at Chitradurga district

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Gymnema sylvestre, with gymnemic acids as active pharmacological constituents, is a popular ayurvedic herb and has been used to treat diabetes, as a remedy for cough and as a diuretic. However, very few analytical methods are available for quality control of this herb and its collected from Chitradurga district. The objectives of the study are to do the phytochemical screening of *Gymnema sylvestre* at Chitradurga district in Karnataka. Identify the elite population of *Gymnema sylvestre* R.Br In Chitradurga. To study and collection of the *Gymnema sylvestre* R.Br from chitradurga geographical location of Karnataka, for quantitative estimation of gymnemic acid in *G. sylvestre* and its marketed formulations. The plant specimen *Gymnema sylvestre* were collected from Chitradurga district. Collected plants were carefully examined and identified with the help of Local Floras. Collection of plant material, phytochemical analysis and soil tests. All the chemicals and reagent were used analytical grade purchased from SRL chemical.

The work carried out on this plant was mainly to know the content of Gymnemic acid at Chitradurga region. Climatic data how effecting on chemical constituents of *Gymnema sylvestre*. The present studies were revealed that the methanol leaf extract of *Gymnema sylvestre* yielded a significant amount of gymnemic acid.

Keywords: Climatic data, *Gymnema sylvestre*, morphological description, phytochemistry.

THEME 6

Digitization & Database

T-6-OP-01

Imperial botanical drawings aid to taxonomy and nomenclature: A case study

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Since years botanical illustrations or colour drawings plays a vital tool when practicing taxonomy and nomenclature. The case in point, drawing commissioned under the supervision of Scottish botanist Nichol A. Dalzell. These drawings are proven to play an important role in the taxonomy and nomenclature of species described by him. The drawings, colored as well as line, commissioned under Dalzell's supervision are presently housed in Royal Botanic Gardens, Kew (K), Royal Botanic Garden Edinburgh (E) and Natural History Museum London (NHM). The drawings from E are reproduced in the 'Dapuri Drawings' which commissioned under Dalzell and Alexander Gibsons' supervision possibly for species appeared in Bombay flora. In the absence of original collections, with the help of drawings, two species of orchids *viz.*, *Habenaria modesta* Dalzell and *H. laciniata* Dalzell are resurrected as well as many drawings are considered for lectotypification. This study is possible due to the digitization of herbarium collections, botanical drawings and letters preserved in 'Director's correspondence'.

Keywords: Dalzell, Dapuri drawings, taxonomy.

T-6-OP-02

Digital morphometrics and its application in species differentiation: A case study in some species of *Argyreia* Lour. (Convolvulaceae)

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Genus *Argyreia* belongs to the family Convolvulaceae and comprises flowering plants commonly known as silvervine or elephant creeper. These plants are native to tropical and subtropical regions, including parts of Africa, Asia, and Australia. *Argyreia* species are known for their large, attractive flowers and are often cultivated for ornamental purposes. *Argyreia* plants typically have simple and alternate, large, broad leaves. The leaves can vary in shape, often being ovate or cordate, and have prominent veins. Morphometric analysis of the leaves of eight (8) species of the genus *Argyreia* was carried out using Elliptic Fourier Analysis (EFA). Principal component analysis (PCA) was performed based on variance-covariance matrix. Resulting PCs are utilized to create a dendrogram via neighbour joining method using Euclidean distance. The dendrogram revealed three major groups among the presently analysed species of *Argyreia*. Group-I was comprised of four species i.e., *A. pilosa, A. nervosa, A. boseana* and *A. sharadchandrajii*. *A. setosa, A. sericea* and *A. elliptica* formed the second group. Due to different leaf shape *A. cuneata* has been placed in last group. Present study reveals the importance of morphometric analysis in species differentiation based on leaf shape and structure and can be used as additional identification tool when combined with other methods.

Keywords: Elliptical Fourier Descriptors, leaf shape, morphometric analysis, outline analysis, PCA.

General Presentation (Poster)

THEME 1

Floristics, Plant Diversity & Conservation

T-1-PP-01

Plant diversity of Assam Don Bosco University campus: A floristic approach

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Plant diversity refers to the variety of plant species that exist on Earth. Plant diversity is crucial for maintaining healthy ecosystems and supporting human well-being. Taxonomic study of the flora and forests is vital for understanding and assessing the richness of the plant diversity. The study was carried out at Assam Don Bosco University Campus, which lies between 26°7'43" North latitudes and 91°54'6.52" East longitudes. The campus comprises 300 acres of land and shared boundary with South Amchang Wildlife Sanctuary. In the present study, 283 species representing 212 genera belonging to 73 families have been recorded. Among these, 259 species under 57 families and 192 genera are angiosperms (Dicot: 147 spp. and Monocot: 112spp.). Gymnosperms are represented by two species under two genera and two families, whereas pteridophytes are represented by 22 species under 14 families and 17 genera. Of the 73 families collected, the most dominant family is Poaceae (36 spp.), followed by Cyperaceae (29 spp.) and Fabaceae (19 spp.). Genus *Cyperus* L. was found the most dominant (17 spp.), followed by *Ficus* L. (10 spp.), *Senna* Mill. (6 spp.) and *Setaria* P. Beauv. (5 spp.). Due to over exploitation and deforestation in the natural habitat, a few of the presently reported plant species are categorized as Data Deficient (8 spp.), Near Threatened (3 spp.), and Least Concern (118 spp.) as per IUCN Red list Category. Strict conservational measures are to be taken to protect these plant species from becoming rare or endangered.

Keywords: Angiosperm, Assam, diversity, gymnosperm, pteridophyte.

T-1-PP-02

Lianas in North-eastern India: A checklist

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Lianas are woody, long-stemmed vines ranging from slender to moderately thick or gigantic, and they are the main components of many tropical forest ecosystems. The present study provides a checklist of all liana species available in the present political boundary of North-eastern India. The study is based on extensive literature scrutiny and herbarium examination. The study also provides up-to-date nomenclature, synonyms, and distribution within and outside North-eastern India. A total of 251 species under 126 genera and 56 families have been recorded based on all available literature. The maximum number of the species belongs to the genus *Combretum* Loefl. (10 spp.), followed by *Jasminum* L. (8 spp.), *Tetrastigma* (Miq.) Planch. (7 spp.), and *Piper* L. (7 spp.). In terms of family, Fabaceae (29 spp.) is the dominant one followed by Apocynaceae (21 spp.), Vitaceae (18 spp.), and Combretaceae (11 spp.). Out of the 251 taxa occurring in North-eastern India, four taxa, *viz*. *Erycibe peguensis* Prain, *Gnetum oblongum* Markgr., *Thunbergia coccinea* Wall. ex D.Don, and *Trachelospermum auritum* C.K.Schneid. have been recorded as rare species in the state of Meghalaya, whereas *Gnetum montanum* Markgr. has been recorded as a threatened taxa in the state of Tripura. The maximum diversity of the species among these North-Eastern regions of India was found in Assam (193 spp.), followed by Arunachal Pradesh and Sikkim (149 spp.), Meghalaya (126 spp.), Manipur (118 spp.), Mizoram (113 spp.), Nagaland (90 spp.), and Tripura (73 spp.). The North-eastern regions of India have a very rich diversity of liana species as far as the number of species is concerned.

Keywords: Liana, North Eastern India, rare, threatened.

T-1-PP-03

The magnitude and impact of plant invasion in threatening native flora of Vagamon Hills of South Western Ghats

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The Vagamon is a famous hill station and tourist destination located in Southern Western Ghats in Kerala. It is the foothill of Anamalai-High Range centre of endemism Grassland-forest ecosystem is the pristine vegetation type here. It was fragmented by the rise of large tea plantations during final decades of 19th century. Though the tea plantations became poor in biodiversity, the intervening camel-hump mountains, rock cliffs and extensive grasslands (total area: Approx. 12,500 ha) still maintain a rich biodiversity and so far, more than 800 species of flowering plants were collected and identified from here. About 25% of the total species are endemic to Western Ghats and more than 55 species of them were previously considered under various threat categories Native flora of this land had largely been replaced by plantations of Tea, Cardamom and Pepper introduced in the last century. Only a few patches of undisturbed land thrive with native flora. Recently, uncontrolled tourism activities are posing a significant threat to the remaining is landed native flora. The spread of invasive species is the second most significant threat to the native flora. In the present study, the threat posed by introduced, exotic and invasive plant species on the flora of Vagamon has been assessed. Plant survey studies has been conducted in manmade plantation areas, evergreen shola like forests patches on hill slopes, open grass lands, plantation areas and land patches used for tourism activities. Among the introduced plantation crops, even though they have severely affected the natural flora in the planted area, *Coffea arabica*, *Camellia sinensis* and *Pinus* sps. has not spread beyond the planted areas. However, there are more than 50 species that are believed to have been introduced deliberatively for ornamental purposes or accidently, have spread far and wide, mainly into the habitat of native flora. These species include *Lantana camera*, *Wedeliatri lobata, Tithonia diversifolia, Dicrarnopteris linearis, Cleome gynandra, Ipomea cairica, Merremia vitifolia, Eupatorium odoratum, Persicaria chinensis, Parthenium hysterophorum, Mikania cordata* etc. They have also been found in various locations like tea plantations, native grasslands and rocky patches and cliffs. The present study has revealed that introduced plantation crops are still confined to their planted areas and not posing a significant threat to native flora, while many of the introduced ornamentals and many exotic plants of unknown source of introduction have spread far and wide, posing a significant threat even in the native flora.

Keywords: Biodiversity threats, invasive species, native flora, plant invasion, Vegamon Hills, Western Ghats.

T-1-PP-04

Ex situ conservation of some endemic plant species of Western Ghats and Konkan

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Ex situ conservation is the process of protecting endangered species outside of their natural habitats. In this process, threatened plants taken out of their natural habitats and placed in special locations where they can be protected. The attempts were made to conserve the following 10 endemic species (2-herbs, 4-shrubs and 4-trees) in the Botanical Garden by using conventional methods. 1) *Adelocaryum coelestinum* (Lindl.) Brand (Boraginaceae) is endemic to Western Ghats and Near Threatened category of IUCN, 2) *Barleria lawii* T. Anderson (Acanthaceae) is endemic to Western Ghats, 3) *Calacanthus grandiflorus* (Dalzell) Radlk. (Acanthaceae) is Endemic to Northern Western Ghats and Near Threatened category of IUCN, 4) *Delphinium malabaricum* var. *ghaticum* Billore (Ranunculaceae) is restricted to northern Western Ghats of Maharashtra, 5) *Flacourtia montana* J.Graham (Salicaceae) is endemic to Western Ghats, 6) *Garcinia talbotii* Raizada ex Santapau (Clusiaceae) is endemic to Western Ghats and Least Concern category of IUCN, 7) *Nesphostylis bracteata* (Baker) D.Potter & J. J. Doyle (Fabaceae) is endemic to northern Western Ghats of Maharashtra, 8) *Piliostigma foveolatum* (Dalzell) Thoth. (Fabaceae) is endemic to Sahyadri region of Western Ghats, 9) *Syzygium stocksii* (Duthie) Gamble (Myrtaceae) is endemic to Western Ghats and Endangered category of IUCN and 10) *Vigna khandalensis* (Santapau) Sundararagh. & Wadhwa (Fabaceae) is endemic to Northern Western Ghats and Near Threatened category of IUCN.

Keywords: Botanical Garden, conservation, endangered, endemic, Konkan.

T-1-PP-05

Checklist of wild orchids at Sharavathi Lion Tailed Macaque Wildlife Sanctuary in Central Western Ghats, Karnataka, India

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Survey was conducted between 2022 and 2024 in Uttara Kannada and Shivmogga districts and identified about 94 wild orchids in Sharavathi Lion Tailed Macaque wildlife sanctuary. Out of which, 55 are epiphytic, 31 are terrestrial and 3 are mycotrophic. Out of 94 wild orchids, 37 are endemic to Western Ghats, 06 are endemic to Western Ghats and Eastern Ghats and 51 are common to India. The above list gives a brief note with phenology, location, distributional status and their endemism.

Keywords: Aginashini and Sharavathi river basin, endemic orchids, Orchidaceae.

T-1-PP-06

Floristic diversity of backwater sites of Thiruvananthapuram district, Kerala

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Backwater ecosystems hold immense ecological significance due to their unique ability to support diverse biological communities and to provide critical environmental services. This study explores the variety of plant species found in these backwater regions, emphasizing both aquatic and riparian flora. The backwaters, consisting of a network of brackish lagoons, lakes, canals, and estuaries, provide a conducive environment for a wide range of plant life, from mangroves and submerged aquatic plants to emergent and floating species. Field surveys were conducted in various backwater sites, including Poovar, Poonthura, Veli, Kadinamkulam, Anchutengu, and Edavaregions, to document and analyze species richness, composition, and distribution patterns. A total of 74 species were recorded, with notable representation from mangroves (*Avicennia, Rhizophora*) and aquatic macrophytes (*Hydrilla, Eichhornia*). Factors such as water salinity, tidal fluctuations, and anthropogenic disturbances influence species diversity. The study highlights the ecological importance of these backwater ecosystems in supporting a range of biodiversity. It also identifies threats such as pollution, invasive species, and habitat degradation that pose challenges to maintaining floristic diversity. Conservation strategies, including sustainable management and restoration efforts, are crucial to preserving the unique plant communities and ensuring the ecological integrity of the backwater sites of Thiruvananthapuram district. This research contributes to the understanding of the floristic composition of backwater ecosystems and provides baseline data for further ecological assessments and conservation initiatives in the region.

Keywords: Backwater ecosystems, macrophytes, mangroves.

T-1-PP-07

Distribution Patterns of the genus *Pittosporum* Banks ex Gaertn. in the Western Ghats: Insights from Herbarium Data and Expert Consultation

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The genus *Pittosporum* Banks ex Gaertn. (Pittosporaceae) is an important component of the flora of the Western Ghats, a region recognized for its rich biodiversity. This study aims to document the distribution patterns of Pittosporum species using herbarium records, previously published studies, and insights gained from expert consultation. Data on the geographical locations, regions, and altitudinal ranges of the species were gathered and analyzed. The results indicate that Pittosporum species are primarily located in the montane and semi-evergreen forests of the Western Ghats, with a particular concentration in high-altitude regions such as the Nilgiri Hills and the Anaimalai Hills. While detailed species richness and ecological data were limited, the distributional data provide valuable insights into the habitat preferences and altitudinal range of Pittosporum species. The findings highlight the importance of specific regions in the conservation of these species and underscore the need for further research to assess their conservation status more comprehensively. This study serves as a baseline for future taxonomic and conservation efforts focusing on Pittosporum in the Western Ghats.

Keywords: Distribution map, Pittosporum, Western Ghats.

T-1-PP-08

Dioecious plant diversity and their conservation status in the eastern Uttar Pradesh (Purvanchal), India

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Dioecy is a condition where staminate and pistillate flowers are present on separate individuals. These plants are prevalent among angiosperms and it is evaluated that only 6% of angiosperms show dioecy nature. Present work deals with an account of the dioecious plant diversity of Eastern Uttar Pradesh (Purvanchal). Eastern Uttar Pradesh surrounded by Gangetic-Ghagra plains in the middle, Terai region in the north and Vindhyan region in the south. Because of this the region supports diverse range of habitats or ecosystems and very rich in unique floristic diversity of angiosperms. Present study based on extensive fieldwork and herbarium studies as well as their conservation status according to the IUCN red list. We observed that these dioecious plants were commonly associated with multiple ecological traits such as herbs, shrubs, climbers or tree habits, fleshy fruits, and small, inconspicuous flowers. About 75 species (trees, climbers, herbs and shrubs) belonging to different families are reported in this field survey. Menispermaceae is the largest family followed by Euphorbiaceae and Moraceae. The dominating genera of dioecious flora belong to medium sized woody trees and woody climbers. The result indicates that dioecy is more common among woody plants with fleshy fruits in comparison to the herbs, shrubs and climbers. These plants contribute very low to the species richness of a plant community of the Eastern Uttar Pradesh. According to the IUCN data, the dioecious flora ofEastern Uttar Pradesh is categorized in different threatened criteria i.e., Least Concern (LC),Not Evaluated (NE) and Data Deficient (DD). It was observed that number of NE species are higher in all growth forms i.e., herbs, shrubs, trees, and climbers.

Keywords: Conservation, dioecious, diversity, flora, IUCN.

T-1-PP-09

Diversity and Distribution of some parasitic and semi-parasitic plant species of Korba District, Chhattisgarh, India

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From the floristic diversity of Chhattisgarh, the flowering plants predominate. The majority of the plants in this group are common autotrophic plants. On the other hand, only a relatively small percentage of plants are parasitic or semi-parasitic. Throughout their life cycle, semi-parasitic plants are able to carry out photosynthesis; they primarily absorb water and mineral salts that have been dissolved by their host plant. This paper focuses on the assessment of diversity and distribution of certain parasitic and semi-parasitic plant species of Korba district, Chhattisgarh. Intensive field work in the area revealed several species as parasitic and semi-parasitic including Cuscuta, Aeginatia, Dendropthoeetc. A general description of distribution at the district level is included, along with information on each species' host plant(s), status as a parasite or semi-parasitic, phenology, uses, and data on distribution in the area under study.

Keywords: Angiosperms, Chhattisgarh, diversity, Korba, parasitic plants, semi-parasitic plants.

T-1-PP-10

Is *Impatiens verecunda* Hook.f. (Balsaminaceae) considered a distinct species?

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The genus *Impatiens* includes around 1,120 species, with approximately 280 species reported from India, many of which are endemic to the Western Ghats. This study focuses on the taxonomic clarification of *Impatiens verecunda* Hook. f., a species was described by J.D. Hooker from specimens collected in the Idukki region of Kerala. Previous researchers, including Bhaskar (2012), had been uncertain about its identity, speculating that it may be synonymous with *I. anaimudica* C.E.C Fischer. However, due to the lack of recent collections, both species were retained as distinct in Bhaskar's treatment. During a recent field survey in Devikulam, interesting specimens of *Impatiens* were collected from rocky embankments. A detailed study of these specimens, alongside a thorough analysis of the type material of *I. verecunda*, revealed that the morphological features, including leaf arrangement, floral structure, and the presence of a purple spot at the base of the wing petals, align closely with *I. cordata* Wight. The differences in plant height and spur length, which initially distinguished *I. verecunda*, were attributed to environmental factors such as habitat conditions. As a result, *I. verecunda* is synonymized under *I. cordata*. Additionally, *I. anaimudica* remains a distinct species based on unique characteristics such as its pubescent stem, crimson flowers, and non-vaulted basal lobes of the lateral united petals. The study also highlights notable variations in *I. cordata* populations, particularly in life history strategies and floral morphology, leading to an amended species description. This research resolves long-standing taxonomic ambiguities within the genus.

Keywords: Devikulam, Idukki, *Impatiens verecunda*, *I. anaimudica*, Periyakanal, Travancore.

T-1-PP-11

Diversity of climbers and their conservation status in Sohagi Barwa Wildlife Sanctuary, Maharajganj, Uttar Pradesh, India

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Present study specially focuses on the floristic diversity of climbers and their conservation status in Sohagi Barwa Wildlife Sanctuary, Maharajganj, Uttar Pradesh. The plants which have climbing habits, frequently exhibit special horticultural usage due to their attractive characteristics. These plants have developed a variety of climbing mechanisms to help growth and development because their stems are weak. This data has been collected by extensive field surveys of the wild life sanctuary, herbarium studies and conservation status according to IUCN Red List. A total of 50 climbers, constituting 32 lianas and 18 vines, under 30 families, were recorded. Family Convolvulaceae included a maximum of 10 climber species. The property of twinning is seen in the plants are right or left-handed. It was also seen that the right-handed twinning is dominant in this area. Conservation status according to the IUCN data shows that the climbers in this area are categorized into different threatened criteria: Not Evaluated (NE), Data Deficient (DD),and Least Concern (LC).

Keywords: Climbers, diversity, IUCN, Lianas, sanctuary, vine.

T-1-PP-12

Diversity of Bamboos and Rattans in Bhuban hill, Assam, India

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Bamboos and Rattans are the most integral part of the ethnic communities particularly the forest dwellers of north-eastern India as they are used widely for food, medicine, household materials, furniture and other socio-cultural practices. These plants are also ecologically useful as they act as soil binder, fodder for many wild faunas and also play an important role as soil purifier. Lying in the Indo-Burma hotspot region, Bhuban hill range of southern part of Assam is a major hill range of the region which occupies *c.* 320 sq. km with lush green forest cover enriched with rich floral and faunal diversity. However, different natural calamities along with rapid growth of human inhabitation results in the increasing dependency of such people towards the forest products. This causes forest fragmentation and disturbance of the flora and fauna in the area. Therefore, documented approach of the floristic health is necessary to develop a conservation plan for their better sustenance. In this study, a total of 14 species including eight species of bamboos (Poaceae) and six species of rattans (Arecaceae) are documented from the Bhuban hill range. Their habitat, phenology, updated nomenclature, economic importance etc. are also provided.

Keywords: Arecaceae, Barak valley, floristics, monocotyledon, Poaceae, Southern Assam.

THEME 2

Nomenclature, Revision & Monograph

T-2-PP-01

Taxonomic status of *Coix lacryma-jobi* var. *stenocarpa* Oliv.

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Coix lacryma-jobi var. *stenocarpa* Oliv. was published in 1890. Later, Balansakept the taxon in a separate species hierarchy, *Coix stenocarpa* (Oliv.) Balansa in 1890. However, workers still accepted its original status. Thus, in present communication studied the morphology and cytology of *C. lacryma-jobi* var. *lacryma-jobi* and *C. lacryma-jobi* var. *stenocarpa*; and also discussed their delimiting characters and status.

Keywords: Coix, cytology, elongated utricles, grass, morphology, taxonomy.

T-2-PP-02

A comparative morphology of the genus *Bonnaya* Link & Otto (Linderniaceae) of Assam

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Bonnaya Link & Otto (Linderniaceae) of Assam is revised on the basis of morphological studies. Comparative diagnoses based on their morpho-taxonomic characters are made and presented in the form of coloured photoplates. A key to the genus of the four species of *Bonnaya*, including the new species *B. gracilis* is provided.

Keywords: Assam, Linderniaceae, species.

THEME 3

Biosystematics, Applied Taxonomy & Phylogeny

T-3-PP-01

Floral traits and their influence on pollination mechanisms in Papilionoideae

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The morphological intricacies of floral structures have long been a focal point of investigation within the Papilionoidea, particularly due to the intricate correlation between floral phenotypes and specific pollination syndromes. This study delves into the nuanced relationship between these floral characteristics and pollination strategies by conducting an extensive comparative analysis of various qualitative and quantitative floral attributes across multiple species of Papilionoideae, particularly those exhibiting keel flowers, from diverse genera indigenous to India. Through a combination of meticulous field observations and controlled laboratory examinations, a detailed assessment of floral morphology, including micromorphological features, and the spatial configuration and dimensionality of floral organs, was conducted. In addition, advanced statistical methodologies, such as Principal Component Analysis (PCA) and correlation matrices, were employed to unravel the complex interrelationships between floral traits and their corresponding pollination mechanisms. Moreover, a hierarchical clustering approach culminated in the generation of a dendrogram predicated upon floral trait similarity. The findings of this study reveal a convergence of floral characteristics among species sharing analogous pollination mechanisms, indicating a robust morphological alignment driven by pollinator-mediated selective pressures.

Keywords: Fabaceae, flower, Papilionoideae, pollination.

T-3-PP-02

Flowering phenology and floral biology of *Sesamum indicum* L. : an important jhum crop of Tripura

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Study of flowering phenology and floral biology can give insights into the reproductive biology and plant-pollinator relationship. The study attempted to assess the floral biology of *Sesamum indicum* L., grown in the jhum land of Tripura. *S. indicum* collected from different jhum lands of Tripura and have been investigated based on their morphological and palynological parameters. Present investigation has been focused on different phenological events like floral buds initiation, anthesis, pollen fertility, and pollen production. Flowering occurs from late September to November and the flower opens at 04:45–05:20 hrs. It takes about 60 days to convert flowers into mature Fruits. Flower longevity ranged between 42.00 to 48.00 hrs. Further, from the palynological observation, it can conclude that pollen grains are suboblate, multicolporate and showing highest fertility in Acetocarmine test. Stigma becomes more receptive at first day of flowering.

Keywords: Floral biology, Jhum land, *Sesamum indicum* L., Tripura.

T-3-PP-03

Morphological and palynological diversity of the family Melastomataceae of Assam

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Melastomataceae is a worldwide distributed angiospermic family comprising of 5400 species with fascinating vibrant flowers. . In Flora of Assam, Kanjilal & al. reported 8 genera and 18 species from this region. The members show great range of diversity in habit, habitat as well as in morphology. Palynology plays a crucial rule in plant taxonomy. The studied taxa have different exine ornamentation of pollens. These features are significant in delimiting the taxa belonging to the family Melastomataceae. The present study reveals the variation in floral morphology and palynology amongst the taxa belonging to the genera- *Melastoma, Osbeckia, Sonerilla, Sarcopyramis, Blastus, Pseudodissochaeta, Oxyspora* and *Medinila*. The variation can be seen mostly in male reproductive structures.

Keywords: Assam, diversity, Melastomataceae, morphology, pollen.

T-3-PP-04

Comparative study on the leaves of certain members of family Fabaceae Lindl., and Euphorbiaceae Juss.

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This paper is based on the comparative taxonomical and morphological studies on the leaves of family Fabaceae Lindl. and Euphorbiaceae Juss. that correlates these families and provide insights into their taxonomic relationships as well.

In family Fabaceae Lindl., also known as bean or legume family, we can observe arrangement of the leaves which are alternate and the leaves are simple or pinnately compound having multiple leaflets with reticulate venations having pulvinus leaf base. On the other hand, in family Euphorbiaceae Juss. also known as Spurge Family, we can observe the arrangement of leaf as alternate, opposite or whorled. We can also see the simple, lobed, trifoliate, and palmately compound leaf. This family is also known for its extrafloral nectaries.

This study will also provide the description and explanation of the similarities and variations between these two families with the help of taxonomical characteristics such as phyllotaxy, leaf apex, leaf base, and other characters which will help us to understand the difference in both the families.

Keywords: Euphorbiaceae, Fabaceae, plant taxonomy, taxonomical characteristics.

T-3-PP-05

An anatomical and micro-morphological investigation of Indian *Stachytarpheta* Vahl (Verbenaceae)

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Stachytarpheta Vahl, one of the species rich genera and a monophyletic genus of the family Verbenaceae, is characterized by its herbaceous or shrubby habit and flowers having two functional stamens and two staminodes. It is native to Africa and Latin America, though largely introduced to different countries almost throughout the globe. Presently around 121 species of this genus are distributed worldwide, among which India shelters only 4. In the present research 3 among the 4 species of the country, namely *S. cayennensis* (Rich.) Vahl, *S. jamaicensis* (L.) Vahl and *S. mutabilis* (Jacq.) Vahl were selected for anatomical and micro-morphological investigation to evaluate taxonomic significance of the observed morpho-anatomical traits. For this purpose light microscopic and SEM analysis have been performed. Based on the current findings, UPGMA and PCA analysis were done to establish relationship among the studied species.

Keywords: Node, PCA, petiole, stomata, trichome, UPGMA, venation.

THEME 4

Ethnobotany, Indian Knowledge System (IKS) & Bioprospectation

T-4-PP-01

Ethno-medicinal studies on indigenous wetland plants of Balia district of Uttar Pradesh India

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Wetlands in Balia district of Uttar Pradesh, particularly Surha Tal, ecosystems are rich in biodiversity, supporting a variety of economically valuable and rare plant taxa. The paper deals with wetland medicinal plant diversity of Surha Tal. Field observation and other literature studies have indicated that Balia district has 75 medicinally important species belonging to 38 genera and 30 families of angiosperms. Some important medicinal plants are *Bacopa monnieri, Centella asiatica, Cyperus rotundus, Eclipta prostrata, Ipomoea aquatica* and *Vetiveria zizanoides* etc. Botanical names, local name, family, and medicinal uses of species are provided in this paper.

Keywords: Agriculture, biodiversity, conservation, wetlands.

T-4-PP-02

An Ethnobotanical Study and the Role of Traditional Knowledge in the Protection of Plant Species of Tinsukia District of Assam

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Biological resources and traditional knowledge associated with them are the foundation of human civilization and it depicts the cultural identity of a community. Utilizing biological resources in herbal medicine is widely popular in Assam as it is useful in common healing practices among the Indigenous people. For the present study, a survey was conducted to investigate and document various plants used by the Deori tribes of the Tinsukia district of Assam. In the survey, 11 key informants were selected purposively and 100 informants (36 females and 64 males) between the ages of 34 and 78 were selected randomly from 4 villages. The data were collected for ethnobotanical and demographic detail using semi-structured questionnaires, group discussions, and field observation. It was observed that the educational attainment of the informants in the areas varies and has a variety of occupations, including farmers, livestock rearing, local traditional healers (practitioners), and herbalists. A total of 74 plant species (32 families) were documented. The medicinal uses of these plants include, stomach disorders, gynecological problems, fistula, kidney stones, urinary infections, respiratory diseases and skin diseases. The most widely use method of preparation was crushing, and the mode of administration was decoction, Asteraceae is the most dominant family and herbs were most abundant while the most frequently used part was leaves. The results were presented in tabular form and analyzed by descriptive statistics and some ethnobotanical analysis tools. Through this paper, an attempt is made to study the rich traditional knowledge of plant species and their various useful properties.

Keywords: Biological resources, decoction, ethnobotany, traditional knowledge.

T-4-PP-03

Ethnobotanical Insights into Wild Edible Plants Utilized by the Galo Community of Arunachal Pradesh

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Present study focuses on the ethnobotanical knowledge of Galo tribe in Arunachal Pradesh. During the course of project numerous field tours were conducted to the parts of major habitats of Galo community such as West Siang, Lower Siang and Leparada districts which yielded in the elucidation of 150 taxa which are edible and used for their medicinal properties. These plants have been an integral part of their culture and livelihood. Galo people's sustainable harvesting practices aids in balancing biodiversity of the ecologically rich Eastern Himalaya. This study particularly aims in finding potential economic benefits and better market strategies to support the sustainable commercialisation of the natural resources through the valuable traditional knowledge.

Keywords: Cultural practices, economic benefits, community livelihoods, sustainable commercialization, West Siang, Lower Siang, Leparada.

T-4-PP-04

Understanding the aluminium tolerance mechanisms in accumulator plants for phytoremediation potential in acidic soils : A comprehensive review

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Aluminum (Al) toxicity in acidic soils is a major obstacle to plant growth and crop productivity. However, several plant families, including Melastomataceae, Theaceae, and Fabaceae, contain species uniquely adapted to tolerate and accumulate high levels of Al. This review compiles current insights into the physiological, biochemical, and molecular mechanisms that support Al tolerance in these species, highlighting processes like sequestration, exclusion, and detoxification, as well as the influence of soil conditions on these responses. Emphasis is placed on the phytoremediation potential of Al-accumulating plants, offering insights into their suitability for restoring and optimizing acidic soils through nutrient adjustments This synthesis provides a basis for employing these resilient species in sustainable soil management, helping to improve agricultural resilience in Al-affected regions.

Keywords: Accumulators, Fabaceae, Melastomataceae, phytoremediation, Theaceae.

T-4-PP-05

Taxonomic categorization of ornamental flora utilized for phytoremediation

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Environmental contamination poses a significant threat to this evolving biota. Ornamental plants are aesthetically pleasing and economically beneficial alternative for remediation of contaminants. The wide variety of shapes and colours of ornamental plants bring to the environment the possibility of landscape intervention offering advantages that include economic benefits, incentivizing the maintenance of the treatment of areas. This study presents a compilation of ornamental plants utilized for the phytoremediation of diverse contaminants over the past five years, spanning from 2019 to 2024. They were subsequently organized into their appropriate taxonomic categories. Following the examination of 64 scholarly articles, it was determined that 59 ornamental plants are employed for phytoremediation purposes. A total of 41 plant species were identified as effective in remediating heavy metals, while nine species were recognized for their ability to remediate organic contaminants. The findings indicated that the quantity of ornamental plants classified as eudicots exceeded that of monocots utilized for phytoremediation. Within the eudicots, the clade Asteridae exhibited the greatest number of members utilized in phytoremediation, while in the monocots, the lilioid and commelinid groups showed a higher prevalence. This study suggests that Asteridae, as a successful lineage of angiosperms, possesses the ability to effectively remove contaminants.

Keywords: Asterids, eudicot, monocot, ornamental plants.

THEME 5

Medicinal Plants & Drug Discovery

T-5-PP-01

Diversity of *Acampe* (Lindl.) species in Kerala and a comparison of their phenolic content, antioxidant activity and antimicrobial potential

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The different species of *Acampe* Lindl. (family Orchidaceae) from Kerala was subjected to a comprehensive taxonomic study. Globally, this genus consists of ten species; however, in Kerala, four distinct species such as *Acampe ochracea* (Lindl.) Hochr; *Acampe congesta* (Lindl.) Lindl.; *Acampe praemorsa* (Roxb.) Blatt. & McCann; *Acampe rigida* (Buch. - Ham. ex Sm.) P.F. Hun have been identified and documented. A detailed taxonomic treatment of these taxa has been undertaken, which includes thorough descriptions of each species and some morpho variants.

In addition to morphological descriptions total phenolic content of the roots and leaves were compared and antioxidant potential of the extracts was assessed. Antimicrobial potential of these species against some gram-positive and gram-negative bacteria were assessed.

From the results of ABTS radical scavenging capacity, it may be interpreted that *Acampe ochracea* and *A. praemorsa*, among all species, inhibit or scavenge the radical in a dose dependent manner with highest percentage inhibition (47.6% and 40.2% respectively) noticed at 100 µg/ml. The mean values across the concentration range, clearly indicated the potential of *Acampe ochracea* in scavenging DPPH free radicals as 61.8 percentage inhibition at 100 µg/ml when compared to other *Acampe* species. The results of the FRAP assay also showed considerable amounts of antioxidant effects from 15.9 µmol of FeSO4/g of to 27.8 µmol of FeSO4/ g in DMSO extract. Also, FRAP values, in other species were optimal ($P < 0.05$) and was comparable to α-tocopherol (10 mg/L) as the reference compound. Phenolic extracts of the roots displayed optimal activities than leaf extracts in *Acampe rigida*.

Keywords: *Acampe congesta, Acampe ochracea, Acampe rigids, Acampe praemorsa*, antioxidant activity, antioxidant potential, phenolic content.

T-5-PP-02

Evaluation of anti- inflammatory activity of *Justicia santapaui* Bennet

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The Traditional Systems of medicines always played important role in meeting the health care needs. Medicinal plants are the backbone of traditional medicine. Popular observations on the use and efficacy of medicinal plants significantly contribute to the occurrence of their therapeutic properties. Thetherapeutic potential of a medicinal plantis due to the presence of some bioactive components and it is called as phytochemicals or secondary metabolites. *Justicia santapaui* Bennet, is an endemic plant belonging to the family Acanthaceae. It is an undershrub and is distributed in the Southern Western Ghats. Traditionally, it is known to be useful for the treatment of arthritis. Rheumatoid arthritis (RA) is a chronic, disabling, and progressive autoimmune disease in which chronic proliferative synovitis and synovial inflammation are observed with significant bone destruction and cartilage destruction resulting in significant joint damage and reduced functionality. During the establishment and development of rheumatoid arthritis, many inflammatory mediators play a key role in bone destruction and inflammation of the synovial membrane, including tumor necrosis factor (TNF-α), interleukin-1β, interleukin-6, nitric oxide (NO), prostaglandins, reactive oxygen species (ROS), platelet-activating factor, leukotrienes, enzymes (lipoxygenases, cyclooxygenases (COX-1 and COX-2), and phospholipases. Various nonsteroidal anti-inflammatory drugs have been shown to reduce pain and inflammation by blocking the metabolism of arachidonic acid by isoform of cyclooxygenase enzyme. Unfortunately, there are many side effects associated with the administration of nonsteroidal anti-inflammatory drugs. Therefore, in the present study, the anti-inflammatory activity of *J. santapaui* is being determined through the protein denaturation and inhibition assay as a preliminary study. Alkaloids are present in copious amount, a need to isolate this metabolite responsible for the anti-inflammatory activity is essential. These findings can act as an aid for those researchers involved in the field of drug discovery.

Keywords: Anti-inflammatory, autoimmune, endemic plants, inflammation, secondary metabolites.

T-5-PP-03

Formulation of Phytosomes Containing Essential Oils of *Syzygium aromaticum* for Antidermatophytic Activity: In Vitro Evaluation

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Over the past few decades, there has been an exponential increase in the prevalence of superficial fungal infections worldwide as a result of immunocompromised persons and rising antifungal resistance. The most prevalent type of fungal infections on the skin worldwide are superficial ones. Although there are many antifungal agents in market but due to their side effect and resistance in fungi herbal compounds can be a good alternative. As it known to that plants have good antimicrobial ability due to presence of alkaloids, phenolics, terpenoids etc. In this study we aimed to develop a drug delivery system for the essential oils (EOs) of *Syzygium aromaticum* L. which is a member of Myrtaceae family. The essential oils of *Syzygium aromaticum* are contains eugenolin large amount followed by caryophyllene which was proved by GCMS analysis. The EOs also have very good antidermatophytic activity against three dermatophytes namely *Trichophyton rubrum, T. mentagrophytes* and *Microsporum gypseum*. The vesicles size of phytosomes was evaluated by DLS (Dynamic Light Scattering) and the stability was by zeta potential analysis. The prepared phytosomes having good entrapment efficiency and drug release profile. Further due to having good antidermatophytic, antioxidant ability EOs of *Syzygium aromaticum* could be a better herbal alternative of commercial antifungal agents.

Keywords: *Syzygium aromaticum*, phytosomes, antidermatophytic, eugenol, GCMS.

T-5-PP-04

In silico exploration of phytoconstituents from medicinal plants for mitigating THC-induced neurotoxicity: A computational approach

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The digitization of traditional medicinal knowledge has opened new avenues for exploring the therapeutic potential of phytoconstituents through in silico approaches. This study investigates the neuroprotective properties of bioactive compounds from medicinal plants traditionally used by indigenous communities in the Barak Valley, Assam, against Δ9-tetrahydrocannabinol (THC)-induced neurotoxicity. Leveraging computational tools such as molecular docking, pharmacophore modeling, and ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) predictions, we identified key phytoconstituents that can mitigate the neurotoxic effects of THC.

Our analysis focused on the interaction of these compounds with critical neurotoxic pathways, including oxidative stress, mitochondrial dysfunction, and neuroinflammation. By creating a digitized repository of molecular interactions, we developed a predictive model to assess the therapeutic efficacy of plant-derived compounds. Preliminary results suggest that select phytochemicals exhibit significant binding affinities towards molecular targets implicated in THC-induced neurotoxicity, offering potential for further experimental validation and drug development.

This in silico study not only highlights the relevance of traditional medicinal plants in neuroprotective research but also emphasizes the importance of digitizing ethnobotanical data for advancing drug discovery. The findings provide a foundation for future in vivo studies, potentially leading to novel therapeutic interventions for cannabinoid-induced neurodegeneration.

Keywords: THC- induced neurotoxicity, medicinal plants, in silico analysis, phytoconstituents, molecular docking, neuroprotection, ethnobotanical digitization.

T-5-PP-05

Comparative analysis of the effects of two species of *Curcuma* genus - *Curcuma caesia* Roxb. and *Curcuma amada* L. on Diabetic Nephropathy

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Diabetic Nephropathy (DN) is one of the major complications of diabetes, leading to end-stage renal disease. Advanced glycation end-products plays crucial role in initiation and progression of this disease. The interaction between AGEs and its receptor plays majorly contributes in enhancing the factors like oxidative stress, inflammation, damage to kidney tissues, that leads in the progression of DN. Since centuries, traditional medicinesare long been utilized plan for treating diabetes and its related complications. Among such botanicals, species from *Curcuma* genus are noted for their bioactive compounds with therapeutic potential. *Curcuma caesia* Roxb. and *Curcuma amada* L. are rich in secondary metabolites and exhibit strong pharmacological properties such as antioxidant, anti-inflammatory, anti-diabetic and renal-protective effects.This study compares the efficiency of both species including their potential antioxidant activity, presence of phytocompounds, pharmacological properties and using advanced in-silico approach, predicts best natural compounds with drugs like properties and better binding affinities to target RAGE between these two species of Curcuma genus, which would probably play an efficient role in controlling of the disease. The comparative findings suggests that both *Curcuma caesia* and *Curcuma amada* might have a promising effect in treatment of DN and further in vitro or in vivo studies would ascertain optimal concentration, proper therapeutic application, safety measuresin regulating DN progression.This could also suggest the potential increase in the use of these endangered species of *Curcuma* genus, more as an integrative approach to DN therapy.

Keywords: Advanced glycation end products, *Curcuma amada* L., *Curcuma caesia* Roxb., diabetic nephropathy, receptor for AGEs.

T-5-PP-06

Targeting MurG-Driven Peptidoglycan Biosynthesis in *Escherichia coli*: A Computational Study of *Cajanus cajan* Phytochemicals

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MurG, a membrane-associated glycosyl transferase, catalyzes the transfer of N-acetylglucosamine (GlcNAc) from UDP-GlcNAc to lipid I, producing lipid II, a key precursor in bacterial peptidoglycan biosynthesis. This step is essential for cell wall construction, and inhibiting MurG disrupts this process, resulting in defective peptidoglycan formation and bacterial lysis. As a crucial enzyme for the survival of *Escherichia coli*, MurG is a promising target for developing antibacterial drugs. However, challenges such as toxicity, off-target effects, and drug resistance limit the success of existing inhibitors. In this study, bioactive compounds from *Cajanus cajan* (pigeon pea) were identified through liquid chromatography-mass spectrometry (LC-MS) and evaluated as potential MurG inhibitors. Molecular docking using Molegro Virtual Docker 6.0 revealed that several phytochemicals exhibited high binding affinities to MurG's active site, interacting efficiently with both the lipid substrate and the sugar donor. These interactions potentially block the transfer of GlcNAc to lipid I, halting lipid II formation and impairing peptidoglycan biosynthesis. ADMET analysis confirmed that the identified phytochemicals have favorable pharmacokinetic properties and minimal toxicity, supporting their potential as selective MurG inhibitors. This study highlights the potential of *Cajanus cajan* phytochemicals to address challenges in antibacterial drug development by providing natural, low-toxicity inhibitors. Insights from molecular docking offer valuable guidance for the design of selective inhibitors that may overcome resistance. These findings lay the foundation for further in vitro and in vivo investigations, contributing to the development of novel antibiotics targeting multidrug-resistant bacteria.

Keywords: Antibacterial agents, *Cajanus cajan*, Glycosyl transferase MurG, molecular docking, peptidoglycan.

T-5-PP-07

In-silico screening of phytochemicals from *Curcuma longa* L. against Rheumatoid Arthritis

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Rheumatoid arthritis is a chronic autoimmune inflammatory systemic disorder of unknown aetiology commonly affecting the joints. It is a disorder that is due to Interleukin-1 and Tumour necrosis factor alpha, which increase chondrocyte catabolic pathways and matrix destruction of cartilage, synovium and bone destruction. *Curcuma longa* L.(turmeric), a member of the Zingiberaceae family is traditionally used in regular household spice and Ayurvedic medicine due to its anti-inflammatory, anti-carcinogenic, anti-diabetic and anti-microbial properties. Turmeric constituents include three curcuminoids: curcumin (diferuloylmethane; the primary constituent), demethoxycurcumin, and bisdemethoxycurcumin, as well as volatile oils (tumerone, atlantone, and zingiberone), sugars, proteins, and resins. Research shows Curcumin and its derivatives modulate the inflammatory response by down-regulating the activity of COX-2, lipoxygenase, and iNOS enzymes; inhibiting the production of the inflammatory cytokines, TNF-A and IL-1. This In-silico screening aimed to determine the binding efficacy of curcumin and its derivatives to TNF-A and IL-1 proteins. The structures of protein and different derivatives of curcumin were obtained from PDB, PubChem and ChEMBL databases. The different in-silico screenings were done and Molecular Docking analysis were performed using Molegro Virtual Docker 6.0 software and results were analysed based on the MolDock score and H-bond score of the compounds along with their respective positive controls. The results of the study show curcumin derivatives have strong inhibitory effects against TNF-A and IL-1. Therefore, the bioactive compounds from *Curcuma longa* L. might have a promising effect on the treatment of rheumatoid arthritis and could be used as a therapeutic anti-inflammatory agent to treat rheumatoid arthritis.

Keywords: Anti-inflammatory, Curcumin, *Curcuma longa* L., In-silico, IL-1, rheumatoid arthritis, TNF-A.

T-5-PP-08

In silico approach to validate efficacy of selected natural compounds targeting HIF-1α to treat Diabetic Retinopathy

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Diabetes is one of the metabolic disorders from which a huge population has been affected globally. A number of factors promote diabetes and in long term affects various other parts of the body. Diabetic Retinopathy (DR) is the cause of long-term complications of diabetes appearing in the eyes. The transcriptional regulator hypoxia-inducible factor (HIF) mediates the cellular response to hypoxia. Studies have demonstrated that one HIF isotype, HIF-1α, is important in hypoxic conditions and that retinal neovascularization is influenced by its target genes. Thus, DR treatments may be more effective if HIF-1α is targeted. Natural products provide effective bioactive compounds with diverse therapeutic effects. In the present study, suitable phytocompounds were studied from the available literature from various databases. The phytocompounds were screened using various conventional and advanced in-silico approaches. Molecular docking against the target HIF-1α with ligands have provided potential phytocompounds that are found to have better binding affinities with the target than the known inhibitors. Thus, the findings suggest natural phytocompounds can be potential drug candidate for the treatment of Diabetic retinopathy.

Keywords: Diabetes, diabetic retinopathy, HIF-1α, molecular docking, phytocompounds.

T-5-PP-09

Medicinal properties of Oxalis species: A review of conventional and modern uses

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Oxalis L. (Oxalidaceae) is a large and diverse genus of flowering plants with approximately 557 species globally, including 18 species in India, 7 species in Northeast India, and 4 species in Assam. The genus is rich in representatives with diverse life forms, and its species have adapted to a wide range of ecological conditions. The medicinal properties of *Oxalis* species include antioxidant, anti-inflammatory, antimicrobial, and antidiabetic activities. While many *Oxalis* species are known to be invasive or weedy, they also hold significant values in traditional and folk medicines across different cultures. This review aims to provide a comprehensive overview of the medicinal properties of the genus *Oxalis*, summarizing the existing literature on its pharmacological applications. By consolidating available data, this paper highlights the therapeutic potential of *Oxalis* species.

Keywords: Ethno-medicine, natural therapeutics, pharmacology, taxonomy.

T-5-PP-10

In silico screening of pajaneelin from *Pajanelia longifolia* and its derivatives for anti-hepatocellular carcinoma activity

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Hepatocellular carcinoma (HCC) is one of the most prevalent forms of liver cancer, representing a significant health challenge worldwide. Natural compounds derived from medicinal plants offer a promising avenue for therapeutic development. Pajaneelin, a bioactive compound isolated from *Pajanelia longifolia*, has demonstrated potential hepato-protective properties. In this study, we employed in silico methods to screen pajaneelin and its derivatives for anti-hepatocellular carcinoma activity. Molecular docking and ADMET (Absorption, Distribution, Metabolism, Excretion, and Toxicity) predictions were used to assess binding affinities and drug-likeness with key HCC-related targets, including kinases and apoptotic proteins. Pajaneelin and selected derivatives exhibited high binding affinities with targets like RTK (Receptor Tyrosine Kinase) in comparison to the drugs available in the market and known inhibitors suggesting their potential efficacy as HCC inhibitors. ADMET analysis confirmed favourable pharmacokinetic and safety profiles, highlighting several derivatives for further in vitro and in vivo evaluation. Our findings indicate that pajaneelin derivatives, optimized through computational approaches, could serve as potential lead compounds in the development of novel anti-HCC therapies.

Keywords: Hepatocellular carcinoma, molecular docking, ADMET, computer-aided-drug designing.

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Immunoprotective Phytotherapeutic role of Traditional Medicinal plantsused by the Hmar community of Barak Valley Assam, India

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The phytotherapeutic properties of various medicinal plants have been explored from time immemorial for curing different diseases and promoting good health. This serves to provide immunoprotection by boosting our immune mechanisms in various diseases. Our immunity has an immense role to play in defending against the disease-causing antigens and synthesizes some biomolecules called immunoglobulins which take part in the defense mechanisms. A comprehensive study of traditional medicinal remedies has provided information about pharmacologically active phytoconstituents that can be used for providing immunoprotection. Various medicinal plants are used by the Hmar community of Barak Valley, Assam, and local healers use them for immunoprotection.

Keywords: Defense mechanism, immunoglobulin, immunoprotection, local healers, medicinal plants, pharmacological, phytoconstituents, phytotherapeutic, traditional.

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