ST. JOSEPH'S COLLEGE (AUTONOMOUS)
DEVAGIRI, KOZHIKODE, KERALA, INDIA - 673008

In collaboration with

MALABAR BOTANICAL GARDEN AND INSTITUTE FOR PLANT SCIENCES (MBGIPS – KSCSTE)

XXXV ANNUAL CONFERENCE OF INDIAN ASSOCIATION FOR ANGIOSPERM TAXONOMY AND INTERNATIONAL SYMPOSIUM ON GLOBAL PERSPECTIVES IN ANGIOSPERM SYSTEMATICS, TRADITIONAL KNOWLEDGE AND BIODIVERSITY CONSERVATION

November 21–23, 2025

PROGRAMME & ABSTRACTS

Anusandhan National Research Foundation
भारतीय वनस्पति सर्वेक्षण BOTANICAL SURVEY OF INDIA

XXXV ANNUAL CONFERENCE OF INDIAN ASSOCIATION FOR ANGIOSPERM TAXONOMY AND INTERNATIONAL SYMPOSIUM ON GLOBAL PERSPECTIVES IN ANGIOSPERM SYSTEMATICS, TRADITIONAL KNOWLEDGE AND BIODIVERSITY CONSERVATION

November 21–23, 2025

Invited Talks

&

Abstracts

Organized by

St. Joseph's College (Autonomous)
Devagiri, Kozhikode, Kerala, India – 673 008
(Accredited A++ grade by NAAC & Ranked 74 by NIRF)

in collaboration with
Indian Association for Angiosperm Taxonomy (IAAT)

Co-organizer
Malabar Botanical Garden and Institute of Plant Sciences (MBGIPS – KSCSTE)

Title
XXXV Annual Conference of Indian Association for Angiosperm Taxonomy and International Symposium on Global Perspectives in Angiosperm Systematics, Traditional Knowledge and Biodiversity Conservation

Invited Talks & Abstracts

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Kerala State Biodiversity Board (KSBB)

Kerala State Council for Science, Technology and Environment
(KSCSTE)

Message

It gives me great joy to convey my warm greetings and best wishes to all the delegates, researchers, and academicians participating in the XXXV Annual Conference of the Indian Association for Angiosperm Taxonomy (IAAT) and the International Symposium on Global Perspectives in Angiosperm Systematics, Traditional Knowledge, and Biodiversity Conservation, hosted by St. Joseph's College (Autonomous), Devagiri.

This conference, coinciding with the Coral Jubilee of IAAT, stands as a testimony to the sustained efforts of the scientific community in understanding, documenting and conserving the rich plant diversity of our planet. I am delighted that our college is hosting the event that unites eminent botanists and young scholars from India and abroad in the shared mission of advancing knowledge in taxonomy and biodiversity conservation.

As an institution guided by the vision of holistic education and environmental consciousness, St. Joseph's College continues to uphold its commitment to nurturing scientific inquiry and promoting ecological responsibility. I trust that the deliberations and outcomes of this conference will inspire new perspectives and collaborative efforts toward the preservation of our natural heritage.

I extend my hearty congratulations to the Department of Botany and the organizing committee for their tremendous efforts in bringing together this esteemed gathering. May this event be intellectually enriching and contribute meaningfully to the global discourse on plant science and conservation.

With blessings and best wishes,

Dr. Fr. Biju John Vellakkada CMI
Provincial
St. Thomas Province, Kozhikode, Kerala, India

30/10/2025

Message

It gives me immense joy to extend a warm and cordial welcome to all the distinguished delegates, invited speakers, eminent researchers, academicians, and enthusiastic students who have gathered to participate in the XXXV Annual Conference of the Indian Association for Angiosperm Taxonomy (IAAT) and the International Symposium on "Global Perspectives in Angiosperm Systematics, Traditional Knowledge, and Biodiversity Conservation." This momentous event, hosted by St. Joseph's College (Autonomous), Devagiri, from 21st to 23rd November 2025, marks a significant milestone in our collective pursuit of scientific knowledge and collaboration. The conference brings together a vibrant community of scholars and professionals dedicated to advancing the study of angiosperm taxonomy and related disciplines. It provides a unique opportunity to exchange ideas, share the latest research developments, and explore innovative approaches in plant systematics, biodiversity conservation, and the integration of traditional knowledge with modern scientific perspectives. I am confident that the deliberations and interactions that unfold will inspire meaningful collaborations and contribute profoundly to the growth of botanical sciences at the national and global levels.

Hosting this prestigious academic event during the Coral Jubilee of IAAT is a matter of great honour and pride for our institution. I believe that this conference will provide an excellent platform for sharing innovative ideas, research findings, and contemporary perspectives in the fields of plant systematics, taxonomy, phytochemistry, and biodiversity conservation. It will also serve as a meaningful space for fostering collaborations and inspiring the next generation of plant scientists.

I extend my heartfelt appreciation to the Indian Association for Angiosperm Taxonomy (IAAT), Malabar Botanical Garden and Institute of Plant Sciences and the Department of Botany of St Joseph's College (Autonomous) Devagiri, Kozhikode for their unwavering commitment and dedicated efforts in organizing this prestigious event. Bringing together a gamut of scholars, researchers and students from diverse institutions and disciplines is no small feat—it reflects the shared vision and collective enthusiasm for advancing the frontiers of botanical science. The meticulous planning, academic rigor, and collaborative spirit demonstrated by the organizing team under the leadership of Dr. Manudev K.M deserve the highest commendation. I am confident that the thought-provoking deliberations, insightful presentations and meaningful interactions that will take place during this conference will not only enrich our understanding of plant

systematics and taxonomy but will also contribute substantially to the broader goals of biodiversity conservation and sustainable environmental management. Such gatherings play a pivotal role in fostering scientific curiosity, nurturing young minds, and strengthening the global network of plant scientists dedicated to preserving the natural heritage of our planet.

I wish the conference and symposium a grand success and hope it gives an intellectually enriching experience for all participants.

Dr. Fr. Biju Joseph
Principal
St. Joseph's College (Autonomous), Devagiri

24/10/2025

Message

I extend my warm greetings to all the delegates participating in the XXXV Annual Conference of the Indian Association for Angiosperm Taxonomy (IAAT) and the International Symposium on Global Perspectives in Angiosperm Systematics, Traditional Knowledge and Biodiversity Conservation, hosted by the Department of Botany, St. Joseph's College (Autonomous), Devagiri.

The conference marks a significant milestone as it coincides with the Coral Jubilee of the IAAT known for its thirty-five years of remarkable contributions to the advancement of plant taxonomy and systematics in India and beyond. It is indeed an honour for our institution to host this prestigious scientific gathering, bringing together distinguished taxonomists, researchers, and young scholars from across the globe.

At St. Joseph's College, we have always upheld the vision of promoting academic excellence and fostering research that contributes meaningfully to environmental stewardship and sustainable development. I am confident that the deliberations and discussions during this conference will inspire collaborative research and innovative approaches towards the conservation of plant diversity.

I congratulate the Department of Botany and the organizing committee for their sincere efforts in hosting this landmark event and wish the conference all success in achieving its academic and scientific goals.

With warm regards,

FR. BIJU K ISSAC CMI
Manager
St. Joseph's College (Autonomous)
Devagiri, Kozhikode - 673 008

Fr. Biju K. Issac CMI
Manager
St. Joseph's College (Autonomous), Devagiri
Kozhikode, Kerala, India

30/10/2025

Foreword

It is with immense pride and joy that I welcome you all to the XXXV Annual Conference of the Indian Association for Angiosperm Taxonomy (IAAT) and the International Symposium on "Global Perspectives in Angiosperm Systematics, Traditional Knowledge, and Biodiversity Conservation", which is to be held from 21st to 23rd November 2025 at St. Joseph's College (Autonomous), Devagiri, Kozhikode, Kerala.

As we celebrate this Coral Jubilee Conference, it is indeed an honour for the Department of Botany to host this prestigious event that convenes scientists, researchers, educators, and students from across the globe.

The challenges of the 21st century remind us of the pressing need to view plant science through an integrated lens. Angiosperm systematics continues to form the foundation of our understanding of plant diversity, Traditional Knowledge guides us towards sustainable living and Biodiversity Conservation remains the most urgent call of our time. This symposium offers a vibrant platform where these realms converge scientific innovation with ancestral wisdom—to explore meaningful solutions for protecting our planet's floral heritage.

Over the course of three days, this erudite gathering will provide a space for sharing ideas, presenting pioneering research and fostering collaborations that will inspire both current and future generations of taxonomists and conservationists.

I warmly invite all speakers, delegates, participants, students and organizers to engage wholeheartedly and contribute to making this conference a truly memorable and impactful event.

With warm regards,

Dr. Delse P. Sebastian
Head, Department of Botany &
Convener,
XXXV Annual Conference of IAAT
St. Joseph's College (Autonomous), Devagiri

24/10/2025

Preface

It gives me immense pleasure to present the Abstract Book for the XXXV Annual Conference of the Indian Association for Angiosperm Taxonomy (IAAT), organised by the Department of Botany, St. Joseph's College (Autonomous), Devagiri, Kozhikode, Kerala, in collaboration with the Malabar Botanical Garden and Institute for Plant Sciences, scheduled to be held from 21st to 23rd November 2025. Commemorating the Coral Jubilee of the Indian Association for Angiosperm Taxonomy, this conference marks a significant milestone, celebrating 35 years of academic excellence, scientific collaboration and remarkable contributions to the advancement of angiosperm taxonomy.

Over the years, the IAAT Annual Conferences have evolved into premier gatherings for taxonomists, systematists, conservation biologists, phytochemists, ethnobotanists, and young researchers from across the country and abroad. This year's meeting continues that legacy under the broad theme: Global Perspectives in Angiosperm Systematics, Traditional Knowledge and Biodiversity Conservation. The thematic sessions of the conference encompass a wide range of topics, including:

1. Advances in Angiosperm Systematics
2. Molecular Phylogenetics and DNA Barcoding
3. Floristic Diversity and Biogeography
4. Ethnobotany and Indian Traditional Knowledge
5. Biodiversity Conservation
6. Climate Change and Plant Adaptation
7. Digital Taxonomy and AI Applications in Botany
8. Economic Botany and Sustainable Utilization of Plant Resources
9. Plant–Animal Interactions in Ecosystem Dynamics
10. Phytochemical Studies and Bioactive Compounds
11. Microscopy in Taxonomy and Structural Botany

In addition to oral and poster presentations, the conference proudly features the prestigious Medal Lectures instituted by IAAT to honour distinguished contributions in Indian plant taxonomy. Two Gold Medals — the Professor Y.D. Tiagi Gold Medal and the Professor V.V. Sivarajan Gold Medal — are awarded each

year to the distinguished Life Members of the Association for their valuable contributions to the field of angiosperm taxonomy and for their efforts in promoting the discipline in India. Additionally, the Professor Chavali Kameswara Rao Annual Endowment Lecture is delivered every year by a leading Indian or foreign scientist during the Annual Conference.

The Association has instituted ten awards with the objective of encouraging active researchers, especially in the field of angiosperm taxonomy. These awards recognise outstanding research contributions presented during the conference and provide a platform for emerging scholars to showcase their work before a panel of eminent scientists and thereby gain national-level recognition.

This abstract volume contains contributions from 265 researchers representing various institutions across India. The scientific programme includes the Professor Y.D. Tiagi Gold Medal Lecture by Dr. Mathew Dan, the Professor V.V. Sivarajan Gold Medal Lecture by Dr. Anzar A. Khuroo, and the Professor Chavali Kameswara Rao Annual Endowment Lecture by Dr. Michael Möller of the Royal Botanic Garden, Edinburgh. In addition, the event features the Prof. A.K. Pandey Award Lecture for revisionary studies, invited lectures from eminent scientists in India and abroad, and competitions for the Prof. Santhosh Nampy IAAT Young Scientist Award, along with various awards for young researchers, scientists, and teachers.

I would like to express my sincere gratitude to the Indian Association for Angiosperm Taxonomy (IAAT) for choosing St. Joseph's College (Autonomous), Devagiri, Kozhikode, to host this milestone event. I extend my heartfelt thanks to the Executive Council of IAAT, and gratefully acknowledge the unwavering encouragement and support from Dr. Fr. Biju John Vellakada CMI, Provincial, Fr. Biju K. Issac CMI, Manager, and Dr. Fr. Biju Joseph, Principal, Fr. Bony Augustine, Administrator of St. Joseph's College, Devagiri, whose vision, leadership, and guidance have been instrumental in making this academic celebration a reality.

I am deeply grateful to the members of the Organising Committee, Advisory Committee, teaching faculty, non-teaching staff, research scholars, and students for their dedicated efforts in ensuring the successful execution of this event. I also extend my gratitude to the invited keynote and plenary speakers, session chairs, and all delegates for their enthusiastic participation and valuable contributions. We gratefully acknowledge the financial and institutional support received from the Anusandhan National Research Foundation (ANRF), Botanical Survey of India (BSI), National Biodiversity Authority (NBA), Kerala State Council

for Science, Technology & Environment (KSCSTE), International Association for Plant Taxonomy (IAPT), Council of Scientific and Industrial Research (CSIR), and Kerala State Biodiversity Board (KSBB).

The abstracts compiled in this volume reflect the richness and diversity of contemporary botanical research in India and beyond. We hope this book will serve as a valuable record of the proceedings and as a lasting resource for students, teachers and researchers committed to advancing the frontiers of angiosperm taxonomy.

We wish all participants an enriching and memorable conference experience at Devagiri.

Dr. Manudev K.M.
Organising Secretary
XXXV Annual Conference of the IAAT

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INDIAN ASSOCIATION FOR ANGIOSPERM TAXONOMY (IAAT)

Indian Association for Angiosperm Taxonomy (IAAT) was established in the year 1990. The headquarters of IAAT is located at the Department of Botany, University of Calicut, Malappuram, Kerala, India. Rheedea-an international peer reviewed journal is published by the Association since 1991, with four online and two print issues per year. With about 1000 life members, it aims to promote Angiosperm Taxonomy by fostering research and collaboration among angiosperm taxonomists and by providing a platform for scientific discussion and knowledge exchange. During the annual conference, two gold medals (Y.D. Tiagi & V.V. Sivarajan) are presented to distinguished life members of the association for their significant contribution to the field of Angiosperm Taxonomy. In addition, Prof. Chavali Kameswara Rao annual endowment lecture is held during the conference. IAAT honours its life members as fellows of the association (FIAAT) for their contribution to the association. Apart from these 10 different awards are instituted for encouraging young workers in the field of angiosperm taxonomy.

Coral jubilee of IAAT

This landmark event, organized in association with the Indian association for Angiosperm Taxonomy, commemorates the 35th Anniversary (Coral Jubilee) of the association. It aims to bring together leading scientists, researchers, and scholars from India and abroad to share research findings and insights on current trends and future directions in angiosperm taxonomy and allied disciplines. The scientific programme will include keynote addresses, plenary lectures, oral and poster presentations, and discussions on key themes such as biodiversity conservation, floristics, nomenclature, molecular phylogenetics, ethnobotany, climate change biology, and digital taxonomy. The conference, focused on 11 major themes provides a platform for showcasing ongoing research throughout the world.

Conference themes

1. Advances in Angiosperm Systematics
2. Molecular Phylogenetics and DNA Barcoding
3. Floristic Diversity and Biogeography
4. Ethnobotany and Indian Traditional Knowledge

5. Biodiversity Conservation
6. Climate Change and Plant Adaptation
7. Digital Taxonomy and AI Applications in Botany
8. Economic Botany and Sustainable Utilization of Plant Resources
9. Plant-Animal Interactions in Ecosystem Dynamics
10. Phytochemical Studies and Bioactive Compounds
11. Microscopy in Taxonomy and Structural Botany

Medals & Endowment Lectures

Professor Y.D. Tiagi Gold Medal

Professor Y.D. Tiagi Gold Medal was instituted in the year 1995 with the endowment of Rs. 20,000/- by the Y.D. Tiagi Felicitation Committee on his retirement as Professor and Head of the Department of Botany, University of Rajasthan. This medal is awarded to a distinguished senior Indian Life Member of the Association especially in recognition of his life-term contribution in the field of Angiosperm Taxonomy, and for strengthening the discipline of Angiosperm Taxonomy in India.

Professor V.V. Sivarajan Gold Medal

Professor V.V. Sivarajan Gold Medal was established in 1996 with the endowment of Rs. 40,000/- donated by the V.V. Sivarajan Endowment Committee to commemorate Professor V.V. Sivarajan who has made valuable contribution to the field of Angiosperm Taxonomy in India. He met with sudden demise on 18th December, 1995 while he was in the Calicut University service. He was the founder Secretary of the Association and the first Executive Editor of *Rheedea*, the official journal of the Association. An additional amount of Rs. 5,000 was also donated to meet the expenditure for giving away the award from 1996 itself. Usually, this medal is awarded to those who are in active service and engaged in research in Angiosperm Taxonomy.

Professor Chavali Kameswara Rao Annual Endowment Lecture

Professor Chavali Kameswara Rao Annual Endowment Lecture was instituted in 2019 from an endowment of Rs. 1,75,000/- received from his students. The lecture is to be delivered by a leading Indian or foreign scientist every year, during the annual Conference of the IAAT. Professor Chavali Kameswara Rao has over 50 years of academic experience in botanical science particularly phytochemistry, plant diversity, database of medicinal plants and computer applications in plant systematics. He was Professor and Chairman of the Department of Botany and Sericulture at the Bangalore University. He was also the President of the Indian Association for Angiosperm Taxonomy in 1999.

Awards for young researchers

Prof. K.S. Manilal Award

This award was instituted in 1997 by Prof. K.S. Manilal to recognize the best research paper in floristics, including the description of new species and new distributional records. The

award aims to encourage and acknowledge significant contributions to the understanding of plant diversity and distribution.

- The maximum age limit of the applicant is 32 years as on 1st January of the respective year.
- Should be a life/annual member of the association.
- Original research articles in Floristics (including a description of new species and new distributional reports) will be considered for the award.
- PhD holders are not eligible for the award, but scholars who have submitted their theses at the time of notification (not awarded) are eligible to submit their abstracts.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Prof. R.S. Rao Award

This award was instituted in 1996 by Prof. R.S. Rao to recognize the best research paper in the field of biodiversity conservation (Angiosperms), with a focus on angiosperms. The award aims to encourage impactful research that contributes to the preservation and sustainable management of plant diversity.

- The maximum age limit of the applicant is 32 years as on 1st January of the respective year.
- Should be a life/annual member of the association.
- Original research articles pertaining to in Biodiversity Conservation (Angiosperms)will be considered for the award.
- PhD holders are not eligible for the award, but scholars who have submitted their theses at the time of notification (not awarded) are eligible to submit their abstracts.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Fr. Antony Mukkath – Prof. K.S. Manilal Award

This award was instituted in 2004 by Prof. K.S. Manilal to recognize the best research paper on modern techniques in plant taxonomy. The award aims to encourage the use and development of innovative methodologies in the classification and study of plants.

- The maximum age limit of the applicant is 32 years as on 1st January of the respective year.
- Should be a life/annual member of the association.
- Original research articles in Modern Techniques in Plant Taxonomy will be considered for the award.
- PhD holders are not eligible for the award, but scholars who have submitted their theses at the time of notification (not awarded) are eligible to submit their abstracts.

- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Prof. T.R. Sahu Award

This award was instituted in 1997 by Prof. T.R. Sahu to recognize the best research paper in medicinal plant systematics. The award aims to promote and reward significant contributions to the classification, identification, and study of medicinal plants.

- The maximum age limit of the applicant is 32 years as on 1st January of the respective year.
- Should be a life/annual member of the association.
- Original research articles in Medicinal Plants Systematics will be considered for the award.
- PhD holders are not eligible for the award, but scholars who have submitted their theses at the time of notification (not awarded) are eligible to submit their abstracts.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Prof. S.R. Yadav Award

This award was instituted in 1998 by Prof. S.R. Yadav to recognize the best paper poster presentation. The award aims to encourage high-quality research and effective communication of scientific findings in the form of poster presentations.

- The maximum age limit of the applicant is 32 years as on 1st January of the respective year.
- Should be a life/annual member of the association.
- This is awarded to original research papers presented in poster presentation session in the IAAT conference.
- PhD holders are not eligible for the award, but scholars who have submitted their theses at the time of notification (not awarded) are eligible to submit their abstracts.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

S.M. & M.R. Almeida Award in Plant Nomenclature

This award was instituted in 2023 by Dr. Suchandra Dutta to recognize the best research paper in the field of plant nomenclature, specifically focusing on angiosperms. The award aims to promote rigorous and accurate application of nomenclatural principles among young researchers and taxonomists.

- The maximum age limit of the applicant is 32 years as on 1st January of the respective year.
- Should be a life/annual member of the association.

- Original research articles pertaining to the nomenclature of angiosperms will be considered for the award.
- PhD holders are not eligible for the award, but scholars who have submitted their theses at the time of notification (not awarded) are eligible to submit their abstracts.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Dr. A.K. Pradeep Young Researcher Award

This award was instituted in 2023 by the students of Dr. A.K. Pradeep, to recognize the best research paper presented by a young researcher. The award is intended to encourage and support emerging talent in botanical research.

- The maximum age limit of the applicant is 28 years as on 1st January of the respective year.
- The candidate should be a life/annual member of the association.
- Abstracts of original research pertaining to angiosperm taxonomy only are considered for this award.
- PhD holders are not eligible for this award.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Awards for Scientists or Teachers

Prof. A.K. Pandey Award for Revisionary Studies

This prestigious award was established in the year 2023, by Professor Arun K. Pandey, a distinguished taxonomist and academic. It is intended to honour and encourage young scientists and researchers who have made exceptional revisionary studies within the field of angiosperm taxonomy. The award aims to promote meticulous taxonomic research, particularly those involving comprehensive revisions of plant groups, and to inspire emerging scholars to pursue excellence in systematics and biodiversity studies.

- The maximum age limit of the applicant is 65 years as on 1st January of the respective year.
- Should be a life member of the association.
- Should be a PhD holder in a topic related to angiosperm taxonomy.
- The application along with biodata and soft copies of best five papers should reach the Secretary (through email, iaatsecy@gmail.com), Indian Association for Angiosperm Taxonomy (IAAT), Department of Botany, University of Calicut, Calicut University P.O., Malappuram, Kerala, on or before 30th September every year.
- The screening will be conducted by an expert committee constituted by the Secretary (HQ), IAAT.
- The awardee will be selected by the screening committee and the same will be intimated for presentation in the forthcoming annual conference of IAAT.

- Contestants for this award must also upload the abstract of their paper through the conference website along with their registration. However, the selection will be made entirely by an expert committee constituted by the Secretary (Headquarters) of IAAT.

Prof. Santhosh Nampy IAAT Young Scientist Award

This award was instituted in 2023 by Prof. Santhosh Nampy, with the purpose of recognizing young scientists and researchers for their outstanding contributions to the field of angiosperm systematics. The award aims to encourage excellence in taxonomic research and promote continued advancements in the understanding and classification of flowering plants.

- The maximum age of the applicant is 35 years as on 1st January of the respective year.
- Should be a life member of the association.
- Should be a PhD holder in a topic related to angiosperm taxonomy.
- The application and full research paper on a topic in angiosperm taxonomy along with biodata should reach the Secretary (through email, iaatsecy@gmail.com), Indian Association for Angiosperm Taxonomy (IAAT), Department of Botany, University of Calicut, Calicut University P.O., Malappuram, Kerala, on or before 30th September every year.
- Contestants for this award must also upload the abstract of their paper through the conference website at the time of registration. However, the preliminary screening will be conducted by an expert committee constituted by the Secretary (HQ), IAAT.
- Best three papers (maximum) will be selected by the screening committee for final presentation. The same will be intimated to the selected candidates by 30th October via mail for presentation in the forthcoming annual conference of IAAT for the final selection of the awardee.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

Prof. M. Sabu Award

This award was instituted in 2006 by Prof. M. Sabu to recognize the best research paper in angiosperm taxonomy presented at the IAAT conference, exclusively by teachers and scientists. The award aims to honour outstanding contributions to the field of angiosperm taxonomy by academic and research professionals.

- The maximum age limit of the applicant is 45 years as on 1st January of the respective year.
- Should be a life/annual member of the association.
- Original research articles in Angiosperm Taxonomy will be considered for the award.
- Final decision on the award will be based on oral presentation in the forthcoming annual conference of the IAAT.

KERALA- GOD'S OWN COUNTRY

Kerala, also known as *'God's Own Country',* is the southernmost state of India, formed on 1 November 1956. The state comprises 14 districts distributed across six regions: North Malabar (far-north of Kerala), South Malabar (northern Kerala), Kochi (central Kerala), Northern Travancore, Central Travancore (southern Kerala), and Southern Travancore (far-south of Kerala).

Much of Kerala's biodiversity is concentrated and protected in the Western Ghats, one of the world's biodiversity hotspots. Until the 18th century, nearly three-quarters of the state's land area was covered by dense forests. Kerala's fauna is notable for their remarkable diversity and high degree of endemism.

The state's rich culture, traditions, and varied demographics have made it one of India's most sought-after tourist destinations. In 2012, *National Geographic Traveller* magazine listed Kerala among the "Ten Paradises of the World." Its beaches, backwaters, lakes, mountain ranges, waterfalls, ancient ports, palaces, religious institutions, and wildlife sanctuaries continue to attract both domestic and international tourists, offering a unique blend of natural beauty and cultural heritage.

KOZHIKODE - THE HOST CITY

Kozhikode, historically known as Calicut, is a vibrant coastal city located in the northern part of Kerala. Steeped in history and cultural richness, it was once a major centre of the spice trade and is famously associated with the arrival of Vasco da Gama in 1498, which marked the beginning of European maritime trade with India. The city lies between the scenic Western Ghats and the Arabian Sea, offering a unique blend of natural beauty, cultural heritage, and urban sophistication. Kozhikode is renowned for its warm hospitality, delicious Malabar cuisine, and academic excellence. It is home to several reputed institutions, including the Indian Institute of Spices Research, Indian Institute of Management, National Institute of Technology and the University of Calicut.

In addition to its historical and academic significance, Kozhikode serves as a gateway to several nearby tourist attractions. Kozhikode Beach is a popular destination known for its historic pier, lighthouse, and local food stalls. Mananchira Square, located in the city centre, features a well-maintained park adjacent to a historic man-made lake. Kappad Beach is of great historical importance as the landing site of Vasco da Gama. Beypore, located a short drive from the city, is known for its traditional wooden *uru* boat-building industry and charming port. Nature enthusiasts can explore the Thusharagiri Waterfalls situated in the Western Ghats, which offer excellent opportunities for trekking. Kakkayam Dam and Valley is another picturesque destination, ideal for eco-tourism. Additionally, the hill district of Wayanad, located nearby, is known for its wildlife sanctuaries, prehistoric caves, and lush green plantations.

ST. JOSEPH'S COLLEGE (AUTONOMOUS), DEVAGIRI

Nestled in the heart of Kerala, St. Joseph's College (Autonomous), Devagiri, is renowned for its academic excellence and commitment to research in botanical sciences. Founded in 1956 by the CMI Congregation and affiliated to the University of Calicut, St. Joseph's College (Autonomous), Devagiri, has been a leading institution in the Malabar region for 68 years, offering high-quality education. Staying true to its motto, PRO DEO ET PATRIA (For God and Country), the college is committed to fostering a just and humane society, promoting national integration and religious harmony, and prioritizing the upliftment of the

underprivileged and marginalized communities. In recognition of its excellence in academics, culture, and social contributions, the college received an A Grade accreditation from NAAC in 2004, followed by a re-accreditation with a CGPA of 3.63 in 2011.

The UGC recognized the college as a “College with Potential for Excellence” in 2010, and it was granted autonomy in 2014. In 2016, the college became the first in the country to receive an A++ grade from NAAC with a CGPA of 3.76. In 2024, the college was re-accredited with an A++ grade and a CGPA of 3.65 in the fourth cycle under the Autonomous College Category. Striking a balance between academics and co-curricular activities, the college has produced over 200 university toppers, maintaining an ideal environment for holistic development.

The college is situated on a small hill of scenic beauty known as "Devagiri", which means the "Hill of God". The campus is located about six kilometres away from the heart of Calicut city and is opposite to Calicut Medical College. The campus spreads across sixty acres of land covered with shady trees. Other than the college, there are five other Devagiri institutions on the campus: Three aided schools (Savio L.P. School, Savio High School and Savio Higher Secondary School), one unaided school (Devagiri Public School), and one for the differently abled (Asha Kiran). Other facilities include hostels for boys and girls, staff quarters, a chapel, an open-air theatre and a playground with eight-lane running tracks and fields for games.

Our vision

- To form leaders who are intellectually competent, spiritually mature, morally upright, psychologically acceptable, who will champion the cause of justice, love, truth and peace and who are ever open to further growth.
- To create a just and humane society where dignity of the human person is respected, where unjust social structures are challenged, where our cultural heritage of ahimsa, religious harmony and national integration is upheld and where the poor and the marginalized are specially taken care of.

Our mission

- To build up a community of staff and students committed to the common pursuit of truth and moral excellence.
- To help students achieve self-discipline, cultivate good habits and become open to the Spirit.
- To train students in clarity of thought and accuracy of expression and develop in them leadership qualities.

- To promote a healthy modern outlook among the students while drawing inspiration from ancient cultural heritage and tradition.
- To become an instrument of social change and force for integration among linguistic, religious and caste groups and inspire young men and women to eradicate social evils.
- To instil in the students a sense of responsibility to the nation and ensure their creative involvement in building up a new India.

Our motto

- The motto of the institution Pro Deo et Patria (for God and Country) aims to promote righteousness and good of our country.

Programmes offered

FYUG Programmes in Major Disciplines (Aided)

Sl. No	Programmes	No. of Seats	Duration
1	B.A. Economics Honours	50	8 Semesters
2	B.A. English Language and Literature Honours	32	8 Semesters
3	B.Com. Finance Honours	60	8 Semesters
4	B.Sc. Botany Honours	36	8 Semesters
5	B.Sc. Chemistry Honours	48	8 Semesters
6	B.Sc. Economics and Mathematics (Double Major)	24	8 Semesters
7	B.Sc. Mathematics Honours	48	8 Semesters
8	B.Sc. Physics Honours	48	8 Semesters
9	B.Sc. Psychology Honours	36	8 Semesters
10	B.Sc. Zoology Honours	36	8 Semesters

FYUG Programmes in Major Disciplines (Self-Financing)

Sl. No	Programmes	No. of Seats	Duration
11	B.A. Animation and Graphic Design Honours	36	8 Semesters
12	B.A. English Language and Literature Honours	40	8 Semesters
13	B.A. Functional English and Psychology	36	8 Semesters
14	B.A. Journalism & Mass Communication Honours	40	8 Semesters
15	B.B.A. Business Analytics Honours	50	8 Semesters
16	B.B.A. Finance Honours	50	8 Semesters
17	B.B.A. International Business Honours	50	8 Semesters
18	B.B.A. Sports Management Honours	50	8 Semesters
19	B.Com. Applied Finance & Accounting Honours	60	8 Semesters
20	B.Com. Computer Application Honours	60	8 Semesters
21	B. Com Finance Honours	60	8 Semesters
22	B. Com (Professional) Honours	60	8 Semesters

23	B.C.A. Honours (AI & ML)	50	8 Semesters
24	B.C.A. Honours (Data Science & AI)	50	8 Semesters
25	B. Sc. Applied Mathematics Honours	48	8 Semesters
26	B. Sc. Computer Science Honours	36	8 Semesters
27	B. Sc. Computer Science & Mathematics (Double Major)	36	8 Semesters

PG Programmes (Aided)

Sl.No	Programmes	No. of Seats	Duration
1	M.A. Economics	20	4 Semesters
2	M.A. English Language & Literature	20	4 Semesters
3	M.A. Malayalam with Journalism	20	4 Semesters
4	M.Com.	20	4 Semesters
5	M.Sc. Botany	10	4 Semesters
6	M.Sc. Chemistry	12	4 Semesters
7	M.Sc. Mathematics	20	4 Semesters
8	M.Sc. Physics	12	4 Semesters
9	M.Sc. Psychology	10	4 Semesters
10	M.Sc. Zoology	12	4 Semesters

PG Programmes (Self-financing)

Sl. No	Programmes	No. of Seats	Duration
1	M.Sc. Computer Science	12	4 Semesters
2	M.Sc. Statistics	20	4 Semesters
3	Master of Computer Application (MCA)	30	4 Semesters
4	Master of Social Work (MSW) - Batch 1	20	4 Semesters
5	Master of Social Work (MSW) - Batch 2	20	4 Semesters

Ph.D. Programmes offered by Research Centers

Sl. No	Programmes
1	Botany
2	Chemistry
3	Commerce
4	Economics
5	English
6	Mathematics
7	Physics
8	Zoology

DEPARTMENT OF BOTANY

The Department of Botany, St. Joseph's College, Devagiri is one of the paramount Botany Departments among the colleges in Kerala, in the quality of the faculty, infrastructure available and the academic ambience prevailing. The department is in proud possession of well-equipped laboratories, library, museum, herbarium and a sprawling botanic garden with a spacious net house and hardening facility. All the faculty members are Ph.D. degree holders. The present enviable stature the department has attained is due to the relentless efforts of the faculty and supporting staff of the yesteryears and the unconstrained support offered by the management. The present staff and supporting staff strive to maintain the benchmarks created by the predecessors.

The Department of Botany was established in St. Joseph's College, Devagiri, in the year 1959. Mr. P.J. Jose was the first teacher in the department. However, he remained in the department for only about one year. He was replaced by Prof. T. M. Mathew who was mainly responsible for building up a post graduate department from the modest beginning. He continued as the Head of the Department till his retirement from the service of the college in 1992. Initially the department conducted only the Pre-University courses. The B.Sc. Course as commenced in the year 1963. Thus, a full-fledged Botany Department came into existence in the college. In the year 1981, through the persistent efforts of Prof. TM Mathew, the department started post graduate course. Another important milestone in the history of the department is its recognition as an approved research centre by the University of Calicut in the year 2000.

Till the 1990s the Department had only limited facilities and infrastructure to run the under graduate and post graduate courses. However through the dedication and commitment of the faculty and supporting staff the Department has overcome these limitations, making it renowned for the discipline and academic excellence it continues to uphold. One of the major developments took place in the department in the 1990s was the construction of a new and spacious museum in 1994 in the second floor of the building. In 1997, a full-fledged tissue culture laboratory was inaugurated in the department. It was the first tissue culture laboratory to be established among the affiliated colleges of Calicut University. In the year 2001, the botanic gardens were opened. It included a vast area neatly fenced off, a big net house with a pond for aquatic plants and galleries for potted plants. In the same year, the research laboratory also started functioning. The year 2003 was the turning point for the department as the Department of Science and Technology awarded an amount of Rs. 16 lakhs under the FIST scheme for the uplift of the infrastructure in the department. The effective utilization of the fund led to the establishment of a long-cherished computer lab as well as an instrument room. Modern instruments were added to the department. It included advanced microscopes, a cold room, UV visible spectrophotometer and a refrigerated centrifuge.

Another development which added impetus to the progress of the Department was the awarding of Rs. 18 lakhs by the Kerala State Council for Science Technology and Environment (KSCSTE). With the amount the Department could procure amenities like Leica Imaging systems, PCR, advanced microscopes, digital balances, automatic fraction collector etc. Meanwhile a number of major and minor projects awarded to the faculty members helped in the upgradation of the facilities in various laboratories. In the year 2008, the herbarium and museums were given facelifts and were upgraded. The laboratories were also renovated. In 2009 a tissue culture hardening facility was established in the botanical gardens.

In the year 2012, a major reorganization was carried out in the department. The Tissue Culture Laboratory was shifted to the first floor with more amenities. The department library and computer room were reorganized. A laboratory with facilities to carryout microbiology and mycology works was setup in the second floor. The funds made available to the Department through the CPE (College with Potential for Excellence) scheme were utilized effectively for the renovation of the laboratories and class rooms. All classrooms and laboratories were equipped with LCD projectors. Thus, the Department has evolved from the humble beginnings to a well-equipped, adequately qualified Department having the capability for effective teaching and quality research. In the year, 2022, a Molecular Systematics Laboratory was established with the research grant received from the Science and Engineering Research Board (SERB).

Heads of the Department

Prof. T.M. Mathew	:	1958–1992
Prof. P.J. John	:	1964–1996
Prof. M.J. Joseph	:	1970–2000
Dr. Fr. K.M. Joseph	:	1981–2009
Dr. C.J. Mani	:	1981–2013
Dr. Abis V. Cherussery	:	1982–2017
Dr. George P.S.	:	1996–2020
Dr. Satheesh George	:	2020–2023
Dr. Delse P. Sebastian	:	2023 onwards

Former Members of the faculty (other than Heads)

Prof. K.S. Alexander
Prof. M.M. Mathew
Dr. Joseph Thomas
Dr. Santhosh Nampy
Dr. C. J. Mani
Dr. Jose Mary Das
Dr. Savichen P.J.
Dr. Jojo Joseph

Current Faculty

1. Dr. Delse P. Sebastian M.Sc., B.Ed., Ph.D.
Designation: Associate Professor & Head
Field of Specialization: Biotechnology & Ecology
Experience: 14 years of teaching and research
Research Contributions: 20 research articles and 5 book chapters
Ph.D. Guidance: Successfully guided 3 doctoral candidates, 2 ongoing
✉ Email: *delsbotany@gmail.com* ✆ Mobile: +91 94473 31351

2. Dr. Satheesh George M.Sc., B.Ed., Ph.D., FLS
Designation: Associate Professor
Field of Specialization: Phytochemistry & Plant Taxonomy
Experience: 20 years of teaching and research
Research Contributions: 105 research articles, 6 new species and 8 book chapters
Ph.D. Guidance: Successfully guided 5 doctoral candidates, 3 ongoing
Awards: Professor K. Unnikrishnan Endowment Award, Dr. S.R. Yadav Award, Best Poster Award (21st Kerala Science Congress), Best Poster Award (22nd Kerala Science Congress)
Memberships: IAAT, Gregor Mendel Foundation
✉ Email: *george.satheesh@gmail.com* ✆ Mobile: +91 9846033013

3. Dr. Manudev K.M. M.Sc., Ph.D., FLS, FIAAT
Designation: Assistant Professor
Field of Specialization: Plant Taxonomy & Molecular Systematics
Experience: 18 years of teaching and research
Research Contributions: 46 research articles, 20 new species and 2 book chapters
Ph.D. Guidance: 2 (ongoing)
Awards: Y.S. Murty Gold Medal, FLS, FIAAT, SR Yadav Award, IAPT Award, UGC Travel Grant
SERB Grant
Memberships: IAAT, IBC, EHSST
✉ Email: *manudevkmadhavan@gmail.com* ✆ Mobile: +91 9496470738

4. Dr. Binu Thomas M.Sc., M. Phil., Ph.D.
Designation: Assistant Professor
Field of Specialization: Taxonomy, Phytochemistry & Ecology
Experience:10 years of teaching and research
Research Contributions: 50 research articles, 3 books, and 5 book chapters
Ph.D. Guidance: Successfully guided 4 doctoral candidates, 4 (ongoing)
✉ Email: *binuthomasct@gmail.com* ✆ Mobile: +91 8848649762

5. Dr. Soumya S.L. M.Sc., Ph.D., FLS
Designation: Assistant Professor on contract
Field of Specialization: Molecular Biology & Food Chemistry
Experience: 7 years of teaching and research
Research Contributions: 17 research articles, and 2 book chapters
Awards: NCERT Second Best Achiever Award, Prof. Abraham Endowment Gold Medal, Junior Scientist Award, Scientist Associate Award, MendelSym Symposium Best paper Award, National Symposium on underutilized and Wild Edible Plants of India-Future Crops Best Oral Presentation award, Fellow of the Linnean Society of London (FLS)
Memberships: The Linnean Society of London
✉ Email: *sl.soumya@yahoo.com* ✆ Mobile: +91 7593033373

6. Dr. Neena A. M.Sc., Ph.D.
Designation: Assistant Professor on contract
Field of Specialization: Plant physiology & Photochemistry
Experience: 8 years of teaching and research experience
Research Contributions: 8 research articles, and 2 book chapters
✉ Email: *ninaprabhakar@gmail.com* ✆ Mobile: +91 9656512203

7. Dr. Neenu Maria George M.Sc., Ph.D.
Designation: Assistant Professor on contract
Field of Specialization: Biotechnology & Plant Breeding
Experience: 6 years of teaching experience and research
Research activities: 2 research articles, and 2 book chapters
✉ Email: *neenumariageorge97@gmail.com* ✆ Mobile: +91 9745167153

Academic Programmes

B.Sc. Botany Honours (FYUGP)

B.Sc. Botany Honours is an undergraduate degree programme that focuses on the scientific study of plants, fungi, and algae. It covers topics such as plant physiology, taxonomy, ecology, genetics, and molecular biology. Students gain both theoretical knowledge and practical skills through lab work, field studies, and research projects. The course prepares graduates for careers in research, environmental management, agriculture, forestry, and biotechnology. It also serves as a strong foundation for higher studies like M.Sc. or research in plant sciences. Fifty students are admitted every year for the B.Sc. Programme.

Certificate Courses Offered:

1. Indoor Gardening
2. Mushroom Cultivation
3. Photographic Techniques
4. Plant Identification and Herbarium Techniques
5. Tissue Culture

In FYUGP, a "Degree Programme" will have different types of "Courses" such as Major courses and Minor courses. In addition to the major and minor courses there are General Foundation Courses. They are Ability Enhancement Courses (AEC), Multi- Disciplinary Courses (MDC), Skill Enhancement Courses (SEC) and Value-added Courses (VAC). All the major and minor courses, have four credits each and all the general foundation courses has three credits each. In FYUGP, students have three options:

- **UG Degree:** Students who choose to exit after 3-years (six semesters) acquiring a minimum of 133 credits by successfully completing all the required minimum courses shall be awarded the UG Degree and they are eligible for two-year PG programme.
- **UG Degree (Honours):** Students who acquire 133 credits in three years can proceed to the 4th year for UG Degree (Honours). UG Degree (Honours) shall be awarded to students who complete the four-year UG programmes with a specific number of courses of minimum 177 credits, including 8 credits from an optional project/dissertation. They are eligible for one year PG programme.
- **UG Degree (Honours with Research):** Students who secure 133 credits with 75% marks and above (CGPA 7.5 and above) cumulatively in the first six semesters are eligible to get selected to Honours with Research stream in the 4th year. UG Degree (Honours with Research) shall be awarded to students who complete the 4-year UG programme with a specific number of courses of minimum 177 credits, including

12 credits from a mandatory research project/dissertation in the 4th year. They can opt for one year PG programme or can join directly for Ph.D. programme.

M.Sc. Botany

M.Sc. Botany is a two-year (4-semester) course and choice-based credit semester system is being followed. Introducing offshoot fields such as plant biotechnology, plant pathology, plant Ecology, Palaeobotany, Ethnobotany and Archaeobotany has expanded the subject's breadth and opportunities. The course of study includes studies in plant anatomy, morphology, systematics, phytochemistry, ecology, genetics, and plant molecular biology, among others. The curriculum content focuses on providing the information and abilities needed for a student to pursue a successful career in Botany and related sciences. Twelve students are admitted every year for the M.Sc. Programme.

Ph.D. in Botany

The Ph.D. programme in Botany offers advanced research opportunities in diverse areas of plant science. Research in the Department spans over the fields such as plant systematics, phytochemistry, molecular biology, plant ecology, tissue culture, and phycology. The programme aims to foster independent and innovative research skills through rigorous academic training and mentorship. Students engage in both theoretical and experimental aspects of plant biology, contributing to the advancement of botanical science. Candidates admitted to the Ph.D. programme, generally holding an M.Sc. degree in Botany or related fields, are expected to complete the programme within five years. The initial year includes coursework and a comprehensive evaluation through written and oral examinations. The final stage involves the submission and defense of a research thesis. Admission is based on the availability of guides and research facilities within the Department. A limited number of research fellowships are available through the University and candidates are encouraged to secure funding from external agencies prior to enrolment.

Research Projects

The Department has undertaken and successfully completed several research projects funded by DST, KSCSTE, RUSA, SERB, and UGC.

Herbarium (DEV)

The Herbarium (DEV) of the Department of Botany, St. Joseph's College (Autonomous), Devagiri, is an internationally accredited repository of plant diversity, serving as an essential resource for research, education, and conservation. Established with the objective of documenting and preserving the rich flora of India, the herbarium houses a systematically arranged collection of nearly 10,000 authenticated and well-preserved plant specimens, including type specimens. The collection represents a wide range of angiosperms and pteridophytes, with particularly significant holdings of the genera *Blumea*, *Crotalaria*, *Osbeckia*, and *Selaginella*.

Each specimen is properly identified, labelled, and curated following standard herbarium procedures. The collection serves as a reference centre for plant taxonomy, systematics, and biodiversity studies, and supports undergraduate, postgraduate, and doctoral research activities. Over the years, the DEV Herbarium has contributed to numerous floristic surveys and maintains active collaborations with national and international research institutions. The herbarium continues to expand through regular additions from student fieldwork, faculty research, and exploration programmes, fostering a strong culture of botanical documentation and conservation awareness among students and researchers alike.

Museum

The Museum of the Department of Botany, St. Joseph's College (Autonomous), Devagiri, houses an impressive and diverse collection that serves as an invaluable resource for teaching and research. The museum maintains more than 250 wet-preserved specimens representing Cryptogams, Gymnosperms, and Angiosperms from the Southern Western Ghats, showcasing the region's rich plant diversity. In addition, it features 10 fossil specimens illustrating the evolutionary history of plants, 65 ethnobotanical collections highlighting traditional plant uses and 110 forest botany specimens depicting characteristic flora from various forest types. The museum also preserves 125 research voucher specimens that document ongoing scientific studies and a specialized carpology section with 54 fruit and seed samples providing comprehensive insights into plant morphology and systematics.

Botanical Garden

The Botanical Garden of St. Joseph's College (Autonomous), Devagiri serves as a vibrant centre for education, research, and conservation. It harbours a rich diversity of plant life, including 114 species of medicinal plants that highlight the ethnobotanical heritage of the region. The garden also conserves 12 species of rare, endangered and threatened (RET) plants, underscoring its role in biodiversity preservation. It maintains a well-curated germplasm collection representing angiosperms, gymnosperms, and lower plant groups, offering valuable material for teaching and scientific study. A dedicated aquatic zone supports the growth of hydrophytes and wetland species, providing a living laboratory for ecological observations. In addition, the garden houses special research collections, supporting advanced studies in plant taxonomy, conservation biology, and applied botany. Together, these components make the Devagiri Botanical Garden a vital resource for students, researchers, and nature enthusiasts alike.

Floristics and Molecular Biology Lab

Floristics and Molecular Biology Laboratory focus on the documentation, classification, and phylogenetic understanding of plant diversity, integrating traditional taxonomic approaches with modern molecular tools. This lab started functioning in the year 2022 with the aid from ANRF (erstwhile SERB) EMEQ Project (EEQ/2022/000696) on the Revision of the Genus *Bupleurum* in India. It is one of the most sophisticated labs in the institute equipped with Thermal Cycler, Electrophoresis, Gel Visualization unit, Deep Freezer, Mini Centrifuge *etc*. for molecular studies and Leica EZ4HD, Meswox ST45 and Leica DM1000 stereomicroscopes and anatomy microscopes are available for specimen workout. This lab is fully air conditioned and has Wi-Fi facility. The lab's primary goal is to elucidate the relationship between species, species boundaries, biogeographical distribution and taxonomic revisions, with a special emphasis on the family Apiaceae in Western Ghats and Genus *Bupleurum* in India. The laboratory is equipped for both classical taxonomic and molecular biological studies, including: DNA extraction and PCR amplification of angiosperms, herbarium specimen preparation and digitization, microscopy and imaging systems for morphological and anatomical studies. The current works are:

1. Taxonomic Revision of the Family Apiaceae in Western Ghats, India
2. Taxonomy and molecular phylogeny of the genus *Bupleurum* L. (Apiaceae) in India

Plant Tissue Culture Facility

The Plant Tissue Culture Facility at St. Joseph's College (Autonomous), Devagiri, serves as a vital centre for plant propagation, conservation, and enhancement of secondary metabolite production. The well-equipped laboratory provides advanced infrastructure for aseptic

culture, micropropagation, and in vitro studies of economically and medicinally important plants. The facility enables large-scale propagation of rare and endangered plant species through callus culture, organ culture, and somatic embryogenesis. Standard protocols are developed and optimized for shoot and root induction, acclimatization, and field transfer of regenerated plants.

In addition to propagation, the laboratory focuses on enhancing secondary metabolite production using in vitro techniques such as elicitor treatments, and precursor feeding. These approaches are particularly useful for medicinal plants, where tissue culture provides a controlled and sustainable means of producing bioactive compounds independent of environmental fluctuations. The facility also supports student training, research projects, and collaborative studies with research institutions.

Plant Physiology and Phytoremediation

The Plant Physiology and Phytoremediation Laboratory at Department of Botany, St. Joseph's College (Autonomous), Devagiri, focuses on the study of physiological and biochemical mechanisms that enable plants to respond to environmental stresses and remediate pollutants. The laboratory provides facilities for conducting experiments related to plant growth, stress physiology, and heavy metal tolerance and accumulation. The lab is equipped with heating mantles and a wet digestion hood for safe and efficient sample preparation, particularly for biochemical and elemental analyses. A range of analytical-grade chemicals and reagents is available to support biochemical estimations of primary and secondary metabolites, enzymatic and non-enzymatic antioxidants, and stress indicators in plants. The Plant Physiology and Phytoremediation lab provides an excellent environment for undergraduate, postgraduate, and research students to gain hands-on experience in experimental plant science, analytical techniques, and sustainable environmental research.

Mushroom Cultivation Centre-'DEVSHROOM'

As part of the outcome-based education and value-added course framework at St. Joseph's College, Devagiri, Calicut, the III B.Sc. Botany students initiated an applied project that translated their theoretical knowledge of mushroom cultivation into practice, leading to the establishment of the Mushroom Cultivation Centre, DEVSHROOM, within the Department of Botany. The centre focuses on cultivating the HU strain of Oyster mushrooms and the visually appealing Pink Oyster mushroom (*Pleurotus djamor*), now operating with 94 cultivation beds. Students actively participate in all stages, from substrate preparation to harvesting and marketing, transforming an academic exercise into a sustainable enterprise. The mushrooms are marketed under the brand name DEVSHROOM after obtaining an FSSAI license (Registration ID: 21324242000510), ensuring food safety and quality. Income from sales is utilized for student welfare, reinforcing the project's social and educational impact. The initiative has enriched students practical understanding of mycology, fostered entrepreneurial skills, and inspired several to start homebased cultivation for additional income. DEVSHROOM stands as a model of applied education where classroom learning evolves into real-world entrepreneurship, empowering students to emerge as future leaders in the field of sustainable mushroom cultivation.

MEDALS & ENDOWMENT LECTURES

PROF. Y.D. TIAGI GOLD MEDAL

Search and research on some tropical species: An overview

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Tropical plants are often curious in multidimensional perspectives, especially in the richness and diversity of its variability. Biosystematics investigations on several endemic species, particularly novel taxa are meagre. The present lecture, based on my experiences over three and a half decades, will throw some light to the themes 10 and 11 of this 35th Annual Conference of IAAT. The theme 10 of the conference is, 'Phytochemical Studies and Bioactive Compounds'. Analyzing the chemical profile of a species with special emphasis on its secondary metabolites has great significance. Species viz. *Myristica trobogarii* M.G.Govind & Dan, *M. pushpangadaniana* M.G.Govind & Dan *ex* Kottaim., *Knema flavostamina* M.G.Govind & Dan, *Hedychium larsenii* Dan & Sathish, and *Amomum andamanicum* V.P. Thomas, Dan & M.Sabu were subjected to chemical characterization. Some of these endemics turned to be a source of potential bioactive compounds. *Curcuma bhatii* Skornick & M.Sabu (syn: *Paracautleya bhatii* Smith), a very rare, vulnerable and narrowly endemic species was also characterized. The theme 11 of the conference is 'Microscopy in Taxonomy'. Anatomical characterization using microscopy is an effective tool to confirm the taxonomic delimitations of a species and to determine its interrelationships with the allied taxa. During my journey in the midst of tropical plant diversity along with a team of young researchers, several instances were there which revealed the importance of microscopic characterization. The light microscopic observations in seventeen species of *Sida* L. (root), twelve sp. of *Piper* L. (stem), six sp. of *Thottea* Rottb. (stem), ten sp. of *Curcuma* L. (petiole), six sp. of *Myristica* Gronov. (petiole) and nine sp. of *Costus* L. (leaves) are discussed.

Keywords: Bioactive compounds, Biosystematics, Microscopy, Phytochemical characterization

PROF. V.V. SIVARAJAN GOLD MEDAL

Linking legacies: Revisiting the role of taxonomy in biodiversity science

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Over the last three centuries, and much earlier, the discipline of taxonomy – a leading legacy of naturalist Carolus Linnaeus–is formally documenting and classifying the bountiful biological diversity on the planet Earth. However, in recent decades, the global biological diversity is experiencing an unprecedented extinction crisis. This has led to the emergence and establishment of a crisis discipline of biodiversity–a conceptual legacy of entomologist Edward Wilson. To tackle the global biodiversity crisis, taxonomy has regained its central role and renewed relevance in modern biodiversity science. It is in this context that the present talk will showcase the research conducted over the last two decades at local, regional and national scales. A bird's overview of the research related to new distribution records, species' discoveries, floristic checklists, field guides, systematic revisions, and biodiversity data syntheses will be presented. The work demonstrates how the research deeply 'rooted' in traditional taxonomy has beneficially 'branched out' to bridge gaps with the sister disciplines of ethnobotany, biogeography and ecology, and contributed considerably to public policy and planning for achieving goals of conservation, restoration, climate change adaptation and environmental sustainability. Looking ahead, the contemporary challenges and future opportunities for linking the luminous legacy of taxonomy with biodiversity science and practice are highlighted, with a prospect to radically reimagine role of taxonomy for the science and society, with particular reference to India – one of the most biodiverse-rich countries in the world.

Keywords: Biodiversity, Biogeography, Ecology, Ethnobotany, Taxonomy

PROF. CHAVALI KAMESWARA RAO ANNUAL ENDOWMENT LECTURE

A journey through the systematics of Gesneriaceae: Impact of molecular data

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Molecular systematics has made tremendous impact on the classification of organisms. Since its emergence in the 1990s it has reshaped many plant families, so the African Violet family Gesneriaceae. It is a medium-sized family in order Lamiales and currently around 150 genera and almost 4000 species. There are significant differences between the last pre-molecular classification the last, the first post-molecular one in 2013, which saw alignment along phylogenetic boundaries. These saw genera disintegrated, new ones segregated from existing ones and newly collected material placed in the new classification. Here, an overview is given how molecular data have been used and how they affected the systematics of Gesneriaceae, with examples from the Old World. An overview is also given how advanced sequencing technologies, so-called the next generation sequencing (NGS) has impacted phylogenomic and systematics.

Keywords: Gesneriaceae, Molecular phylogeny, Phylogenomics, Systematics

KEYNOTE & INVITED LECTURES

KEYNOTE LECTURE–1

From the Shenzhen Code (2018) to the Madrid Code (2025): Some highlights of the revision

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The nomenclature session of the International Botanical Congress held during July 2024 in Madrid, Spain, addressed a total of 447 proposals (433 published in Taxon and 14 proposed from the floor of the session) to amend the *Shenzhen Code*, and of these about 168 proposals were accepted. Subsequently, the *Shenzhen Code* was revised and published as Madrid Code in July 2025. A few of the revisions, highlighted here, are mentioned verbatim from the *Madrid Code*. A holotype for pre-1990 species and infraspecies names, published without the citation or indication of holotypes, ascertaining their typification may or may not be straight forward. *As per the Madrid Code, p*hotographs are not treated as illustrations, and thus they do not constitute original materials. Similarly, illustrations cannot be syntypes. Prior to the *Madrid Code*, some of the published generic names, accompanied with descriptions and type species, were treated as not validly published. According to the *Shenzhen Code* Art. 20.2: The name of a genus may not coincide with a Latin technical term in use in morphology at the time of publication unless it was published before 1 January 1912 and was accompanied by a species name published in accordance with the binary system of Linnaeus. In the interest of nomenclatural stability under the current *Code,* binding decisions on the valid publication of each generic "name" or any case with identical spelling where this former provision has been applied are listed in App. VI and take retroactive effect. In general, a specific or infraspecific epithet is a noun or an adjective; however, it may also be an adverb. As per *Madrid Code* Art. 23.5, The specific epithet, when adjectival in form and not used as a noun, agrees with the gender of the generic name; when the epithet is a noun in apposition or a genitive noun or a noun and its accompanying adjective in the genitive case, it retains its own gender and termination regardless of the gender of the generic name; when the epithet is an adverb, its termination is independent of the gender of the generic name. Prior to the *Madrid Code,* some post-1989 specific names, accompanied with descriptions and

type citation, were treated as not validly published because of the incorrect usage of type terms. *Madrid Code* Art. 40.4 now explicitly permits the incorrect use of the term "lectotypus" or "neotypus" (or equivalents) in the protologue of the name of a new taxon to be corrected under Art. 9.10 to "holotype" to resolve the uncertain status of some names that had been treated as not validly published because the correct term "typus" or "holotypus" (or equivalents) had not been used. Regarding synonyms cited with a query sign (?), a distinction is made between superfluity and basionymy. According to *Madrid Code* Art. 51 *Note 1*. The inclusion, with an expression of doubt, of an element in a new taxon, e.g., the citation of a name with a question mark, or in a sense that excludes one or more of its potential type elements, does not make the name of the new taxon nomenclaturally superfluous. The new Art. 51.2, together with an amendment to Art. 56.1, permits a legitimate name of a new taxon or a replacement name published on or after 1 January 2026 to be rejected if it, or its epithet, is derogatory to a group of people. In addition, the new Rec. 51A.1 advises authors to avoid publishing names of new taxa or replacement names that could be viewed as inappropriate, disagreeable, offensive, or unacceptable. A Special-purpose Committee on Ethics in Nomenclature, established at the Madrid nomenclature session, has the mandate to consider ethical issues associated with naming taxa and to report back to the Cape Town IBC in 2029.

KEYNOTE LECTURE–2

Explaining Indian plant diversity by integrating the plant's genetic structure with the geological histories

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India boasts of two biodiversity hotspots and several unique ecoregions. While extensive taxonomic plant explorations have been carried out across various biodiverse regions of India, the evolutionary histories of most of our landscapes have not been studied. One of the most common evolutionary patterns that has been investigated for Indian plants explores whether our forests represent plant species that have come into India or have gone out of India. In the absence of taxonomic depth in many of these biogeographic studies, currently, we only have very generalised biogeographic predictions for Indian plants. In order to address this knowledge gap, we carried out comprehensive molecular and ecological investigations in a few plant groups native to India. We present results from taxa within the Zingiberaceae and Gesneriaceae families from the NE of India and the Western Ghats and show that the phytodiversity in India may be explained by the complex geological and climatic histories encountered in these two biodiverse regions. I will enumerate on a few key factors that we propose have strongly influenced the evolutionary patterns observed in these plants, and these factors may be relevant in other plant groups as well. Our results also show that the Himalayan uplift, followed by monsoon intensification, contributed to higher speciation rates in plants from the NE region. Finally, we propose that the results derived from our study should be utilised to understand phylogenetic patterns of other Indian plants to establish a more comprehensive picture of the evolution of the biota of our country.

Keywords: Biogeography, Evolution, Genetic history, Gesneriaceae, Zingiberaceae

KEYNOTE LECTURE–3

The evolution, systematics and biogeography of river-weeds Podostemaceae

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Podostemaceae are aquatic angiosperms growing on riverbed rocks worldwide including India, where no other plants survive. The early evolution prior to diversification involved adaptations to the habitats, such as amphibious life cycle, sticky seed coats, adventitious roots generated from the hypocotyl, absence of stomata and intercellular space, adhesive roots and shoots, and absence of double fertilization. Morphologically and anatomically, subfamily Podostemoideae is more specialized than Tristichoideae. For example, shoot apical meristem is present in Tristichoideae like in other plants, but absent from Podostemoideae, where the leaf is produced from the base of a young leaf. The body plan differs from that of terrestrial plants and is diversified in the subfamilies. Due to the separate populations in rapids and waterfalls, the species are not only monophyletic, but occasionally paraphyletic. Biogeographically, Asian Podostemoideae are a monophyletic group dispersed from American/African Podostemoideae of Gondwana origin, and the nearby Southeast Asian Podostemoideae dispersed out of India. By contrast, Tristichoideae, with most species in Asia, may have originated and diversified there, while only *Tristicha trifaria* (Bory *ex* Willd.) Spreng. migrated to Africa and then to America by long-distance dispersal. Taxonomically, Indian Podostemaceae with *c.* 20 species are much fewer than Thailand (52 sp.) and Cambodia, Laos and Vietnam (47 sp.), requiring further exploration and compilation. Indian Podostemaceae is also characteristic with several endemic genera, which are neo-endemics (recent origin) and paleo-endemics (ancient origin).

Keywords: Evolution, Morphology, India, Paraphyly, Phylogeny, Podostemaceae

KEYNOTE LECTURE–4

Beyond classification: The broader relevance of systematics

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Accurate identification, appropriate selection of taxa, and proper classification form the foundation of all biological research. Misidentification or inappropriate taxon choice can lead to flawed phylogenetic inferences, wasted resources, and misguided policies. With the growing availability of molecular sequence data in public databases, researchers from diverse fields, often with limited taxonomic expertise, now employ molecular tools in disciplines such as ecology, conservation biology, phylogenetics, biogeography, pharmacognosy, ethnobotany, agriculture, and forestry. In medicinal plant research, for instance, precise species identification is crucial, as misidentification can invalidate studies on bioactive compounds, given that morphologically similar species may differ greatly in chemical composition and therapeutic value. This presentation illustrates, with published examples involving taxa from Sri Lanka and India, how systematics transcends traditional boundaries. It emphasizes that systematics is not an isolated discipline, but a cross-cutting science that underpins and validates all other branches of biological and applied research.

Keywords: Identification, Systematics, Taxon selection, Taxonomy

KEYNOTE LECTURE–5

Potential use of Costa Rican wood data for neotropical dendrochronology: Distinctiveness of annual ring and dendrochronological potential in relation with type of species, growing condition, altitudinal and life zones, and climate type

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Costa Rica has a tropical climate composed by diverse life zones with more than 2000 tree species. This study aims to establish the distinctiveness of annual ring (AR) and different types of AR according to variation of anatomical features and dendrochronological potential (DP) of 320 tree species of Costa Rica and their families, genera, species type, growing condition, altitudinal level and life zones, and climate type. The AR distinctiveness was catalogued as (i) without boundary, (ii) well-defined, and (iii) more or less distinctive, meanwhile the different types of AR were catalogued as: Type 1: density variation, Type 2: marginal parenchyma, Type 3: pattern of fiber/parenchyma, Type 4: vessels distribution, and Type 5: fiber band. The results showed that 70 species (21.9%) did not present AR boundary, 104 species (32.5%) presented well-defined AR, and the remaining species (146 species or 45.6%) presented more or less distinctive AR. In relation to AR type, 21.9% that did not present AR boundary were catalogued without annual rings, 32 species presented Type 1, 20 species Type 2, 30 species Type 3, 7 species Type 4, and 35 species Type 5, and remaining species presented two or more AR types. Ten families presented well-defined AR, 20 families without AR boundary, 16 families with more or less distinctive AR. 42 genera did not present annual rings, 70 genera presented well-defined AR, 79 genera were classified as more or less distinctive AR, and 15 genera presented annual rings of these three types. According with this results, 70 species did not present any DP and 104 species presented well-defined AR with high DP, which must be confirmed with particular studies. The 8 species that grow exclusively in dry tropical condition presented well-defined AR (with high DP), but 137 species (73.3%) that grow in rainy tropical condition presented absent or poor defined AR, then DP varied from medium to low. Many species (67) that grow in low high (basal and premontane) presented null DP and many species presented (+/-) (medium DP) and 41 species shown high DP. Few species grow in

high part (montane and subalpine), but barely presented distinctive AR, then high DP are presented. Finally, many species present medium and high DP, the applications of dendrochronology were limited.

Keywords: Broadleaved species, Central American, Neotropical species, Tree rings, Woody tropical species

KEYNOTE LECTURE–6

A floral life of crime; an introduction to forensic botany

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Botany is a vast and complex discipline. One aspect of botanical expertise that is not widely recognised is forensic botany. This talk will discuss how the botanical community can contribute to societal well-being and security through engaging with policing and security organisations and supporting their objectives. Examination of botanical material at crime scenes can play a crucial role in ensuring the conviction of suspects. Alongside 'traditional' policing methodologies, botanical expertise can assist in the recovery of missing persons; establish time frames (particularly in relation to time of body deposition), and use botanical trace evidence (e.g. fragmentary plant material) to link suspects to crime scenes or their victims. Individual criminal cases will be used to illustrate approaches used and exemplify how forensic botany, alongside other disciplines such as archaeology, anthropology, entomology, fire science and soil science, can be effectively deployed. Additionally, developments in eDNA, microbial DNA and other disciplines will be discussed and their potential application to criminal investigation reviewed. Finally, the challenges of enabling botanists to engage with forensic examination and policing will be discussed. [NOTE: this talk will principally be based upon the author's experience within the United Kingdom. [No images of the deceased will be used, and the author's casework will be anonymized].

Keywords: Floral life, Forensic Botany

KEYNOTE LECTURE–7

Integrative taxonomy and the future of Plant Systematics in India

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Plant taxonomy in India is entering a transformative phase that demands an integrative approach combining traditional morphology with molecular, cytological, anatomical, and biogeographical evidence. Given the immense floristic diversity of the country and complex evolutionary history, such a holistic framework is essential for accurate species delimitation and phylogenetic interpretation. Traditional methods alone often struggle to resolve complex groups or identify cryptic species concealed within morphologically similar taxa. Integrative taxonomy addresses these challenges by validating morphological insights with molecular and other complementary datasets, leading to more reliable and reproducible taxonomic conclusions. There is an urgent need for trained specialists focusing on specific plant families or genera who can conduct extensive and systematic field studies across underexplored regions. Detailed evaluation of specimens, consultation of protologues, and examination of type materials are vital for ensuring accurate identification and nomenclatural stability. Equally important is access to historical collections preserved in overseas herbaria, which often hold crucial reference specimens for Indian taxa. Strengthening collaborations among institutions in India and abroad will facilitate knowledge exchange, provide access to advanced analytical tools, and inspire young researchers to pursue taxonomy. Such partnerships can accelerate species discovery, refine biodiversity assessments, and guide conservation priorities. An integrative and collaborative approach will not only deepen our understanding of rich plant diversity in India but also ensure that taxonomic research remains globally relevant, scientifically rigorous, and supportive of long-term conservation and sustainable development goals.

Keywords: Cryptic species, Collaboration, India, Integrative taxonomy, Plant diversity

KEYNOTE LECTURE–8

A Southern Silk Route Sikkim & Kalimpong: History, culture, landscape & wild flowers (diversifying plant taxonomy for societal commitments)

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Trade routes entwine the places of production to the places of commerce. The in-demand commodities were usually those that were restricted to certain geographies and therefore, monopolized and these, invariably were at the heart of trade routes. Trade routes also amplitudes the exchanges of culture, religion, ideas and knowledge. Sikkim's centuries old trans-Himalayan trade with its neighbours transformed its socio-economic-political milieu. Tibetan wool was the driver of the Sikkim's trade route along with other important merchandise handled in the trade from Lhasa and vice-versa. The Tea-Horse Road trickled down to Sikkim with its coveted merchandise – the tea, which was preferred by the elites as early as 17th century. Lately, these regional overlapping trade routes were assimilated into the larger framework of Silk Route and Sikkim's trade route is now portrayed as a minor artery of the southern or south-western Silk Route. This book attempts to encapsulate the evolution of Sikkim from a closed kingdom to a bustling hub of the trans-Himalayan trade all the while understanding the heterarchical influence of the silk route trade, under a botanical theme. A multi-scalar approach is employed in this book to flesh out the interplay between history, culture, geography and nature in the silk route region of Sikkim and Kalimpong in a congruent manner. The book presents the history of Sikkim trade route chronologically through photographs of places and monuments from past to present along with text and more than 250 photographs of major places along the Silk Route. From a botanical perspective, this book serves as a comprehensive guide to the diverse flora along the Silk Route, showcasing the plant wealth of 1137 taxa belonging to 582 genera under 132 families that thrive in this unique environment. The taxa are arranged alphabetically with correct taxonomical names, followed by basionym, synonym, and local names, if any, with local and global distribution. For easy identification of plants, photographs of 654 taxa are given. The book offers a practical guide for students, researchers, ethnographers, historians, foresters, policymakers, travellers, nature enthusiasts and people in the tourism sector.

Keywords: Conservation, History, Landscape, Plant taxonomy, Society

KEYNOTE LECTURE–9

Digitization of herbarium specimens and Indian Virtual Herbarium database: Country's largest digital herbarium

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Digital images and associated data of herbarium specimens have greatly enhanced their accessibility to researchers worldwide. The Botanical Survey of India (BSI) maintains 13 herbaria—ARUN, ASSAM, BSA, BSD, BSHC, BSI, BSID, BSIS, BSJO, BSS, CAL, MH, and PBL—established across the country, which serve as major centers for botanical research both in India and abroad. In view of this, the Indian Virtual Herbarium (https://ivh.bsi.gov.in) was developed by the Botanical Survey of India and inaugurated on 1 July 2022 by Shri Bhupender Yadav, Hon'ble Union Minister for Environment, Forest and Climate Change. The initiative was also commended by Shri Narendra Modi, Hon'ble Prime Minister of India, during "Mann Ki Baat" on 31 July 2022. This platform provides free and full online access to more than 250,000 digitized herbarium specimens along with their associated metadata from the BSI herbaria. Currently, it includes all type specimens, as well as collections of Wallich, Roxburgh, and various general specimens, totaling over 200,000 entries. The database represents the largest repository of information on plant diversity in India, serving not only taxonomists but also naturalists, ecologists, molecular biologists, and amateur botanists.

Keywords: Digitization, Herbarium, Indian virtual herbarium

INVITED LECTURE–1

Conservation planning for plants: Prioritization to action

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Conservation planning for Indian plants has become an urgent need considering growing threats from land-use changes and infrastructural expansion. Prioritization using methods such as IUCN Red List is the first step, which needs to be followed by systematic planning of conservation action that integrates ecological, socio-cultural, and landscape-level factors. Drawing on the experience from the IUCN Red List and Green Status assessment of threatened plants from the Western Ghats, this paper outlines steps linking scientific evaluation with conservation planning. Based on personal experiences, the paper discusses case-studies of Area-based and Species-Based conservation actions. It suggests a strategy for capacity building, outreach and networking for effective plant conservation.

Keywords: Conservation management plan, Conservation standards, Western Ghats

INVITED LECTURE–2

Can mobile applications replace expertise in plant identification?

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With the growing demand for accessible plant identification tools, numerous mobile applications have been emerged now-a-days to assist users in the identification of plant species. Digital tools are gaining popularity in research as well as public education and the apps are increasingly used by both professionals and amateur botanists for species identification. This study presents a comparative evaluation of 33 plant identification applications, focusing on key parameters including recognition accuracy, usability, user interface design, and functionality. Six sample species were identified through traditional methods and then cross-verified using those apps. The findings indicate that only a limited number of applications demonstrated relatively high accuracy, with two achieving over 50% species-level correctness. Eight apps failed to provide any correct identifications, despite having high ratings and large user bases. High app store ratings and download counts did not consistently reflect actual performance. Many free applications outperformed paid alternatives, raising questions about the cost-effectiveness of subscription-based models. While most applications support multiple languages, there remains significant variation in ease of use and interface quality, pointing out the need for further development. Additionally, a user survey (n>100) was also conducted among individuals from diverse backgrounds which revealed that 73% of respondents consider these applications to be only moderately accurate and insufficient as standalone identification tools. The study concludes that while mobile applications serve as useful aids, they are not yet reliable enough to replace expert-based approaches and should be used in conjunction with an expert taxonomist.

Keywords: Apps, Floristics, Species Identification, Taxonomy

INVITED LECTURE–3

Post-harvest processing and scope of sustainable utilization of a few selected plant resources of North East India

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North East (NE) India bestowed with nearly 14000 species diversity of flora and fauna, shares a key positioning in biodiversity of the globe. Among nearly 8000 floral diversities, only a limited number of species were harnessed in assessing their potential for value addition and possible sustainable utilization. A few plant wild or less explored resources of NER were studied for post-harvest processing and sustainable utilization for value added products. Among the wild nutmegs of the family *Myristicaceae* distributed in NE India natural wax and a few bioactive markers were identified from leaves, seeds and others having commercial potential in flavour and fragrance industries. Similarly, a wild species of the family *Hypoxidaceae* showed potential for the extraction of natural fibre with commercial potential. Among the lesser consumed edible species, the post-harvest processing of lesser-known spices of the genus *Alpinia* L. (Zingiberaceae) showed the presence of bioactive markers having potential against diabetes. Further, the lesser-explored vegetable *Parkia timoroana* (DC.) Merr. showed potential as a functional food. An in-depth study on the value addition of the lesser explored plant resources and private and public partnership may impact socio-economic status of the NER.

Keywords: *Alpinia*, Fibre, Functional food, *Hypoxidaceae*, *Myristicaceae*, *Parkia*, Wax

INVITED LECTURE–4

Flora of Madras in the late seventeenth and early eighteenth centuries

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Herbaria are collections of dried plant specimens that provide a snapshot of plant diversity at a particular place and time. They serve as a resource to address a wide range of research questions, especially to investigate the environmental changes over the past three centuries globally. Between 1670 and the present day, Madras (now Chennai) expanded from a modest settlement of 30,000 into a megacity of around 12 million people. The continuous expansion of the city has a profound impact on its flora as well as the ways in which people perceive and engage with plants. In the UK, the Sloane Herbarium at the Natural History Museum (BM), London and Oxford University Herbaria (OXF), Oxford holds over ten thousand plant specimens collected from in and around Madras between 1690 and 1712 by the English East India Company (EIC) officers, merchants and collaborators of the makers of early herbaria of the world. The collected specimens and associated botanical information (vernacular names and uses) were the result of co-created knowledge through the mediation of the indigenous people. As part of the on-going Royal Society funded research project on "Reconstructing the Flora of Madras in the late seventeenth and early eighteenth centuries", we attempt to bring the following major outcomes: (i) to prepare an annotated checklist of the Flora of Madras in the late 17th and early 18th centuries by documenting and identifying historical specimens, (ii) to compare the checklist with the present-day flora of Chennai in order to identify the species that have undergone local extinction or change, (iii) to document the historical vernacular names in order to compare them with contemporary usage for understanding the changes over the last 300 years, and finally (iv) to document the contributors and makers of early herbaria of Madras. The talk will highlight an update of all those projected outcomes of the project in detail.

Keywords: Contributors, EIC, Historical collections, Madras, Makers, Oxford Herbarium, Sloane Herbarium

INVITED LECTURE–5

Stem anatomy of some species of the family Amaranthaceae

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Amaranthaceae *s.l.* belongs to the order Caryophyllales and is a moderately large family of angiosperms that includes both Amaranthaceae and Chenopodiaceae. It is characterised by the presence of herbaceous species or woody shrubs, while climbing species [e.g., *Hebanthe erianthos* (Poir) Pedersen] are rare. In the young stems, several primary vascular bundles originate from the pro-meristem, which unite to form a complete ring of vascular cambium. Concomitant to the initiation of primary vascular bundles, in some of the taxa, like *Achyranthes* L., *Alternanthera* Forssk., *Amaranthus* L., *Celosia* L., *Cyathula* Blume, and *Digera* Forssk, develop additional vascular bundles that were situated in the centre of the pith (referred to as medullary bundles). As the plants grew, small alternate segments of vascular cambium ceased to divide, and a new segment of cambium initiated outside of it. This newly initiated cambial segment connects with the pre-existing alternate segment of cambium and establishes a complete ring of the cambium. With the increase in the stem diameter, the tangential width of the newly initiating cambial segments increases, and in thick stems, an entire ring of cambium is replaced by a new one. Initiation of these segments of cambia was observed from the parenchyma cells located external to the phloem produced by the previous cambium. Structurally, regular and successive cambia were exclusively composed of fusiform cambial cells, while ray cells remained absent in all the investigated species (at least in the early stages of secondary growth). In the later stage of secondary growth, large heterocellular rays developed in the thick stems, but their frequency was much less. In some of the taxa, these rays were paedomorphic and difficult to discriminate from the axial parenchyma cells. The xylem fibres were living and bear living protoplasts in all the species investigated in the present study. Stems of species with thick stems were composed of several successive rings of xylem alternating with the rings of phloem. Secondary xylem was diffuse porous with indistinct growth rings and composed of vessels, fibres, and axial parenchyma, with exceptionally large rays only in the thick stems. In all the investigated species, vessel diameter increased progressively from the centre towards the periphery of stems. *Hebanthe erianthos* (Poir.) Pedersen, a climbing member of the family, shares feature typical of climbing members in other eudicot families.

Keywords: Amaranthaceae, Cambial variant, Hebanthe, Master cambium, Medullary bundles, Secondary growth, Successive cambia, Absences of rays

INVITED LECTURE–6

Learning from the cliffs: How today's plant adaptations can shape tomorrow's climate resilience

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Cliffs represent some of the planet's most extreme terrestrial habitats. They are defined by steep escarpments, shallow soils, high irradiance, and prolonged seasonal droughts. Yet, these seemingly hostile environments host remarkably specialized plant communities that have evolved a range of structural and physiological adaptations to survive under conditions that mirror those projected for future climates. In the Northern Western Ghats (NWG) of India, basaltic cliffs sustain diverse assemblages of stress-tolerant species, including succulents, lithophytes, geophytes, and desiccation-tolerant (DT) plants. These species endure severe water deficits and temperature fluctuations through strategies such as reversible desiccation, mat formation, and microhabitat engineering—mechanisms that maintain photosynthetic integrity and community stability on near-vertical rock faces. Our recent work highlights that the NWG cliffs act as refugia for many endemic species and serve as natural laboratories for studying plant resilience. Based on long-term studies (2016–2024) across 38 cliff locations in the NWG basalt cliffs, we integrate floristic inventories, trait-based ecology, and biogeographical modelling to link plant functional types with environmental gradients, variations in habitat and microclimatic conditions. The findings suggest that cliff flora represent a vital genetic and functional pool for climate adaptation which offers traits relevant to drought-tolerant crop development, green infrastructure design, and ecological restoration in arid and urban environments. Insights gained from these vertical ecosystems can inform adaptive strategies to enhance biodiversity conservation, climate-resilient agriculture, and sustainable landscape management in an uncertain future climate.

Keywords: Climate resilience, Cliff ecology, Desiccation tolerance, Plant functional traits, Western Ghats

INVITED LECTURE–7

Traditional knowledge in the conservation and sustainable management of biodiversity for sustainable livelihoods: Tribal communities in Southern India

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From time immemorial human race has been dependent on plant resources for its livelihood, material, cultural and emotional needs. This has enabled us to evolve a unique system of knowledge on utilization and conservation of plant genetic resources. Presently, majority of human population depends on 100–150 plant species for most of its requirements. In contrast, tribals living in southern India use 1000–1500 species. Nearly 10 species of food plants, which were hitherto unreported, came into light during ethnobotanical studies on six tribal communities living in hills of Andhra Pradesh. There is a lesson here that, by enlarging the dietary habits with a diversity of plant products our dependence and extensive cultivation of few species can be reduced. Medicinal properties of plants have been recognized by tribal communities and practiced as a tradition. Tribal elders possess a great deal of knowledge of medicinal plants and their curative properties. They use medicinal plants solely or in combination. Each tribe has its own method of collecting plants as well as preparation of medicines. Sustainable harvesting of wild edible fruits is the norm of their culture. Only ripe fruits are harvested so as to ensure that the seeds are viable and attain full germination potential. Fishing using stupefying botanicals to harvest only large fish is another way of sustainable management. The traditional farming practices of tribal communities are truly sustainable. Their subsistence life style, diet habits and dependence on rain fed irrigation have influenced them to cultivate and conserve traditional cultivars or land races. Tribal communities practice a unique method of farming namely Mixed Cropping System where a number of crops are grown together in a given area depending on monsoon. Seed material for sowing and grains for consumption is preserved in traditional granaries in which the seeds could remain viable till next season. These traditional and age-old practices have enabled them to adapt to changing climatic conditions and practice climate smart agriculture. Due to the above practices, tribal people could conserve genetic strains for a long time.

However, at present, there is every threat for the genetic material conserved by the tribes due to various reasons. Hence, there is a need to conserve the traditional cultivars as they form basic raw material for further crop improvement. Policy decisions, which might affect conservation and sustainable management practices of tribal communities and ecological balance of biodiversity, should be taken through prior consultation of tribal people inhabiting the areas to seek practical solutions.

Keywords: Biodiversity, CC adaptation, Cropping patterns, Policy, Sustainable practices, Traditional knowledge

INVITED LECTURE–8

Extrafloral nectaries and their strategic positioning

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Extrafloral nectaries (EFNs) are specialized nectar-secreting structures located outside the floral organs of plants, functioning primarily in indirect defense rather than pollination. Distributed across numerous angiosperm families. EFNs secrete a carbohydrate and amino acid-rich nectar that attracts ants and other predatory insects. This mutualistic interaction benefits both partners: the insects gain a valuable food source, while plants receive protection against herbivores and other potential threats. Morphologically, EFNs display remarkable diversity in form, size and anatomy. They may be vascularized or non-vascularized and usually consist of a secretory layer, sub-secretory layer and vascular tissue. EFNs occur on various plant parts such as leaves, petioles, stems, bracts, pedicels, calyces and fruits. The position of EFNs significantly affects their function: those on the abaxial (lower) leaf surface minimize exposure to sunlight and rainfall and maintaining photosynthetic efficiency. However, this downward orientation may also have drawbacks, as gravity could cause nectar to drip before the nectar-cup fills completely, potentially reducing reward efficiency, while adaxial (upper) EFNs, though more exposed to desiccation, enhance deterrence by making protective ants visible to herbivores. Nevertheless, the presence of EFNs on the adaxial surface can reduce photosynthetic efficiency, representing a potential drawback of this positioning. Petiolar EFNs, directly connected to the leaf vasculature, allow efficient nutrient flow for continuous nectar secretion without reducing photosynthetic capacity. Evolutionary studies indicate that EFNs arose independently across multiple plant lineages, particularly within the rosid clade during the Cretaceous period concurrent with the diversification of Fabaceae and Hymenoptera. The repeated gain and loss of EFNs across taxa underscore their adaptive role in enhancing plant survival under variable environmental conditions. Beyond their defensive function, EFNs may also mediate interactions between ants and pollinators. The “decoy nectar” hypothesis posits that EFNs evolved to divert ants from floral nectaries, reducing interference with pollination and ensuring

reproductive success. This spatial separation between EFNs and floral nectaries highlights an evolutionary balance between defense and reproduction. Overall, EFNs exemplify a sophisticated plant-animal mutualism that integrates ecological defense, physiological efficiency and evolutionary adaptation. Their structural diversity, functional flexibility and repeated evolutionary origins underscore their ecological and evolutionary importance in maintaining the balance between herbivore deterrence and pollination across diverse angiosperm lineages

Keywords: Extrafloral nectar, Rosid, Pollination, nectar, Photosynthesis, Cretaceous

INVITED LECTURE–9

Metabolomics: A key tool for understanding and advancing plant science

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Metabolomics represents a rapidly advancing and powerful field that offers comprehensive, system-wide insights into the chemical fingerprints of plants, reflecting their overall physiological status, genetic expression, and adaptive responses to the various environmental stimuli. Being the "omics" field closest to the phenotypic expression, metabolomics provides a direct functional readout of biochemical processes, quantifying the entire complement of small-molecule metabolites within a biological system at a specific time. This allows for a deeper, more mechanistic understanding of the interplay among a plant's genome, transcriptome, proteome, and its environment. The application of metabolomics has revolutionized numerous facets of plant science. In plant physiology and stress biology, it is indispensable for dissecting complex responses to abiotic stresses such as drought, salinity, and extreme temperatures, and biotic stresses including pathogen attack and herbivory. By identifying and quantifying changes in primary and secondary metabolites, researchers can pinpoint crucial metabolic pathways that underpin plant resilience and adaptation, leading to the development of more robust crop varieties. Beyond stress research, metabolomics has critical applications in plant functional genomics, helping to functionally annotate unknown genes by linking genetic variations to specific metabolic outputs. In plant breeding and quality control, it is used to screen for and select desirable traits, such as improved nutritional value, enhanced flavor profiles, or increased synthesis of valuable pharmaceutical compounds. Furthermore, metabolomics serves as an invaluable tool in chemotaxonomy, providing chemical signatures that assist in the classification, authentication, and phylogenetic analysis of plant species, offering a high-resolution view of biochemical relationships that complements traditional morphological and genetic methods. By analyzing the distinct metabolic profiles of different taxa, metabolomics can resolve ambiguous taxonomic relationships and help identify cryptic species based on unique secondary metabolite patterns. The comprehensive metabolic profiles generated by advanced analytical techniques like GC-MS and

LC-MS provide unparalleled clarity into a plant's inherent biochemical potential and how it is modulated by external factors. This non-targeted approach enables the global assessment of metabolic shifts, moving beyond the study of single compounds to reveal coordinated changes across entire pathways. For instance, our recent research explored the use of the monoterpene Geraniol as a defense-priming agent against *Pythium myriotylum*-induced rhizome rot in ginger. Metabolomics profiling revealed that Geraniol effectively reprogrammed the ginger defense system, accelerating the accumulation of key defense-related metabolites upon pathogen challenge. Collectively, these powerful applications position metabolomics as a cornerstone technology for advancing our understanding of plant biology and for developing innovative, sustainable solutions in agriculture and biotechnology.

Keywords: Crop improvement, Mass spectrometry, Metabolic profiling, Metabolomics, Plant physiology, Stress tolerance

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INVITED LECTURE–10

Molecular taxonomy: revolution or regression in species delimitation?

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Plant taxonomy is undergoing a paradigm shift, moving from classical morphology-based systems toward integrative frameworks powered by genomic technologies. This transformation is particularly consequential in biodiversity hotspots like India, were high species richness and endemism demand more precise and reliable classification methods. Traditionally, morphological traits formed the cornerstone of species identification, but their limitations, especially in resolving cryptic taxa, have become increasingly apparent. The rise of molecular taxonomy has revolutionized species delimitation by leveraging DNA and RNA sequencing, protein-coding markers, and high-throughput tools like DNA barcoding and next-generation sequencing (NGS). These methods have illuminated hidden evolutionary relationships, clarified taxonomic ambiguities, and accelerated species discovery. In India, families such as Capparaceae, Eriocaulaceae, and Fabaceae have benefited from such approaches, while other ecologically dominant groups like Orchidaceae, Poaceae, and Rubiaceae remain understudied at the molecular level. Integrating molecular data with traditional disciplines, including anatomy, cytology, palynology, phytochemistry, etc., has enabled a more holistic, evidence-based approach to taxonomy. This molecular shift has also influenced species concepts, particularly through frameworks like de Queiroz's unified species concept, which views species as independently evolving metapopulation lineages. Advances such as the multispecies coalescent (MSC) model further enhance species delimitation by accounting for genetic divergence and incomplete lineage sorting. Nevertheless, concerns persist regarding MSC-based approaches, which can overestimate species diversity by capturing population-level genetic structure rather than true speciation events. This can pose challenges for conservation planning and evolutionary research that rely on consistent and stable species definitions. While molecular tools undoubtedly advance taxonomic resolution and deepen our understanding of evolutionary relationships, they also prompt a re-evaluation of traditional species concepts. Whether this molecular shift constitutes a genuine revolution or a potential regression ultimately hinges on how thoughtfully and integratively these methods are applied.

Keywords: Genomic tools, Integrative taxonomy, Molecular systematics, Species concept

INVITED LECTURE–11

Using plants in forensics: state of the art and prospects

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Forensic botany can provide significant supporting evidence during criminal investigations; nevertheless, it is still an underutilized tool. The success of laboratory testing strongly depends on the accurate recognition, documentation, collection, and preservation of botanical evidence. The primary goal of Forensic Botany in criminal investigations is to establish associations between the victim, the suspect and the crime scene. The use of plant taxonomy can be important as a forensic tool in criminal investigations. Plant taxonomists are encouraged to make themselves available to educate the police about the potential applications of plant taxonomy in their investigations. The plant taxonomists are accustomed to working with plant fragments, such as leaves, flowers, fruits and seeds attached to clothing, or any small parts of plants that may be associated with a particular criminal investigation, can be analyse in a modern forensic laboratory. Especially, grass species are tremendously abundant, and many species are difficult to distinguish from one another unless one is a taxonomic expert. Furthermore, most forensic scientists are familiar with methods for human identity testing, the use of the plant evidence is yet unknown. This review paper encompasses different sub disciplines that come under forensic botany and highlights the current state and future potential of Forensic Botany.

Keywords: Crime scene, Evidence, Forensic, Investigation

AWARDS

PROF. A.K. PANDEY AWARD FOR REVISIONARY STUDIES

AK-OP-01

Taxonomic revision of the Asian genus *Nogra* (Glycininae: Leguminosae)

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Taxonomic revision of the less known Asian genus Nogra Merr. is presented here based on the scrutiny of protologues, relevant literature and herbarium specimens (including types) and live specimens (excluding *Nogra filicaulis* (Kurz) Merr. and *N. guangxiensis* C. F. Wei). *Nogra* is a small genus belonging to subtribe Glycininae of tribe Phaseoleae of Leguminosae and comprises only four species namely *N. dalzellii* (Baker) Merr., *N. filicaulis*, *N. grahamii* (Wall. ex Benth.) Merr., *N. guangxiensis* in the World as per the recent literature. The genus is distributed and confined to Asia (China South-Central, China Southeast, India, Laos, Myanmar, Thailand). The name *Nogra* which came from an anagram of generic name *Grona* Lour. *Nogra dalzellii* was collected from Maharashtra by many workers but *N. filiculis* and *N. grahamii* were not collected so far in recent years from India. *Nogra filiculis* is a rare species and there is a single specimen at CAL which was collected after 100 years of its discovery. *Nogra grahamii* was collected second authors from Thailand for the present study. Nomenclatures of all the taxa were studies and lectotypes are designated for the binomials *N. filicaulis*, *N. grahamii* and their associated names. The identity of *N. guangxiensis* is discussed and it was considered as a synonym of *N. graha*mii. Here we reported only three species in the genus. A comprehensive taxonomic account and ecology of the species is provided. Additionally, key to the species, line drawings of leaves, standard, wing and keel petals are given to facilitate easy identification of species.

Keywords: *Grona*, Kurz, Nomenclature, Pegu, Lectoype

PROF. SANTHOSH NAMPY YOUNG SCIENTIST AWARD

SN-OP-01

From forests to phylograms: Decoding Indian *Aeschynanthus* diversity

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Aeschynanthus Jack is the largest Asiatic epiphytic genus in the family Gesneriaceae, commonly known as 'lipstick plants' or 'blush-worts'. The genus was first described by Jack in 1823, with two species—*A. volubilis* Jack and *A. radicans* Jack from the Indonesian Island, Sumatra. Globally, the genus is recognized with approximately 182 species and exhibits a strong biogeographical distribution pattern, stretching from the Western Ghats and Sri Lanka to the Eastern Himalayas, and further through Southeast Asia to the Solomon Islands, crossing the Wallace's Line. In India, Northeast India serves as the primary diversity centre for the genus, with additional representatives found in South India and the Andaman and Nicobar Islands. By venturing into Indian forests and major herbaria, and analyzing genetic lineages, the present study aims to uncover the identity, distribution, and phylogenetic placement of Indian *Aeschynanthus* species. The genus is characterized mainly by the epiphytic habit, they root superficially in moss on branches or in debris accumulated in crotches, fern roots, etc. When conditions are suitable, species may grow on rocks or cliffs as lithophytes. The branches may be pendulous, creeping, arching, or erect, and adventitious roots may form at the nodes. The leaves are typically opposite, rarely whorled, thick and leathery in appearance. Inflorescences are borne in solitary or few-flowered clusters in the axils along the vine, or as pseudo terminal clusters. In most species, the peduncle is very short or absent, and likewise, the bracteoles are mostly short, stiff, and deciduous. The calyx free, or fused in various extend, in some species having a tubular calyx acting as a water-calyx. The corolla characters seem to be most adapted for bird pollination. The brightly coloured, often red, arcuate corolla tube, strong protandry, downwardly shedding pollens from the exserted stamens, and the production of copious nectar with low-sucrose content support ornithophily. The stamens are strongly protandrous and are generally coherent in pairs. An annular or weakly crenate disc is present in the genus. The seeds develop in a long, narrow capsule with at least two appendages; one or more at the hilar end, to which the seeds are attached to the capsule, and one at the apical end. For the sectional delimitation in *Aeschynanthus*, seeds serve as the primary source of characters. To obtain in-depth morphological knowledge, about 25 collection trips were carried out and spent above 200 days in the field. Ten states, (Arunachal Pradesh, Assam, Karnataka, Kerala, Meghalaya, Mizoram, Nagaland, Sikkim, West Bengal, and Tamil Nadu) were covered, and collected live samples as much as possible. Apart from the field, several National (ARUN, ASSAM, BSHC, CAL, and CALI) and International (BM, E, and K) herbaria were also consulted to get a thorough conclusion. The investigation led to the description of two new species (*A. reiekensis* Lalhlupuii, S.D.Khomdram & S.D.Yumkham and *A. maoi* Debta & A.Shenoy) from the study region and the lectotypification of three existing names (*A. oblanceolatus* (J.Anthony) C.E.C.Fisch., *A. philippinensis* C.B.Clarke and *A. stenosepalus* J.Anthony). Seed characters of 17 Indian species were analysed with

Scanning Electron Microscope. The seed micromorphology, when assessed alongside molecular data, indicated that the current sectional classification—largely based on seed traits—lacks robust molecular support. The distribution study implies that, *A. clarkei* Moaakum, S.Dey, Barbhuiya & G.Krishna*, A. chayangtajoensis* Chowlu, A.Shenoy & A.Ray*, A. maoi, A. reiekensis* and *A. tirapensis* Bhattacharyya are endemic to Northeast India, while *A. perrottetii* A.DC. is endemic to the Western Ghats and Sri Lanka. The global conservation assessment, based on IUCN Categories and Criteria, revealed that out of the 22 Indian species, four species fall under the Critically Endangered (CR) category, two species as Endangered (EN), thirteen species as Least Concern (LC), and three species as Data Deficient (DD). For the phylogenetic analysis, a total of 382 sequences were generated for the ingroup taxa, 78 for the ITS locus, 56 for *rps*16, 46 for *psb*A-*trn*H, 43 each for *rpl* 32 and *trn* LF, 40 for *ndh*F and 39 each for *rps*12-*rpl*20 and ETS. 20 additional sequences were retrieved from NCBI for ITS. For the outgroup, 47 sequences were generated. The present study analysed the combined amplicon sequence data (nuclear + chloroplast) for 50 sampled matrices, after checking the congruence of matrices with ILD test. For a greater number of samples generated through Sanger sequencing, ITS and *rps*16 matrices were separately built and was non-congruent for compilation and analysed separately. All the trees support the monophyly of the genus with strong statistical support. The combined tree generated using Parsimony and Bayesian methods yielded similar topologies and exhibited two major clades of *Aeschynanthus* (Clade I & II). Clade I includes all the Indian species, nested along with species from Indochina and South China. Clade II includes species from New Guinea, Sulawesi, Philippines, and Seram. Clade I is further divided into two, of which Clade Ia consists of a species distributed in China and Vietnam, and Clade Ib is further divided into two sub-clades of which one (sub-clade I) consists of all the Indian species confined to Northeast India along with the species from China and Vietnam, and the other (sub-clade II) consists of a polytomous clade of South Indian-Sri Lankan species. Based on the morphological and molecular studies, synonymised the Sri Lankan taxa *A. ceylanicus* Wight under the South Indian *A. perrottetii* and also the treatment considered all the existing varieties (*A. perrottetii* var. *malabaricus* C.B.Clarke, var. *planiculmis* (C.B.Clarke) Gamble, *A. ceylanicus* var. *pinguis* C.B.Clarke) conspecific to *A. perrottetii*. Apart from this, the study supporting the synonymisation of *A. sikkimensis* (C.B.Clarke) Stapf under *A. parviflorus* (D.Don) Spreng., *A. austroyunnanensis* W.T.Wang under *A. micranthus* C.B.Clarke, and *A. deleiensis* C.E.C.Fisch. and *A. mimetes* B.L.Burtt under *A. parasiticus* C.B.Clarke.

Keywords: Conservation, Micromorphology, Phylogeny, Taxonomy

SN-OP-02

A glimpse through the Monocot diversity of Idukki district, Kerala

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Survey and documentation of the floristic wealth of a region is a prerequisite for planning the proper utilization of its potential plant resources on one hand and to conserving the depleting genetic resources on the other. Idukki, the 'Cradle of plantation crops' and 'Home to nature' is the largest district of Kerala covering an area of 4,612 km^2 and is one of the richest parts of southern Western Ghats with 5 national Parks and 3 wildlife sanctuaries. The vegetation comprises evergreen forests, semi-evergreen forests, moist deciduous forests, dry deciduous forests, shola forests, grasslands, and forest plantations. Anamudi 'the Everest of South India' is located in this district. Monocots are much diverse and one of the major groups of flowering plants in the Idukki district. During the present study, a total of 652 species in 248 genera under 28 families were collected. Out of the total plants, 592 species occur in the wild and 58 were cultivated. It is the largest number of taxa of monocotyledons compared with the rest of the districts. 45% of the state's monocotyledon diversity occurs in this district, which indicates the species richness of the district. Among the 592 wild taxa, 213 are included in IUCN Red List for threatened plants. The study area harbours 138 (23%) endemic species. 26 species are introduced, majority of them are introduced for ornamental and fodder purposes, but most of them become aggressive colonizers and threaten the habitat of the native species. During the investigation, five new species: *Eriocaulon vamanae* Dani & Nampy, *Burmannia munnarensis* Dani & Nampy, *Ariopsis idukkiana sp. nov.* and *Peliosanthes breviscapa sp. nov.* were described. *Eriocaulon vamanae* Dani & Nampy was described from Meesapulimala. It resembles *Eriocaulon nepalense* var. *luzulifolium* (Mart.) Praj. & J.Parn., but differs in the shape of its involucral bracts and receptacle, the fusion of the sepals in male flowers, the shape and indumentum of the sepals in female flowers, the size and indumentum of the petals in female flowers, and the seed coat appendages. *Burmannia munnarensis* Dani & Nampy is described from Munnar on the way to Rajamala. It is morphologically most similar to *B. indica* but can be easily distinguished by its narrow flower wings, involute margin of the perianth lobes, shorter perianth tube and shape of inflorescence. *Ariopsis idukkiana sp. nov.* is discovered from Anakulam of the district. It is closely allied to *A. peltata*, but can be easily distinguished by its acute apex of the spathe, ovate dome shaped apex of the male spadices and slightly angled fruits. Moreover, in *A. idukkiana* petiole is attached at or near the leaf base, whereas in *A. peltata* Nimmo younger leaves have attachment just above the leaf base and mature leaves show peltate nature. *Peliosanthes breviscapa* is morphologically close to *Peliosanthes neilgherriensis* Wight but can be distinguished by several key characters: shorter scapes measuring 7–13 cm (*vs*.16–40 cm), densely flowered racemes (*vs*. laxly flowered), tepals fused with the staminal corona (*vs*. free) and a broader corona approximately 2.3 mm wide (*vs*. *c.* 1.7 mm). It is collected from Meenuliyanpara. *Burmannia indica* Jonker was rediscovered after 110 years. It was first described by F.P. Jonker in 1938 in his monograph of Burmanniaceae based on the homogenous collection of A. Meebold in 1909 from Peermade (now in Idukki district of Kerala). Hazra (1988) in *Fascicles of Flora of India* and Sasidharan (2011) in his *Flowering plants of Kerala* mentioned the occurrence of this species based on Meebold's collection and stated that it is endemic to Kerala. There was no subsequent collection of this species

anywhere from South India after the original collection by Meebold in 1909 (Hooker, 1888; Gamble, 1928; Matthew, 1983). Thus, it's report forms a rediscovery after 110 years and proves its existence in the area. Seven species such as *Cyperus raynalianus* (Govind.) Bauters, *C. diaphanous* Schrad, *C. intactus* Vahl, *C. albescens* (Steud.) Larridon & Govaerts, *Scleria multilacunosa* T.Koyama, *Festuca bromoides* L., *Tripogon pungens* C.E.C.Fisch. are new records to Kerala and two *viz*. *Eriocaulon rhodae* Fyson and *Urochloa eminii* (Mes) Davidse are new reports to the study area. *P. neilgherriensis* Wight and *P. courtallensis* Wightwere reinstated. Wight (1853) described these two species from South India and were recognized as distinct species by Hooker (1894) and Gamble (1928). However, Jessop (1976) in his revision of *Peliosanthes* Andrews, recognized only a single species, *P. teta* Andrews with two sub-species, *P. teta* subsp. *teta* and *P. teta* subsp. *humilis* (Andrews) Jessop *ex* Gandhi. The South Indian species were treated under the synonymy of *P. teta* subsp. *humilis*. During our study we have collected specimens of this genus from different areas of Idukki district. Critical examination revealed that these specimens are quite distinct and belong to *P. courtallensis* and *P. neilgherrensis*, which however, has long been treated as synonyms of *P. teta* subsp. *humilis*. Out of 28 reported families, Poaceae (186), Orchidaceae (127), Cyperaceae (99), Commelinaceae (41), Zingiberaceae (28) and Araceae (25) were the dominant families with the highest number of taxa. The genus *Cyperus* L. with 43 species represents the largest genera followed by *Fimbristylis* Vahl (21), *Eriocaulon* L. (18), *Dendrobium* Sw. (15), *Murdannia* Royle (14), *Eragrostis* Wolf (14), and *Habenaria* Willd. (13). 26 introduced exotic species from eight families were collected. The majority of them are introduced for ornamental and fodder purposes, but most of them threaten the habitat of the native species. Since Idukki is one of the major tourist destinations, the majority of the hill stations are accessible to tourists. The development of tourism actively and passively affects the floral and faunal diversity through construction activities, road widening, pollution, etc. Moreover, the extreme climate fluctuations and their resulting flood, fire regimes, snowfall, landslides, etc. lead to habitat fragmentation and destruction. The study provided a comprehensive account of the monocotyledon diversity of Idukki, which provides insights into the importance of conservation, identification, impact assessment, research, management decisions, and policy formulation. The present paper discusses the taxonomy, diversity, endemism and conservation of monocotyledons in Idukki district.

Keywords: Flora, Idukki, Monocot, Vegetation

SN-OP-03

Pollination biology of five species of the tribe Commelineae (Commelinaceae)

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The reproductive ecology of the family Commelinaceae, despite its considerable taxonomic and ecological diversity, remains inadequately understood globally and particularly in India. This study provides a comprehensive account of the pollination biology of five representative species of the tribe *Commelineae—Commelina diffusa* Zoll. *ex* C.B.Clarke, *Dictyospermum montanum* Wight, *Floscopa scandens* Lour., *Murdannia nudiflora* (L.) Brenan, and *Rhopalephora scaberrima* (Blume) Faden—with a focus on understanding their reproductive mechanisms, floral adaptations, pollinator interactions, and breeding systems. Through integrated field and laboratory investigations conducted between 2015 and 2019, the study examined floral morphology, phenology, pollen and stigma biology, pollination ecology, fruit and seed set, and breeding system dynamics in both natural populations and controlled environments. All the species exhibited short floral longevity, with flowers lasting less than a day and anthesis synchronised with pollinator activity, generally in the morning hours between 07:00 and 11:00 a.m. The synchrony between pollen viability and stigma receptivity ensured successful fertilization within a narrow temporal window. Distinct floral architectures and morphologies were observed, each reflecting adaptive responses to enhance pollination efficiency and reproductive assurance. *Commelina diffusa* and *R. scaberrima* displayed heteranthery, where dimorphic stamens serve distinct functions for pollen feeding and pollination. *Dictyospermum montanum* showed reciprocal enantiostyly, a rare feature in the family that facilitates cross-pollen transfer through mirror-image floral arrangements. *Murdannia nudiflora* produced both chasmogamous and cleistogamous flowers, indicating facultative cleistogamy, while *C. diffusa* exhibited andromonoecy, bearing both bisexual and male flowers on the same plant. Collectively, these features represent sophisticated floral mechanisms evolved to balance cross-pollination and reproductive assurance. Pollen biology revealed uniformity in pollen type—monolete, spinulose grains—but significant interspecific variation in quantity and viability. Pollen production was highest in *D. montanum* and *R. scaberrima*, reflecting their predominantly xenogamous nature. The pollen–ovule (P/O) ratios ranged widely: *M. nudiflora* (266:1) suggested facultative autogamy, *C. diffusa* (1508:1) indicated mixed mating, while *D. montanum* (3144:1) and *R. scaberrima* (2049:1) pointed to predominant xenogamy. Maximum pollen fertility and viability were recorded during early anthesis, followed by a steady decline toward the end of the floral lifespan. *In vitro* germination assays demonstrated optimal germination percentages and pollen tube lengths in Brewbaker and Kwack's medium, confirming the essential roles of calcium and boron ions in pollen tube growth. Stigma biology analyses revealed dry stigmas with solid or semi-solid styles in all species, with well-developed papillae that enhance pollen adhesion and germination. The stigmatic surface exhibited peroxidase and esterase activities indicative of receptivity, which was found to coincide closely with the period of maximum pollen viability. This tight synchronization between male and female phases in flowers of very short duration underscores the precision of reproductive timing in Commelinaceae, ensuring fertilization even within brief anthesis periods. The five taxa were uniformly entomophilous, with insects serving as the principal pollinators. Hymenopterans and syrphid flies constituted the

dominant floral visitors, their abundance varying with local environmental conditions. Major pollinators included *Halictus* sp., *Ceratina* spp., *Tetragonula iridipennis*, *Amegilla zonata*, and *Apis dorsata*. *T. iridipennis* proved to be the most efficient pollinator for *D. montanum* and *R. scaberrima*, while *Halictus* sp. dominated in *C. diffusa*. *Floscopa scandens* was pollinated chiefly by *Amegilla zonata* and *Apis dorsata*, whereas *Ceratina* sp. was most effective in *M. nudiflora*. Insect visits generally commenced soon after anthesis and continued until flower senescence. Pollinator behaviour varied among taxa: bees and syrphid flies frequently manipulated the stamens while foraging for pollen, thus ensuring contact with stigmas. The absence of nectar was compensated by visual and tactile cues such as bright petal colouration, contrasting anthers, and hairy filaments, all of which enhance attraction and pollen transfer. Breeding system experiments demonstrated that all species were self-compatible, yet cross-pollination generally yielded higher fruit-set percentages. Spontaneous autogamy was prominent in *C. diffusa* (72.4%) and *M. nudiflora* (47.6%), reflecting their capacity for reproductive assurance under low pollinator activity. *Dictyospermum montanum* and *F. scandens* favoured xenogamy, showing higher fruit set in manually cross-pollinated flowers (76–84%) compared with self-pollinated ones. *Rhopalephora scaberrima* exhibited a mixed mating system with both autogamous (41.4%) and xenogamous (92.1%) fruit set. Mechanisms such as delayed selfing in *C. diffusa*—caused by the post-anthesis coiling of the style towards the medial stamen—and cleistogamy in *M. nudiflora* acted as fallback strategies to ensure reproduction when pollinators were scarce or environmental conditions were unfavourable. Fruit and seed biology observations confirmed successful reproduction under both natural and experimental conditions. Fruit maturation occurred within 3–5 days after fertilization, and dehiscence followed within a week. The fruiting percentages under natural pollination ranged from 45% in *D. montanum* to over 70% in *C. diffusa*. Dispersal modes varied: *R. scaberrima* displayed zoochorous dispersal through its hooked, sticky capsules, whereas the other taxa were primarily autochorous or hydrochorous. Ovule-to-seed ratios were high across taxa, indicating efficient fertilization and embryo development. Collectively, the findings highlight the complex interplay between floral morphology, pollinator behaviour, and breeding mechanisms that governs reproductive success in *Commelineae*. The coexistence of selfing and outcrossing systems enables these taxa to maintain reproductive stability in fluctuating environments. Morphological specializations such as heteranthery, enantiostyly, and andromonoecy promote pollen transfer and genetic diversity, while selfing and cleistogamy assure seed set when pollinator service declines. The study also demonstrates that even in the absence of nectar—a primary pollinator reward—these plants have evolved deceptive visual and structural traits to maintain pollinator visitation. From an evolutionary and ecological perspective, the observed diversity in mating systems and pollination adaptations reflects the flexibility and resilience of Commelinaceae in tropical ecosystems. The integration of autogamous and xenogamous mechanisms allows them to thrive across a range of habitats, from forest margins to disturbed sites. These findings further underscore the ecological importance of bee and fly pollinators and the potential vulnerability of these taxa to ongoing declines in pollinator populations. This investigation represents the first detailed comparative study of pollination biology in Indian members of the tribe *Commelineae*. It contributes valuable baseline data for future research on floral evolution, plant–pollinator interactions, and conservation biology within the family. By elucidating the fine balance between floral specialization and reproductive assurance, the study enhances our understanding of how adaptive modifications in reproductive strategy have contributed to the evolutionary success of Commelinaceae in the tropics.

Keywords: Andromonoecy, Cleistogamy, Enantiostyly, Heteranthery

DR. A.K. PRADEEP YOUNG RESEARCHER AWARD

AKP-OP-01

Beyond a single lineage: Untangling the complex phylogenetic history of Indian *Senecio*

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Senecio L. (Asteraceae) is one of the species and taxonomically difficult genera. Its evolutionary history has been shaped by historical and ongoing interspecific hybridisation, resulting in complex evolutionary patterns. Phylogenetic studies have proved handy to uncover evolutionary relationships and test the validity of morphology-based classifications. Worldwide, *Senecio* has been the focus of numerous phylogenetic analyses; however, Indian species remain largely unexplored. A total of 47 Indian *Senecio* species is primarily distributed in the Himalayas and the Western Ghats. In the present study, we aimed to examine infrageneric relationship based on the traditional classification system in the light of modern phylogenetic methods. We sampled 37 accessions representing 29 species of *Senecio*, collected from different localities in India, in order to evaluate their placement within the subtribe Senecioninae. Analyses based on different nuclear (ITS, ETS) and plastid markers (trnL, L-F and psbA-trnH) reveal that the Indian species are distributed in multiple clades along the phylogenetic tree. This underscores the presence of cryptic diversity, potential convergent evolution of traits, and the need to reassess infrageneric classification.

Keywords: India, Phylogeny, *Senecio*

AKP-OP-02

Critical taxonomic studies on the endemic species of the genus *Arundinella* (Poaceae) from Kerala

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Arundinella Raddi is a widely distributed grass genus comprising of 57 species distributed around the world. In India, this genus is represented by 27 species and among these 11 species are endemic. Out of all Indian endemics, 10 species are restricted to the southern Peninsular India: one species to Maharashtra, one species to Tamil Nadu, six species to Kerala and the rest two species to Kerala, Tamil Nadu and Karnataka. Only one endemic species, *Arundinella tuberculata* Munro *ex* Lisboa shows comparatively wide distribution across India. Since six species are endemic to Kerala, a critical study on these species were conducted. The current study discusses the taxonomy of these species and their intraspecific variations. It has been observed during the study that *Arundinella*, like many other grass genera exhibit a wide range of variations. Albeit, the genus has characteristic features to stand out as a distinct genus.

Keywords: Grass taxonomy, Identification, Morphology, New species, Variations

AKP-OP-03

Systematics of *Lepidagathis* (Acanthaceae: Barlerieae) in India

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Lepidagathis Willd. (Acanthaceae: Barlerieae) is a pantropical genus (Manzitto-Tripp *et al*., 2021), with 156 accepted species globally (POWO, 2025). It is characterised by: (i) densely secund spikes (sometimes compounded into globose heads) or many-flowered thyrse with flowers in dense whorls at each node, (ii) unequally 5-lobed calyx lobes (2+2+1 configuration), anterior lobes often partially fused, (iii) corolla distinctly bilabiate with quincuncial aestivation, (iv) pollen grains tricolporate with reticulate ornamentation, more open in areas adjacent to apertures, and (v) seeds covered with hygroscopic trichomes. The present study on the Systematics of the genus in India, funded by the SERB-DST (SERB/CRG/2020/001605), recognised 29 species and two varieties, of which 21 species are endemic to the country. The remaining 14 taxa share their distribution with one or other countries in the Indian subcontinent. This paper provides a summary of findings based on a scrutiny of earlier literature, a critical examination of herbarium specimens, and thorough morphological and molecular studies. This includes: (i) the updated circumscription for all species with dichotomous keys, illustrations, photographic plates, and extinction risk; (ii) taxonomic (sections and species) and nomenclatural novelties; (iii) taxonomic evidences for subsuming ten names and reinstating one name; (iv) typifications for 16 names; (v) systematic significance of pollen and seed micro-morphologies; and (vi) evolution and phylogenetic relationships of all species based on molecular data from rbcL, rpl32-trnL, trnS(GCU)–trnG(UCC) and ITS regions with an evidence of morphological synapomorphies and a note on biogeography.

Keywords: Acanthaceae, Biogeography, India, *Lepidagathis*, Molecular Phylogeny, Taxonomic Revision

AKP-OP-04

Diversity of wings in the diaspores of South Indian Combretaceae

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South India harbours a remarkable variety of ecosystems ranging from forests, grasslands, and sholas to plateaus, coastal belts, and sacred groves, supporting high levels of floral diversity. Among the adaptive strategies for survival and colonization, seed dispersal plays a pivotal role, with wind dispersal (anemochory) being one of the most effective modes in open habitats. The family Combretaceae comprising about 10 genera and over 580 species globally, displays notable adaptations for dispersal across diverse habitats. Majority of the members of this family are trees, shrubs, and lianas. Most of the members produce winged

diaspores, but structure and aerodynamics of these wings exhibit striking diversity. In some taxa, well-developed wings fail to facilitate effective wind dispersal, while in others, subtle morphological adaptations in wing form enhance buoyancy and movement along air currents. Distinct wing morphologies were observed to influence dispersal trajectories and dispersal distance, reflecting ecological adaptations to habitat types. The present study highlights the diversity of wing structures in the diaspores of Combretaceae in South India, emphasizing their functional significance in dispersal ecology and adaptive evolution.

Keywords: Aerodynamics, Anemochory, Fruit morphology, Seed dispersal, Winged seeds, Wing morphology

AKP-OP-05

Diversity of climbers of Ratnagiri district (Maharashtra)

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Flora has been a part of human life from ancient period and floristic study is the basic information about plant species. The present study aimed to document the floristic study of climbing plants from the Ratnagiri district of Maharashtra. Climber plants mean a type of plants that uses other plants or structure of support to grow upward, because it has weak stem that can't stand on their own stem. Ratnagiri is a costal district of Maharashtra and is a part of Konkan and Western Ghats region. Total area of Ratnagiri district is 8208 km^2 and it divided into nine tehsils for administrative purpose. During our continuous field visit and floristic studies of Ratnagiri district during last three years (2023–2025), we have collected total 123 taxa (Angiosperms) of climbing flowering plants belong to 23 families and out of that 18 species are endemic to India. Out of 123 taxa, three taxa are reported first time from the Ratnagiri district and three taxa are reported as a new record for the state of Maharashtra. In this study the family Convolvulaceae Juss. is dominant family with 26 taxa and genus *Ipomoea* L. is dominant genus with 17 taxa.

Keywords: Climbers, Floristic, Konkan, New records, Ratnagiri

AKP-OP-06

Flight behaviour in the winged seeds of *Dolichandra unguis-cati* (Bignoniaceae)

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Plants are generally stationary, but exhibit complex movements that play crucial roles in their survival, reproduction, and colonisation of new habitats. Seed dispersal is a major strategy for plant movement, accomplished through diverse mechanisms. For their effective dispersal, the dispersal units are variously modified in plants grown in different

environments. The diaspores, which are dispersed by means of wind, are light in weight with extended structures that are helpful for their aerodynamic movements. The present study uncovers the mystery behind the dispersal units of *Dolichandra unguis-cati* (L.) L.G.Lohmann, belonging to the family Bignoniaceae. It produces seed diaspores with two wings developed from its integument. These diaspores are flat, smooth, shiny and papery in texture, and exhibit four different types of aerodynamic movements: 1) vertical autorotation, 2) rolling autorotation, 3) straight rolling or tumbling and 4) rocking or straying. The diversity of movement is due to the uniform mass distribution in the seed, horizontally flat wings, unique micromorphology of the seed, shape of the cotyledons, symmetrical chordwise mass distribution, surface texture, rigidity, high aspect ratio and the presence of various types of curvature in their wings.

Keywords: Aerodynamics, Bioinspiration, Biomimetics, Bioprospecting, Diaspores, Seed Dispersal

AKP-OP-07

Floristic keys to the Flora of The Maharaja Sayajirao University of Baroda: An integrated taxonomic approach

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Accurate taxonomic documentation of campus flora is essential for biodiversity assessment, ecological monitoring, and conservation planning. The flora of The Maharaja Sayajirao University of Baroda had been documented in earlier studies, but a systematic revision integrating modern classification and user-friendly taxonomic tools was lacking. This study aimed to update the floristic account and develop practical aids for plant identification. Extensive field surveys were conducted across the M.S. University of Baroda campus. Vegetative and reproductive parts were collected, photographed, and examined morphologically using stereomicroscopes. Plant identification was performed with standard floras, and species were classified under APG-III (2009). Bracketed keys and floral formulas were constructed for representative taxa. A total of 778 species were recorded, including 680 angiosperms (281 trees, 302 herbs, 55 shrubs, 37 climbers, and 20 palms), along with 37 cacti, 38 succulents, 21 orchids, and 23 pteridophytes. Bracketed keys and floral formulas were prepared for 20 orders, encompassing 75 families and 90 genera. Comparison with earlier floristic studies (1955–2010) revealed both continuity and shifts in species composition, reflecting ecological and anthropogenic influences. Additionally, a novel classification of families based on carpels, locules, and ovules was proposed, providing a new perspective for teaching and comparative taxonomy. This study revises and enriches the floristic diversity of the MSU campus, offering innovative taxonomic tools that enhance plant identification, research, teaching, and conservation awareness.

Keywords: APG-III classification, Bracketed keys, Floristic survey, MSU Baroda flora

AKP-OP-08

Clinging to survival: A study of Epizoochorous dispersal mechanisms in selected grasses

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Seed dispersal by animals is an important ecological process that influences plant population dynamics, promotes colonization of new habitats, and maintains community diversity. Despite its critical role in many species, epizoochory, the external transport of diaspores on animal bodies, remains comparatively understudied among zoochorous mechanisms. Grasses, with their global distribution, structural diversity, and exceptional ability to thrive in disturbed habitats, provide ideal models to study this mechanism. The present study investigates the epizoochorous dispersal mechanisms of six grass species: *Centotheca lappacea* (L.) Desv., *Chloris barbata* Sw., *Chrysopogon hackelii* (Hook.f.) C.E.C.Fisch., H*eteropogon contortus* (L.) P.Beauv., *Oplismenus compositus* (L.) P.Beauv. and *Pseudechinolaena polystachya* (Kunth) Stapf, which are commonly found in fragmented and disturbed ecosystems. Experimental assessments of diaspore attachment efficiency and retention were conducted on synthetic substrates mimicking animal fur and different fabrics under simulated movement conditions. Detailed morphological and micromorphological analyses revealed a remarkable diversity of attachment structures including retrorse bristles, hooked hairs, sharp callus, scabrid awns and viscid secretions. These features enable mechanical interlocking, penetrative anchorage, or adhesive attachment to surfaces. Retention trials showed that attachment was strongly influenced by surface texture, with long pile substrates exhibiting the highest retention. Diaspore weight and length showed a negative correlation with retention efficiency, emphasizing the importance of specialized structural traits in successful attachment and dispersal. By facilitating transport across fragmented landscapes, epizoochory promotes gene flow, supports population persistence, and contributes to the ecological success and taxonomic richness of Poaceae. These micromorphological adaptations also hold promise for biomimetic applications including surgical clips, bio-adhesives, and reusable gripping materials.

Keywords: Biomimetic applications, Bioprospecting, Grass morphology, Diaspores, Poaceae, Seed dispersal

AKP-OP-09

Diversity and distribution of *Impatiens* species in the Lower Dibang Valley and Anjaw district, Arunachal Pradesh, India

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The Eastern Himalayan region is a global biodiversity hotspot and a centre of endemism for several plant genera, including *Impatiens* Riv. *ex* L. (Balsaminaceae). Despite their ecological importance and horticultural potential, the floristic diversity of *Impatiens* in northeastern Arunachal Pradesh remains poorly documented. This study presents the results of extensive field surveys conducted in 2025 in the Lower Dibang Valley and Anjaw district, covering altitudes from 500 m to over 3,000 m. Standard herbarium and photographic documentation protocols were used to record morphological traits, habitat

characteristics, and associated flora. A total of 27 *Impatiens* species were documented, including 15 species endemics to the region and one new to science taxa. Species richness was found to be highest between 1,500–2,500 m, particularly along shaded stream banks and moist forest understories. The Lower Dibang Valley showed greater diversity compared to Anjaw, likely due to its wider altitudinal gradients, high precipitation, and varied microhabitats. Preliminary phylogenetic assessments suggest that several populations represent distinct clades, warranting integrative taxonomic revision. This study highlights the urgency for conservation measures in these fragile montane ecosystems, which face increasing threats from road expansion, shifting cultivation, and climate change. The findings contribute to the floristic inventory of Arunachal Pradesh and provide baseline data for future molecular, phylogenetic and evolutionary studies on Impatiens diversity in the Himalayas.

Keywords: Arunachal Pradesh, Balsaminaceae, Endemism, *Impatiens*, Species diversity

AKP-OP-10

Comparative analysis of trap architecture in six *Utricularia* (Lentibulariaceae) species across different habitats in India

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Carnivorous plants are renowned for their remarkable trapping mechanisms, with *Utricularia* L. (Lentibulariaceae) representing the largest carnivorous lineage, comprising 285 species across 33 sections worldwide. In India, it is represented by 37 species under five sections. These species inhabit diverse environments ranging from terrestrial, aquatic epiphytic, rheophytic, and lithophytic habitats. *Utricularia* evolved unique bladders that capture organisms in water or damp soil using an exceptionally rapid suction mechanism. The bladders are considered as the most complex and highly specialized structures within the plant kingdom. The present study aims to compare the distinct characteristics of traps across various life forms, examining their structural adaptations to different habitats in India, and to investigate the morphology and anatomy of traps in *U. roseopurpurea* Stapf *ex* Gamble, *U. graminifolia* Vahl, *U. reticulata* Sm., *U. striatula* Sm., *U. aurea* Lour. and *U. gibba* L. using light and scanning electron microscopy, with the objective of identifying patterns of variability among different life forms and taxonomic groups. Statistical analysis was conducted to compare the trap characters among species and histochemical analysis to document the presence of various substances like total proteins (proteases), lipids and carbohydrates.

Keywords: Bladderwort, Carnivory, Habitat, Trap, Scanning Electron Microscopy

AKP-OP-11

Taxonomic insights into the tribe Miliuseae (Annonaceae: Malmeoideae) in India

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The tribe Miliuseae (Annonaceae: Malmeoideae) is a taxonomically complex and ecologically important group of tropical trees and shrubs, comprising approximately 556 taxa across 24 genera. It exhibits remarkable diversity throughout Southeast Asia and the Indian subcontinent, extending to New Guinea, Australia and western Pacific Islands. In India, the tribe is represented by 84 taxa across 13 genera, of which 41 are endemic. However, the taxonomy of several genera within this tribe remains poorly resolved, largely due to historical misidentifications, incomplete descriptions, and imperfect herbarium specimens. As part of an ongoing revisionary study, we present comprehensive taxonomic updates for the tribe Miliuseae in India based on extensive fieldwork, examination of herbarium specimens, literature review and critical morphological analyses. This study resolves several morphologically challenging species complexes within the genera *Miliusa* Lesch. *ex* A.DC., *Polyalthia* Blume, and *Pseuduvaria* Miq.. Two species are described as new to science, and one species is newly recorded for Indian flora. Notably, an endemic species of *Orophea* Blume has been rediscovered after its type collection. An endemic *Miliusa* species has been recollected, leading to an amended description and revised taxonomic placement. To support future identification and classification, a new informal species group is proposed within *Miliusa*. Additionally, one new nomenclatural combination is proposed to reflect recent generic reassignments. Nomenclatural and typification ambiguities have been clarified for several names in accordance with the provisions of the *International Code of Nomenclature for algae, fungi, and plants*. Geographical distribution data for several taxa have been updated, providing valuable information to support effective conservation planning.

Keywords: New Species, Nomenclature, Rediscovery, Revision, Typification

AKP-OP-12

Studies on conical and other distinct Si-Phytolith morphotypes in taxonomy of *Scirpus s.l.* (Cyperaceae)

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Scirpus Tourn. *ex* L. *s.l.* is a complex taxon in Scirpeae tribe of Cyperaceae family because from this taxon many lineages as different genera were segregated by different authors from time to time. Twenty-four species were first mentioned by Linnaeus (1753), later Koyama (1963, 1978) separated into 4 genera i.e. *Scripus* L., *Bacothryon* A. Dietrich, *Bolboschoenous* Palla and *Schoenoplectus* Palla based on morphological characters (Node, leaf, bract and Spikelet). Lye (2003) separated the genus *Schoenoplectiella* from *Schoenoplectus* based on some morphological and embryological characters. Another taxonomical approach is tribal placement, where different authors placed different taxa into different tribes after morphology, anatomy, embryology and molecular studies. In the present work, phytolith mophology study was carried out from eight species that were previously placed into *Scirpus s.l.* [*Actinoscirpus grossus* (L.f.) Goetgh. & D. A. Simpson, *Erioscirpus comosus* (Wall.) Palla, *Schoenoplectiella erecta* (Poir.) Lye, *Schoenoplectiella lateriflora* (J.F.Gmel.) Lye, *Schoenoplectiella praelongata* (Poir.) Lye, *Schoenoplectus litoralis* (Schrad.) Palla, *Schoenoplectus triqueter* (L.) Palla and *Scirpus wichurae* Boeckeler]. Qualitative and quantitate study of phytolith morphotypes were carried out for the taxonomic relevance. Twenty-three phytolith morphotypes were found so far. Conical

and Elongate were common one in all the studied species. Conical morphotype was represented with highest percentage in all species, then elongate one and another higher amount was in nutlet surface phytolith. Conical phytolith showed variation in platform margin, conical arrangement and satellite character. These things were found as taxonomically important as they varied among the studied taxa (genera level). Also, nutlet surface phytolith was important in taxonomic specificity due to their uniqueness in different taxa.

Keywords: Abundance study, Phytolith, Scirpeae, *Scirpus*, Taxonomy

AKP-OP-13

An angiosperm check list of lateritic plateau of Goregudda Forest, Kumta taluk, Uttara Kannada district, Karnataka state, India

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Lateritic plateaus are rich in iron and richness of herbaceous species. It was dominated in Monsoon season. It exhibits different communities of plants, which turns plateau in to different color in different seasons. The Goregudda is located in coastal zones of Kumta taluk, Uttara Kannada District, Karnataka, India. The survey reveals about 221 species belonging to 178 genera and 62 families. The dominant families are Fabaceae (24 species) and Poaceae (23 species). 5 Carnivores plant species, 37 endemic species with 1 new species reported.

Keywords: Carnivores, Coastal zones, Grass, Medicinal plants, *Parasopubia*, Uttara Kannada

S.M. & M.R. ALMEIDA AWARD IN PLANT NOMENCLATURE

SMA-OP-01

Typification remarks on four names of the genus *Celastrus* (Celastraceae: Celastroideae)

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The genus *Celastrus* L. (Celastraceae: Celastroideae), comprising about 44 recognized species, is widely distributed across Asia, Africa, the Americas, and Oceania. Its species are primarily deciduous, though a few are rarely evergreen, occurring as stragglers or scramblers, or more commonly as vigorous liana. Ding Hou (1955) provided the first comprehensive monograph of the genus Celastrus, including the Indian taxa. In his treatment, *Celastrus wallichii* G. Don was excluded from the genus with the note "not Celastrus (ovary many-celled)", a decision later determined to be unjustified following a detailed examination of the protologue and the rediscovery of the lost holotype. This study reinstates *C. wallichii* as a correct and legitimate name. Furthermore, Hou's inadvertent designation of lectotypification for the name *C. stylosus* Wall., *C. hindsii* Benth., and *C. monospermus* Roxb. were found to be erroneous and ineffective under the provision of International Code of Nomenclature for algae, fungi, and plants. Accordingly, these names are here lectotypified based on original material in accordance with the provisions of the Code.

Keywords: Holotype, India, Lectotype, Nomenclature, Wallich

SMA-OP-02

Unravelling the taxonomy of *Rotula*-Disjunctions within Ehretiaceae

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Ehretiaceae, a primarily pantropical lineage within Boraginales, comprises trees, shrubs, and subshrubs distinguished from the chief herbaceous core of the order by their woody habit and fruit characters. The family includes approximately 10 genera and 150 species in world, with *Ehretia* P.Browne, and *Rotula* Lour. as its only representatives in India. Despite morphological coherence, the delimitation and rank of Ehretiaceae remain debated. The recognition of Ehretiaceae varies between treatments as either an independent family or as the subfamily Ehretioideae, while recent studies have consistently recovered the family as a well-supported clade. The genus *Rotula* of Ehretiaceae is represented by a single species, *Rotula aquatica* Lour. in India. It is a rheophyte shrub, typically confined to rocky riverbanks and beds of seasonal watercourses. *Rotula* has been of a debate owing to its combination of morphological features that overlap with different lineages of Boraginales. Traditionally, *Rotula* has been placed in the family Ehretiaceae, though some classifications

included it in subfamily Cordioideae, owing to its small purple flowers and drupe like fruits. Recent classifications retain *Rotula* within Ehretiaceae. *Rotula* shows a typical aquatic habit while other species of Ehretiaceae are terrestrial and woody. Presence of small, axillary or terminal cymes, purple flowers and fruit splitting into four nutlets makes it different from other species of Ehretiaceae leading to inconsistent placements. The present study addresses the taxonomic uncertainties of *Rotula aquatica* Lour. and nomenclatural ambiguities within Ehretiaceae in India.

Keywords: Boraginales, Ehretiaceae, Nomenclatural ambiguities, *Rotula*, Taxonomy

SMA-OP-03

Nomenclatural notes and typification of some names in Indian *Cyperus* (Cyperaceae)

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The genus *Cyperus* L. represents one of the largest and most taxonomically intricate groups within Cyperaceae. Globally, it comprises 964 species, with 92 taxa (*sensu stricto*) reported from India. During a revision of south Indian *Cyperus*, several nomenclatural challenges were identified, particularly concerning typification and synonymy. This study critically examines original descriptions, protologues, and historical herbarium specimens to resolve ambiguities surrounding the names *C. corymbosus* Rottb. and *C. pangorei* Rottb. The paper clarifies uncertainties in their protologues, designates types for *C. pangorei* Rottb. and *C. tuberosus* Rottb., and resolves confusion arising from the overlooked holotype of *C. corymbosus* Rottb. in India. Furthermore, it reinstates *C. diphyllus* Retz., reappropriates *C. nudus* Roxb., and consolidates valid synonyms under the correct taxa, thereby providing a robust nomenclatural framework for South Indian *Cyperus*.

Keywords: *Cyperus*, herbarium research, nomenclature, species reinstatement

SMA-OP-04

Revisiting the typification of selected names in Indian Lythraceae

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The family Lythraceae J. St.-Hil. is a moderately sized, predominantly subtropical to tropical, cosmopolitan family in the order Myrtales, comprising 28 currently accepted genera and approximately 600 species. In India, it is represented by about 77 taxa. As part of the ongoing revision of the family in India, a detailed examination of historical literature, protologues, and type specimens is being carried out. Critical evaluation revealed some conflicting or ineffective lectotypifications in earlier treatments. In accordance with the International Code of Nomenclature for algae, fungi, and plants (ICN), this study designates two second-step lectotypes to facilitate the correct application of names, while two previously published subsequent lectotypifications are shown to be ineffective, as the earlier

lectotypifications remain valid, and one epitype has now been corrected as a residual syntype.

Keywords: Lagerstroemia, Nomenclature, Revision, *Rotala*, *Sonneratia*, Typification

SMA-OP-05

Revisiting the taxonomy of *Mallotus intercedens* and *Mallotus rhamnifolius* (Euphorbiaceae)

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The genus *Mallotus* (Euphorbiaceae), commonly known as 'Kamala' in India, was first described by Loureiro in 1790 and currently comprises about 118 species distributed throughout the Paleotropics. In India, 22 taxa are reported, including 18 species and 4 infraspecific taxa, with six taxa endemic to the country. The present study highlights the necessity of resolving the nomenclatural ambiguity between *Mallotus intercedens* Pax & Hoffmann and *M. rhamnifolius* (Rottler *ex* Willd.) Müll. Arg. After critical examination of protologues and taxonomic literature reveals that *M. intercedens* was based on *M. rhamnifolius*. Accordingly, *M. intercedens* should be treated as a synonym of *M. rhamnifolius*.

Keywords: Endemism, Kamala tree, Taxonomy, Western Ghats

SMA-OP-06

An approach to delimit the genus *Agrostis* from *Calamagrostis* (Poaceae: Agrostidinae) with a case study

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The subtribe Agrostidinae is readily distinguished by its characteristic one-flowered spikelets. However, the delimitation between the genera *Agrostis* L. and *Calamagrostis* Adans., which together comprise the majority of species within the subtribe, remains unstable. Despite recent efforts by various authors, the status of several species continues to be ambiguous. The present article addresses the taxonomy and nomenclature of one such poorly understood species with a complex taxonomic history, for which a new name is proposed here.

Keywords: Himalayan Agrostology, Nomenclature, Replacement name, Species complex

PROF. R.S. RAO AWARD

RSR-OP-01

Plant regeneration *in vitro* of *Turnera subulata* and assessment of clonal fidelity using SCoT and ISSR markers

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Turnera subulata Sm. is a medicinally and ecologically significant angiosperm under the family Passifloraceae. The larvae of Towny coster butterflies (*Acraea terpiscore* L.) consume the flowers of *T. subulata*, signifying their favoured host plant. Larval consumption of flowers inflicts significant harm to the host plant, leading to a decrease in seed production and subsequent propagation. The commercial use of plant genetic resources necessitates substantial quantities of plant stock materials, leading to the depletion of populations in their natural habitats and resulting in their extinction in the wild. An optimal resolution to this problem is the utilisation of in vitro regenerated plants via plant tissue culture technology. The present study deals with the development of an efficient micropropagation protocols for large scale propagation of *T. subulata* using cotyledon explants via direct and indirect organogenesis. The plant growth regulators utilised in the study are BAP, TDZ, IBA, IAA and 2,4-D. Cotyledon derived shoots were rooted and acclimatized in their natural habitat with 90% success. Clonal fidelity assessments of in vitro regenerated plants were conducted utilising SCoT and ISSR markers. The protocol can be used for large scale production of *T. subulata* for sustainable management of plant diversity.

Keywords: Acclimatization, Clonal fidelity, ISSR, Micropropagation, Plant growth regulators, SCoT

RSR-OP-02

Conservation of 25 threatened angiosperms integrating Grinnellian and Eltonian Niche factors in the Western Ghats

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The Western Ghats is home to more than 1,500 endemic angiosperms, where 357 of which are threatened. Niche adaptability and niche specificity are important factors contributing to the restricted distribution of both paleo and neo-endemic species. Defining their conservation status, future planning, and eco-restoration requires a crucial understanding of their population structure and dynamism in relation to biotic and environmental interactions within their habitat. Twenty-five species were selected based on their diverse habit, habitat, and distribution patterns across high-elevation, medium-elevation, low-elevation, and low-elevation riparian forests within the Western Ghats. The IUCN Red List status of these 25 species was assessed using the SIS, incorporating population and phytosociological data following a careful scrutiny of taxonomic and distribution records, and included the flagship species, *Strobilanthes kunthiana* (Nees) T.Anderson *ex* Benth., for the first time. The study explored limitations of bioclimatic prediction in niche modelling, utilizing standardized spatial GIS tools to integrate data on terrain, land use, and classified vegetation across the Western Ghats. Incorporating the vegetation layers significantly refined the predicted area,

enabling the identification of potential conservation and restoration sites for each species. This niche profiling made a significant contribution to understanding Eltonian niche factors. Important species have been successfully germinated and are currently maintained in *ex situ* conservation at a nursery. This integrated, niche-specific approach is now being used for the *in-situ* conservation and eco-restoration of degraded threatened species habitats and is being implemented in convergence with multi-stakeholder participation, including the Kerala Forest Department, Kerala State Biodiversity Board, LSGs- BMCs and MGNREGA women's groups.

Keywords: Biodiversity, EbA, Ecorestoration, Eltonian niche, Red list

RSR-OP-03

Habitat diversity and conservation of Indian Micrairoids (Poaceae)

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Micrairoideae Pilg., one of the twelve recognised subfamilies in Poaceae, comprises about 192 species with notable representation in India, including several endemic taxa. The subfamily is divided into nine genera, grouped into three tribes: Micraireae Pilg., Eriachneae (Ohwi) Eck-Borsb. and Isachneae Benth. The largest tribe in the subfamily is Isachneae, with 113 species distributed under six genera: *Hubbardia* Bor, Isachne R.Br., *Coelachne* R.Br., *Heteranthoecia* Bor, *Sphaerocaryum* Nees. *ex* Hook.f. and *Limnopoa* C.E.Hubb. In India, the subfamily is represented by two species of *Eriachne*, 37 species of *Isachne*, four species of *Zenkeria* Trin., two species of *Hubbardia*, and one species each of *Limnopoa* and *Sphaerocaryum*. Micrairoideae members are characterised by their niche specificity and confinement to distinct microhabitats. Many species exhibit a high degree of habitat specialisation, often resulting in localised endemism and fragmented populations. The present study focuses on the identification of different microhabitats inhabited by Indian Micrairoideae, through extensive field explorations and spatial analysis. The climatic niche and habitat preferences of the group were characterised using bioclimatic and altitudinal data. Principal Component Analysis (PCA) was employed to identify the environmental gradients influencing species distribution, while Levins' niche breadth index was used to quantify niche specialisation among species. Results of the study highlight pronounced niche differentiation aligned with distinct microhabitat types from ephemeral pools on laterite plateaus to montane marshes and shaded lithic environments, illustrating how environmental heterogeneity drives local endemism of the species. This study advances understanding of niche dynamics in Micrairoideae and provides a foundation for habitat-specific conservation action.

Keywords: Biodiversity conservation, endemism, habitat specialists, niche breadth and microhabitat

RSR-OP-04

Tree community structure and carbon stocks of Madras Christian College campus, Chennai

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Trees play a vital role in sustaining ecosystems by providing ecological, cultural, aesthetic, economic and livelihood benefits worldwide apart from the fundamental ecosystem services such as climate regulation, soil protection, flood control, carbon sequestration, temperature regulation, and provision of habitats. The role of trees and a small patch of forest in urban landscapes is critical and irreplaceable. The Madras Christian College (MCC) campus is one such site located in the rapidly growing Chennai Megacity with Tropical Dry Evergreen Forests (TDEF). The present study has the following objectives: (i) to develop a species-specific profile for the trees of the MCC campus and (ii) to understand the community structure and estimate the total carbon stored in the trees of the MCC campus. To accomplish these objectives, an extensive field survey was carried out throughout the campus, with fifty vegetation plots of 10×10 m (disturbed and undisturbed) established. All the trees with a girth size greater than or equal to 10 cm girth at breast height (GBH) were measured. Besides, tree saplings with a girth size between 1 and 10 cm GBH and seedlings with a girth size of less than 1 cm GBH were enumerated from the 3×3 m and 1×1 m subsample plots. All the data collected from the MCC campus in the present study will be discussed under the following major outcomes: (i) a species-specific tree profile, (ii) tree community structure, such as composition, diversity, abundance, frequency, basal area, and Important Value Index (IVI); and (iii) tree carbon stocks.

Keywords: Carbon stock, Chennai Megacity, MCC campus, Tree Community Structure, Urban Landscape

RSR-OP-05

Germination biology and *ex- situ* conservation of selected endemic and threatened trees from the northern Western Ghats

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Endemic trees are those found only in a specific geographic area and are crucial for maintaining the region's unique biodiversity. Their evolutionary history has made them highly adapted to the local climate and ecosystem, which forms co-dependent relationships with surrounding native flora and fauna which making them keystones of their habitat. The northern Western Ghats is a globally significant biodiversity hotspot facing severe threats from habitat loss and anthropogenic pressures, which threaten its endemic flora. Due to several climatic issues resulted from anthropogenic pressure creating problems in seed germination and reproduction of eco-sensitive species. These continuous barriers in germination resulting in rapid population decline of many endemic biotas. However, for restoration of this endemic flora needs habitat conservation as well as ex-situ seed germination. The present study highlights seed germination studies and *ex-situ* conservation of selected endemic and threatened tree species of the northern Western Ghats which is essential for large-scale propagation, restoration of degraded habitats, and protecting species outside their natural habitat. To achieve the best germination result, various pre-sowing treatments, including water soaking, hot water treatment, acid scarification, and plant hormone treatment, were applied to overcome seed dormancy and sown in different sowing media to enhance germination percentages. Endemic and threatened trees are multiplied in the large quantity, some of the saplings are introduced in the botanic garden for ex-situ conservation, rest of saplings will be reintroduced to their natural habitat and monitored. This insight provides valuable information about achievements of conservation efforts and underscores the need for further research on seed germination. The findings not only provide

insights into seed biology but also contribute for mass propagation of the species and practical conservation measures. Such integrated efforts, combining seed biology research with ex-situ conservation in botanical gardens, are crucial to protecting genetic diversity, restoring ecological balance, and preserving the rich natural heritage of the northern Western Ghats for future generations.

Keywords: Endemism, Cotyledons, Pre-sowing treatments, Plumule, Seedling, Testa

RSR-OP-06

IUCN assessment of endemic *Osbeckia* in India

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The genus *Osbeckia* L. comprises about 50 taxa, distributed from Madagascar through tropical and subtropical Asia to northern Australia. In India, the genus is represented by 28 taxa, most of which occur in the Eastern Himalayas and the Western Ghats. Of these, 15 taxa are endemic to India. Proper IUCN assessments for the Indian endemics of *Osbeckia* have lacking so far. Therefore, this will be the, the threat status of the endemic *Osbeckia* species in the Indian region has been evaluated using the IUCN Red List Categories and Criteria. Based on occurrence and ongoing threats, it is recommended that more than 50% of these taxa be listed under threatened categories. Habitat as well as species-specific monitoring and conservation measures are recommended for the threatened taxa.

Keywords: Area of Occupancy, Extent of Occurrence, Melastomataceae, Threatened, Western Ghats

RSR-OP-07

A little tilt, a riddle large: Understanding fitness and evolutionary consequences of enantiostyly in *Didymocarpus*

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Enantiostyly is a stylar polymorphism where the style is deflected away from the stamen to the left (L-morph) or right (R-morph). Despite Darwin's recognition, the function and evolution of enantiostyly remain unexplored. To understand this, we studied *Didymocarpus* Wall. (Gesneriaceae), an enantiostylous genus that exhibits interspecific variations in the degree of style deflection and flower size. We tested two hypotheses: 1) enantiostyly with larger style deflection promotes pollen transfer between morphs and reduces selfing, and 2) smaller flowers and lesser style deflection are correlated with reproductive assurance through self-pollination in a pollinator-limited condition. To understand the function of enantiostyly, we tracked pollen in a species with high style deflection. To explore the correlation between stylar deflection and reproductive assurance under pollinator limitation, we conducted floral morphometrics, pollinator observations, pollinator exclusion experiments, and natural fruit-set estimation on five enantiostylous species with varying style deflection. Macro-evolutionary patterns of enantiostyly and flower size were explored using ancestral state reconstruction, and the rate of trait evolution using R packages ape and phytools. We found that species with high style deflection promote pollen transfer between different morphs. Although enantiostyly reduces self-pollination, it is highly pollinator-

dependent, as pollinator exclusion experiments failed to produce fruit. The presence of species with less style deflection and small flowers appears to have evolved recently in *Didymocarpus*. This avoids pollinator dependency and assures reproduction through selfing under pollinator limitation. These results provide evidence of adaptive evolution within the genus in response to pollinator availability.

Keywords: Floral trait Evolution, Mating Strategies, Pollen Transfer dynamics, Reproductive Fitness, Stylar Polymorphisms

PROF. K.S. MANILAL AWARD

KSM-OP-01

Diversity analysis of angiosperms in Palakkad gap, Western Ghats, Kerala

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Palakkad Gap is the widest mountain pass in Western Ghats. It is located between the Nilgiri Hills to the North and the Anaimalai Hills to the South. It is the major break in the stretch of Western Ghats with an elevation of 60–380 m and 30–40 km wide. The present inquiry summarizes the angiosperm diversity of Palakkad Gap with emphasis on endemics, IUCN conservation status, lifeform analysis and biological invasion. The evaluation of the angiosperm's diversity revealed the presence of 610 species belonging to 413 genera and 101 families with higher elemental contribution by Fabaceae followed by Asteraceae, Lamiaceae, Apocynaceae, Euphorbiaceae, Acanthaceae etc. The present study located two critically endangered species, three endangered species, three vulnerable species, 181 data deficient species and maximum species in the least concern category. The present study has reported 22 endemic plants from the study area with a thero-phanerophytic type of phytoclimate. Seven new plant novelties along with one new generic record for Kerala, could be documented from the Palakkad Gap region. *Casearia seethalakshmiae* V.Suresh & Ambika, *Holarrhena parishadii* V.Suresh, Sojan & Ambika, *Ledebouria mavelii* V.Suresh, Sojan & Ambika, *Polycarpaea barbellata* V.S.A.Kumar, S.Arya, V.Suresh & Alen Alex, *P. ebracteata* S.Arya, V.S.A.Kumar, V.Suresh & Alen Alex, *P. palakkadensis* V.S.A. Kumar, S. Arya & Suresh, *P. psammophila* V.Suresh, V.S.A.Kumar, S.Arya & Alen Alex are taxonomic novelties from the study area and *Pentatropis capensis* (L.f.) Bullock is a new generic record for Kerala.

Keywords: Angiosperms, Diversity, Palakkad Gap, Western Ghats

KSM-OP-02

Taxonomic novelties in Podostemaceae: *Dalzellia filicupulata* and *Dalzellia angustivittata* from the southern Western Ghats

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Podostemaceae are mostly small, thalloid annuals that grow on rocks in fast-flowing freshwater habitats, exhibiting a vegetative body that defies conventional differentiation into stem, leaf, and root. The family is often referred to as an embryological family because of the lack of antipodals, triple fusion, and endosperm, the prevalence of single fertilisation, and the presence of a pseudo-embryosac. These plants grow vegetatively while submerged during the rainy season and produce flower buds underwater in the early dry season. As part of an ongoing revisionary study of Podostemaceae in India, extensive exploration was conducted, which resulted in the discovery of two new species. *Dalzellia filicupulata* Arshad & Nampy, *sp. nov*. and *D. angustivittata* Nampy & Arshad, *sp. nov*., resembles *D. ceylanica* (Gardner) Wight in having crustose shoots and cupules surrounding the young buds.

Dalzellia filicupulata differs from *D. angustivittata* and *D. ceylanica* by having filiform cupular leaves, a broad crustaceous shoot, dorsiventrally flattened cupules, and longer pedicels and stigma. The types and arrangement of cupular leaves, the fusion of perianth lobes, the length of pedicels, and the structure and arrangement of the cupules are characteristics that set *D. angustivittata* apart from *D. ceylanica*. This study provides detailed morphological descriptions and photographic documentation of both species. Their discovery highlights the continuing significance of the Western Ghats as a centre of endemism for rheophytic taxa and underscores the need for further systematic exploration of Podostemaceae in India.

Keywords: *Dalzellia filicupulata*, *Dalzellia angustivittata*, Podostemaceae, Kerala

KSM-OP-03

A quest to rediscover century-old lost species – A case study of genus *Impatiens* (Balsaminaceae) in the Western Himalaya

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The Himalayan region represents one of the world's richest biodiversity hotspots, yet several plant taxa remain understudied. The genus *Impatiens* Riv. *ex* L. (Balsaminaceae), known for its remarkable floral diversity and ecological adaptability, exhibits significant endemism in the Indian Himalayas and Western Ghats. This study presents a comprehensive evaluation of *Impatiens* species diversity across the Western Himalayan states, based on extensive field surveys conducted between 2018 and 2025. A total of 27 taxa were documented, including four species—*Impatiens violoides* Edgew. *ex* Hook.f., *I. reidii* Hook.f., *I. inayatii* Hook.f. and *I. serrulata* Hook.f. rediscovered after more than a century since their type collections. Detailed morphological analyses, habitat characterization, and photographic documentation confirm their identity and current distribution. The rediscovery of century old lost taxa from Western Himalaya not only enriches the floristic inventory of the Himalayas but also underlines the urgent need for habitat conservation amidst rapid ecological changes. This work contributes to a renewed understanding of systematics, floral variations, ecology and distribution of *Impatiens* species in the western part of Himalayan biodiversity hotspot region.

Keyword: Balsam, Endemism, *Impatiens*, Rediscovery, Western Himalaya

KSM-OP-04

A new taxon under *Scirpus wichurae* from Meghalaya, India

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The genus *Scirpus* Tourn. *ex* L. *s.l.* is one of the most complicated and heterogeneous taxa in the tribe Scirpeae. Currently, *Scirpus s.s.* is comprises of *c.* 47 species worldwide and is represented in Indian sub-continent by five species. Of which four in the East Himalaya, three in Assam, and two in West Himalaya. However, there is no report on distribution of *Scirpus wichurae* Boeckeler in India in any recent world databases (like POWO) and Flora

(eg., *Flora of China*), despite the species was previously reported in regional floras from India and also in *Flora Malesiana*. Even, the protologue of *S. wichurae*, mentioned *indicatio locotypica* as '*India Orientali, M. Khasia*' (now in Meghalaya, India) and '*Jacu Hama Japoniae'*, Japan. According to the latest reports from world databases the species is now considered absent in India. This study reports collection of a taxon from Meghalaya, India, and the taxon look morphologically similar to *S. wichurae*, but bristle micro-characters are similar to *S. karuisawensis Makino.* Nutlet surface micro-characters of the taxon are partly similar to the species under *S. sylvaticus* complex, but quite different from *S. radicans S. sylvaticus*, and *S. atrovirens*. On the other hand, molecular phylogeny of *S. wichurae* by Jung and Choi (2011) based on ITS and rbcL revealed that the species is closely related to *S. karuisawensis and S. mitsukurianus* Makino. Additionally, FE-SEM based micro-morphological study of the perianth bristle, nutlet surface and nutlet surface phytolith characters suggest that this taxon is a new addition to the Indian flora and propose it be described as a new variety *S. wichurae* var. *bristelongatus*.

Keywords: Bristle, FE-SEM, *Flora of China*, LM, *Scirpus karuisawensis*

KSM-OP-05

Diversity and comparative study of involucral bracts in species of the family Asteraceae of Amravati, Maharashtra

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Family Asteraceae is one of the biggest and most varied groups of flowering plants. Its remarkable diversity is primarily attributed to the capitulum inflorescence — a dense cluster of small flowers (florets) surrounded by specialized leaf-like structures known as phyllaries or involucral bracts. In systematics, these bracts serve as essential diagnostic features. Their high degree of variability makes them extremely useful in classifying species. This variation is expressed through several characteristics, including the number, arrangement, form, size, shape, texture, and modifications at the apex. In the present work, the comparative morphological characteristics of involucral bracts were examined across 12 tribes and 31 species of the family, with an emphasis on recording them using digital and binocular microscopy. The plant specimens were collected from the Amravati region in Maharashtra, India. The variety of collection sites like fields, roadsides, wastelands, and forest margins—perfectly represents the different ecological niches found in the Amravati region. Extensive observations revealed that involucral bracts were generally consistent at species level but showed marked variation among tribes and genera. For example, members of the Inuleae exhibited gradational scarious margins and differences in bract length, while species of the Heliantheae displayed both uni- and multi-seriate bracts with variation in pubescence and apex form. In contrast, the Cardueae possessed highly specialized connate and spiny bracts, whereas the Cichorieae and Eupatorieae showed comparatively simpler structures. Beyond their value as reliable taxonomic markers, bract traits such as seriation, connation, pubescence, and appendages also reflect ecological adaptations related to pollinator attraction, dispersal, and protection. Thus, this comparative account not only aids in species identification and floristic documentation but also enriches our understanding of evolutionary patterns within the Asteraceae in the Amravati region.

Keywords: Asteraceae, Involucral bracts, Morphological variation, Taxonomy, Tribes, Amravati

KSM-OP-06

A taxonomic revision of the genus *Tetrataenium* (Apiaceae) in the Western Ghats

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The genus *Tetrataenium* (DC.) Manden. is distributed mainly in Turkiye to Central Asia and Indo-China with 23 species. The genus is represented by 12 species in India, of which nine are present in the Western Ghats. The taxonomic status of all species present in the Western Ghats is examined, including their habitat, phenology, distribution, conservation status, typification, and schizocarp micromorphology as analysed by scanning electron microscopy (SEM). The conservation status of species endemic to the Western Ghats is evaluated in accordance with International Union for Conservation of Nature (IUCN) guidelines. The present study added three new species, three lectotype designations and a new combination, *Tetrataenium dalgadianum* (S.M.Almeida) C.Rekha & Manudev. In addition, the taxonomic status of *T. aquilegifolium* is reevaluated and reduced as a heterotypic synonym of *T. grande* (Dalzell & A.Gibson) Manden.

Keywords: *Comb. nov.,* IUCN, SEM, *Sp.nov.*, Synonymisation, Typification

KSM-OP-07

Taxonomic revision of the genus *Anaphalis* (Asteraceae) in the Western Ghats: Distribution insights, novelties, and cypsela morphology

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Anaphalis DC., a diverse and taxonomically challenging genus of Asteraceae (tribe Gnaphalieae), comprises about 110 taxa worldwide and represents the largest genus of Asian Gnaphalieae. In India, it is the most species-rich genus of the tribe, with 43 taxa (38 species and five varieties), largely confined to the Himalayas and the Western Ghats. The Western Ghats harbour 19 species, of which 13 are endemic. The genus is characterized by remarkable morphological variability and phenotypic plasticity, often blurring species boundaries and complicating distinctions from allied genera such as *Gnaphalium* L., *Helichrysum* Mill., and *Pseudognaphalium* Kirp., due to overlapping traits and complex phylogenetic affinities. The present study provides a comprehensive taxonomic revision of *Anaphalis* in the Western Ghats, incorporating detailed descriptions, identification keys, habitat preferences, phenology, distribution patterns, endemism, conservation assessments, and cypsela micromorphology based on SEM analysis. Notably, two species new to science from the southern Western Ghats are described. The work also resolves critical nomenclatural issues through typification and reinstatement of names, thereby refining the taxonomy of this ecologically significant genus.

Keywords: *Anaphalis munnarensis*, *Gnaphalieae*, *Gnaphalium*, *Helichrysum*, Typification

KSM-OP-08

From ephemeral beauty to rarity: The Balsams of Tamil Nadu

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Impatiens L. (Balsaminaceae) is one of the largest flowering plant genera, comprising approximately 1,200 species worldwide. In India, the genus is represented by 323 taxa, chiefly distributed across the Eastern Himalayas and the Western Ghats. The Western Ghats is one of the center of speciation for *Impatiens*, and supports about 130 species, including several recently described species. The Western Ghats of Tamil Nadu has a greater number of *Impatiens* species found in the Nilgiris, Anamalais, Megamalai and Agasthiyamalai hills. The Nilgiris is a crucial conservation hotspot in the Western Ghats, playing a vital role in safeguarding southern India's rich biodiversity. Approximately, 89 taxa of *Impatiens* are reported from Tamil Nadu at elevations between 1200 and 2500 m. However, a few species occur at lower elevations, of which 79 are endemic and 31 taxa are strictly endemic to Tamil Nadu, with most of species found in Nilgiris. *Impatiens* species are classified into seven sections, adapted to a wide range of elevations and exhibit morphological variations. Among the different sections, the section *Scapigerae* mostly includes fragile epiphytic or lithophytic ephemerals, which grow with moss for a short period during the monsoon and are endemic only to the Indo-Sri Lankan region. The *Scapigerae* is confined to southern India, mostly in the Nilgiris and the Anamalais. It comprises about 36 species, with only one species (*Impatiens acaulis* Arn.) also distributed in Sri Lanka. This research aims to document the *Impatiens* species in Tamil Nadu and emphasizes the importance of their conservation.

Keywords: Conservation, Endemism, *Impatiens*, New species, Rediscovery

KSM-OP-09

Systematic studies in genus Capparis (Capparaceae) from Indian Peninsula

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Genus *Capparis* Tourn. *ex* L. (Capparaceae) is a significant group of tropical and subtropical shrubs, climbers and trees renowned for its economic, medicinal and ecological importance. Globally, the genus comprises 146 species, while in Indian Peninsula, it exhibits considerable diversity with 24 recognised taxa, including 10 narrow endemics, grouped into four sections: *Sodada*, *Busbeckea*, *Capparis*, and *Monostichocalyx*. Systematic investigations of this genus in Indian Peninsula are imperative due to its complex taxonomy, marked by high morphological diversity and huge variations among many taxa. Comprehensive studies employ an integrative approach that combines morphological, anatomical, palynological, and cytological evidence to delineate species boundaries amidst high variability. Anatomical studies provide supporting evidence, often highlighting xerophytic adaptations in the stem and leaf. Palynological analysis focuses on pollen

characteristics, including size, shape, and exine patterns, which are non-plastic characters for species-level differentiation. The Indian Peninsula is a center of diversity, hosting many narrowly endemic species underscoring the regions importance as a center of evolution for the genus. The current study aims to address the complex taxonomy of the genus *Capparis* through an integrated approach that incorporates various systematic aspects.

Keywords: Anatomy, *Capparis*, Endemism, *Monostichocalyx*, Palynology

PROF. T.R. SAHU AWARD

TRS-OP-01

Fragrance in flux or fixed by species? Exploring environmental influences on essential oil profiles in the genus *Hedychium*

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Essential oils are complex mixtures of plant volatile compounds that play a crucial role in defence and ecological interactions. They are primarily influenced by genetic factors but may also be governed by environmental conditions. The genus *Hedychium* J.Koenig, belonging to the Zingiberaceae family, is unique for its fragrant flowers. They are endemic to the Asian paleotropics. Their aromatic properties make them valuable to both the medicinal and perfumery industries. Although studies exist on the medicinal activities of essential oils of a few species, variations in their composition across geographic distribution and their correlation with the soil and abiotic factors remain unexplored. The study aims to assess the effect of environment and soil on essential oil composition to understand the adaptations of *Hedychium* species. Leaf and rhizome samples of multiple *Hedychium* species were collected from diverse locations in North-East India and the Western Ghats. Environmental parameters, including temperature and precipitation, were recorded. Oils were extracted by steam-distillation and their chemical constituents were identified and analysed using Gas Chromatography-Mass Spectrometry (GC-MS). The resulting chemical profiles were analysed in relation to altitude, temperature, precipitation, and soil elemental composition using multivariate statistical analyses. The analysis confirmed that essential oil profiles are predominantly structured by species identity, irrespective of geographic origin. Minor intraspecific variations were observed, which were not consistently correlated with the abiotic factors, indicating that they are not the primary driver of composition in vegetative tissues. Chemical profiles consistently clustered by species rather than by location, highlighting their importance in taxonomic identity.

Keywords: Chemotaxonomy, Environmental factors, Essential oils, *Hedychium*, Secondary metabolites, Zingiberaceae

TRS-OP-02

Taxonomic reappraisal and conservation assessment of the medicinally important plant: *Tribulus rajasthanensis* (Zygophyllaceae)

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Tribulus rajasthanensis Bhandari & Sharma is an IUCN assessed threatened plant, known for its traditional use in the treatment of various ailments. The taxonomic rank of this species has historically been ambiguous, having been treated either at the species level or at the varietal level, i.e., *T. terrestris* var. *rajasthanensis* (Bhandari & V.S. Sharma) Hemaid & Jac. Thomas, with the latter treatment being followed to date. In the present study, based on extensive field explorations, herbarium examinations, morphometric analyses, integrating molecular phylogenetic evidence, it is demonstrated that *T. rajasthanensis* and *T. terrestris* are both morphologically and genetically distinct, thereby supporting the recognition of *T. rajasthanensis* at the species rank. In addition, it was noticed that the holotype of the name *T. rajasthanensis* was lost, thus a lectotype is selected in accordance with recent rules of *ICN*. Contrary to previous claims of endemism to the Great Indian Desert (India and Pakistan), this study based on literature and herbarium survey, documents a broader distributional range of this taxon across five countries *viz*. India, Pakistan, Saudi Arabia, Oman, and Somalia. Following a reassessment under IUCN categories and criteria, the species threat status at the national level has been revised from Critically Endangered to Endangered. Species distribution modelling (SDM) was also conducted for present and future climate scenarios (2041–2060) which indicated that climate change is likely to have a negligible impact on the potential range of species, rather anthropogenic pressures and habitat degradation constitute the major threats to the species.

Keywords: Climate change, Endangered, India, IUCN, Phylogeny, *T. terrestris*

TRS-OP-03

In silico and *in vitro* evaluation of anti-diabetic and anti-inflammatory potentials of *Humboldtia sanjappae* in model cell lines

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Humboldtia sanjappae Sasidh. & Sujanapal, an endemic leguminous plant, was investigated for its potential anti-diabetic and anti-inflammatory activities through an integrated *in silico* network pharmacology and *in vitro* cell-based approach. Phytoconstituents identified from *H. sanjappae* using LCMS/MS analysis screened through network pharmacology to predict potential molecular targets and associated pathways relevant to diabetes and inflammation. The compound–target and target–pathway interactions were visualized and analyzed to identify core regulatory nodes involved in insulin signalling, glucose metabolism, and inflammatory cascades. Subsequently, *in vitro* assays using model cell lines were conducted to validate the predicted bioactivities. The plant demonstrated significant inhibition of pro-inflammatory mediators and improved glucose uptake in insulin-resistant cell models, indicating its dual modulatory potential. These findings provide a scientific basis for the traditional use of *H. sanjappae* and highlight its promise as a source of lead compounds for managing metabolic and inflammatory disorders.

Keywords: Diabetes mellitus, Enzyme inhibition, Gene ontology, Inflammation, LC-MS/MS analysis, Network pharmacology

TRS-OP-04

Comparative studies on antioxidant activity of *Bulbophyllum* species

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Bulbophyllum Thouars is one of the largest genera in the Orchidaceae family. It is known for its wide range of bioactive chemicals, which have strong medicinal potential. *Bulbophyllum* species have been utilized for a long time to treat various diseases, including pain, cancer, infections, inflammation, and respiratory issues. This research investigated the antioxidant properties of *Bulbophyllum mysorense* (Rolfe) J.J.Sm., *B. sterile* (Lam.) Suresh, and *B. fimbriatum* (Lindl.) Rchb.f. using the DPPH free radical scavenging assay (96-well plate method). Analysis of leaf and bulb extracts was carried out at five different concentrations (20–100 µg/ml) and found the IC50 values for % radical scavenging activity (%RSA). One-way ANOVA statistical analysis revealed significant differences (all F values were much higher than the critical F value, and $p < 0.05$) across concentrations for each extract. These results confirmed the dose-dependent antioxidant activity. The ascorbic acid standard had the highest activity (IC50 = 53.48 µg/ml). The *B. mysorense* leaf extract was the most effective (IC50 = 74.94 µg/ml), followed by the *B. fimbriatum* extract (70.72 µg/ml) and the *B. sterile* extract (85.66 µg/ml). In all cases, the leaf extracts worked more effectively than the bulb extracts. The antioxidant activity was inferior to the standard; however, significant free radical inhibition was noted. The results of this study suggest that *Bulbophyllum* species are potential sources of natural antioxidants, supported by strong ANOVA results, and require future phytochemical and bioactivity studies for drug development.

Keywords: ANOVA, Antioxidant activity, *Bulbophyllum*, DPPH free radical scavenging, IC50, Orchidaceae

TRS-OP-05

Comparative phytochemical profiling, antioxidant activity, and UPLC-QTOF metabolite characterization of endemic *Pogostemon* species of India

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The genus *Pogostemon* Desf. (Lamiaceae) comprises aromatic herbs or shrubs of notable therapeutic and commercial importance. The present study investigates the comparative phytochemical composition, antioxidant potential, and metabolite characterization of selected *Pogostemon* species. Fresh and dried plant parts (leaves, stems, and roots) were extracted using methanol, acetone, and aqueous solvents through ultrasonic-assisted extraction. Total phenolic and flavonoid contents were quantified using standard spectrophotometric methods, while antioxidant activities were assessed through FRAP, DPPH, and ABTS assays. Furthermore, UPLC-QTOF analysis was employed to identify and compare bioactive compounds among the species. Results revealed significant interspecific variation, with certain species exhibiting higher phenolic and flavonoid contents that correlated with enhanced antioxidant activities. UPLC-QTOF profiling indicated distinct

metabolite patterns and the presence of unique compounds potentially responsible for species-specific bioactivities. The comparative analysis highlights the biochemical richness and diversity within the *Pogostemon* genus, providing valuable insights into the relationship between phytochemical composition and antioxidant potential. These findings emphasize the pharmacological relevance of *Pogostemon* species and offer a scientific basis for their future exploration in natural product research, therapeutic development, and sustainable utilization.

Keywords: Antioxidant activity, Lamiaceae, Phytochemical profiling, *Pogostemon*, UPLC-QTOF

TRS-OP-06

α-Amylase inhibitory potential of *Humboldtia* species: Correlation between *in vitro* activity and molecular docking of phenolic compounds

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α-Amylase inhibitors play a pivotal role in the management of postprandial hyperglycemia associated with Type-2 Diabetes mellitus. Natural products have emerged as promising sources of α-amylase inhibitory agents due to their structural diversity and bioactivity. The present study investigates the α-amylase inhibitory potential of phenolic compounds identified in *Humboldtia* Vahl species, using LC–MS analysis, complemented by molecular docking and *in vitro* assays. The LC–MS/MS profiling revealed several bioactive constituents, in which the phenolic compounds were evaluated for drug-likeness and pharmacokinetic properties based on ADMET screening. Selected compounds meeting favourable ADMET criteria were subjected to molecular docking studies to predict their binding affinities and interaction profiles with the α-amylase enzyme. Docking analysis demonstrated that several phytochemicals exhibited strong binding interactions with key catalytic residues of α-amylase, suggesting potential inhibitory activity. *In vitro* α-amylase inhibition assay of the plant extract showed a concentration-dependent effect, though the percentage inhibition was comparatively lower than that of the standard drug, acarbose. The findings indicate that while the crude extract exhibits modest enzyme inhibitory activity, specific phytochemicals within the extract possess promising α-amylase binding potential, warranting further isolation and characterization studies to explore their therapeutic relevance in diabetes management.

Keywords: Acarbose, α-Amylase inhibition, Antidiabetic potential, LC–MS/MS analysis, Molecular docking, Phytochemicals,

TRS-OP-07

Bioprospecting of underutilized *Curcuma* sp. for natural pigment extraction and its economics of production

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The genus *Curcuma* L. includes many species, with *C. longa* L. being the most widely cultivated. However, several lesser-known relatives remain underexplored despite their potential in food, health, and cosmetic applications. This study comparatively analysed their

proximate composition, mineral content, volatile oils, and pigment characteristics to evaluate their value as functional foods and bioactive resources. Biochemical analysis revealed that *C. rubescens* Roxb. possessed the highest soluble protein (6.03 ± 0.55%), crude fibre (10.0 ± 0.45%), and substantial carbohydrate content (50.56 ± 0.21%), making it a promising for dietary fibre and protein enrichment. *C. ferruginea* Roxb. showed moderate protein (1.43 ± 0.03%) and carbohydrate (49.76 ± 0.07%) but the highest fat content (3.15 ± 0.02%). Mineral analysis indicated higher nitrogen and micronutrient levels in *C. ferruginea*, particularly manganese (266.20 ppm) and zinc (188.47 ppm), whereas *C. rubescens* was rich in iron (243.60 ppm). GC-MS profiling revealed species-specific aroma compounds: *C. rubescens* contained curzerene (25.33%) and germacrone (20.39%), while *C. ferruginea* was dominated by epicurzerenone (25.03%) and (+)-2-bornanone (14.12%). Their distinct pigmentation also showed application potential: the lemon-yellow rhizome of *C. ferruginea* was linked to lower curcumin distribution, while *C. rubescens* leaf sheath contained a thermostable, pH-sensitive red pigment identified as malvidin using LCMS-MS. Extraction was optimized via RSM, highlighting economic feasibility and potential as a natural food colour. Both *C. rubescens* and *C. ferruginea* being locally adapted and stress tolerant, making them relevant in sustainable agriculture and nutrition improvement. Promoting these underutilized *Curcuma* species will help in empowering farmers, and boosting food security for resource deprived population.

Keywords: *Curcuma rubescens*, Malvidin, Natural food colour, Underutilized *Curcuma* species

TRS-OP-08

Evaluation of antioxidant properties and anticancer activity of *Garuga pinnata*

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Garuga pinnata Roxb. is a deciduous tree belonging to the family Burseraceae (the incense or torchwood family). It is native to Asia, including the Indian subcontinent, southern China, and Indo-China. The tree is known by many vernacular names, including Grey Downy Balsam Tree (English), Kakad (Marathi), Ghogar, Kharpat (Hindi). Various parts of the tree have been used in traditional medicine. The bark has been application as an astringent, for tanning, and in decoctions. Modern studies have also investigated its potential anti-inflammatory, antioxidant, and antidiabetic properties. Traditional medicine has long used *G. pinnata* for various ailments (some related to tumors and inflammation), modern scientific research provides evidence of its *in vitro* (cell-based) cytotoxic and anti-inflammatory potential, suggesting it could be a source for developing novel anticancer agents. The extracts were analyzed for their total phenolic content (TPC), total flavonoid content (TFC), antioxidant activity (AA) and anticancer activity. The plant extracts showed anticancer activities against A549 cancer cell lines; they reduced total cell count and induced cell death in a drastic manner. Current research strongly suggests that *G. pinnata* contains powerful bioactive agents, particularly the garuganins, which can directly kill cancer cells.

Keywords: A549 cancer cells line, Burseraceae, Cytotoxic Garuganins, *Garuga pinnata*, Traditional medicine

PROF. S.R. YADAV AWARD

SRY-PP-01

Seed micromorphology and its significance in the systematics and evolution of Caryophyllaceous taxa in southern Peninsular India

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Documentation of seed micromorphology revealed striking variability in size, shape, and surface pattern within the family Caryophyllaceae. Seed morphology of 35 taxa belonging to 14 genera of Caryophyllaceae was investigated with Stereo zoom microscope and Scanning Electron Micrographs to assess the diagnostic significance in generic and species delimitation, and provide additional evidence on evolutionary insights. Variation in seed size, shape, number, colour, surface ornamentation, testa cell shape, margin, and anticlinal walls, nature of hilum zone, and dorsal planes were examined. Among the traits, seed size, shape and nature of dorsal planes provided valuable diagnostic information for delimiting the taxa at the generic level. Seed shapes of the taxa ranged between reniform, pyriform, elliptic, triangular, sub-reniform, sub-orbicular, sub-cylindric, and asymmetrical shield-shaped. Seed size varied from 0.2–2 mm in length and 0.1–1.6 mm in breadth. Distinctive testa ornamentations from colliculate, corrugate, reticulate, rugulate, tuberculate, to psilate patterns served as critical traits in separating closely allied genera such as *Polycarpon* Loefl. and *Polycarpaea* Lam., *Stellaria* L. and *Schizotechium* (Fenzl) Rchb.. Intrageneric variations were evident in species within *Drymaria* Willd. *ex* Schult., *Polycarpaea*, *Silene* L., *Stellaria* L., and *Polycarpon*. Comparative evaluation suggests that seed morphology not only aids in resolving taxonomic ambiguities but also reflects evolutionary trends. Primitive taxa tend to retain psilate or faintly sculptured testa, while advanced taxa show specialized surface patterns, indicating adaptive significance related to dispersal strategies and ecological specialization. The detailed taxonomic key based on seed micromorphological characters to delimit the species is useful in the identification of taxa within the family in southern Peninsular India.

Keywords: Caryophyllaceae, *Polycarpaea*, Seed morphology, Testa ornamentation

SRY-PP-02

Comparative study of *Vincetoxicum fasciculatum* and *Vincetoxicum hookerianum*

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The genus *Vincetoxicum* Wolf comprises about 256 species worldwide, of which 30 species and five varieties are reported from India, including nine species and four varieties in Maharashtra. Among them, *Vincetoxicum fasciculatum* (Buch.-Ham. *ex* Wight) Kuntze and *V. hookerianum* Kuntze are closely related taxa that exhibit high morphological variability,

making their identification in the vegetative state difficult. To resolve their taxonomic delimitation, detailed anatomical and micro-morphological studies were undertaken. Comparative analyses of root, stem, petiole, and leaf anatomy were carried out, focusing on micro-morphological features such as epidermal cells, stomata, and trichomes using a compound microscope. Key anatomical characters evaluated included the arrangement and type of vascular bundles, nature of cortical tissues, presence or absence of hypodermis, secondary growth patterns, and structural diversity of trichomes. Micro-morphological traits studied involved stomatal type and index, epidermal cell shape, cuticle thickness, and surface ornamentation of leaves. The study revealed that characters such as discontinuous hypodermis, shape of stele, distribution of vascular elements, and trichome morphology play a crucial role in distinguishing these two species. These findings highlight the taxonomic significance of anatomical and micro-morphological traits in resolving species-level delimitation within *Vincetoxicum*.

Keywords: Anatomy, micro-morphology, *Vincetoxicum*

SRY-PP-03

Biomimetic analysis of the aerodynamic strategies in the dispersal units of *Symphorema involucratum* (Lamiaceae)

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Symphorema involucratum Roxb. is a woody climber in the family Lamiaceae, distributed from India to China. The dispersal unit of this plant is a unique multi-winged (6–8) helicopter diaspore that performs efficient autorotation in the air during wind dispersal. The present study was conducted to explore the uniqueness of the structural aerodynamic strategies of this diaspore responsible for the specific autorotation and their mechanical analysis for biomimetic aerodynamic design. The diaspores were collected from the Madayippara lateritic plateau of Kerala, and field observations were conducted. Detailed morphogenetic, macro- and micromorphological, aerodynamic, experimental and model simulation studies were performed using the collected diaspores. The results showed that diaspore in *S. involucratum* is a unique type of infructescence with the persistent involucral bracts of the inflorescence serving as wings for autorotation during dispersal. The elliptic-oblong or spathulate shape, foliaceous structure with reticulate venation pattern, dendritic stellate texture, dorsiventral curvature, predetermined geometrical right-side leading-edge curvature and spatial configuration of each wing, three-dimensional triagonal configuration of the diaspore and distribution of the centre of mass along the middle vertical axis are the signatures of the hidden aerodynamic strategies leading the stable autorotation. Statistical comparison of experimental results of aerodynamic performance showed that the diaspores of *S. involucratum* are more efficient in autorotation (lower descent rate) than other helicopter diaspores. Model simulation analysis of the flow dynamics and force distribution around the dispersal units revealed that structural drag modulation and lift generation strategies lead to slow and stable autorotational mechanics in them, offering valuable

insights for biomimetic potential for passive flight and wing design for decelerators and air dropping systems.

Keywords: Anemochory, Bioprospecting, Helicopter, Inflorescence, Lamiaceae, Winged diaspores

SRY-PP-04

Floristic diversity of Bramhagiri Hill, Tryambakeshwar, Maharashtra, India

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Bramhagiri hill (19°54'53"N 73°31'32"E), located in Tryambakeshwar tehsil of Nashik district, Maharashtra, is an ecologically and culturally important hill range forming a part of the Northern Western Ghats. The hill is the origin of the sacred Godavari River, and its diverse topography supports a mosaic of habitats. The elevation (3829 ft) and rugged topography of Bramhagiri influence local climatic conditions, with the hill receiving significant orographic rainfall during the monsoon season. This rainfall sustains a wide range of microhabitats, from moist valleys and seasonal streams to open grasslands and rocky plateaus, creating conditions for high floristic diversity. Despite its significance, the region has received little systematic floristic attention. The present study aimed to enumerate the flowering plant diversity of Bramhagiri hill. Extensive field surveys were conducted during different seasons between 2023–2025. Specimens were collected and identified with the help of regional floras and standard taxonomic literature. Till date, the study has documented 300 species belonging to 80 genera and 70 families, and the survey is still ongoing. Several species were found to be endemic to the Western Ghats, while others possess medicinal, edible, importance. The enumeration also documented rare and threatened taxa, highlighting the conservation value of the hill. The analysis revealed that the vegetation supports a unique assemblage of herbs and grasses adapted to seasonal extremes. Increasing anthropogenic pressures such as pilgrimage activities, developmental encroachments, grazing, and littering were observed to pose significant threats to the natural habitats. This floristic enumeration provides the first comprehensive baseline inventory of the flowering plants of Bramhagiri hill. The occurrence of endemic species such as *Ceropegia anjanerica* Malpure, M.Y.Kamble & S.R.Yadav, *C. mahabalei* Hemadri & Ansari, *Delphinium malabaricum* var. *ghaticum* Billore, *Impatiens dalzellii* Hook.f. & Thomson from Bramhagiri Hill highlights the need of the conservation. It contributes to understanding the plant diversity and emphasizes the urgent need for effective conservation strategies to safeguard this ecologically sensitive landscape.

Keywords: Bramhagiri hill, Conservation, Endemism, Floristic diversity, Northern Western Ghats, Tryambakeshwar

SRY-PP-05

Assessment of mangrove diversity in Kannur district, Northern Kerala, with emphasis on morpho-anatomical characteristics of selected true mangrove species

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Mangroves are flowering plants that have uniquely adapted to thrive in highly saline environments which offer a variety of vital ecological services. The current study determined the diversity of true mangroves and mangrove associates as well as the morpho-anatomical characterisation of selected true mangrove species in different ecosystems of Kannur district Kerala. The present study resulted the documentation of 10 true mangrove taxa and 11 mangrove associates from different mangrove ecosystems in Kannur district like Koduvally, Pulloopi Kadavu, Eranholi, Kayappanachi and Pappinisseri. Additionally, the morpho-anatomical analysis also helps to the identification and comparison of true mangrove taxa.

Keywords: Mangrove associates, Ecosystem, Morpho-anatomical characters, True mangroves

SRY-PP-06

In vitro propagation of *Pseuderanthemum malabaricum*, a rare medicinal plant

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In vitro propagation of *Pseuderanthemum malabaricum* (C.B.Clarke) Gamble commonly known as Malabar false or Chuttimulla in Malayalam, is a rare medicinal shrub endemic to India and Sri Lanka. It comes under the family Acanthaceae. Till date, there is no report on micropropagation of this taxon. Therefore, an *in vitro* micropropagation protocol has been standardized for *P. malabaricum* by using nodal explants. Nodal explants measuring a size of about 2–2.5 cm were excised from *in vitro* grown plants and cultured on various plant growth regulators such as 6- Benzylaminopurine (BAP), Kinetin (Kn), Thidiazuron (TDZ) alone or in combination with Indole-3-acetic acid (IAA). The highest response was observed on Murashige Skoog's (MS) medium supplemented with 1.0 mg/L BAP alone. Individual shoots were isolated and cultured on MS medium supplemented with 1.0 mg/L BAP and 0.5 mg/L IAA for shoot elongation. The optimum rooting of the shoots was observed on half strength MS medium supplemented with 1.0 mg/L Indole -3- butyric acid (IBA) after 45 days. The rooted shoots were transplanted to soil with 95% success. This standardized protocol for rapid micropropagation of *P. malabaricum* will be helpful for the conservation of this precious taxon and to explore its various phytochemical potentials and therapeutic activates for future studies.

Key words: Acclimatization, Direct organogenesis, *In vitro* propagation, Nodal explant

SRY-PP-07

Tree flora in Dharampur forest of south Gujarat

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Trees are among the most valued plants on earth: they provide food and tools, produce oxygen and are major carbon sinks, host and support other organisms, block noise and reduce air pollution, mitigate flooding, provide insights from the past and serve as recreational environments. They are vital for biodiversity, a stable ecosystem, and the

overall health of the planet and human society. India is home to a rich diversity of trees, with the comprehensive database "Trees of India" listing 3,708 tree species. This database also highlights that the country has a significant number of endemic species, with 609 being endemic to India, and a concerning 347 of the total tree species currently listed as threatened. The flora of Gujarat is diverse, with some studies recording around 310 tree species. The region towards the south of river Narmada is called southern Gujarat. The forests in this region are tropical moist and dry deciduous type famous for rich its rich flora and wildlife. There are numerous indigenous tree species of Gujarat and they have been evaluated under various regional threat categories. Besides, there are many species for which data is insufficient to put them in any one of these categories. Hence, this present study was conducted to prepare a comprehensive floristic account of trees of Dharampur forest region of Gujarat state. The study also aimed to locate the rare and critically endangered species and find out their conservation measures. A total of 189 species of trees has been identified for Dharampur forest in the present survey of documentation. They belong to 189 species of angiosperms belonging to 130 genera speared over 38 families. Thirty-five tree species having very narrow ranges of their distribution in Gujarat been collected in present investigation. Certain rare tree species like *Bombax insigne* Wall., *Sterculia gutata* Roxb., *Soymida febrifuga* (Roxb.) A.Juss., *Firmiana colorata* (Roxb.) R.Br., *Radermachera xylocarpa* (Roxb.) Roxb. *ex* K.Schum. were located. At least 500 seeds of each rare species were collected and grown them in nursery beds.

Keywords: Conservation, Dharampur, Gujarat, Native trees, Threatened, Trees

SRY-PP-08

Karymorphological studies on Two Species of *Canavalia* (Fabaceae) from India

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The genus *Canavalia* DC. (Fabaceae) with 60 species worldwide, with India representing eight species. The present study reports karyomorphological data of *Canavalia mollis* Wall. *ex* Wight & Arn. and *C. rosea* (Sw.) DC., revealing a mitotic chromosome number of 2n=22 in both species. The karyotypic formula of *C. mollis* 2n=7m+4sm and *C. rosea* 2n=5m+6sm. This study represents first time chromosomes report and karyomorphological analysis for both species.

Keywords: *Canavalia*, Chromososme, Fabaceae Karyomorphology, India

SRY-PP-09

Regional assessment of medicinal plants from Bhimashankar Wildlife Sanctuary

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Bhimashankar Wildlife Sanctuary (BWS), located along the crestline of the northern Western Ghats in Pune and Thane districts of Maharashtra, was notified in October 1985 for the conservation of the state animal, the Giant Squirrel. As an ecologically significant protected area of the Western Ghats, BWS harbors remarkable plant diversity. A literature survey revealed the presence of 1,142 angiosperm taxa at species and infraspecific levels, distributed across 619 genera and 124 families. Of these, 1,094 taxa are wild, belonging to 118 families and 586 genera, while 34 are planted and 14 are introduced. Owing to this heterogeneous diversity, a detailed assessment of plant resources is crucial. In the initial phase, 55 medicinally important plants, commonly traded near the Bhimashankar temple, were studied for regional assessment. Plant diversity was analyzed using a stratified random sampling approach, with quadrats of 10 × 10 m for trees, 5 × 5 m for shrubs and climbers, and 1 × 1 m for herbs, amounting to 150 sampling points. The findings highlight the unique medicinal plant wealth of Bhimashankar Wildlife Sanctuary and emphasize the need for long-term conservation strategies.

Keywords: BWS, Medicinal plants, Regional assessment

SRY-PP-10

Antidiabetic plants from Nashik – Ethnomedicinal and Phytochemical insights

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Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycemia resulting from defects in insulin secretion, insulin action, or both. The prevalence of diabetes is escalating globally, making it necessary to explore for alternative remedies. Traditional medicinal plants have long been utilized in various cultures to manage diabetes. This study documents and evaluates antidiabetic ethnomedicinal plants traditionally used in the tribal regions of Nashik district of Maharashtra, India. An ethnomedicinal survey recorded 35 plant species across multiple families, employed in managing diabetes. Preliminary phytochemical screening confirmed the presence of secondary metabolites across many species. From the survey, four representative plants were selected for detailed investigation. Extracts were evaluated for reducing sugar content, antioxidant activity (DPPH assay), and antidiabetic potential using α-amylase and α-glucosidase inhibition, glucose uptake (yeast model), and anti-glycation. The selected species showed appreciable reducing sugar levels and strong antioxidant activity. All exhibited significant α-amylase and α-glucosidase inhibition in a dose-dependent manner, with results close to the standard Acarbose. Extracts also enhanced glucose uptake and suppressed advanced glycation end-product formation, supporting their traditional use. Overall, this study highlights Nashik's rich ethnomedicinal knowledge and identifies a few species with promising antidiabetic activity. These findings encourage and justify further phytochemical characterization and in-vivo validation to develop affordable, plant-based antidiabetic therapeutics.

Keywords: Antidiabetic assay, Ethnomedicinal plants, Phytochemical analysis, Nashik

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

FAM-KSM-OP-01

Plastome characterization of *Embelia ribes* (Myrsinoideae: Primulaceae): Hotspots of nucleotide diversity and phylogenetic inference

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Embelia ribes Burm.f., a valued medicinal plant source of embelin, belongs to the subfamily Myrsinoideae of Primulaceae. Despite its wide distribution in south and south-east Asia, and its medicinal importance, genomics of the species and the genus *Embelia* remains unexplored. In this study, complete plastome sequence of *E. ribes* has been reported. The plastome of *E. ribes* spans 1,57,186 bp, exhibiting quadripartite structure with LSC (86,681 bp), SSC (18,248 bp) and pair of IRs (26,093 bp) regions. The plastome comprises 134 genes, including 89 protein-coding genes, 8 rRNA genes, and 37 tRNA genes, of which 19 are duplicated in the IR region. The comparative plastome analysis reveals six hot spots of nucleotide diversity and 61 SSRs identified can be used as a potential tool for species identification and population genetics. Phylogenomics supports close relationship of *Embelia* with *Aegiceras* Gaertn. and *Myrsine* L. The study provides complete plastome data of *E. ribes,* contributing in species delineation, evolutionary species relationship, population genetics, and conservation.

FAM-KSM-OP-02

Predicting plant taxonomic ranks from volatile metabolites: insights from molecular fingerprints and machine learning

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Plants synthesize a wide range of structurally diverse specialised metabolites, among which volatile compounds play key roles in mediating ecological and environmental interactions. Yet, it remains unclear to what extent their distribution reflects evolutionary relationships. While chemotaxonomic studies have shown that closely related taxa share similar metabolites, most are restricted to narrow taxonomic scales and rarely incorporate structural or biosynthetic information. In the present study, we asked whether plant volatile metabolites can predict higher taxonomic ranks (orders, families and genera) and explored the patterns of distribution of metabolite clusters on the phylogeny. Using a global qualitative dataset of 2139 plant volatile metabolites from 38 orders, 70 families, and over 200 genera, we trained machine learning classifiers on both binary metabolite data and five molecular fingerprint types and clustered metabolites to assess alignment with structural and broad biosynthetic classes. Finally, we mapped these metabolite clusters onto the phylogeny and the phylogenetic signals were calculated. Prediction accuracy was moderate with

qualitative volatile metabolite data, and slightly improved when molecular fingerprints were incorporated. Mapping the metabolite clusters generated from the collated data onto the phylogeny exhibited moderate to weak phylogenetic signals, suggesting that no strict constraints by structural or biosynthetic similarities are present. Our findings highlight the importance of chemical characters and molecular fingerprints for chemotaxonomy and provide insights into how evolutionary history and ecological pressures shape the chemical diversity of plants.

Keywords: Machine learning, Metabolite clusters, Molecular fingerprints, Plant volatile metabolites, Phylogeny, Taxonomic ranks

FAM-KSM-OP-03

Systematics of Smilacaceae in the Indian subcontinent: molecular phylogenetics and biogeographic insights from Himalayan *Smilax*

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The genus *Smilax* L., commonly known as Sarsaparilla, belongs to the family Smilacaceae and serves as an informative model for understanding plant diversification. With a global distribution, *Smilax* shows over 50% of its species in Asia, nearly half of which occur in the Himalayas. Recognized as a global biodiversity hotspot, the Himalayas function as a vital ecological refugium, holding exceptional ecological and evolutionary significance. The biogeographical importance of Himalayan *Smilax* is further emphasized by its role in connecting species across East Asia, offering critical insights into the evolutionary forces shaping plant distributions. Despite their ecological, phytogeographic, medicinal, and economic relevance, *Smilax* species in the Indian Subcontinent remain understudied at both the morphological and molecular levels. This study focuses on Indian subcontinent *Smilax* species to address long-standing taxonomic ambiguities, revise classification, and establish a robust framework for species identification. By integrating morphological and molecular approaches, including plastome analyses, the research aims to resolve phylogenetic relationships and adulteration issues, unravel evolutionary histories, and examine the biogeography of Himalayan taxa. Patterns of phylogenetic relationships and morphological diversity provide indirect insights into the adaptive potential and resilience of *Smilax*, while comparative chloroplast genome analyses enable the identification of molecular markers to clarify evolutionary relationships and assess genetic diversity. Collectively, this study advances understanding of *Smilax* taxonomy, phylogenetics, and biogeography, highlighting its ecological significance and informing conservation priorities within the Himalayan biodiversity hotspot.

Keywords: Biogeography, Chloroplast genome, Diversification, Hotspot, Sarsaparilla, Systematics

FAM-KSM-OP-04

Integrative morpho-molecular analysis of the genus *Erigeron* (Asteraceae) in India

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The *Erigeron* L. (Asteraceae: Astereae: Conyzinae) is represented by 22 taxa in India comprising 20 species and two varieties, distributed across 11 states. A phylogenetic analysis of the genus was conducted using eight species collected from eastern and western Himalayan regions, based on two markers [internal transcribed spacer (ITS) and the chloroplast trnL-F intergenic spacer (trnL-F)]. The objective of this study was to assess the correlation between morphological traits and molecular phylogenetic data. Ten prominent morphological characters were selected and a data matrix was prepared by scoring the morphological data using binary and multistate codes. A maximum likelihood (ML) phylogenetic tree was constructed using RAxML v2.0 software and an ancestral state reconstruction was done using Mesquite v4.01 software by linking both morphological and molecular data. This integrated analysis revealed high degree of congruence between phylogenetic clades and morphological traits. Each clade within the phylogeny was supported by distinct morphological characters like habit, stem branching pattern, flower type, corolla colour etc. that enhanced the resolution and confidence in species delimitation. This indicates that these morphological characters are evolutionary conserved within lineages, and therefore, can be reliably used along with molecular data for combined taxonomic study. This integrative approach can also be applied in other genera within Asteraceae for more robust and comprehensive systematic studies.

Keywords: Ancestral states, Morphometrics, Phylogeny, Species delimitation

FAM-KSM-OP-05

Seed morphometric traits as diagnostic tools for species-level classification in *Eulophia* (Eulophiinae: Orchidaceae)

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Seeds are critical in the fields of taxonomy, phylogeny, evolutionary biology and conservation biology. This study focuses on the morphological characteristics of seeds from ten *Eulophia* Lindl. species, using both qualitative and quantitative analysis to evaluate the potential utility of these traits in taxonomic and evolutionary studies of the genus. Quantitative measurements include various parameters of the testa (seed coat) and embryo: testa length (4.935–16.190mm), testa width (1.586–2.734 mm), testa length-to-width ratio (2.459–9.507 mm), embryo length (1.405–2.364 mm), embryo width (0.808–1.277 mm), embryo length-to-width ratio (1.445–2.624 mm), area of testa (5.973–19.795 mm^2), area of embryo (0.957–2.321 mm^2), ratio of area of testa to embryo (3.954–18.745), perimeter of testa (11.96–34.118 mm), perimeter of embryo (3.734–5.988 mm), testa volume (3.546–20.093 mm^3), embryo volume (0.314–20.093 mm^3), ratio of volume of testa to embryo (6.141– 40.321), and air space volume (2.968–19.228 mm^3). Cluster analysis revealed distinct groupings among the species: *E. andamanensis* Rchb.f. and *E. dab*ia (D.Don) Hochr. are closely related, as shown by their high similarity; *E. ochreata* Lindl., *E. zollingeri* (Rchb.f.) J.J.Sm., *E. herbacea* Lindl. and *E. nuda* Lindl. also form a distinct group, indicating they share significant similarities; *E. picta* and *E. pratensis* are related and cluster together, joining *E. diffusiflora* M.W.Chase, Kumar & Schuit. into a larger group. Additionally, *E. graminea* Lindl. links various smaller groups and shows shared traits. The morphological characteristics of the seeds indicate no clear pattern among the studied

species, suggesting further assessments to elucidate more distinct differences and relationships within *Eulophia* and its diagnostic value for delimitation of different species.

Keywords: Evolution, Morphometry, Seed, SEM, Systematics, Taxonomy, Testa

FAM-KSM-OP-06

Re-investigation on the systematics of *Rotala* (Lythraceae) in South India

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Rotala L. is an amphibious genus in the family Lythraceae and is considered the most diverse in South India, nearly 40 recognized species are distributed in India. Approximately 50% of these species have been described in the last decades. The genus exhibits significant phenotypic plasticity, leading to considerable morphological variation. This variability can result in ambiguities, prompting the designation of new taxa without thorough investigation. The presence of overlapping characteristics among species further adds to the confusion for taxonomists. This study aims to clarify the specific boundaries of the genus *Rotala* in South India using modern taxonomic tools. The findings indicate that 90% of the newly identified species are phenotypes of well-established species. Therefore, in addition to morphological characterization, it is important to integrate modern taxonomic methods when investigating the taxonomy of the genus *Rotala*.

Keywords: Lythraceae, Modern trends, Phenotypes, *Rotala*, Taxonomy

FAM-KSM-OP-07

Revisiting *Bupleurum* section *Eubupleura* (*Bupleurum*: Apiaceae) in India based on morphological and molecular evidences

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Bupleurum L., known as Chai Hu or Hare's ear is a perennial herbaceous genus in the carrot family Apiaceae. They are used as medicine in Chinese pharmacopoeia and in European pharmacopoeia, so they are considered as an important plant throughout the world. 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 32 species which are mainly distributed in Himalayan ranges and five species confined to Peninsular India. Comparing with the other genera in Apiaceae, this genus is characterised by having simple leaves and an umbel of yellow or dark purple flowers. Hence the taxonomic identification from the rest genera is simple and identification within the genus is difficult. So, the morphological difference, interrelationship and the phylogeny of the species in India were not yet studied. The species distributed in India are classified into three sections viz. Sect. *Perfoliata,* Sect. *Coriacea* and Sect. *Eubupleura*. Among these sections Sect. *Eubupleura* have maximum species with complexity in identification using morphological traits, so this work aims to

solve such complexity using morphological and molecular tools. Maximum Likelihood and Bayesian analysis were performed for phylogenetic analysis and the phylogenetic position of all the taxa were analysed with a well resolved tree.

Keywords: Apiaceae, *Bupleueum*, *Eubupleura*, Molecular, Morphology, Taxonomy

FAM-KSM-OP-08

Macro and micro morphology of genus *Osbeckia* from Karnataka, India

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Osbeckia L. is a widely distributed genus within the Melastomataceae family, with seven species reported in Karnataka. The present deliberation on macro (habit, root, stem, leaf, inflorescence, flower, fruit, etc.) and micro (pollen & seed through Scanning Electron Microscope-SEM) morphological characteristics of five species from Karnataka. The systematic diagnosis through dichotomous key characters, as well as their respective diversity in order of elevation and widespread distribution through their seed surface adaptation, and deliberation on the genus *Osbeckia* (Melastomataceae) in Karnataka, India.

Key words: Diversity, Melastomataceae, *Osbeckia*, Pollens, SEM, Seeds

FAM-KSM-OP-09

Pollinarium and seed morphometry of some *Peristylus* genus in Karnataka, India

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Peristylus Blume records 102 accepted species from tropical and subtropical Asia to Mongolia and Pacific, with 35 species reported from India. The present study provides a clear morphological analysis supplemented by photoplates. Pollinarium diversity and seed morphometric analysis of eight *Peristylus* species in Karnataka were used to resolve taxonomic conflicts among species, using modern scanning electron microscope (SEM). Pollinarium diversity shows substantial variations based on the surface of each pollinia within the pollinarium. Seed morphometry of *Peristylus* genus is unique, with short-flat, elongated, one-end-open, fusiform seeds with enlarged testa cells, and parameters were recorded.

Keywords: Dust seeds, Orchidaceae, Pollinia, Pollinarium, SEM, Tribe Orchidinae

FAM-KSM-OP-10

Molecular insights into the disjunct distribution of wet-zone *Miliusa* (Annonaceae) species in the Western Ghats and Northeastern India

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Miliusa Lesch. *ex* A.DC. is an Asian palaeotropical genus belonging to the family Annonaceae. The genus is primarily distributed across Indian subcontinent, mainland southeast Asia and southeast Asian islands. It belongs to the tribe Miliuseae and subfamily Malmeoideae. In India, *Miliusa* is represented by 26 species and two varieties, mostly restricted to wet evergreen forests of Western Ghats (WG), Northeastern India (NEI) and Andaman & Nicobar Islands (ANI). The present study investigates the phylogenetic relationship and biogeographic disjunction of wet-zone *Miliusa* species distributed across the Western Ghats (WG) and Northeastern India (NEI). While the evergreen species are restricted to the wet evergreen zones of the WG and NEI, the intervening mainland is dominated by deciduous species. Molecular dating analysis revealed that the WG and NEI populations form distinct evolutionary lineages. Additionally, the deciduous members of *Miliusa* exhibit an independent evolutionary history. Strikingly, the temporal framework of these evolutionary events strongly coincides with the paleoclimatic and geological changes in the Indian subcontinent. It is therefore inferred that environmental shifts might have played a pivotal role in shaping the present-day distribution and evolution of deciduous and evergreen taxa. From a taxonomic perspective, this long-term isolation supports the recognition of the WG and NEI *Miliusa* populations as evolutionarily distinct lineages. This study highlights the importance of integrating molecular and morphological data to infer patterns of divergence and diversification of *Miliusa* species in India.

Keywords: Disjunction, Evolution, Molecular dating, Phylogeny, Western Ghats

PROF. M. SABU AWARD

MS-OP-01

Studies on the endemic and threatened flowering plants of the Cardamom Hills Reserve, Idukki district, Kerala

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Cardamom Hill Reserves (CHR) is a tropical high upland mid-elevation evergreen forest ecosystem in the southern Western Ghats with boundaries extending up to the Periyar Tiger Reserves towards the south, Munnar high ranges towards its north, Idukki Reserve Forest to the west and the Cumbum and Kothakudy valleys of Tamil Nadu to the eastern side. The CHR, comprises the cardamom plantations and adjoining sholas, grasslands, and forested areas of great biodiversity. Encompassing an area of approximately 2,800 square kilometres, these hills are a treasure trove of biodiversity and are home to several narrow endemic and threatened flowering plants. Cardamom hills are located outside protected forest areas and the floristic diversity of these hills has not been subjected to any detailed studies. Many of the narrow endemic plants are being cleared for Cardamom/Coffee plantations, and tourism requirements day by day without any check and many are becoming extinct even before being discovered. In this scenario, a detailed taxonomic study has been conducted during the period 2015–2025 on the floristic diversity and endemism in Cardamom hills of Idukki district. About 230 Western Ghats endemic flowering plants could be identified during the study, out of which about 75% are strictly confined to the southern Western Ghats. Two new species have been reported during the study, viz., *Ixora predeepii* Balan & S.Harikr. and *Vigna sathishiana* Balan & Pradeep. Out of the 230 endemic plants, 25 belong to the IUCN threatened categories. The dominant genera with maximum endemism are *Impatiens* Riv. *ex* L. (16 sp.) followed by *Strobilanthes* Blume (11 sp.) and *Litsea* Lam. (7 sp.).

Keywords: Cardamom Hills, Endemism, Western Ghats

MS-OP-02

Angiosperm diversity and biomonitoring studies along with special focus to conservation needs in Walayar hill ranges in north-western side of Palghat Gap, Southern Western Ghats

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The present investigation focuses on the angiosperm diversity and bio-monitoring in Walayar forest range, located on the north-western side of the Palghat Gap. A total of 1077 taxa belonging to 610 genera and 133 families were recorded, with Fabaceae being the dominant family. Fabaceae also exhibited the highest generic diversity, with 39 genera represented. The study found therophytes (424) and phanerophytes (328) to be the most prevalent lifeforms. Among the forest types, deciduous forests dominate the vegetation,

featuring characteristic drier elements specific to this range, followed by semi-evergreen forests. This also reflected in the elemental composition with predominance of deciduous followed by semi-evergreen and grassland elements. Nine unique microhabitats hosting special plant associations were identified, and a shift in vegetation with gradual disappearance of microhabitats was observed with increasing temperature. Adaptive traits such as pubescence, succulence, semi-parasitism, carnivory etc. were found among the plants, enabling them to thrive harsh edaphic and climatic conditions operating in the Palghat Gap zone. Approximately 14% of the taxa recorded are endemic, and IUCN threat assessment categorize 27 taxa as threatened. Major threats that adversely affect the health of the vegetation include forest fire, alien invasive taxa, mines and quarries, highway construction, tourism, waste disposal, grazing etc. As the range lies in the vicinity of Palghat Gap playing a major role in climate regulation, the conservation of existing vegetation and protection initiatives along with greening the Gap is essential to protect these fragile ecosystems.

Keywords: Anthropogenic threats, Deciduous elements, Palghat Gap, Plant adaptations

MS-OP-03

Year-round tree identification using bark traits: A systematic approach for conservation and taxonomic clarity

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Bark, the outermost layer of woody plants, plays a vital role in protecting trees from herbivory, fire, and environmental stressors. Its structural complexity and year-round visibility make it a valuable morphological trait for tree species identification, especially when leaves, fruits, and flowers are absent. Traditional identification methods relying on these ephemeral traits are often labor-intensive and require expert knowledge, limiting their utility in large-scale ecological assessments. This study emphasizes bark's durability and distinctiveness as a reliable alternative for tree identification in both forestry and conservation contexts. A systematic field survey was conducted, accompanied by bark image collection using DSLR and mobile cameras. Detailed morphological analyses were performed, and the data were digitized to develop a structured bark trait database. The resulting compilation aims to support accurate, accessible tree identification and enhance educational and research efforts in plant systematics, ecology, sustainable forest management, and biodiversity conservation.

Keywords: Bark, Conservation, Taxonomy, Tree identification

MS-OP-04

Climbing mechanisms of lianas in the Western Ghats

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Lianas, the woody climbers of tropical forests, represent an important yet often overlooked component of forest ecosystems. The Western Ghats, one of the eight "hottest hotspots" of

biological diversity, harbor an exceptional range of liana species showing remarkable ecological adaptations. This study focuses on 228 species of lianas recorded from various forest types across the Western Ghats to understand their diverse climbing mechanisms. Detailed morphological observations revealed multiple adaptive features such as twining stems, tendrils, hooks, thorns, spines, prickles, and strangling habits, each representing an evolutionary response to the challenges of vertical growth and light competition. Despite their structurally weak stems, these plants demonstrate impressive biomechanical strategies that enable them to ascend host trees and spread their canopies efficiently. The distribution pattern of climbing modes showed a strong correlation with habitat type and forest stratification, with tendril climbers dominating in moist deciduous zones and twiners and stranglers more frequent in evergreen forests. These findings highlight the adaptive plasticity of lianas and their vital role in maintaining canopy connectivity, enhancing species diversity, and contributing to forest dynamics. The present study also emphasizes the need for detailed anatomical and ecological analyses to better understand lianas' evolutionary significance and their contribution to forest resilience in the Western Ghats.

Keywords: Climbing mechanisms, Lianas, Morphological adaptation, Tropical forests, Western Ghats

MS-OP-05

Re-evaluation of sectional delimitation in *Zingiber*: Integrating morphology, palynology, anatomy, and molecular phylogenetics

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The genus *Zingiber* Mill. exhibits diverse inflorescence habits that have historically served as a basis for sectional classification. Notably, two species, *Zingiber junceum* Gagnep. and *Z. gramineum* Noronha *ex* Blume, have been variably placed in sect. *Dymczewiczia* and sect. *Zingiber* due to the presence of both radical inflorescences on erect peduncles and inflorescences developing apically on leafy shoots. Previous phylogenetic studies indicated that *Z. officinale* Roscoe, typically exhibiting radical erect inflorescences (sect. *Zingiber*), can occasionally produce apical inflorescences (sect. *Dymczewiczia*), while *Z. pellitum* Gagnep. (sect. *Dymczewiczia*) shows close affinity to sect. *Zingiber*. Our current phylogenetic analysis corroborates these observations, showing that *Z. capitatum* Roxb. (sect. *Dymczewiczia*) clusters with members of sect. *Zingiber*, indicating that inflorescence type alone is unreliable for sectional delimitation. Palynological evidence from the current study demonstrates that both sections share spherical pollen with cerebroid sculpturing, suggesting closer taxonomic affinity. Anatomical studies further reveal that bundle caps in both sections are attached to adaxial and abaxial epidermis. Nuclear ITS-based phylogenetic analysis supports the nesting of sect. *Dymczewiczia* within sect. *Zingiber* with high bootstrap support (98%). Collectively, morphological plasticity in inflorescence habit, pollen morphology, anatomical features, and molecular evidence strongly indicate that sect. *Dymczewiczia* should be merged into sect. *Zingiber*, as previously proposed. This integrative approach highlights the importance of combining multiple lines of evidence for resolving taxonomic ambiguities in *Zingiber*.

MS-OP-06

Infraspecific variations in *Curcuma inodora*: Taxonomic insights and evolutionary implications

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The genus *Curcuma* L. (Zingiberaceae) comprises of nearly 120 species worldwide, with approximately 40 species recorded in India, including eight species documented from Maharashtra, many of which exhibit notable morphological and genetic variation important for taxonomic and evolutionary studies. Taxonomic identification within the genus is often challenging due to pronounced infraspecific variation, which can obscure species boundaries and complicate identification. In the Melghat region, populations of *Curcuma inodora* Blatt. display remarkable variations in both aerial and underground characters, providing an opportunity to explore evolutionary implications. In the present study, distinct variants were examined using morphological, phytochemical and molecular approaches to assess infraspecific diversity and its taxonomic relevance. Morphological assessment revealed three types of inflorescence position, considerable variation in sterile bract colour and shape and eight distinct labellum forms. All variations represented continuous rather than discontinuous variation, highlighting their infraspecific nature. Phytochemical profiling through HPTLC showed significant differences in flavonoid and phenolic composition among 14 populations, indicating their diagnostic utility. Molecular characterisation using ISSR and RAPD markers further revealed genetic divergence; with cluster analysis grouping populations into subclusters that reflected both relatedness and polymorphism. Taken together, the morphological, phytochemical and molecular evidence underlines the taxonomic significance of infraspecific variation in *C. inodora*. Divergence is mostly driven by geographical isolation, restricted gene flow and reproductive barriers. These variations serve as stocks of future evolutionary lines. Infraspecific variation in *C. inodora* indicate the evolutionary process of incipient speciation.

Keywords: *Curcuma inodora,* HPTLC Infraspecific variation, Molecular markers, Morphology, Phytochemistry

MS-OP-07

Indian *Rhamnus* (Rhamnaceae): Taxonomy and nomenclature

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The genus *Rhamnus* L. (Rhamnaceae) in India has long been taxonomically problematic due to overlapping morphological characters, historical misidentifications, and inconsistent typifications. This study presents a comprehensive reassessment of Indian *Rhamnus*, integrating a critical review of protologues, historical collections, herbarium specimens, and typification under the ICN. Species, including *Rhamnus virgata*, *R. hirsuta*, *R. napalensis*, and *R. triquetra* are lectotypified and, where necessary, epitypified to stabilize nomenclature. Field and herbarium evidence clarify long-standing confusion around *R. persica*, *R. prostrata*, and related taxa, demonstrating that many Indian records previously

attributed to *R. persica* correspond instead to *R. virgata* or *R. prostrata*. Importantly, *R. purandharensis*, originally described as an endemic shrub of hilltop forts in Maharashtra but later reduced to synonymy under *R. virgata* var. *hirsuta*, is here reinstated as a distinct species based on consistent morphological differences. The study also re-evaluates poorly known taxa such as *R. collettii* and *R. procumbens*, noting their morphological variability and affinities with allied species. *R. xizangensis*, a Chinese endemic is first time collected from Arunachal Pradesh, India. Its similarity with congeneric taxa has been discussed. Distributional records across the Himalayas, Peninsular India, and adjoining regions are updated, and diagnostic characters for species delimitation are refined. This reassessment provides nomenclatural stability and a clearer taxonomy of *Rhamnus* in India.

Keywords: India, New addition, Nomenclature, Revision, *Rhamnus*, Taxonomy

MS-OP-08

A revisit to *Garcinia* section *Garcinia* in India

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Garcinia L. (Clusiaceae) is a pantropical genus comprising over 260 species, with significant economic importance. According to the latest taxonomic revision, the genus consists of 33 species and seven varieties in India. Out of this, the section *Garcinia* was represented by two species in the wild, namely *G. celebica* L. and *G. sibeswarii* Shameer, J.Sarma, N.Mohanan & A.Begum, occurring in the Andaman and Nicobar Islands (A & N islands) and Northeast India, respectively. Due to the difficulty in collecting fresh specimens from these regions, revisionary works have relied primarily on herbarium specimens, and the correct identity and occurrence of the species under this section remained ambiguous for over a century. Hence, a study has been undertaken, utilizing fresh field collections and establishing representative plant populations at the *ex-situ* germplasm conservatory through seedlings and grafts. Morphological studies, in comparison with the protologues and type specimens, revealed that the plant population existing in the A & N islands is distinct from *G. celebica* and has been reinstated as *G. kurzii* Pierre. Both species were further differentiated anatomically and using chloroplast genome-based molecular markers. The allied taxon, *G. kingii* Pierre *ex* Vesque, has been synonymized with *G. kurzii.* Contrary to earlier reports, it is concluded that *G. celebica* is not found wild in India. *G. speciosa* Wall., a species recently merged with *G. celebica*, was found to be a valid entity native to Myanmar, but the report of its occurrence in the A & N island is erroneous. The section *Garcinia* in India has been updated with two native species, namely, *G. kurzii* and *G. sibeswarii,* besides two introduced species, *G. celebica* and *G. mangostana* L.

Keywords: Conservation, Crop wild relatives, Indian flora, Taxonomic revision

MS-OP-09

Studies on the rare, endemic and threatened flowering plants of three hill stations of Idukki district, Kerala

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Idukki is known for its floristic richness, with diverse habitats such as evergreen forests, grasslands, shola forests, semi-evergreen forests, scrub jungles, and wetlands. The present work elucidates the rare plants of hill stations including Elappara, Urumbikkara and Vagamon, with special emphasis on the conservation of threatened taxa. A total of 160 rare and threatened endemic plants species restricted to the Western Ghats-Sri Lankan biodiversity hotspot were documented during the study from these hill stations. Out of which about 70% of the plants are confined to the southern Western Ghats, with 27 species endemic to Kerala. About 14 species are common to Western Ghats and Sri Lanka. Among the families Orchidaceae dominates with highest number of endemic plants (20 spp.) followed by Balsaminaceae (18), Leguminosae (14), Lauraceae (14), Rubiaceae (13), and Melastomataceae (11). During the present study ten new species, namely, *Argostemma quarantena* Balan & Robi*, Gymnanthemum sahyadricum* Balan & Robi, *Litsea manilaliana* Robi & Udayan*, Eriocaulon meenachilense* Balan & Robi*, Litsea vagamonica* Robi & Vijayash.*, Eugenia elapparensis* Robi, Balan & Sujanapal*, Chlorophytum idukkianum, Ixora gadgiliana* Balan & Robi*, Ophiorrhiza meenachilarensis* Robi & Balan, and *Tarenna idukkiana* Robi & Balan are described as new species from the study area. *Impatiens megamalayana* Ramas. and *Robinia pseudoacacia* L. are reported as new record to Kerala. Extended distribution of *Humboldtia bourdillonii* Prain, an endangered tree legume is reported from the study area. Several threatened tree species were also documented, including endangered taxa such as *Cinnamomum keralaense* Kosterm. and *Humboldtia vahliana* Wight; vulnerable species like *Aglaia apiocarpa* (Thwaites) Hiern, *Aporosa cardiosperma* (Gaertn.) Merr., *Bentinckia condapanna* Berry *ex* Roxb., *Cinnamomum sulphuratum* Nees, *Diospyros trichophylla* Alston, *Euonymus angulatus* Wight, *Lasianthus rostratus* Wight, and *Pterospermum reticulatum* Wight & Arn.; and near-threatened species including *Actinodaphne bourdillonii* Gamble, *Litsea bourdillonii* Gamble, *L. coriacea* (B.Heyne *ex* Nees), *L. laevigata* (Nees) Gamble, and *L. wightiana* (Nees) Wall. *ex* Hook.f.

Keywords: Elappara, Urumbikkara, Vagamon

MS-OP-10

Foliar epidermal structure in some Burseraceae

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The present study examines the foliar epidermal structure of 15 previously unstudied species across six genera of Burseraceae to provide a comprehensive account of their foliar epidermal structure and its taxonomic significance. The adaxial epidermal cells are generally larger and have thicker walls than the abaxial. In most taxa, the cells are typically polygonal, with straight or undulated walls on both the surfaces, while abaxial epidermal cells are distinctly wavy in *Bursera delphechiana* J.Poiss. *ex* Engl. and *Protium* Burm.f.. Most species exhibit mucilaginous epidermal cells. The leaves are hypostomatic in majority of taxa except *Commiphora agallocha* Engl. The predominant stomatal type is anomocytic. Cuticular striations occur in *Bursera* Jacq. *ex* L. and *Canarium* L. species and can be linear, curved, or eccentric. In *Commiphora berryi* (Arn.) Engl., epidermal cells of both surfaces develop papillae. Epidermal components like size, shape and orientation of cells, cuticular ornamentation, stomatal type, size, index, frequency and variations in the epidermal

appendages have great diversity in their structure and distribution therefore offers valuable information in the identification of several species.

Keywords: Burseraceae, Epidermis, Foliar anatomy, Structure

MS-OP-11

Micro-climatic habitats and angiosperm compositions of Rameshwara Sacred grove, Sharavathi river basin, central Western Ghats, Karnataka

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Sacred groves represent one of the oldest informal systems of forest conservation and often preserve the last remaining fragments of primary forests, especially in the Western Ghats. These patches provide critical refugia for numerous endemic species. The diversity of sacred groves has been extensively documented, but their internal ecological dynamics, such as species associations, community structure, and microclimatic habitat gradients, remain less understood. The present study investigates angiosperm composition and microhabitat variation within the Rameshwara Sacred Grove, Hulkodu Village, located in the Sharavathi river basin of the central Western Ghats, Karnataka. Using both transect and quadrat sampling methods, we recorded 288 species belonging to 241 genera across 87 families within a 78-hectare forest. Among trees, *Olea dioica* was the most abundant, followed by *Aporosa cardiosperma* (Gaertn.) Merr., *Ixora brachiate* Roxb., *Diospyros buxifolia* (Blume) Hiern, *Knema attenuata* (Wall. *ex* Hook.f. & Thomson) Warb., and *Garcinia morella* (Gaertn.) Desr. The herbaceous layer was dominated by regenerating tree saplings along with *Elephantopus scaber* L. Five distinct microhabitats were identified, each supporting unique angiosperm assemblages. The emergent layer included *Canarium strictum* Roxb. individuals with girths exceeding 80 cm. In terms of basal area, *Terminalia paniculata* B.Heyne *ex* Roth contributed the highest cover (4.61 m²/ha, 5 individuals), followed by *Aporosa cardiosperma* (Gaertn.) Merr. (2.79 m²/ha, 106 individuals) and *Lagerstroemia macrocarpa* Hance (1.8 m²/ha, 1 individual). This study highlights the ecological significance of sacred groves in maintaining floristic diversity and microclimatic heterogeneity, offering insights into the conservation value of these culturally, religiously protected landscapes in the Western Ghats.

Keywords: Ecology, Flowering plants, Micro habitats, Species association, Stand structure

MS-OP-12

Investigation on nutritional, phytochemical, elemental analysis and their biological activities of *Duabanga grandiflora* fruit extract

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Duabanga grandiflora (Roxb. *ex* DC.) Walp. is a large tree that belongs to the family Lythraceae. It is traditionally valued for its medicinal and nutritional importance. However, limited scientific data are available on its phytochemical composition and biological activities. The present study investigated the nutritional composition, phytochemical constituents, and bioactive compounds of pet ether and methanol fruit extract of *D. grandiflora*. Proximate analysis was performed for nutritional profiling, qualitative phytochemical screening was carried out for secondary metabolites, and bioactive constituents were identified using Gas Chromatography–Mass Spectrometry (GC–MS), which revealed 16 compounds in the methanol extract & 14 compounds in the petroleum ether extract. The extract was also evaluated for its biological activities using standard in vitro assays. The fruit extract showed appreciable levels of carbohydrates, proteins, fats, and fibre, confirming its nutritional potential. Phytochemical screening revealed the presence of alkaloids, flavonoids, tannins, phenols, and glycosides. GC–MS analysis identified several bioactive compounds with reported antioxidant, antimicrobial, and therapeutic properties. supporting the medicinal value of the fruit extract. These findings indicate that *D. grandiflora* fruit is a promising source of nutrients and bioactive compounds with potential applications in nutraceuticals and natural therapeutics. Further studies are warranted to isolate and characterize the active principles for pharmaceutical uses.

Keywords: Antimicrobial, Antioxidant, *Duabanga grandiflora,* Elemental, GC-MS, Phytochemical Analysis.

GENERAL THEMES

THEME 1

ADVANCES IN ANGIOSPERM SYSTEMATICS

T01-OP-01

Resolving infraspecific ambiguity in *Alseodaphne semecarpifolia* (Lauraceae) through integrative morphometric and pollen SEM analysis

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The genus *Alseodaphne* Nees (Lauraceae) comprises more than 50 species distributed across tropical Asia, with nine species recorded from India. Among these, two species — *Alseodaphne semecarpifolia* Nees and *A. habrotrica* Kosterm. along with three varieties of *A. semecarpifolia*, namely var. *angustifolia* Meisn., var. *parvifolia* Hook.f. and var. *malabarica* Robi & Udayan were reported from South India. In revision of the genus, Kostermans (1973) observed extensive morphological variation in species growing in dry forests of Peninsular India and Sri Lanka and synonymized the two varieties of *A. semecarpifolia*, thereby creating taxonomic uncertainty in their infraspecific categorization. Present study aimed to clarify these ambiguities by integrating quantitative morphometric data and scanning electron microscopy (SEM)-based pollen analysis. Field collections were made from multiple locations representing the species and varieties under investigation. Morphometric traits related to leaves, inflorescences and fruits were measured. A total of 57 morphological characters were analysed (40 qualitative and 17 quantitative) and multivariate analyses were conducted to identify patterns of morphological differentiation. A dendrogram was constructed to visualize grouping patterns. Pollen grains were examined under SEM to document aperture types, exine ornamentation and other micromorphological features that could serve as diagnostic characters. The combined analysis revealed significant variation within *A. semecarpifolia*, indicating that its varieties cannot be synonymized and should instead be recognized as distinct varieties. This integrative approach underscored the significance of combining classical and modern systematic methods to resolve taxonomic challenges and contributed to improving the classification of Lauraceae in South India.

Keywords: *A. semecarpifolia*, Morphometric data, Peninsular India, Pollen

T01-OP-02

Genomic evidence of population differentiation between Indian and Sri Lankan Black Pepper (*Piper nigrum*) revealed by SNP markers

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Black pepper (*Piper nigrum* L.) is one of the most economically important spice crops in South and Southeast Asia, with India and Sri Lanka representing two major centers of cultivation and genetic diversity. Understanding population differentiation between these regions is critical for germplasm authentication, breeding, and tracing the origin of traded produce. In the present study, we performed low-coverage whole-genome sequencing of 100 representative Indian black pepper genotypes and compared them with publicly available genomic data of 100 Sri Lankan accessions generated by restriction-site associated DNA (RAD) sequencing. A genome-wide set of 7623 high-quality SNPs was identified and used to assess genetic diversity, population structure, and differentiation. Nei's genetic distance and related parameters revealed clear divergence between Indian and Sri Lankan populations, supported by Analysis of Molecular Variance (AMOVA), which indicated significant partitioning of genetic variation between the two regional groups. Population structure and principal coordinate analyses consistently classified accessions into two distinct clusters corresponding to their geographical origin. Furthermore, a subset of SNP loci unique to Indian or Sri Lankan accessions was identified, representing potential genomic regions associated with regional adaptation and lineage divergence. These studies could identify genomic regions exhibiting high linkage disequilibrium (LD) between Sri Lankan and Indian accessions, which can be employed as diagnostic markers to differentiate both accessions in trade and export. Such markers could be utilized by customs departments to resolve legal claims related to import duty clearances, thereby safeguarding farmers' interests and conserving national revenue.

Keywords: Black Pepper genetics, Germplasm authentication, SNP markers, Population differentiation, India and Sri Lanka

T01-OP-03

Flow Cytometry as a tool for ploidy estimation and taxonomic authentication in Red Ginger (*Zingiber officinale*) genotypes

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Red ginger (*Zingiber officinale* Rosc.) is one among the ginger genotype gaining attention due to its unique red colour, high essential oil and pungency. It is mainly regarded as a diploid and is commonly propagated vegetatively by rhizomes. Assessment of genetic variability alongside ploidy level enhances our understanding of the crop's inherent diversity. In this study, red ginger genotypes such as Indian red ginger and exotic red ginger were characterized for selected phenotypic and biochemical traits. The two genotypes exhibited significant differences across morphological and biochemical traits. The ploidy levels of these two elite genotypes were successfully determined using chromosome count and flow cytometry (FCM). The chromosome number was initially estimated using conventional root-tip squashing method. The somatic chromosome number of Indian red ginger was 2n = 22 and that of exotic red ginger was 2n = 33. The ploidy was confirmed further using flow cytometric technique. The results confirmed that Indian red ginger was diploid whereas the exotic red ginger was found to be triploid. The major morphological and biochemical differences between the gingers may be related to different ploidy levels. The occurrence of polyploidy is common in certain plant taxa. Flow cytometry has emerged as a potent tool for assessing ploidy and genome characteristics that aid in species recognition and classification. When integrated with morphological, karyological, and molecular data,

flow cytometric analyses provide an objective and quantitative framework for determining taxonomic identity. Thus, this technique complements traditional approaches and contributes significantly to resolving complex taxonomic relationships and understanding evolutionary patterns among species.

Keywords: Flow cytometry, Polyploidy, Red ginger

T01-OP-04

Combining morphological, anatomical and phylogenetic evidences to resolve the identity of *Litsea wightiana* (Lauraceae) in the South India

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We analysed patterns of morphological and anatomical differentiation of the *Litsea wightiana* (Nees) Wall. *ex* Hook.f. (Lauraceae), through morphometric analyses of populations and morphotypes, aiming at evaluating current taxonomic proposals and at identifying discriminative characters for the delimitation of taxa. We performed multivariate and univariate morphometric analyses using 45 morphological characters of 376 individuals from 42 populations distributed throughout Western Ghats especially Kerala, Tamil Nadu regions representing nine morphotypes that comprise nearly all the morphological diversity and geographic distribution of the complex. The results obtained from the Principal Component Analysis (PCA) and Cluster Analysis (CA) revealed the taxonomic differences between *L. wightiana* and *L. floribunda* (Blume) Gamble showed distinct morphological features. Chloroplast markers rbcL and matK were used to differentiate the intraspecific variation between the species and psbA-trnH used to study the interspecific variations of *L. wightiana*. The complex presents phylogenetic patterns difficult to understand which suggest that the complex does not correspond to a single species, and also helps to understand does each morphotype correspond to a taxon.

Keywords: Litsea, Morphotypes, Phylogeny, South India,

T01-OP-05

Low-coverage whole genome resequencing reveals genomic variation and taxonomic relationships among Black Pepper (*Piper nigrum*) accessions

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Black pepper (*Piper nigrum* L.), a highly valuable spice crop globally, displays significant morphological variability between cultivated and wild varieties; however, its genomic diversity and taxonomic relationships are insufficiently investigated. This study conducted low-coverage whole genome resequencing on 152 *P. nigrum* accessions to examine genome-wide variation and molecular taxonomic patterns. Sequencing produced between 9 and 42

million reads for each sample. Of these, 75 accessions (about 49.3%) had high-quality mapping to the reference genome, with alignment efficiencies between 69% and 99% and most were over 97%. Variant calling and annotation showed that most single nucleotide polymorphisms (SNPs) and insertions-deletions (InDels) were found in intergenic, upstream and exonic areas. There were a lot of synonymous SNPs, but not many stop-gain and stop-loss mutations. This means that coding sequences were not much disrupted. The transition/transversion (Ts/Tv) ratio was between 1.73 and 2.19, with an average of about 1.85, which is in line with high-quality variant calls. InDels had a similar genomic distribution, with most of them being between genes and only a few frameshift events. These variant patterns highlight both conserved and divergent genomic regions among accessions. Initial SNP-based clustering analyses identified distinct genetic groups, corroborating molecular evidence for taxonomic differentiation within *P. nigrum*. Overall, this study establishes a foundational genomic resource for black pepper and demonstrates that whole genome resequencing can effectively resolve intra-specific diversity and infer taxonomic relationships, providing valuable insights for future evolutionary and breeding studies.

Keywords: Black pepper, InDels, SNPs, WGS

T01-OP-06

Taxonomic insights into three endemic species of *Dicliptera* (Acanthaceae) from Peninsular India

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The genus *Dicliptera* Juss. (Acanthaceae) is represented by 24 species in India, with greatest diversity in the Peninsular region. Despite their ecological and morphological significance, Indian members of the genus remain underexplored, particularly from the perspectives of cytogenetics, palynology and seed micromorphology. As part of ongoing taxonomic revisionary work on *Dicliptera* from Peninsular India, three endemic species, viz. *Dicliptera baphica* Nees, *D. cuneata* Nees, and *D. srisailamica* Rasingam, Nethaji & Susmitha, were collected and documented. The present study provides novel chromosome counts for *D. baphica* (2n = 58), *D. cuneata* (2n = 26), *D. srisailamica* (2n = 26), palynological and seed micromorphological insights for three Peninsular Indian taxa of *Dicliptera*, thereby strengthening the taxonomic understanding of the genus. These findings not only expand the cytological baseline for the genus in India but also offer valuable reference points for future systematic and evolutionary investigations within Acanthaceae.

Keywords: Acanthaceae, Cytotaxonomy, *Dicliptera*, Morphology, Peninsular India

T01-OP-07

Character evolutionary studies on genus *Murdannia* (Commelinaceae)

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Murdannia Royle (Commelinaceae) comprises about 61 species distributed mainly in tropical and subtropical regions, and is represented by 27 species, one subspecies and four varieties in India. Having greater diversity and endemism, India is considered to be the center of diversity for the genus. *Murdannia* is considered one of the taxonomically difficult groups to diagnose due to the homoplasy in the morphological characters resulting from various parallel and convergent evolution. The genus exhibits variation in several floral as well as vegetative features. Ancy (2013) used both vegetative and reproductive characters for the cladistic analysis. However, the distribution and mapping of these characters on a phylogenetic tree were not done. The present study is to understand the evolution of phylogenetically important characters and to reconstruct the character states for a better understanding of morphological evolution in *Murdannia.* The study utilises Mesquite v3.04 to optimize the characters on the Bayesian consensus tree based on the combined nrITS-cpDNA datasets as inferred from Bayesian inference analysis which enabled a systematic evolution of all the diagnostic characters of each individual based on the likelihood method.

Keywords: Bayesian inference, cpDNA, Evolution, ITS, *Murdannia*

THEME 2

MOLECULAR PHYLOGENETICS AND DNA BARCODING

T02-OP-01

From taxonomic uncertainty to genomic clarity: resolving *Spicatum* complex (*Hedychium*, Zingiberaceae)

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How does a species' geographic range influence its phenotypic and genotypic diversity, and what does such variation imply for species boundaries? We explore these questions in *Hedychium spicatum* Sm. (Zingiberaceae), a morphologically variable, widely distributed ginger within the *Spicatum* complex. Based on its sympatric occurrence and interfertility with congeners, we asked the following questions: (i) Does the widely distributed *H. spicatum* form a genetically cohesive group? (ii) Does *H. spicatum* hybridise with its sympatric congeners? To test these questions, we sampled 11 populations of *H. spicatum* along with its sympatric congeners across the distributional range. Using single-nucleotide polymorphisms from reduced-representation genome sequencing and simple-sequence repeats, we inferred genetic structure with model-based and model-free clustering. We identified intermediates, hybrid lineages, and cryptic taxa across its distributional range. Our results reveal multiple instances of gene flow between *H. spicatum* and at least four co-occurring congeners, producing morphological intermixing and taxonomic ambiguity. Notably, the Western Ghats population appears to result from long-distance migration from the Himalayas. It is undergoing progenitor–derivative speciation, which likely led to the misidentification of *H. venustum* Wight as a distinct species rather than an admixed variant of *H. spicatum*. Extant populations of *H. spicatum* are also shaped by demographic fluctuations linked to the last glacial maxima in the Himalayas and by biogeographic barriers. In conclusion, the morphological, genomic, and taxonomic complexities of *H. spicatum* exhibit an emergent-system-like feature and show how a widely distributed species can provide insight into speciation processes on a spatial scale.

Keywords: Ginger lily, Northeast India, Phylogeography, Population genomics, Species complexes, Speciation

T02-OP-02

Preliminary insights into nuclear and plastid phylogeny of genus *Begonia* in Northeast India

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The genus *Begonia* L. is one of the most species rich angiosperm lineages, with remarkable morphological diversity. Despite their taxonomic significance, phylogenetic relationships among *Begonia* species in Northeast India has not been extensively studied, limiting our understanding of their diversification and evolutionary history in this region. Nuclear (ITS2) and plastid (ndhA, rpl32-trnL, ndhF-rpL32) markers is being employed to reconstruct phylogenetic relationships among the northeastern taxa. Thorough morphological study was carried out to authenticate each specimen, and DNA was extracted from collected specimens, followed by PCR amplification and sequencing of the selected regions. Both Maximum likelihood (ML) and Bayesian Inference (BI) was employed to reconstruct the phylogeny. Preliminary analyses indicate notable incongruence between nuclear and plastid datasets, suggesting potential hybridization or incomplete lineage sorting among closely related taxa. These findings will highlight the complexity of phylogenetic relationships in Northeast Indian *Begonia*. The study is expected to provide new insights into species delimitation, character evolution, and biogeographic patterns of this diverse genus in a biodiversity rich but understudied region.

Keywords: *Begonia*, Northeast India, Phylogeny

T02-OP-03

Phylogeny of *Annona*, *Artabortys* and *Polyalthia* (Annonaceae); *Michelia* (Magnoliaceae) and *Clematis* (Ranunculaceae) based on *rbc*L, *mat*K, *psb*A-*trn*H and *psb*K gene sequences from Satpura ranges of Amravati district

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The seven species, five belong to the family Annonaceae, one belongs to the family Magnoliaceae and one belongs to family Ranunculaceae were taken from the hilly area of the Satpura range of Maharashtra. The phylogenetic tree based on gene loci *rbc*L, *mat*K, *psb*A-*trn*H and *psb*K showed that *Artabotrys hexapetalus* (L.f.) Bhandari, branches off separately from the *Annona* species, indicating an earlier divergence within the Annonaceae family. This suggests that *A. hexapetalus* has distinct evolutionary traits compared to the *Annona* species. The analysis revealed a close association between *Polyalthia longifolia* (Sonn.) Benth. & Hook.f. *ex* Thwaites and *Michelia champaca* (L.) Baill. *ex* Pierre. However, *P. longifolia* is more closely related to the *Annona* species than *A. hexapetalus*, suggesting a closer evolutionary relationship within these genera of the Annonaceae family. In contrast, *M. champaca* forms a distinct branch, indicating it diverged earlier from the common ancestor it shares with the Annonaceae species. The phylogenetic tree showed that *Clematis chinensis* Osbeck, representing the Ranunculaceae family, diverged before the other species in the tree. This provides a reference point for understanding the evolutionary relationships among the species in Annonaceae and Magnoliaceae, which are supported by the morphological data in the present study.

Keywords: Annonaceae, Magnoliaceae, Molecular markers, Ranunculaceae

T2–OP–04

Integrative taxonomic assessment of the morphologically distinct *Henckelia repens* (Gesneriaceae): Evidence from morphology, anatomy, cytology, and molecular data

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The genus *Henckelia* Spreng. (Gesneriaceae: Didymocarpoideae) was taxonomically restructured in 2011 through the dismantling of the polyphyletic *Chirita* Buch.-Ham. *ex* D.Don and allied segregates, yielding a new circumscription that reflects a natural, monophyletic lineage within Didymocarpinae based on multi-locus molecular phylogenetic evidence. Interestingly, *Henckelia* displays remarkable morphological variation: South Indian taxa are predominantly acaulescent, whereas caulescent forms dominate in Northeast India and Southeast Asia, with repent and tuberous forms representing possible evolutionary intermediates or ecological adaptations. The distinctiveness of the morphologically different South Indian taxon *H. repens* (Bedd.) A.Weber & B.L.Burtt was examined through an integrative approach combining comparative morphology, micromorphology, anatomy, cytology, and multi-locus phylogenetics (nrITS, trnL–F). Both maximum-likelihood and bayesian analyses shows *H. repens* as a strongly supported lineage within South Indian *Henckelia*, with congruence between nuclear and plastid partitions. Diagnostic traits, including its repent habit, distinctive trichome assemblages, and seed-coat sculpturing together with a stable diploid karyotype, complementing its taxonomic distinctness in line with the molecular topology. By refining species boundaries and highlighting character systems of high diagnostic value, this study contributes baseline data for conservation and ongoing taxonomic discovery in the Western Ghats, a biodiversity hotspot.

Keywords: Chromosome, *Henckelia*, India, Repent

T02-OP-05

Influence of cotyledonary tissue on cationic and anionic peroxidase expression in *in vitro* grown developing embryonic axis of groundnut

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Peroxidases, one of the key antioxidant enzymes, are widely distributed in nature and catalyse oxidation of various electron donor substrates concomitant with the decomposition of H_2O_2. The class III peroxidases observed in plants (non-animal) are involved in various essential physiological processes of plant growth and development throughout their life cycle. A cationic and an anionic groundnut peroxidase were studied from different embryonic axis grown in aseptic condition. Real-time quantitative Real Time Polymerase Chain Reaction (RT-PCR) has become the standard method for in depth studies of gene expression. In the present study, groundnut embryo is taken as explant, embryo is parted into three types, embryo with half cotyledon, whole seed and only embryo were grown under aseptic condition. Embryonic tissues were crushed in liquid nitrogen and mRNA was isolated using standard protocol and stored at -20°C. The obtained mRNA pool was

converted to cDNA. Peroxidase genes like Prx8, TH2, Ana1, Ana2, and Ana3 were studied using RT-PCR for their expression profile in different parts of the embryonic axis. Both cationic and anionic genes are present on the genomic DNA however their expression is varied in different organs and at different time of plant life cycle. The elucidation of gene expression patterns leads to a better understanding of biological processes.

Keywords: Groundnut, Plant tissue culture, Peroxidase enzymes, RT-PCR

T02-OP-06

Chloroplast DNA-based sequence length polymorphism markers supplement DNA barcoding for phylogenetic and diversity studies in *Myristica* species

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Chloroplast DNA (cpDNA), with its conserved structure and maternal inheritance, has long been employed in DNA barcoding and phylogenetic studies. However, universal barcoding loci such as *rbcL* and *matK* often lack sufficient resolution to discriminate closely related taxa, particularly within the genus *Myristica* Gronov. To address this limitation, we developed novel cpDNA-based sequence length polymorphism (SLP) markers as complementary tools to conventional barcoding. Comparative analysis of nine *Myristica* chloroplast genomes revealed 25 insertion–deletion (InDel) loci (>5 bp) and 597 simple sequence repeats (SSRs), showing significant interspecific variation. From these, 84 SLP markers (59 SSRs and 25 InDels) were designed, and eight markers targeting hypervariable intergenic spacer regions were validated across 33 *Myristica* accessions. A unique 25 bp deletion in the *ycf4_cemA* region was consistently observed in all cultivated *M. fragrans* accessions, providing a diagnostic marker for species authentication. Additional loci captured intraspecific variation among *M. fragrans* cultivars, while UPGMA analysis resolved three distinct phylogenetic groups across the genus. Importantly, a species-specific marker was also identified for the IUCN red-listed *M. andamanica* Hook.f., supporting its conservation and accurate identification. Compared with universal barcoding regions that displayed limited polymorphism, cpDNA-based SLP markers demonstrated higher discriminatory power, reproducibility, and suitability for PCR-based assays that can be resolved on agarose gels. These markers represent scalable, cost-effective resources for species identification, phylogenetic reconstruction, germplasm management, and quality control of nutmeg and related *Myristica* products.

Keywords: Chloroplast DNA, DNA Barcoding, InDels, *Myristica*, SLP markers

T02-OP-07

DNA barcoding reveals the traditional house construction materials of the highland indigenous peoples of Tamil Nadu- a phylogenetic approach

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The Nilgiris Biosphere Reserve (NBR) in Tamil Nadu, India, is home to a rich mosaic of indigenous communities whose traditional knowledge systems emphasize the sustainable use of native plant resources for traditional housing construction. This study employs DNA barcoding and phylogenetic analysis to identify and authenticate plant species used in indigenous traditional housing construction practices, revealing a nuanced understanding of ethnobotanical usage embedded in tribal heritage. Using standardized plastid marker i.e. ndhF, we barcoded 12 out of 18 plant samples collected from Toda, Kota, Kattunayakan tribal settlements. Phylogenetic relationships were reconstructed to infer evolutionary linkages and validate species-level identifications. The results identified 12 unique species spanning 7 families, including members of Poaceae, Fabaceae, and Lauraceae, many of which are endemic or regionally significant. The integration of molecular data with ethnobotanical knowledge underscores the precision of traditional material selection and highlights the role of phylogenetics in traditional housing construction. This study not only contributes to the documentation of tribal biocultural heritage but also advocates for DNA barcoding as a tool in preserving indigenous practices and informing ecological sustainability in the Western Ghats biodiversity hotspot.

Keywords: Built-forms, DNA barcoding, Nilgiris Biosphere Reserve, Phylogenetics, Tribal houses

T02-OP-08

Molecular markers in plant molecular systematics

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Biodiversity is an enigma that is yet to be better understood. The art and science of taxonomy which aims to enumerate biodiversity, no doubt started with morphological analysis. However robust morphological characters are in identifying and classifying species, it introduces observational bias or inferential bias. Integration of micromorphology, phytochemistry, karyology, embryology, palaeontology etc. has revolutioned taxonomy. One such power tool is molecular sequencing. Molecular markers are the starting point of molecular systematics. Molecular markers could be RFLP, AFLP, microsatellites and single nucleotide polymorphisms. Molecular sequences have proved as indispensable tools for evolutionary analysis of plants and also a tool for DNA barcoding. I discuss the various markers that could be used for molecular phylogeny reconstruction and DNA barcoding which will help us understand the evolution of biodiversity.

Keywords: Barcodes, Internal transcribed spacer, Phylogeny, Plastid genes, rbcL, SNP

T02-OP-09

Molecular phylogeny of genus *Nothopegia* (Anacardiaceae) in Central Western Ghats Karnataka, based on the ITS, rbcL and trnLF markers

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Nothopegia Blume (*nom.cons.*) genus is an Anacardiaceae family, a small dioecious tree and shrub, four species can be located within the Central Western Ghats in Karnataka. These species are difficult to differentiate based solely on morphological traits because of their almost identical characteristics and endemic position in the area. Using a variety of techniques, individuals attempt to understand the genus' taxonomic difficulty. The current research used DNA information to explain the genus systematic evolutionary phylogeny. Also, we have to use certain primers for molecular phylogeny characterization, Four *Nothopegia* species sequence result, twenty-one ingroup taxa and two outgroup species query sequences were retrieved from NCBI. For molecular studies purposes Freshly obtained leaf samples were used to isolate whole genomic DNA by the CTAB method, This DNA was then amplified and sequenced using several primer combinations like sequences of ITS, rbcL and trnLF, to compare the phylogenetic results the sequence of each taxon was first Aligned by Mega version11.0.10 and create consensus sequences by using Sequencher v5.2 software. The aligned sequences will undergo BLAST analysis at the NCBI. Subsequently, the consensus sequences will be submitted to the NCBI. Maximum parsimony analysis was carried out by PAUP v 4.0a169. The combining sequence of ITS, rbcL, and trnLF primers, Analysis of Maximum likelihood in Raxml GUI version 2.0, and Bayesian analysis was performed using MrBayes v3.2.7a software, edited sequenced. It was found that when building a tree of phylogeny, the data proved quite beneficial. A clear phylogeny of the genus may be constructed by adding different species from different regions.

Keywords: Bootstrap, CTAB, Maximum likelihood, NCBI, Parsimony, Posterior probability

THEME 3
FLORISTIC DIVERSITY AND BIOGEOGRAPHY

T03-OP-01

Grasses of Mangaladevi Hills, Western Ghats

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Mangaladevi is situated on the peak of the Periyar Tiger Reserve, at a height of 1,337 meters, near Thekkady in Kerala. The place borders the Idukki district of Kerala and the Theni district of Tamil Nadu. The area is characterized by the ancient Mangaladevi Kannagi temple and its remnants, located at the summit of the mountain. The temple is dedicated to the goddess Mangaladevi, also known as Kannagi, making the site significant in both culture and religion, with a rich history and extensive mythology. The temple features four stone structures dedicated to Lord Shiva and Lord Ganapati. Entry to the place is restricted and requires prior permission from the Wildlife Warden of Thekkady. Every year, the place is illuminated by the celebration of the Chitrapournami festival, when entry is permitted, and devotees gather to worship. Grasslands and the Shola forests are the main vegetation of the area. The vegetation of the area is studied through frequent visits. Grasses are the dominant plant community of the region. A total of 152 distinct grass species has been identified in the area. *Panicum* L. (9) and *Eragrostis* Wolf (8) have the highest number of species. Grass genera such as Anthraxon (6), *Arundinella* Raddi (6), *Cyrtococcum* Stapf (6), *Digitaria* Haller (6), *Ischaemum* L. (6), *Setaria* P.Beauv. (6), *Dimeria* R.Br. (5), and *Garnotia* Brongn. (5) have relatively more species than the remaining. *Imperata cylindrica* (L.) Raeusch. is an exotic species identified in the area. Rich endemics were also found in the region. *Cymbopogon travancorensis* Bor*, Dimeria lawsonii* (Hook.f.) C.E.C.Fisch.*, and Dimeria deccanensis* Bor, are some of them.

Keywords: Grasses, Kerala, Mangaladevi, Western Ghats

T03-OP-02

An overview of sedges of Konkan region of Maharashtra state

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Cyperaceae is a family of graminoid, monocotyledonous flowering plants known as sedges. It is a cosmopolitan and the seventh largest family in the Angiosperms. The species of this family are distributed widely in marshy places, ponds and wetlands. Many species are used as crops for animal food, medicine, ornamental purposes and nutritious food. Two subfamilies, 95 genera and about 5687 species are reported around the world. In India the

family is represented by 32 genera and 610 taxa and in Maharashtra it is represented by 15 genera and 214 taxa. During floristic surveys in the Konkan region of Maharashtra 15 genera and 91 taxa are documented in the present study based on actual field work and consultation with herbaria. Members of the family Cyperaceae are mostly growing in aquatic to marshy habitats where they are the major component of estuaries, waste places and seasonal water bodies. Some of the members grow in steep rock crevices, grasslands, paddy fields, dry and gravelly soil. Due to its non-attractive, inconspicuous flower many researchers overlook the family. Morphologically the family Cyperaceae is difficult to identify even at generic level; in this family nutlets and surface of nutlets are of special importance in taxonomy. The present studies include a detailed morphological account of sedges of the Konkan region of Maharashtra state with special emphasis on nutlet characters.

Keywords: Cyperaceae, Floristics, Konkan, New records, Nutlets

T03-OP-03

New recorded and discovered angiosperm taxa in the present century from Rajasthan: A review

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Rajasthan, the largest state of India, harbors rich floral diversity because of its diverse habitats. Though the state has >60% arid and semi-arid zone with areas of sparse vegetation, it dispenses uniqueness in biodiversity. In the first quarter of the century (2001-2025), continuous botanical explorations have led to the discovery and documentation of many new varieties, subspecies and species of angiosperms. The present review compiles updated records of angiosperm taxa reported from Rajasthan since 2001, highlighting their taxonomic descriptions, phenological details, and ecological significance. The study synthesizes the contributions of a number of researchers, taxonomists, and floristic surveys, thereby expanding the understanding of the floral wealth of Rajasthan. Data were retrieved from scientific databases, such as Scopus, Google Scholar, Researcher Scholar, BioStor, Plant Discoveries, Web of Science, PubMed, Plants of the World Online, and Science Direct. Despite of lack ecological barrier, nine new taxa, viz. *Aloe trinervis* C.S.Purohit, Kulloli & Suresh Kumar, *Striga todgarhica* C.S.Purohit, *Oropetium almeidanum* Kulloli & R.D.Shinde, *Euphorbia jodhpurensis* Blatt. & Hallb., *Calligonum crinitum* Boiss., *Cerastium fontanum* Baumg., *Ipomoea sagittifolia* Burm.f., *Tacca leontopetaloides* (L.) Kuntze, *Portulaca bharat* Amber Srivast., N.Chauhan, S.S.Dash & Sushil K.Singh, one subspecies *i.e. Cyperus conglomeratus* subsp. *curvulus* (Boeckeler) Kukkonen and one variety *i.e. Butea monosperma* var. *lutea* have been reported from the state. From different regions of Rajasthan, 48 species, one subspecies and 5 varieties have been reported for the first time, from families such as Poaceae, Fabaceae, Solanaceae, Orchidaceae, Asteraceae, etc. These taxa enrich the region's floristic diversity and provide critical insights into its ecological resilience and conservation value. The review emphasizes the importance of sustained floristic surveys and taxonomic studies for biodiversity conservation and management in the fragile ecosystems of Rajasthan.

Keywords: Angiospermic flora, New species recorded, Rajasthan taxa, Species discovered

T03-OP-04

Morphological characterization and genetic diversity assessment of *Abrus precatorius* accessions from Kerala, India

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Abrus precatorius L. (Fabaceae), commonly known as rosary pea, is an important medicinal plant extensively used in traditional Indian medicine systems including ayurveda, unani, siddha, and homeopathy. However, comprehensive studies on morphological variability among different accessions remain limited. This study evaluated the morphological diversity and genetic relationships among *A. precatorius* accessions collected from various geographical regions of Kerala, India. Field surveys were conducted across Kerala, yielding 50 accessions from different districts and these accessions were maintained at the Field Gene Bank, Christian College, Kattakada, Thiruvananthapuram. Detailed morphological characterization considering data on 58 characters, comprising 25 qualitative and 33 quantitative traits were recorded and analysed using Ward's minimum variance hierarchical cluster analysis. Qualitative analysis revealed substantial variation in flower colour, standard petal colour, seed shape, seed coat colour, and hilum colour. Purple flowers (84%) and red seed coats (84%) predominated among accessions. Quantitative traits demonstrated considerable diversity, with leaf area ranging from 77.66 to 360.33 cm² and seed number per fruit varying from 5.33 to 14. Hierarchical cluster analysis at 30.5% similarity level grouped the 50 accessions into eight distinct clusters, with sizes ranging from one to fourteen members. Cluster II was the largest with fourteen accessions, while clusters III and IV each contained single accessions, indicating unique morphological characteristics. This study demonstrates significant morphological diversity among *A. precatorius* accessions from Kerala, particularly in floral and seed characteristics. The identified variation provides valuable information for germplasm conservation, breeding programs, and sustainable utilization of this medicinally important species.

Keywords: *Abrus precatorius*, Morphological characterization, Genetic diversity, Hierarchical cluster analysis, Medicinal plants, Kerala

T03-OP-05

Taxonomic study of the family Fabaceae from Vidarbha region Maharashtra, India

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Fabaceae is the third largest angiosperm family, comprising about 795 genera and more than 19,500 species, many of which have significant economic and ecological value.

Traditionally, the family was divided into three subfamilies based mainly on flower structures. Recent studies mainly focus on Legume phylogeny using several chloroplast markers. Analyses using chloroplast sequences (matK) [3696 legumes] as well as the nuclear genes with transcriptomes and genomes have led to a reclassification of the family into five major subfamilies. Koenen *et al.* (2020) support a new classification system recognizing six subfamilies: Caesalpinioideae, Cercidoideae, Detarioideae, Dialioideae, Duparquetioideae, and Papilionoideae, with morphological support. The present work reports the recent floristic explorations of flowering plants from Vidarbha region, Maharashtra, India with reference to the Fabaceae family. During the entire explorations, Fabaceae was found to be the second largest family in the study area in terms of genera and species. This work also provides a statistical assessment of species diversity with comparative analysis of observed species.

Keywords: Fabaceae, Recent, Statistical, Taxonomy, Vidarbha region

T03-OP-06

Exploring the 'True Nettles' of Urticaceae: Taxonomic insights

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Members of the family Urticaceae Juss. are often generalized as stinging plants and consequently overlooked in floristic and taxonomic studies. However, the stinging trichomes that produce the characteristic irritation are confined to the tribe Urticeae, which includes the genera *Dendrocnide* Miq., *Girardinia* Gaudich., *Laportea* Gaudich., *Urtica* L. etc., which are the true nettles of the plant world. In Peninsular India, the taxonomy of Urticeae has been understudied despite their ecological and ethnobotanical importance. This revision synthesizes data from fieldwork, and herbarium specimens to provide clarified species boundaries and diagnostic characters for the tribe in the region. Detailed morphological analysis validates the identity and relationships of all Urticeae species, updates keys for identification, and documents their distribution, habitat preferences, and phenology. Several previously misapplied names, and types are clarified. This work highlights the clear distinction of "true nettles" in Indian flora and provides a critical baseline for further phylogenetic, ecological, and conservation research on stinging Urticaceae.

Keywords: Urticeae, Urticaceae, True nettles, Taxonomic revision, Peninsular India

T03-OP-07

Systematic studies on the genus *Eleocharis* in Kerala, India

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Eleocharis R.Br. is a cosmopolitan genus comprises of about 250 species that occurs abundantly in water logged areas from sea level to high elevation zones. They are ecologically, economically and medicinally significant, however research on this particular group did not progress well due to substantially reduced floral structures and taxonomic

ambiguities. Therefore, the present study emphasizes the taxonomic diversity of the genus *Eleocharis* in Kerala based on field investigation and published data. A total of 14 taxa belongs to the genus have been recorded. From the present study *Eleocharis neglecta* Borude, Chandore, Gholave & S.R.Yadav is a new addition to South India and *E. acutangula* (Roxb.) Schult. subsp. *neotropica* D.J.Rosen is a new addition to the Southern Western Ghats. Medicinal, fodder, endemic and ecologically important species under the genus were enlisted. Most of the earlier authors treated species of *Eleocharis* in *Scirpus* L. as the genus is closely related to *Scirpus*, *Fimbristylis* Vahl and *Bulbostylis* Kunth. In order to clarify the existing taxonomic confusions, micromorphological studies on achenes were also done. Based on available information and observations, a comprehensive list of species from the genus *Eleocharis* in Kerala is provided here and the study highlights the present status and floristic distribution of plant species and it will help in framing a proper reference for future exploration of this plant group.

Keywords: Cyperaceae, *Eleocharis*, Kerala, New Record, Taxonomy

T03-OP-08

Polymorphism in some endemic Apiaceae members from Western Ghats (India)

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Identification of Apiaceae members is difficult, as it requires all plant characters, especially fruit and mericarp characters. However, many species are a puzzle for delimitation as they show morphological variations, and thus, workers treat those variations as new species. The present study focuses on the elaboration of morphological variations in some endemic species of the Apiaceae, such as *Tetrataenium* (DC.) Manden., *Pinda* P.K.Mukh. & Constance, *Polyzygus* Dalzell, etc.

Keywords: Apiaceae, Endemism, Morphological variations, Taxonomy

T03-OP-09

Examining the origin and phylogeny of endemic *Humboldtia* (Fabaceae), of the Western Ghats, India

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The Western Ghats (WG), a global diversity hotspot, comprises over 60% endemic woody plants. Yet, molecular systematics and biogeographic studies from the region remain scarce. Here, we examined the origin and phylogeny of *Humboldtia* Vahl, an endemic genus, to understand woody plant evolution in the WG. *Humboldtia* comprises eight accepted species, one restricted to Sri Lanka and seven to the WG. Among the WG endemics, *H. brunonis* Wall. occurs in central WG, while the remaining six are confined to southern WG, distributed above and below the Shencottah Gap (SG); except for two, all are point-endemics. Using three plastid and one nuclear marker, we reconstructed the phylogeny with

maximum-likelihood and Bayesian inference, estimated divergence times in a Bayesian framework with fossil and secondary calibrations, and inferred ancestral areas using the DEC model. The results suggest *Humboldtia* originated in the Miocene (~17 Myr; 95% HPD: 28–9 Myr) from Asia, with *H. brunonis* sister to the SWG clade, indicating vicariant origins. Within SWG, cladogenetic events occurred primarily via subset sympatry. Two varieties, *H. unijuga* var. *unijuga* Bedd. and *H. unijuga* var. *trijuga* J.Joseph & V.Chandras., were recovered as sister species with strong support. In the nuclear-only tree, *H. sanjappae* Sasidh. & Sujanapal, was sister to *H. vahliana* Wight, whereas in the combined-marker it was nested within *H. vahliana*. These results suggest speciation in *Humboldtia* is likely driven by ecological factors, given its strong sympatric distribution. This underscores the importance of integrating morphological and functional traits with molecular and ecological data in better delimiting and elucidating speciation patterns in this key WG endemic genus.

Keywords: Biogeography, *Humboldtia*, Integrative taxonomy, Speciation pattern, Western Ghats

T03-OP-10

Pachysandra axillaris subsp. *axillaris* (Buxaceae) a new genus record for the flora of India

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The genus *Pachysandra* Michx., a small genus of the Boxwood family Buxaceae, is distributed in the subtropical regions of North-Central, South-Central, and Southeast China, Taiwan, Southeastern United States, and extends to the temperate regions of Japan. In India, the family Buxaceae is represented by only two genera, *Buxus* L. and *Sarcococca* Lindl. During recent ethnobotanical explorations in Manipur, India, a population belonging to the genus *Pachysandra* of the family Buxaceae was encountered. The members of the genus *Pachysandra* are subshrubs, creeping or decumbent, or perennial herbs with alternate, petiolate, thinly leathery or papery leaves, inflorescences with male flowers inserted in middle to apical part, female flowers in basal part. The flowers are small, white or rose with 2 or 3 locular ovary and 2 or 3 styles. The genus is comprising of only four taxa *P. axillaris* subsp. *axillaris P. axillaris* subsp. *stylosa* (Dunn) Boufford & Q.Y.Xiang *P. procumbens* Michx. *P. terminalis* Siebold & Zucc. The detailed morphological studies of the specimens collected, herbarium consultation and the literatures confirmed the taxa as *Pachysandra axillaris* Franch. subsp. *axillaris*. The genus *Pachysandra* has not been previously reported from India and this discovery represents a new generic record for the Indian flora, thereby extending the known distribution range of the genus westward from China into the Indian subcontinent.

Keywords: Buxaceae, Manipur, genus record, *Pachysandra*

T03-OP-11

Tribe Maydeae (Poaceae) in India: An overview

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Tribe Maydeae Dumort. is one of the important groups in the family Poaceae. It comprises five genera *viz*. *Coix* L., *Polytoca* R.Br., *Trilobachne* (Stapf) Schenck *ex* Henrard, *Tripsacum* L., and *Zea* L. with 40 taxa worldwide, and five genera and 16 taxa in India. The present study deals with the taxonomy, nomenclature, synonymy, distribution, cytological studies of Indian taxa and review of its worldwide use as a food, medicine, and ornament especially focusing on wild genera.

Keywords: India, Lectotype, Maydeae, Poaceae, Taxonomy

T03-OP-12

Endemic plants of Haveri district, Karnataka

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The Haveri district serves as a gateway to the northern districts of Karnataka. The present study reports a total of 46 endemic taxa belonging to 24 families, documented along with their botanical names, families, habits, phenology, and IUCN status. Distributional analysis revealed that Western Ghats elements were dominant (40%) with 18 taxa, followed by Indian endemics (16), Southern India (6), and Peninsular India (3), while three taxa were narrowly endemic to Karnataka. The family Acanthaceae harbours the maximum number of endemic taxa (6). The critically endangered (CR) species *Ceropegia bhatii* S.R.Yadav & Shendage showed an extended distributional record beyond its type locality. *Geodorum laxiflorum* Griff. is reported here as a new addition to the flora of Karnataka from the Haveri district. Therefore, the forests of the district require special attention for conservation.

Keywords: Endemic flora, Threatened plants, Extended distribution, Conservation, Diversity, Karnataka

T03-OP-13

Section *Kyllinga* of the genus *Cyperus* (Cyperaceae) in India

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Taxonomic revision of the section *Kyllinga* (Rottb.) J.Kern of the genus *Cyperus* L. has been undertaken for the Flora of India, and the findings are discussed. During the study 3 species and 2 varieties were merged with other well-established species, and kept one species as of doubtful distribution in India. Reasons for merging the taxa are discussed and justified synonymization of their names. As a result of the study, the total number of taxa under section *Kyllinga* of the genus *Cyperus* in India has come down from 17 to 11, comprising 6 species, 2 subspecies, 2 varieties and 1 forma.

Keywords: *Cyperus*, *Kyllinga*, Synonyms, Taxonomic revision

T03-OP-14

Floristic diversity of the Wan Wildlife Sanctuary (WLS): A core of Melghat Tiger Reserve

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Wan Wildlife Sanctuary, one of the important core regions of the Melghat Tiger Reserve, derives its name from the river Wan, spanning an area of 211 sq. km in Akola district, Maharashtra. Floristic surveys carried out between 2016 and 2019 revealed that the major vegetation type is dry deciduous forest. The study documented 501 plant species, including 496 angiosperms and 5 pteridophytes, representing 335 genera from 83 families. The flora is dominated by families such as Fabaceae (87 taxa), Poaceae (45 taxa), Asteraceae (30 taxa), Acanthaceae (26 taxa), and Malvaceae (20 taxa). The survey also recorded 40 endemic species, along with 59 wild edible plants and 44 medicinal plants belonging to 26 families, traditionally used by the local Rathi and Korku communities. Additionally, 20 invasive alien weed species were documented from the sanctuary. During the survey some threats have been observed such as the spread of invasive alien weeds, burning of litter-fall, transportation from sanctuary area and collection of medicinal plants and non-timber forest products, etc.

Keywords: Floristic studies, Korku, Melghat Tiger Reserve, Wan Wildlife Sanctuary, Wild edible

T03-OP-15

Genus *Dinetus*: revision for India and one new record for the Gujarat

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This paper presents a comprehensive taxonomic revision of the genus *Dinetus* Buch.-Hum. *ex* D.Don in India, recognising six species. It includes detailed morphological descriptions, photographs, distributional data, and taxonomic notes. A significant new distribution record is also reported: *Dinetus racemosus* (Roxb.) Sweet is documented for the first time in Gujarat, specifically from the Saputara region. This twining climber, native to India, is typically found along forest margins, in thickets and roadside habitats. The discovery highlights the ecological importance of Saputara and emphasises the need for conservation

due to threats such as habitat destruction from infrastructure development and tourism. This finding underscores the necessity for continued botanical exploration and habitat protection.

Keywords: *Dinetus racemosus*, Distribution, Revision, Saputara

T03-OP-16

Spur diversity of wild balsams (*Impatiens* spp.) in the southern Western Ghats, India

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The genus *Impatiens* L., commonly known as "balsams", is peculiar with a distinct and unique floral structure. Their modified lower sepal known as "lip", often possess a distinct structure, literally like a "tail" of the flower, called as "spur", which attributes peculiarity to the floral morphology of this genus. The present paper discusses about the diversity of this spur in the wild balsams of the southern Western Ghats, and its taxonomic significance. The absence or the presence of the spur, as well as the length, shape, apex, and pubescence of the spur are major and stable characters for the delimitation within the genus, at the species level and infra-specific level. Some species altogether lack the spur in their floral structure (eg: *I. pandata* E.Barnes, *I. stocksii* Hook.f. & Thomson, etc.), whereas some others have long narrow tail like (eg: I. *scapiflora* B.Heyne, *I. acaulis* Arn., *I. ligulate* Bedd., etc.), as clavate (eg: *I. clavicornu* Turcz., *I. dendricola* C.E.C.Fisch., etc), as rudimentary (eg: *I. tomentosa* B.Heyne *ex* Wight & Arn., *I. eravikulamensis* Hareesh & Salish, etc.), as sickle-like (eg: *I. chinensis* L.), etc. The *Impatiens* sect. *Epiphyticae* is distinct in having large bag or pouch like beautifully coloured spur. The exact function of this spur has to be explored, however, in our findings, it has an important role in the balancing of flowers.

Keywords: Southern Western Ghats, Spur, Wild Balsam

T03-OP-17

Endemism and distributional insights into Loranthaceae and Viscaceae of Peninsular India

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Mistletoes of the order Santalales are represented by the families Loranthaceae and Viscaceae, widely distributed across the Indian subcontinent. Globally, Loranthaceae includes about 900 taxa in 73 genera, while Viscaceae comprises around 400 species in 7 genera. In India, Loranthaceae comprises 60 taxa, of which 26 species and 3 varieties under 8 genera occur in Peninsular India. Viscaceae comprises 21 species under 4 genera in India, with the highest diversity in Peninsular India, represented by 14 species under 2 genera. Endemism is a striking feature of these groups in peninsular India. Of the 26 species and 3 variants of Loranthaceae, 12 are endemic restricted to the Western Ghats. Among the peninsular Indian states, endemic Loranthaceae are concentrated in Tamil Nadu (9 spp.),

Kerala (8 spp.), Karnataka (8 spp.), Maharashtra (2 spp.), Goa (1sp.), Andhra Pradesh (1sp.), and Gujarat (1 sp.). In addition, the family also include a steno-endemic species. Similarly, 6 of the 14 species of Viscaceae in Peninsular India are endemic, occurring in Karnataka (4 spp.), Tamil Nadu (2 spp.), Kerala (1 sp.), and Maharashtra (1sp). The family also includes one rare endemic and one steno-endemic. These narrowly distributed taxa show habitat specialization, specific forest types, particular host species. Such patterns highlight Peninsular India, particularly the Western Ghats, as a center of diversity and endemism of mistletoes.

Keywords: Endemism, Loranthaceae, Mistletoes, Peninsular India, Viscaceae

T03-OP-18

Floristic studies on Harishchandragad ranges, Maharashtra

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Harishchandragad ranges are a group of hills in the state of Maharashtra, India. It lies in the northwestern region of the Deccan Plateau, between the Godavari and the Bhima rivers. These are low-lying hills with an average elevation of about 600 meters, and they lose elevation in the southeastern direction. The Kalsubai is the highest peak. The Harishchandragad is another important peak. In the northwest, the range merges with the Western Ghats. The Harischandragad range region in the Western Ghats is the treasure of floristic diversity; it contains a diverse range of plant species, including several endemic and rare taxa. In the present investigation between June 2024 and July 2025, extensive field assessments were conducted in the various vegetation of the Harishchandragad Mountains. We have collected 160 species of angiosperms belonging to 129 genera of 58 families. The current project collects plant samples, pictures, and GPS coordinates for each taxon in order to learn about the biodiversity of species in the Harischandragad range. According to present conditions, the number of species is dropping by the day, and they will disappear from various vegetation zones in a few years. Forest fragmentation is primarily caused by heavy rains and anthropogenic activities such as deforestation, land sliding, increased ecotourism, expanding agriculture, commercial logging, fuelwood, settlement expansion, forest fires, and infrastructure development, such as road and dam construction. The present study suggests that due to the continuous heavy pressure of anthropogenic activities in the Harishchandragad ranges, they need to be conserved.

Keywords: Angiosperm, Conservation, Flora, Harishchandragad ranges, Maharashtra

T03-OP-19

Morpho-taxonomic studies on long-lasting complex of *Ipomoea diversifolia* and *Ipomoea laciniata* (Convolvulaceae)

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The family Convolvulaceae is one of the dominant families of angiosperms and with *c*. 2000 species that are classified into 60 genera. The members of the family are mainly distributed in the tropical and temperate regions. The genus *Ipomoea* L. is one of the main genera of family Convolvulaceae, it comprises about 700 species. Recent studies on the genus including morphological and molecular have shown the genus to be polyphyletic. During literature survey it has come to attention that two taxa of the genus *Ipomoea* viz., *I. diversifolia* R.Br., *I. laciniata* (Dalzell) C.B.Clarke are distributed in the India and Australia. *Ipomoea diversifolia* is described in 1810 by Robert Brown from Australia and reported it is also distributed in India, Philippines while another species *Ipomoea laciniata* is described by Dalzell from India as a *Pharbitis laciniata* Dalzell from India in 1851. The preliminary studies on the Indian populations and virtual consultation of the Australian species showed some significant morphological differences. Therefore, to resolve the taxonomic ambiguities in the identity of both species the present work has been carried out by conduction some additional experimental work including cytological studies, pollen SEM and seed morphology. All these issues are discussed in the present communication.

Keywords: Chromosome behaviour, Morning glory, Palynology

T03-OP-20

Floral diversity survey through the trekking path of Vazhvanthol Waterfalls, Trivandrum

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Vazhvanthol Waterfalls is located near Vithura, in Trivandrum district, Kerala. The present work deals with the floral studies of Vazhvanthol waterfalls. It reports 45 species of plants. Out of 45 species *Gluta travancorica* Bedd., *Elaeocarpus tuberculatus* Roxb., *Cinnamomum verum* J.Presl., *Dillenia pentagyna* Roxb., *Alstonia venenata* R.Br., *Entada rheedi* Spreng. *Hopea parvifolia* (Warb.) Slooten, *Schleichera oleosa* (Lour.) Oken, *Hydnocarpus laurifolia* (Dennst.) Sleumer are economically important trees growing this habitat. *Smilax zeylanica* L., *Cyclea peltata*Hook.f. & Thomson, *Olea dioica* Roxb., *Apama siliquosa* (Lam.) Ding Ho, *Cissampelos pareira* L., *Stachytarpheta indica* (L.) Vahl., *Alstonia venenata* R.Br., *Curculigo orchioides* Gaertn., *Biophytum sensitivum* (L.) DC., *Alstonia scholaris* (L.) R.Br., *Entada rheedi* Spreng., *Helectres isora* L. are medicinal plant found in that area. *Anisoptera scaphula* (Roxb.) Kurz, *Dillenia pentagyna* Roxb., *Naregamia alata* Wight & Arn., *Helectres isora* L., *Rubia cordifolia* L., *Hopea parvifolia* (Warb.) Slooten are in endangered list. *Elaeocarpus tuberculatus* Roxb, *Palaquium gutta* (Hook.) Baill., *Gluta travancorica* Bedd., *Capparis rheedii* DC. are threatened plants. Plant resources are renewable but depleting due to deforestation, overgrazing by domestic animals are some reasons. Habitat destruction or fragmentation, improper agricultural practices have endangered-many species of flowering plants instead of utilizing all the spaces for commercial purpose, steps should be taken for preserving biodiversity, through which we can conserve our planet. It should be protected for our future generation.

Keywords: Endangered, Vazhvanthol, Threatened

T03-OP-21

Morpho-variations and species endemism in the genus *Ardisia* of the Western Ghats

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Ardisia Sw. represents one of the largest genera in the family Primulaceae, with 739 accepted species worldwide. The Western Ghats harbor 17 species, of which 9 are endemic. The genus is very complex due to the presence of morpho-variants and is often confused by variations in both vegetative and reproductive traits. Leaf morphology, inflorescence architecture, and floral characteristics vary in response to ecological parameters like altitude, light intensity, soil profile, and rainfall. The variations are influenced by geographic isolation and habitat specificity, and these adaptations promote population-level differentiation and the formation of species complexes. Such variable populations are observed in *A. pauciflora* B.Heyne *ex* Wall., *A. solanacea* Roxb., *A. elliptica* Thunb., and *A. crenata* Sims, which exhibit greater ecological amplitude. Endemic taxa exhibit remarkable morphological stability, as they are restricted to a specific geographic range with relatively uniform ecological conditions like altitude, temperature, humidity, and soil type. The present study deals with the morphological variations and endemicity of the genus *Ardisia* in the Western Ghats.

Keywords: Endemicity, Morpho-variants, Primulaceae, Species complex

T03-OP-22

Diversity of *Scleria* (Cyperaceae) in Marathwada, in the State of Maharashtra, India

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This study purposes to contribute to the knowledge on the taxonomy of *Scleria* P.J.Bergius in Marathwada, in the state of Maharashtra, India. Specimens housed in the Herbarium of Cyperaceae at Shri Sundarao Solanke College, Majalgaon, Beed district, were examined, and species identification was carried out using relevant taxonomic literature. Five species of *Scleria* were recorded from Marathwada: *Scleria caricina* (R.Br.) Benth., *S. multilacunosa* T.Koyama, *S. parvula* Steud., *S. terrestris* (L.) Fassett, and *S. tessellata* Willd. An identification key, detailed species descriptions, illustrations, and notes on diagnostic characters and geographic distributions are provided to aid in identification and classification of these species.

Keywords: Cyperaceae, Marathwada, Maharshtra, *Scleria*, Taxonomy

T03-OP-23

Environmental filtering plays a stronger role than geographic isolation in shaping plant communities on tropical sky islands

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Rocky outcrops are high-elevation habitats that function as 'sky islands'. Owing to their ecological resemblance to oceanic islands and their harsh environmental conditions, plant community assembly on these outcrops is shaped by both stochastic processes, driven by spatial isolation and dispersal limitation, and deterministic processes, driven by environmental filtering. Although previous studies have reported exceptionally high plant diversity and endemism on rocky outcrops and examined the independent effects of dispersal and environment as critical drivers of species assemblages, the relative importance and the potential interactions between these two factors remain poorly understood. To address this gap, we investigated the relative role of spatial separation and environmental variation in structuring seasonally dynamic herbaceous communities on the high-elevation laterite plateaus of the Northern Western Ghats. Across 56 transects spanning eight plateaus along latitudinal and elevational gradients, we recorded 93 species, many of which had single-plateau occurrences, highlighting the high conservation value of these habitats. Consistent with predictions from spatial theories, we found that species richness increased with plateau area, while community similarity decreased with geographic distance. However, variance partitioning revealed that these compositional differences among communities were primarily driven by environmental gradients rather than dispersal limitation, with environmental variables explaining nearly four times more variation in community structure than geographic distance alone. These findings indicate that deterministic environmental filtering is the dominant assembly mechanism, overriding stochastic spatial processes in this system. Overall, our study highlights the ecological uniqueness and fragility of these endemic-rich communities to habitat degradation and climate change.

Keywords: Herbaceous species, Laterite plateaus, Plant community, Sky islands, Species assemblages, Tropical biodiversity

T03-OP-24

High-altitude flora of the Western Himalaya: Mzacrohabitat diversity, adaptations, and ethnomedicinal relevance

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The Himalayan flora is renowned for its exceptional diversity and endemism, shaped by varied climatic and elevational gradients ranging from tropical to alpine zones. Within these, the alpine and sub-nival belts harbors distinctive macrohabitats such as alpine meadows, rocky scree slopes, glacial moraines, and sub-nival grasslands. These habitats support specialized high-altitude flora that thrive under extreme ecological conditions, including freezing temperatures, high UV radiation, low oxygen availability, and short growing seasons. Such flora not only represent key biodiversity elements but also play critical ecological roles in soil stabilization, nutrient cycling, and ecological succession. Genera like *Saussurea* DC., *Primula* L., *Gentiana* L., and *Arenaria* L. display unique morphological and physiological adaptations such as cushion-forming growth, antifreeze compounds, and UV-protective pigments, enabling survival in these fragile environments. equally significant are their ethnomedicinal uses, as high-altitude plants form the backbone of traditional healthcare systems in Himalayan communities. Many species are used to treat cold-related ailments, wounds, digestive disorders, and respiratory infections, while also holding cultural and ritual importance. The reliance on alpine medicinal flora highlights their socio-economic and cultural value in addition to ecological significance. However, rapid climate change and habitat shift threaten both their natural populations and the traditional knowledge systems associated with them, as upslope migration of lower-altitude plants may displace these slow-growing species. Documenting the macrohabitat diversity, floristic composition, and ethnomedicinal importance of Himalayan high-altitude flora provides a holistic framework for conservation planning. A total 576 plants have been collected from different habitats of Alpine region, out of which 59 species of ethnomedicinal plants have been documented belonging to 29 families and 50 genera. Integrating ecological and ethnobotanical perspectives is thus essential for safeguarding both biodiversity and traditional healthcare practices in the high mountains.

Keywords: Alpine-flora, Ethnomedicinal, Habitat shift, Macrohabitats, Western Himalaya

T03-OP-25

Genetic variability, correlation analysis, and selection indices in *Cardiospermum halicacabum* accessions from Kerala: Implications for medicinal plant improvement

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Cardiospermum halicacabum L. (Sapindaceae), commonly known as balloon vine, is a medicinally valuable climber extensively used in traditional Indian medicine. To support conservation and breeding efforts aimed at enhancing biomass and phytochemical yield, this study assessed genetic variability and trait interrelationships across 68 accessions collected from diverse ecological zones of Kerala and conserved at the Field Gene Bank, Christian College, Kattakada. Six agrobotanic traits of leaf length, leaf breadth, leaf area, biomass yield, apigenin content, and gallic acid content were evaluated under uniform conditions. Genetic parameters were estimated using Burton's formula, broad-sense heritability, genetic advance, Snedecor and Cochran's correlation analysis, Smith's selection index, and Mahalanobis D^2 statistics. Genotypic coefficients of variation (25.16%–56.22%) exceeded phenotypic values, indicating strong genetic control. Heritability was high (>80%) for biomass yield, leaf length, and leaf area,

while apigenin and gallic acid showed moderate heritability. Biomass yield exhibited the highest genetic gain (1.12), followed by leaf area (1.05). Significant positive genotypic correlations were observed among leaf traits and between phytochemicals. Selection index values identified six elite accessions (Ch 29, Ch 31, Ch 52, Ch 28, Ch 9, Ch 53). D^2 analysis grouped accessions into 12 clusters, with maximum divergence between Clusters V and III (18.82). Cluster VII showed superior morphology; Cluster VIII had highest phytochemical content. These findings highlight substantial genetic diversity, enabling targeted selection for integrated improvement of morphological and phytochemical traits, and provide a foundation for conservation and hybridization strategies to develop elite medicinal varieties.

Keywords: Apigenin, *Cardiospermum halicacabum*, D^2 analysis, Gallic acid, Genetic variability, Selection index

THEME 4

ETHNOBOTANY AND INDIAN TRADITIONAL KNOWLEDGE

T04-OP-01

Socio-cultural and ethnomedicinal plants from Agasthyamala Biosphere Reserve with special reference to the Kani Tribe

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The Agasthyamala Biosphere Reserve (ABR), part of the southern Western Ghats, is globally recognized for its rich biodiversity and traditional ethnobotanical knowledge. Among the indigenous groups inhabiting this region, the Kani tribe plays a vital role in conserving sacred and medicinal plants for their cultural and healthcare practices. This study highlights some socio-cultural and ethnomedicinal plants from Agasthyamala with special reference to the Kani tribe. Plants such as *Trichopus zeylanicus* Gaertn. *(*Arogyapacha), *Aristolochia indica* L. (Eswaramooli), *Terminalia chebula* Retz. (Kadukkai), *Exacum travancoricum* Bedd., and *Phyllanthus rangachariarii* Murugan etc. represent a blend of therapeutic efficacy and cultural symbolism. Their uses in treating various ailments, fatigue, snake bite, liver disorders etc. illustrate the deep interconnection between nature and tribal healthcare systems. However, habitat loss and declining traditional knowledge pose serious threats to this heritage. By documenting and scientifically validating such practices, the present study emphasizes the importance of integrating indigenous wisdom into biodiversity conservation and sustainable healthcare strategies.

Keywords: Biodiversity, Ethnobotany, Fatigue

T04-OP-02

Role of *Withania somnifera* (Ashwagandha) for promoting fertility in males

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Male infertility is a significant global health issue, contributing to nearly half of all infertility cases. Oxidative stress, hormonal imbalance, and impaired spermatogenesis are among the major causes. *Withania somnifera* (L.) Dunal (Ashwagandha), a key herb in Ayurveda, has long been used as a rejuvenator and fertility enhancer. It is known for its adaptogenic, antioxidant, and androgenic properties that may positively influence male reproductive health. Objectives- To evaluate the role of *W. somnifera* in improving male fertility. A comprehensive review of published clinical and experimental studies was conducted using scientific databases. The efficacy of *W. somnifera* root extracts and formulations was analyzed in relation to seminal parameters, testosterone levels, luteinizing hormone (LH), follicle-stimulating hormone (FSH), and markers of oxidative stress. Phytochemical

constituents such as withanolides and alkaloids were also examined for their therapeutic potential. Studies demonstrated that administration of *W. somnifera* significantly improved sperm count, motility, and morphology in infertile men. It reduced seminal oxidative stress, normalized serum testosterone and LH levels, and enhanced overall semen quality. The antioxidant and adaptogenic effects were attributed to bioactive compounds like withanolides and sitoindosides that modulate hypothalamic–pituitary–gonadal axis activity and reduce cortisol-induced reproductive suppression. *Withania somnifera* shows promising potential in managing male infertility by improving seminal quality, hormonal balance, and oxidative defence. Its phytoconstituents act synergistically to restore normal reproductive function.

Keywords: Ashwagandha, Bioactive compounds, Fertility-promoting plants, Phytochemical profiling, Sitoindosides, Withanolides

T04-OP-03

Ethnomorphoanatomical studies of *Natsiatum herpeticum*: A lesser-known medicinal herb of Darrang district, Assam

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Natsiatum herpeticum Buch.-Ham. *ex* Arn. (Icacinaceae) belongs to the Unicorn plant family (Icacinaceae) is a dioecious climbing shrub of tropical evergreen forests and subtropical regions of Southeast Asia. Traditionally, it has been used by native communities of Darrang district, Assam, for treating inflammation, back pain, skin ailments, rheumatism, and gastrointestinal disorders, highlighting its therapeutic potential. The plant with its purported medicinal properties, has attracted attention as a potential source of bioactive compounds. Ethnobotanical surveys reveal the utilization of its roots and leaves in unrefined preparations for a wide range of local applications. Hence, ethnomorphoanatomical studies have been carried out to understand its significance in the context of the medicinal application of the plant parts. The study reveals deposition of dark brown alkaloid and druses of calcium oxalate and oil drops in pith parenchyma cells of stem sections. Leaf transverse sections exhibit deposition of dark alkaloids and oil drops along with glandular and non-glandular trichomes present in lower epidermis correspond to the potential ethnomedicinal applications. The present investigation represents the first comprehensive report on the ethnomedicinal relevance and morpho-anatomical aspects of this species.

Keywords: Assam, Darrang district, Ethnobotany, Morphoanatomy, *Natsiatum herpeticum*

T04-OP-04

Ethnobotanical perspectives on kidney stone treatment in Goa

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Goa, bound by the coastal belt and the Western Ghats on its borders, harbors a rich diversity of flora and fauna. Villagers residing near these rich ecosystems of Goa have tremendous knowledge about the uses of plants from these regions. ‘Vakhadali,’ also called ‘Vaiju’, are traditional healers in Goan villages who use various medicinal plants to cure ailments. This

study documents and analyses ethnomedicinal knowledge held by Vaidya Mitra cardholders and Quality Council of India-certified local healers in the State of Goa concerning plants traditionally used to prevent and treat kidney stones (urolithiasis). Information was collected using a questionnaire, personal interviews, and participatory observations. Data recorded includes vernacular names, plant parts used, modes of preparation and administration, perceived efficacy, and harvest practices. Preserving and validating this traditional knowledge offers promising leads for developing safe and effective complementary therapies against urolithiasis. It also supports culturally appropriate healthcare in Goa while supporting biodiversity conservation and recognizing Goa's ethnomedicinal heritage.

Keywords: Ethnobotany, Medicinal plants, Traditional healers, Urolithiasis

T04-OP-05

Enumeration of medicinal plants used by the rural community of selected villages of Salem district, Tamil Nadu, India

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A survey was carried out on medicinal plants used by the rural communities of 7 selected villages in and around the D. Perumapalayam Panchayat of Salem district of Tamil Nadu, India namely D. Perumapalayam, Karaikadu, Kathalapadi, Komberikadu, Poochikattu Vattam, Valayakaranoor, Vedapatti. Using standard methods, field surveys were made in the study area. About 66 plant species were documented with parts of the plants used and medicinal values along with their dosage forms. The enumerated plants species are distributed among 43 genera under 33 families. The plants are used for the treatment various common diseases like common cold, fever, stomach pain, headache and also for the treatment of wounds, snake bites, insect bites, dog bite etc, by the inhabitants. Plant parts such as leaves, barks and roots are widely used and other plant parts such as seeds, latex, fruits, flowers etc., are also used for the treatments. The dosage forms such as paste, juice, decoction and consumption of fresh parts as such are in use. They are administered either orally or by external applications. The present study reveals that the use of medicinal plants for the treatment of diseases is prevailed among inhabitants of the study area and this traditional knowledge is to be documented for future generations.

Keywords: Medicinal plants, Poison bites, Rural community, Salem district, Traditional knowledge

T04-OP-06

Sacred landscapes, strategic Botany: ethnobotanical legacy of 'Chatrapati Shivaji Maharaj's' Forts in Nashik

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Walking through the ancient corridors of six remarkable hill forts – Anjaneri, Trimbakeshwar, Ramshej, Dhodap, Salher, and Mulher – in Maharashtra's Nashik region reveals more than weathered stone and faded grandeur. These bastions from Chhatrapati

Shivaji Maharaj's era carry within their walls a living library of botanical wisdom that once sustained entire communities. The great Maratha king understood something profound about the relationship between people and plants, as reflected in his Ajnapatra: "गडावरील झाडे जी असतील ती राखावी... प्रयोजक अप्रयोजक जे झाड होत असेल ते गडावर लावावे जतन करावे" (Fort trees should be protected... whether useful or seemingly useless, all trees should be planted and nurtured on the fort). Through careful field surveys and heartfelt conversations with village elders, traditional healers, and fort custodians – keepers of oral traditions passed down through generations – this study uncovers how plants were woven into every aspect of fort life. From the sacred tulsi groves near temple ruins to the sturdy teak that formed fortress walls, from healing herbs like adulsa to the humble bamboo that served countless purposes, each species tells a story of ingenious adaptation and deep ecological understanding. Perhaps most remarkably, Shivaji Maharaj's philosophy that "रयतेने झाडे लेकरांसारखी वाढवली असतात" (people nurture trees like their children) continues to resonate today. These forts, nestled in the biodiverse Western Ghats, remain sanctuaries where rare plants flourish, offering lessons for our modern world about sustainable living and the timeless bond between human communities and their natural heritage.

Keywords: Ethnobotany, Chhatrapati Shivaji Maharaj hill forts, Nashik region

T04-OP-07

A preliminary survey on medicinal plants used in Thattapparai village of Gudiyattam taluk, Vellore district, Tamil Nadu

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The present study documents some important medicinal plants used in Thattapparai village of Gudiyattam Taluk, Vellore district, Tamil Nadu, India. A field survey was conducted from July 2023 to December 2023. In this study fifty plant species belonging to 19 families were identified, documented and the data collected from the traditional and herbal practitioners of the village were summarized to disseminate the awareness on wealth of these plants in treatment of ailments. The information on medicinal plants is collected through personal interview and also using a standard questionnaire. The local name, parts used, ailments treated along with the form of administration was carefully recorded. The present study showed that the informants in Thattapparai village were found to be good repository for retrieving knowledge on the traditional medicinal plants used by the local people.

Keywords: Herbal practitioners, Thattapparai, Traditional Medicinal plants

T04-OP-08

DNA barcoding reveals the traditional house construction materials of the highland indigenous peoples of Tamil Nadu- a phylogenetic approach

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The Nilgiris Biosphere Reserve (NBR) in Tamil Nadu, India, is home to a rich mosaic of indigenous communities whose traditional knowledge systems emphasize the sustainable use of native plant resources for traditional housing construction. This study employs DNA barcoding and phylogenetic analysis to identify and authenticate plant species used in indigenous traditional housing construction practices, revealing a nuanced understanding of ethnobotanical usage embedded in tribal heritage. Using standardized plastid marker i.e. *ndh*F, we barcoded 12 out of 18 plant samples collected from Toda, Kota, Kattunayakan tribal settlements. Phylogenetic relationships were reconstructed to infer evolutionary linkages and validate species-level identifications. The results identified 12 unique species spanning 7 families, including members of *Poaceae, Fabaceae,* and *Lauraceae*, many of which are endemic or regionally significant. The integration of molecular data with ethnobotanical knowledge underscores the precision of traditional material selection and highlights the role of phylogenetics in traditional housing construction. This study not only contributes to the documentation of tribal biocultural heritage but also advocates for DNA barcoding as a tool in preserving indigenous practices and informing ecological sustainability in the Western Ghats biodiversity hotspot.

Keywords: Built-forms, DNA barcoding, Nilgiris Biosphere Reserve, Phylogenetics, Tribal houses

T04-OP-09

Documentation of medicinal plants used by Siddi Tribes in Haliyal Taluku, Uttara Kannada district, Karnataka, India

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Ethnobotany is the scientific study of how various cultures use plants for practical purposes, ranging from medicines and foods to clothing and intoxicants. The concept of ethnobotany was initially proposed by a botanist John William Harshberger in the early 20th century. The Siddi's population was originally from South-East Africa, they were settled by the British in Burj Bandhur, India in 1673, and later in Kanle (now Ponda) in Goa state. The plants were collected from Siddi's settlement areas of Gadagera, Wada and Garadoli villages of Haliyala taluk, Uttara Kannada district, Karnataka, India and the information on traditional medicine was gathered using structured, open-ended interviews, proposed by G. Martin (1995) along with questionnaire from herbal practitioners (Miss. Milagrin P. Parnandis, Mr. Danil

Doddamani, Mr. Titan Desai, Mr. Pransisk & Miss. Julena Parnandis). The collected species were identified by using botanical guides and floras. The present study resulted in recording about 39 medicinal plant species belonging to 26 families and genera to treat 25 different types of ailments. The Siddi's of Haliyal taluk represent a unique intersection of history, culture, and ethnobotanical knowledge; they also celebrated 'Siddi Habba'. Leaves of *Datura metel* L., *Leucas aspera* (Willd.) Link and roots of *Rauvolfia serpentina* (L.) Benth. *ex* Kurz mainly used as snake bite, scorpion sting and allergy. The uses of *Achyranthes aspera* stem for inflammation, *Asparagus racemosus* Willd. thorn used for headache (external). *Semecarpus anacardium* L.f. seeds were used for analgesic (back pain) and inflammation.

Keywords: Ethnobotany, Haliyal, Siddi's, medicinal plants, Uttara Kannada

T04-OP-10

Some important millets of Guna district used by Sahariya tribe

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This study provides a concise ethnobotanical overview of the important millets traditionally used by the Sahariya tribe of Guna district (Madhya Pradesh, India). Through field interviews, participant observation and review of local knowledge, we document the primary millets—pearl millet (*Pennisetum* Rich./*Cenchrus* L. sp., locally "bajra"), *sorghum (Sorghum bicolor* (L.) Monch., "jowar"), *finger millet (Eleusine coracana* Gaertn., "ragi"), *foxtail millet (Setaria italica* (L.) Beauv., *little millet (Panicum sumatrense* Roth, "kutki"), kodo millet (*Paspalum scrobiculatum* L.) and barnyard millet (*Echinochloa frumentacea* Link, "sama")—and characterize their roles in Sahariya subsistence, culture and agroecology. These species are used for household staples (roti, porridge), special-occasion dishes, traditional beverages, animal fodder and medicinal/ritual applications. Nutritionally, millets provide local diets with complex carbohydrates, dietary fiber, micronutrients and protein profiles advantageous for food security in semi-arid conditions. Agronomically, millets show drought tolerance, low input requirements and adaptability to marginal soils—traits aligned with the tribe's mixed-farming systems and seasonally variable rainfall. The research highlights ongoing challenges: declining cultivation area due to cropping shifts, loss of traditional varieties, and limited market access. We recommend community-based conservation of landraces, integration of indigenous knowledge into local extension services, and value-chain interventions (post-harvest processing, niche marketing) to revive millet cultivation and enhance livelihoods. Preserving millet diversity among the Sahariya can strengthen cultural identity and promote resilient, nutritious food systems in Guna district.

Keywords: Ethnobotany, Food security, Guna district, Landraces, Millet conservation, Millets, Sahariya

T04-OP-11

Folk knowledge and food security: documentation of wild edible plant use among the Gawali tribe of Nanded district (Maharashtra, India)

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It is essential to document the traditional knowledge of food and medicine from rural and tribal communities before it disappears due to modernization and loss of cultural heritage. The present study focuses on recording the ethnobotanical knowledge of wild edible plants used by the Gawali tribe of Nanded district, Maharashtra, as a source of nutrition and health care. Indigenous knowledge was collected through structured questionnaires, personal interviews, and extensive field surveys conducted during 2022–2024. A total of 51 wild edible plant species of medicinal importance belonging to 31 families were documented. These plants are commonly utilized by the Gawali community not only as food but also for treating various health-related ailments, reflecting a close linkage between nutrition and medicine. The documented species exhibited a remarkable diversity in their edible and therapeutic applications, demonstrating the tribe's deep ecological knowledge and dependence on local biodiversity. The study emphasizes the urgent need to promote awareness about the sustainable use, conservation and protection of wild edible plants, which play a crucial role in ensuring food security, livelihood sustenance, and traditional healthcare among rural and tribal populations.

Keywords: Folk knowledge, Food security, Gawali tribe, Nanded, Wild edible plants

T04-OP-12

An appraisal of the non-wood forest produce used by the Kani tribes in Kulathupuzha Forest Range, Kerala

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Kulathupuzha forest Range is known for its high biodiversity and abundance of Non-Wood Forest Produce (NWFPs) and serves as the traditional habitat of the Kani community, mainly concentrated in Pottamavu, Pambuchathamannu, Kalayapuram and Thannimoodu. A total of 241 families inhabit in this region, occupying an area of 108.23 (ha). NWFPs such as medicinal plants, fruits, seeds, honey, bamboo and plant derived materials play a crucial role in the survival security of this forest dependent community. A total of 33 species of NWFPs were documented during the survey. Edible products serve as an important source of food and nutrition particularly during lean periods. NWFPs also hold cultural significance, being used in festivals, rituals, and religious practices, thus preserving tribal heritage. Marketing of these products occurs through local traders, village markets, Van Samrakshana Samithis (VSS) and Vanashree. The present study aims at assessing the diversity, availability and economic potential of the NWFPs in the Kulathupuzha Forest Range. The available data were collected and compiled through field surveys, interactions with local collectors and review of published documents. The preliminary observations revealed that NWFPs contribute significantly to the food security, traditional health practices and income generation for the tribal and rural households. The study highlights the need for developing sustainable harvesting techniques, storage, value addition, and improved marketing channels to fully utilize this treasure trove there by improving the livelihoods of the tribes of Kulathupuzha.

Keywords: Biodiversity, Kani tribe, Kulathupuzha, NWFPs

T04-OP-13

Ethnobotanical studies of Akole Tehsil, Ahilyanagar, Maharashtra, India

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Akole tehsil is located in the Ahmednagar district of Maharashtra, India, covering an area of 1,505 km². Along with small grasslands, Akole tehsil also includes the mountainous region in western Maharashtra, Ahilyanagar district, known for its location in the Sahyadri mountain range (Western Ghats) and high peaks like Kalsubai, the highest peak in Maharashtra. Its geography includes significant agricultural and forest land, along with a large tribal population. A comprehensive floristic assessment of the study area was undertaken, resulting in the documentation of approximately 600 plant species, representing 370 genera and 112 families. Seasonal phenological data were also recorded, noting the number of species observed in flowering and fruiting phases during different seasons. The indigenous communities inhabiting the forested region, primarily the Mahadeo Koli and Thakar tribes, reside along the hilly slopes of the Sahyadri ranges. These tribes continue to rely on the traditional systems of medicine, a knowledge system inherited and preserved through generations. An ethnobotanical survey was conducted to systematically record traditional knowledge related to plant use. The documented ethnobotanical information encompassed diverse plant uses, including food, fodder, timber, medicinal and veterinary applications, religious practices, and fuel. A total of 110 species belonging to 96 genera and 51 families were recorded for their ethnobotanical significance.

Keywords: Akole, Biodiversity, Ethnobotany, IKS

T04-OP-14

Documentation of ethno-veterinary uses of select plant species in Hirpora Wildlife Sanctuary, Kashmir Himalaya

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Hirpora wildlife sanctuary, lying in the lap of Pir Panjal Range of Kashmir Himalaya, harbours a rich diversity of prized medicinal plants traditionally used by the migratory tribes of Gujjars, Bakarwalas and neighbouring local villagers as well. These tribal communities reside inside the sanctuary during the summer season for livestock grazing. The present study provides a detailed account of the ethno-veterinary uses of plant species by these communities during their temporary seasonal stay in the sanctuary. To collect the data on ethno-veterinary uses, a total of 100 informants selected from representative age groups were interviewed. The study documented a total of 29 species, belonging to 25 genera and 21 families, with practiced ethno-veterinary uses. These include 23 herbs, 3 shrubs, 2 climbers and a single sub-shrub species. In total, 10 different types of livestock diseases have been documented to be treated with these plant species, with the majority (i.e., 11 species) being used for alleviating digestive disorders. Different plant parts were used in the ethno-veterinary practices, with the majority as aerial parts. The documentation of valuable

ethno-veterinary information, as carried out during the present study, can be useful for the bio-prospecting of potential plant species and subsequent commercial utilization with equitable benefit sharing among these tribal communities.

Keywords: Ethno-veterinary, Hirpora, Kashmir Himalaya, Tribal communities

T04-OP-15

Systematic documentation of intangible heritage related to food and medicine among the tribes of Malappuram district, Kerala

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The tribal communities of Malappuram district, Kerala, harbor a rich repository of traditional knowledge on food and medicinal practices, forming a crucial part of intangible cultural heritage. However, rapid modernization, environmental change and declining intergenerational transmission are threat to the survival of these practices. This study focuses on the systematic documentation of traditional food and medicinal knowledge among the Paniyan, Muthuvan, Then-Vetta Kuruman and Kattunayakan tribes in the Chaliyar, Chungathara, Pothukallu and Mampad Gramapanchayats of Malappuram district. A qualitative ethnographic approach was employed, including participant observation, semi-structured interviews, and focus group discussions with tribal elders and local practitioners. Indigenous plants, preparation techniques, and the cultural context of each practice were recorded, categorized, and cross-verified. A total of 54 informants were interviewed from the study area. Results were very promising and revealed a diverse spectrum of food systems and medicinal practices, encompassing wild edibles, nutritionally significant local recipes and herbal remedies for various ailments like epilepsy, urinary disorders, women's health disorders, skin diseases, etc. These practices were closely tied to seasonal cycles, ecological knowledge and spiritual traditions, reflecting the holistic approach of these tribal communities. The study underscores the urgency of preserving this intangible heritage and provides a foundation for community-based conservation strategies. Systematic documentation not only safeguards tribal identity but also offers avenues for integrating traditional knowledge into contemporary health, nutrition, poverty alleviation, employment generation and sustainable development initiatives.

Keywords: Ethnobotany, Malappuram, Then-Vetta Kuruman, Traditional medicine, Traditional food, Tribal communities

T04-OP-16

Bridging ayurveda and modern plant taxonomy: a study of synonyms, controversies, and morphological correlations in medicinal plants

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The Ayurvedic system of medicine, with origins tracing back to the Vedic period, contains extensive documentation of medicinal plants across classical texts and Nighantu (lexicons). These manuscripts systematically describe plant morphology and pharmacodynamics while

cataloguing nearly 12,000 distinct Sanskrit plant names, many of which exhibit overlapping synonyms. The branch of Ayurveda dedicated to this knowledge is Dravyaguna, encompassing nāma (nomenclature), rūpa (morphology), and guṇa (therapeutic properties) of drug. In contemporary practice, attempts have been made to align Ayurvedic plants with botanical nomenclature. However, challenges arise due to divergent interpretations of Sanskrit texts, overlapping synonyms, and the influence of regional nomenclature, often resulting in multiple botanical identities being assigned to the same Ayurvedic plant. This paper aims to elucidate the basis of synonymy through selected examples. Furthermore, a detailed examination of controversial plants such as Jīvanti, Nāgabala, Shankhapushpi etc. will be undertaken, highlighting the critical role of morphological characters in resolving ambiguities and establishing accurate botanical correlations. Additionally, the paper explores the role of modern taxonomic tools, including synonymic databases, floras, and digital resources, by integrating classical textual analysis in collaboration with Ayurveda experts to minimise the controversies. Thus, this study seeks to underscore the potential of systematic taxonomy in bridging gaps between Ayurveda and modern botany, thereby facilitating precise identification and sustainable utilization of medicinal plants with contemporary taxonomy.

Keywords: Ayurveda, Controversial plants, Dravyaguna, Plant taxonomy

T04-OP-17

Traditional knowledge on medicinal and food practices in maternal and child care along the coastal belt of Malappuram district, Kerala

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Coastal communities of Kerala possess a rich repository of traditional knowledge (TK) that supports maternal and child health, primarily transmitted orally across generations, is at risk of depletion due to cultural shifts, modernization and changing lifestyles. The study aims to document and analyse ethnic maternal and child care practices, emphasizing food and medicinal practices in coastal areas of Malappuram district. It also explores the ethnic, nutritional and therapeutic dimensions of these practices. Data collected through systematic surveys, structured interviews and participant observation after obtaining Prior Informed Consent (PIC) from all participants. A total of 132 knowledge holders were interviewed and documented 738 ethnobiological information. Practices were categorized according to participant group, type of food and medicine and maternal stage. Results were analysed for nutritional, therapeutic and ethnic dimensions. Findings reveal a multidimensional system of TK where pre-partum practices focus on invigoration and anaemia prevention; post-partum practices focus on enhancement of lactation and recovery; childcare practices promote nutrition and immunity. The study underscores the importance of documenting ethnobotanical and TK for maternal and child health, biodiversity conservation and sustainable use of bioresources. This knowledge can be converted into employment and income generation by integrating with Kudumbasree, Self Help Groups, and Mahatma Gandhi National Rural Employment Guarantee (MGNREGA) Programmes. Preserving these practices and sustainable utilization contribute to cultural continuity and informed strategies for integrating traditional health practices into modern public health frameworks.

Since this knowledge is primarily transmitted orally, it remains vulnerable to loss, therefore may be documented before it became extinct.

Keywords: Coastal communities, Ethnic practices, Malappuram, Maternal and child care, Medicinal plants, Traditional knowledge

T04-OP-18

Traditional knowledge and culinary innovation: The role of wild edible plants in tribal food systems of Dang, Gujarat

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The traditional knowledge of wild edible plants (WEPs) constitutes an adaptive system of ecological wisdom developed and transmitted across generations of indigenous communities. Rooted in Traditional Ecological Knowledge (TEK), these practices reflect centuries of empirical observation, experimentation, and cultural refinement, facilitating the sustainable use of local biodiversity. However, socio-cultural and environmental changes have led to the gradual erosion of such knowledge. Present study examines WEP utilization patterns among tribal communities of the Dang district, Gujarat, emphasizing their integration into diverse culinary traditions. Field surveys and ethnobotanical interactions with tribal elders, women, and traditional healers revealed that WEPs serve not only as a vital source of nutrition but also as a cornerstone of cultural identity. Communities employ a spectrum of preparation techniques, from direct consumption to elaborate processing, converting plant parts into vegetables, pickles, chutneys, snacks, flavouring agents, and innovative recipes that optimize locally available resources. Notable examples include *muthiya*, prepared with seasonal leafy greens such as *Commelina diffusa* Burm.f., *Chlorophytum tuberosum* (Roxb.) Baker, and *Colocasia esculenta* (L.) Schott, and *ravaiya*, made from the tender fruits of *Oroxylum indicum* (L.) Kurz. Traditional desserts are also prepared using seeds of *Achyranthes aspera* L. and *Celosia argentea* L. The culinary use of WEPs demonstrates a distinctive and adaptive approach to food systems, ensuring food security, enhancing nutritional diversity, reinforcing cultural and ecological sustainability, and providing insights into resilience under changing climatic conditions. Documenting these practices preserves cultural heritage and informs strategies for sustainable nutrition, biodiversity conservation, and climate-adaptive food systems.

Keywords: Dang district, Gujarat, Innovative recipes, Traditional ecological knowledge, Tribal culinary heritage, Wild edible plants

T04-OP-19

Indigenous agricultural heritage and its role in millet-based farming among tribal farmers of Attappady, Kerala

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Indigenous knowledge represents a living repository of ecological wisdom deeply embedded in traditional farming communities. In India's tribal regions, these time-tested practices form the foundation of millet-based agroecosystems, supporting both sustainability and food security. The present study conducted in Attappady, the millet village of Kerala, assessed the relevance, adoption patterns, and scientific validity of Indigenous Traditional Knowledge (ITK) in millet cultivation. Using a structured survey and participatory rural appraisal, data were collected from 118 respondents representing 25 tribal households. Most farmers (83 percent) identified traditional soil fertility management as essential for maintaining productivity, and 97 percent reported enhanced yield stability when ITK was combined with modern agricultural practices. Highly prevalent practices included selection of mature earheads for seed material (100 percent), multi-seed sowing (98 percent), and mixed cropping (96 percent), reflecting the adaptability and resilience of traditional methods. In contrast, bio-repellents prepared from turmeric and garlic showed limited acceptance (36 percent), indicating the need for further validation. Statistical analysis ($p < 0.05$) confirmed a strong correlation between ITK adoption and drought resilience, with experienced and small-scale farmers showing greater adherence. Principal Component Analysis revealed that traditional experience and cultural continuity encouraged ITK retention, while modernization and higher education tended to reduce dependence on indigenous methods. The study emphasizes that ITK is not merely a collection of farming practices but a vital cultural heritage that sustains biodiversity and community resilience. Integrating traditional wisdom with contemporary science can strengthen climate-resilient and sustainable millet cultivation systems.

Keywords: Agroecology, Indigenous traditional knowledge, Millet cultivation, Sustainable agriculture, Tribal farmers

T04-OP-20

Waghdev's Grove: tribal wisdom and tree conservation – A case study from villages in Dahanu Taluka

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In Dahanu Taluka of District Palghar in Maharashtra, the Warli and other tribal communities conserve Waghdev groves, small patches of old-growth vegetation associated with shrines dedicated to Gramdev, a protective spirit revered for safeguarding villagers and livestock from leopard attacks. This paper examines the cultural, ecological, and conservation significance of approximately 30 Waghdev groves from selected villages in both the eastern and western parts of Dahanu Taluka, highlighting their role in maintaining biodiversity and reinforcing community identity. Typically ranging between 0.25 and 0.5 acres, these groves protect around 39 species of large trees, many exceeding 150 years in age, functioning simultaneously as sacred spaces and ecological reservoirs. Waghdev groves embody indigenous models of sustainability, offering valuable insights for community-led conservation and climate resilience, while contributing to biodiversity preservation and climate mitigation. Community taboos that prohibit tree felling ensure the long-term survival of these species-rich patches and the fauna they support. A key outcome of this study is the

recommendation to recognize these ancient trees as 'Heritage Trees', thereby strengthening protection measures and sustaining traditional ecological knowledge. Beyond Waghdev groves, the study also documents more than 300 plant species, several of which hold economic and cultural importance for the Warli community.

Keywords: Heritage trees, Traditional Grove, Traditional Use

T04-OP-21

Evaluation of the anti-fertility activity of *Hyptis suaveolens*

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For thousands of years, humans have relied on nature as a source of medicinal plants to prevent and treat a wide range of ailments. Many of these plants contain bioactive compounds that exert therapeutic effects, and some have been traditionally used as natural contraceptives due to their perceived safety and efficacy. *Hyptis suaveolens* (L.) Poit., commonly known as bush mint, has been reported in traditional medicine to possess antifertility properties in women. Despite these longstanding claims, there is limited experimental and clinical evidence to substantiate its contraceptive potential. The present study was undertaken using female albino rats as an experimental model to investigate the anti-implantation activity of the aqueous extract of *H. suaveolens*. The study focused on early pregnancy, a critical period for embryo implantation, which is highly sensitive to pharmacological interventions. The aqueous extract was administered orally at doses of 50, 100, and 150 mg/kg body weight for five consecutive days, corresponding to the early gestational period in rats. The outcomes were evaluated by examining the number and condition of implantation sites. The results demonstrated that the extract exhibited significant anti-implantation activity, with approximately 56.6% of implantation sites affected, and total abortifacient activity reaching 63.6%. Interestingly, no observable changes were noted in the color or size of the implantation sites compared to the control group, suggesting that the extract interfered with implantation without inducing gross morphological alterations. These findings provide preliminary scientific support for the traditional use of *H. suaveolens* as a natural antifertility agent.

Keywords: Antifertility, Anti-implantation, *Hyptis suaveolens*, Traditional medicine

T04-OP-22

Study of ethno-floristic survey and anthropogenic effect in Sacred Groves of Pudukkottai district

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Biodiversity is variability among living organisms from all sources. Now day's biological diversity is depleted due to natural disasters, global warming and anthropogenic disturbances. Such as construction of buildings and creating pathways causes of decline in the plant diversity of sacred groves. Huge forest areas reduced to small patches due to

increase of human population in and near sacred groves. Conservation and sustainable use of biodiversity have been an integral part of Indian ethics. Even though our ancient people followed traditionally to conserve biodiversity as sacred groves. It is indigenous method of conservation followed in India and throughout the world. The present study was carried out in five sacred groves, namely (i) Kanadukathan-Ayyanar temple (ii) Porpanaikottai-Muniswarar temple (iii) Thapasumalai-Karuppasamy temple (iv) Oorapatty-Muniyandavar temple (v) Narthamalai-Araya Karuppar temple. A floristic survey was carried out in a five sacred groves size about 9.20 square Km in Pudukkottai district. From this study 25 trees, 35 shrubs and 40 herbs species among 43 families (39 Dicot, 4 Monocot) of Angiosperms were recorded.

Keywords: Anthropogenic effect, Biodiversity, Conservation, Sacred groves

THEME 5

BIODIVERSITY CONSERVATION

T05-OP-01

Riparian vegetation under invasion pressure: assessing the impact of alien plants along the Karimpuzha River, Kerala

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River basin ecosystems are often affected by flooding, which creates bare land that facilitates invasion by plant propagules dispersed by water. This study focuses on the unprotected riparian ecosystems of Karimpuzha, originating from Karimpuzha Wildlife Sanctuary in the Nilgiri Biosphere Reserve. For the phytosociological survey, three riparian zones-lower, middle, and upper-were established at 12 sites to capture vegetation gradients. Three 1 m × 1 m quadrats per zone were sampled, along with 12 permanent quadrats in disturbance-prone riverbank areas. Results show the riverbank is dominated by infrequent and invasive species, indicating an early to mid-successional stage with active species turnover and community restructuring. Species density was highest in the lower zone, decreasing towards the upper zone, which had the greatest density of invasive species. Most species in the successional areas are invasive.

Keywords: Invasive, Flooding, Succession, Western Ghats

T05-OP-02

Decoding seed germination of wild-native trees: Linking conservation with community livelihoods

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The present study aimed to establish robust and reproducible germination protocols for three ecologically and economically important wild-native tree species of India: *Cassia fistula* L. (Bahava), *Buchanania lanzan* Spreng. (Charoli), and *Terminalia bellirica* (Gaertn.) Roxb. (Behada). Despite their recognized medicinal, nutritional, and agroforestry value, large-scale propagation of these species remains limited due to seed dormancy and inconsistent germination. As seed germination represents not only the onset of a new life cycle but also a key driver of evolution and sexual selection, enhancing germination success is fundamental to maintaining a strong gene pool and sustaining genetic diversity within natural populations. To overcome dormancy barriers, a range of pre-sowing treatments was evaluated, including mechanical scarification, hot water soaking, acid scarification (H_2SO_4), and hormonal priming with gibberellic acid (GA_3) at varying concentrations. Germination percentage and mean germination time were assessed under controlled laboratory and nursery conditions. Hot water soaking at 80 °C for 10 min yielded the highest germination in *C. fistula*, while 24 h soaking resulted in 60% germination in *T. bellirica* within nine days.

Alternate wetting and drying (two cycles) markedly improved germination and seedling vigor in *B. lanzan*. Untreated controls showed poor germination (<40%), confirming combined physical and physiological dormancy barriers. The optimized species-specific protocols developed herein not only facilitate large-scale propagation and genetic conservation but also reinforce evolutionary continuity by enabling natural regeneration, promoting biodiversity restoration, and linking conservation with community livelihoods in tropical India.

Keywords: *Buchanania lanzan*, *Cassia fistula*, Conservation, GA_3, Genetic diversity, Seed dormancy, *Terminalia bellirica*

T05-OP-03

Current population status of the endangered species *Nymphoides krishnakesara* in its type locality

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The genus *Nymphoides* Seguier is represented by more than 50 species worldwide. Out of them, ten species are reported from India, of which four species are endemic to seasonal pools on the lateritic plateaus of southern Western Ghats. *Nymphoides krishnakesara* K.T.Joseph. & Sivar., one among them was reported from a seasonal pool in Madayippara lateritic plateau of Kannur district, Kerala by Joseph and Sivarajan (1990). Even though its extended distribution to neighbouring districts has been recorded recently, its type locality is under severe anthropogenic disturbance. This may lead to local extinction, a condition referring to the disappearance of a species from a specific geographic area, even if it survives elsewhere, due to pressures such as habitat modification, urbanization, mining, climate change and over exploitation. This phenomenon can have significant ecological consequences, as it leads to a reduction in biodiversity and the disruption of ecosystem functions within the affected region. The present study aims to assess the current distribution, population status and ecological requirements of *N. krishnakesara* in its type locality. Field surveys were conducted to map the distribution of *N. krishnakesara* populations, estimating their population size and density, and characterizing the environmental conditions in which they thrive. Population size was determined by using quadrat sampling method. The ecological requirements of *Nymphoides*, such as depth of water in the pool, soil nutrient levels, soil type and associated species, were determined by different protocols. This narrow endemic species is evaluated as Endangered and hence conserving the population is particularly important.

Keywords: Biodiversity conservation, Lateritic plateaus, Local extinction, Seasonal pools, Urbanization

T05-OP-04

Spatiotemporal assessment of forest fragmentation in Purna Wildlife Sanctuary, Gujarat, using Multi-Temporal Sentinel-2 Data

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Forest fragmentation poses a significant threat to biodiversity conservation and ecosystem functioning, particularly in ecologically sensitive regions such as the Purna Wildlife Sanctuary of the Dang district, Gujarat. This study aims to assess the spatiotemporal dynamics of forest fragmentation within the sanctuary using multi-temporal Sentinel-2 data for the years 2016, 2020, and 2025. Sentinel-2 Level-1C imagery was atmospherically corrected to surface reflectance, and spectral bands including Red (B4), NIR (B8), and SWIR (B11, B12) were used along with vegetation indices such as NDVI and EVI to characterize vegetation patterns. Supervised classification employing the Random Forest algorithm in Google Earth Engine (GEE) was performed to generate land-cover maps, which were subsequently simplified into binary forest and non-forest layers. Fragmentation metrics such as patch density, edge density, and mean patch size were computed to quantify structural changes. Preliminary results indicate a reduction in core forest area and an increase in edge and fragmented patches, suggesting intensifying anthropogenic pressures and land-use alterations. The forests, dominated by moist deciduous species such as *Tectona grandis* L.f., *Terminalia tomentosa* Wight & Arn., and *Anogeissus latifolia* (Roxb. *ex* DC.) Wall. *ex* Guill. & Perr., show signs of habitat discontinuity affecting ecological connectivity. The integration of Sentinel-2 data with GEE-based analysis provides a robust framework for long-term monitoring and supports effective forest management and biodiversity conservation strategies in the Western Ghats region of Gujarat.

Keywords: Forest fragmentation, Google earth engine, Random forest, Purna wildlife sanctuary, Sentinel-2

T05-OP-05

Pollen cryopreservation as a long-term genetic conservation strategy for native *Nymphaea* species in India

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Conservation of native aquatic flora is crucial for maintaining freshwater ecosystem stability and biodiversity. *Nymphaea* L., a genus of wild water lilies, plays an important ecological role in freshwater ecosystems by improving water quality and supporting aquatic biodiversity. However, habitat degradation and climate change have caused a significant decline in native *Nymphaea* populations across India. To safeguard their genetic diversity, *ex-situ* conservation through pollen cryopreservation provides a sustainable strategy for long-term preservation and utilization. This study developed and standardized pollen cryopreservation protocols for seven *Nymphaea* genotypes, viz., *N. omrana*, *N. pubescens* Willd., *N. rosea* Raf., *N. nouchali var. nouchali* Burm.f., *N. nouchali var. versicolor* (Simms) Hook.f. & Thomson, *N. nouchali var. caerulea (*Savigny) Verdc., and *N. micrantha* Guill. & Perr. Key parameters, including pollen collection time, desiccation, storage, and *in vitro* germination conditions, were optimized to maintain post-thaw viability. Cryopreserved pollen retained high germination rates (85.4 ± 0.1% to 95.7 ± 0.5%), comparable to fresh pollen (83.3 ± 0.3% to 96.8 ± 0.2%), with the *t*-test showing a non-significant variation between stages ($p > 0.05$). Scanning Electron Microscopy confirmed the preservation of pollen morphology and structural integrity. Establishing a *Nymphaea* pollen cryobank highlights the potential of cryogenic storage as a long-term *ex-situ* biodiversity conservation tool. Beyond conservation, cryopreserved pollen serves as a vital resource for controlled hybridization and breeding programs, overcoming asynchronous flowering barriers and

enabling year-round access to viable pollen. This integrated approach supports both the conservation and sustainable utilization of *Nymphaea* genetic resources, contributing to the broader effort for the conservation and sustainable utilization of threatened freshwater biodiversity.

Keywords: Cryopreservation, *Ex-situ* conservation, *Nymphaea*, Plant breeding, Pollen viability, Wetland biodiversity

T05-OP-06

Floristic diversity of regenerated tree species and their conservation in Kaundinya Wildlife Sanctuary of Andhra Pradesh

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Kaundinya Wildlife Sanctuary (KWS), located in the Palamner–Kuppam forest ranges of Chittoor district, Andhra Pradesh, covers an area of 357.6 km² between 12°39'–13°10' N latitude and 78°29'–78°52' E longitude. A study was conducted by the ICFRE–Institute of Forest Biodiversity, Hyderabad (2012–2018) with the objective of study of the dynamics of natural regeneration of woody species in the Nallamalais, Seshachalam Hills and KWS of the Eastern Ghats. Phytosociological studies were carried out using the quadrat method with plots of 31.62 × 31.62 m for trees and nested quadrats of 5m × 5m for saplings and 1m × 1m for seedlings. A total of 44 tree species were recorded in the KWS. Among them, good regeneration was observed in *Drypetes sepiaria* (Wight & Arn.) Pax & K.Hoffm. and *Psydrax dicoccos* Gaertn. etc., fair regeneration occurred in eight species such as *Albizia amara* (Roxb.) Boivin*, Dalbergia paniculata* Roxb.*, Ixora parviflora* Vahl and *Ziziphus xylopyrus* (Retz.) Willd. *etc,* poor regeneration was recorded in five species including *Anogeissus latifolia* (Roxb. *ex* DC.) Wall. *ex* Guill. & Perr., *Chloroxylon swietenia* DC., and *Syzygium alternifolium* (Wight) Walp. etc, Seven species, including *Antidesma ghaesembilla* Gaertn.*, Diospyros ferrea* (Willd.) Bakh.*, Limonia acidissima* L.*, Prosopis cineraria* (L.) Druce and *Ziziphus mauritiana* Lam. etc, showed new regeneration, while 22 species such as *Acacia mangium* Willd.*, Albizia odoratissima* (L.f.) Benth.*, Bauhinia racemosa* Vahl*, Premna tomentosa* Willd.*, Sapindus emarginatus* Vahl, and *Wrightia tinctoria* (Roxb.) R.Br. etc. showed none. To conserve diversity and enhance regeneration, the study recommended adopting a shelter wood or seed tree system, mother trees should be marked and conserved, while local communities must be educated to protect flowering and fruit-bearing trees crucial for natural regeneration. Soil conservation measures to be undertaken because it is very important for natural regeneration.

Key words: Fruit-bearing trees, Kaundinya Wildlife Sanctuary, Phytodiversity, Regeneration

T05-OP-07

A study on endemism among floral diversity in Vagamon and surrounding areas

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Vagamon, located in the Kottayam and Idukki districts of Kerala, is a serene hill station with rich biodiversity and stunning landscapes. Nestled at an altitude of about 1,100 meters above sea level, Vagamon's microclimate has shaped various habitats including grass lands, shola like forests, puddles, rocky patches and evergreen patches. Even though the plantations developed in the last two centuries has caused much destruction of its original native flora, a rich and unique biodiversity still thrives with several endemic plants species. 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 44 species of them were previously considered under various threat categories. A total of 47 endemic flowering plants that are under various levels of threat has been identified so far. Among them species like *Humboldtia bourdillonii* Prain has been recently found as thriving in small, isolated population; *Uniyala multibracteata* (Gamble) H.Rob. & Skvarla, has been rediscovered after 140 years from this area and species like *Chlorophytum vanapushpam* Sunil and *Litsea vagamonica* Robi & Revathi has been newly discovered. Many grass species also have been reported from this area, among which species like *Zenkeria elegans* Trin. and *Arthraxon lancifolius* Hochst. are possessing unique features.

Keywords: Endemism, Floral diversity, Vagamon, Western Ghats

T05-OP-08

Seed germination in some wild legumes of Tumkur district, Karnataka, India

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Plants are biological treasure; threat due to many reasons such as over exploitation from wild and increase in the hybrid. It becomes threat to the conservation of wild varieties. Conservation is possible only if they are propagated; plant nurseries play an important role but relay on germination of seeds and its management. In the present investigation on seed germination in wild legume were under taken, wild edible legumes were collected from natural habitat. Seeds were collected during respective season and germinated in pot containing sterilized media of soil, green manure and sand in the ratio of 2:2:1. Initiation of germination varied among the legume species. The overall percentage of germination was 60-100%. *Medicago sativa* L., *Tamarindus indica* L., and *Vigna aconitifolia* (Jacq.) Maréchal., are 100% germination with in a weak, at faster rate. *Sesbania bispinosa* (Jacq.) W.Wight. with 40% and, Mucuna pruriens (L.) DC., resulted 20% with seed emptiness and low viability as compared to seeds of other plants.

Keywords: Conservation, Germination, Wild legume

T05-OP-09

An assessment of tree diversity in Karjikoppa Reserve Forest, central Western Ghats of Karnataka

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Studies on the floristic diversity of reserve forest patches from the central Western Ghats are one of the data-deficient ecosystems, even though they provide niches to numerous plant and animal species that depend on the Western Ghats as a key habitat, making them an ecological oasis. Reserve forests can sustain ecological connection between various ecosystems by acting as pathways for species distribution and movement. The present investigation from Karjikoppa Reserve Forest of Shivamogga district, Karnataka, is a preliminary scientific exploration to address the gap in the floristic structure of angiosperms of the region. Creating a comprehensive image of the local tree species is aided by vegetation analysis. Since the study area is indicative of the entire Western Ghats, this kind of study is crucial for sustaining biodiversity. Fourteen transects (100 m x 5 m) comprise 0.7 hectares of the study site. Ecological indices were performed to understand the strength composition of the area. Which includes 77 tree species (718 individuals). Following the Lauraceae, Phyllanthaceae, and Apocynaceae families, the Rubiaceae were determined to be the highest genera based on floristic data. The greatest number of individuals was identified in the Oleaceae family (89 individuals), which was followed by the Anacardiaceae (77 individuals) and Salicaceae (40 individuals). The present study revealed 6 species are vulnerable, 26 are of least concern, 32 are not evaluated, and 13 are data deficient. We want to further evaluate this with other protected areas of the Western Ghats.

Keywords: Central Western Ghats, Conservation, Karjikoppa, Reserve Forest, Tree diversity

T05-OP-10

Eco-morphological structuring of *Sonerila* (Melastomataceae) in the Western Ghats: a trait-environment clustering approach

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The Western Ghats harbour exceptional micro-endemism in *Sonerila*, yet the ecological units structuring its distributions across steep climatic, edaphic, and hydrological gradients remain poorly defined. We delineate biologically interpretable eco-morphological clusters within Western Ghats by integrating field reliable traits—acaulescent versus caulescent habit, tuber presence/absence, microhabitat class (rupicolous, riparian/seepage, forest-floor/understory, lateritic outcrop), and broad flowering season-with environmental descriptors (elevation; temperature–precipitation summaries; slope and terrain ruggedness; proximity to perennial/seasonal streams; forest cover; and human-modification signals). Curated, spatially thinned occurrences were encoded as mixed data and grouped into clusters, which we profiled to infer ecological drivers and vulnerability. The resulting clusters track recognisable settings: cool, rugged shola–grassland ecotones enriched for acaulescent, tuber-bearing forms; mid-elevation evergreen/semi-evergreen edges with shade-tolerant, caulescent herbs; seasonal lateritic pavements and rocky uplands dominated by rupicolous, non-tuberous plants with rain-synchronised phenology and elevated human impact; and riparian/seepage lines-linear, moisture-dependent microhabitats highly sensitive to disturbance. These trait–environment associations provide coherent ecological signatures and flag instances of morphological convergence that merit anatomical or molecular follow

up. By resolving eco-morphological groupings, we clarify niche structure in *Sonerila*, sharpen survey timing and targeting (e.g., monsoon-phased laterites, discrete seepage networks), and define operational, habitat-specific units for stewardship in a landscape undergoing rapid land-use change and climatic variability.

Keywords: Eco-morphology, Melastomataceae, Niche structure, *Sonerila*, Trait–environment clustering, Western Ghats

T05-OP-11

Significance of sacred groves in terms of biodiversity conservation and cultural aspects

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'Sacred Groves' are considered to be one of the best management methods for *in situ* conservation of our bio-wealth. In India, many of the endemic plant and animal taxa across different groups as well as many microbes are reported to be specifically conserved in sacred groves. This tradition of ethnic peoples is playing major role in the environment management, maintenance of medicinal resource stock and gene resources for peoples. India is the richest country in terms of number of Sacred Groves. As per the ENVIS report there are about 13,720 sacred groves across almost all states. Sacred groves are not only a means of protection of nature, plants and animals; but also reveal a clear picture of evolution, spiritual and physical changes of human life. The study of human genealogy in anthropology shows that at different stages of human evolution; different concepts of behaviour and social systems existed and it has been displayed in all these periods. Humans have remained as an integral part of nature. The relationship of human and sacred groves is revealed through a detail study of sacred groves and presented in the paper.

Keywords: Conservation, Culture, Human, Relationship, Sacred groves

T05-OP-12

Conservation status of angiosperm in Koppal district, Karnataka, India

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The current study aims at assessing the conservation status of Angiosperm species in Koppal district, Karnataka. The survey was conducted from 2019-2025 in 30 sampling spots. The sum of 615 species was recorded in the study area, of which globally conservation status of 403 species was assessed as per IUCN data base. 403 species are belonging 204 genera and 75 families. The dominant family was Fabaceae with 78 species (19.35%) and 43 genera followed by Poaceae 38 species (9.42%) and 31 genera and Asteraceae with 24 species (5.95%) and 24 genera. The habitat analysis revels that, herbs are abundant with 201 species (49.87%) followed by trees 100 (24.81%), shrubs 65 (16.12%) and climber 37 (9.18%). According to IUCN status Least Concern (LC) 207 species (51.36%), followed by Not Evaluated (NE) 173 species (42.92%), Data Deficient (DD) 8 species (1.98%), Vulnerable (VU) 7 species (1.73%) and Endangered (EN) 1 species (0.24%). At present the biodiversity

of Koppal district were under threat due to the high anthropogenic and rock mining activities. The findings establish a baseline reference for future taxonomic studies.

Keywords: Dry deciduous scrub forest, Forest conservation, IUCN status, Koppal district, Threaten plants

T05-OP-13

Orchid diversity, threat analysis and conservation strategies in Sindhudurg district, Maharashtra, India

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Sindhudurg district is one of the districts in Maharashtra possess diversified habitat and very rich floral diversity it is home for number of endemic rare, endangered and threatened orchids found in Western Ghats. During present investigation attempts were made to study orchid diversity and their threats and to develop some strategies for conservation of habitat and species. During assessment of orchid diversity their taxonomy, distribution, habitat, and conservation strategies are focused. Around sixty-six species of orchids, belonging to Twenty-six genera, were recorded from Sindhudurg area, however there could be some more species yet to be found. The orchid diversity comprised 34 terrestrial, 32 epiphytic among this *Habenaria* Willd. and *Dendrobium* Sw. emerged as the most diverse genera, with 16 and 10 species, respectively. Notably, *Habenaria* dominated the terrestrial orchids, while *Dendrobium* was prominent among epiphytes. The study highlights the presence of 27 orchid species that are endemic to India. The orchids were found to inhabit a range of habitats, including evergreen forests, deciduous forests, and grasslands. Habitat destruction, over-collection, animal threat and climate changes were identified as major threats to the orchid diversity of the region. This study provides valuable insights into the orchid diversity of Sindhudurg district, highlighting the need for conservation efforts to protect these ecologically important species.

Keywords: Conservation, Endemic species, Orchids, Sindhudurg, Western Ghats

T05-OP-14

Recapitulating carnivory with an efficient micropropagation protocol for the endangered *Nepenthes khasiana*: 2iP induced regeneration, pitcher development, and clonal fidelity assessment

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This study established an effective micropropagation protocol for the endemic carnivorous plant *Nepenthes khasiana* Hook.f., with a focus on inducing its ornamental pitchers and evaluating the natural cytokinin 2-iP for the first time. The process began with optimal seed

germination (90.67%) on ½ MS media supplemented with GA3.For shoot multiplication, 2-iP proved superior. Nodal explants on media containing 2-iP (2.0 mg/L) achieved an 83.33% regeneration frequency, producing 8.85 shoots of 9.10 cm length. Even better results were obtained using in-vitro raised axillary buds on a combination of 2-iP (2.0 mg/L) and IBA (0.5 mg/L), which yielded a 93.33% regeneration frequency with robust leaf and root development. Callus formation was optimally induced at 50% using 2-iP (1.5 mg/L) and 2,4-D (0.5 mg/L). Rooting was most successful for nodal shoots on NAA (3.0 mg/L), producing 11.25 roots per shoot. The protocol successfully recapitulated the ontogenic development of carnivory, with in-vitro leaves chronologically modifying into basal pitchers. Crucially, the regenerated plantlets showed a 95% survival rate and high genetic stability, with low polymorphism (5.88-9.09%) revealed by SCoT and ISSR markers. In conclusion, the application of 2-iP was highly effective, enabling the efficient production of genetically true-to-type, ornamental-quality planting material of this endangered species, highlighting the ontogeny of its carnivorous features.

Keywords: Callus, Clonal fidelity, ISSR, SCoT N6-(2-Isopentenyl) adenine (2-iP)

T05-OP-15

Rare and endangered plants of Gujarat: Challenges and conservation efforts

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Gujarat, situated in the arid and semi-arid regions of western India, supports a remarkable diversity of rare, endemic, and endangered plant species. However, factors such as habitat loss, overgrazing, urbanization, and climate variability have severely threatened their survival. Species such as *Commiphora stocksiana* (Engl.) Engl., *Tephrosia collina* V.S.Sharma, *Bombax insigne* Wall., *Tamarix kutchensis* B.V.Shetty & R.P.Pandey, and *Cansjera rheedii* J.F.Gmel. show poor natural regeneration due to seed dormancy and low germination rates, making their conservation a critical need. Our work focuses on developing effective propagation and conservation strategies for these taxa. Seeds were collected, categorized by morphology, and treated using methods such as hot water, cold water, acid treatment. Treatments notably improved germination and early growth, especially in *Tephrosia collina*. Some species like, *Olax nana* Wall. *ex* Benth. found in the arid regions of Kachchh, Gujarat, has been observed to rarely or never produce fruits under natural conditions, leading to the absence of viable seed-based regeneration. To overcome this limitation, we attempted vegetative propagation using underground tubers/roots, which resulted in successful sprouting and establishment of new plants. This achievement demonstrates an effective alternative propagation method for *O. nana*, providing a valuable approach for its ex-situ and in-situ conservation. Overall, this study presents a conservation framework that scientific experimentation, and field-based implementation. It demonstrates a replicable model for the restoration of endangered flora in arid and semi-arid ecosystems.

Keywords: Conservation, Endangered, Germination, Gujarat, Threatened

T05-OP-16

Ecological niche modelling to assess the impact of climate change on aquatic invasive species *Cabomba furcata* in Kerala

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Wetlands are vital reservoirs of biodiversity that support a rich variety of species through their complex physical and chemical characteristics. In the Anthropocene, these ecosystems face increasing threats that compromise their ecological integrity, particularly from the spread of aquatic invasive plants that alternative community composition and ecosystem functioning. Kerala, a biodiversity rich state in southern India, contains 217 wetlands that play a crucial role in sustaining native flora and fauna while providing essential ecosystem services for biodiversity conservation. Among the major threats, the invasive aquatic plant *Cabomba furcata* Schult. & Schult.f., poses significant ecological challenges by competing with native plants and disrupting habitat structure for aquatic species. To support biodiversity conservation efforts, this study applied the MaxENT algorithm to model the habitat suitability of *C. furcata* in Kerala using 35 occurrence records and seven environmental predictors aimed at guiding ecological management. Elevation emerged as the most influential factor, followed by NDVI and temperature seasonality, reflecting the sensitivity of invasion dynamics to environmental variability. The results indicate that the coastal plains of Kerala, dominated by freshwater ecosystems and recurrent monsoon flooding, are highly vulnerable to invasion and subsequent biodiversity loss. The findings highlight the importance of proactive conservation strategies based on habitat suitability modelling to protect wetland biodiversity and maintain ecological balance in invaded regions through early detection and adaptive management.

Keywords: Aquatic biodiversity, *Cabomba furcata*, Invasive plant, Ecological Niche Modelling, Wetlands

THEME 6

CLIMATE CHANGE AND PLANT ADAPTATION

T06-OP-01

Securing climate refugia for Western Ghats endemics: IUCN-informed niche-specific conservation planning against climate-invasive species synergy

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The Western Ghats, a global biodiversity hotspot, faces unprecedented threats from climate change and biological invasion, challenging traditional conservation frameworks. To address this, we conducted a multicriteria assessment for 130 threatened species, with 73 species currently published on the IUCN Red List. Our study expands these assessments by integrating climate vulnerability across the region's diverse moist forest types. We selected a representative sample (approximately 10%) for Ecological Niche Models (ENMs), grouped into five ecologically distinct vegetation types: Montane, Sub-montane, Medium Elevation Evergreen, Low Elevation Evergreen, and Riparian. We utilized ENMs to predict future range dynamics, explicitly assessing both latitudinal and longitudinal niche shifts under projected climate scenarios. Crucially, these predictions incorporated spatial data on invasive species prevalence to model the compounded threat. The results demonstrate highly differential vulnerability across the five groups based on the niche overlap and specificity. ENMs indicate a high risk of habitat contraction and directional range shifts for over 65% of the sampled species, with extinction risk significantly amplified where projected suitable habitats overlap with invasive fronts. This pattern confirms that generic protected area management is insufficient. The findings provide an urgent mandate for refining existing Red List assessments supplemented with scrutinised occurrence records, standardised population, threat and conservation data and underscore the necessity of highly customized, niche-specific conservation planning and site-specific eco-restoration to secure climate refugia against this dual environmental and biotic pressure.

Keywords: Invasive Species, Niche modelling, Range shift, Red list, Vulnerability assessment

T06-OP-02

Study of Aluminum-accumulation in *Spermacoce latifolia* and *Mussaenda frondosa* of family Rubiaceae collected from Ranchi District, Jharkhand

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Certain members of the family Rubiaceae exhibit a tendency to accumulate aluminum—an uncommon phenomenon observed in specific plant, often acknowledged as hyperaccumulators. The present study was conducted on *Spermacoce latifolia* Aubl., a common herb found in Jharkhand, and *Mussaenda frondosa* L., a shrub used in landscaping

for its dense and attractive appearance. T Plant samples were collected from three different locations in Ranchi and analyzed for both qualitative and quantitative tests of Aluminum using Chrome Azurol-S and ICP-MS. In this study, the aluminum accumulation was studied across different vegetative organs of both species, and translocation ratios were determined to assess the internal movement of Aluminum within plant tissues. The result shows that *S. latifolia* exhibits higher affinity towards aluminum compared to *M. frondosa*. Further comprehensive studies on the presence of Aluminum and its hyperaccumulation mechanisms in these plants may have potential applications in agriculture, horticulture, and phytoremediation.

Keywords: Aluminum accumulation, Histochemical tests, Rubiaceae, ICP-MS

T06-OP-03

Antioxidant defense enzyme activity and gene expression analysis in the wild variety of *Momordica charantia*

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Drought is a major abiotic stressor that lowers crop growth, development and yield. Plants response to drought stress involves a number of physiological processes. However, lipid peroxidation and the antioxidant defense system are important for drought tolerance. The goal of the current study was to find out the correlation between antioxidant enzyme activity and its gene expression for drought resistance in the wild variety of the commonly cultivated bitter gourd viz, *M. charantia* L. var. *muricata* Willd. This wild variety is known to have drought tolerance, but scientific investigation pertained to this is still lacking. The current study analyzed antioxidant enzyme activity and its gene expression for drought tolerance of *M. charantia* var. *muricata* in comparison with the cultivated variety, *M. charantia* var. *charantia.* Both the control and treated plants were grown in the greenhouse of the Department of Botany for the experiments. While the control plants received regular watering, the experimental groups experienced water stress by not receiving irrigation for 3, 5, 7, 9, and 11 days. According to the study, the wild variety produces two-fold increases enzymatic antioxidants viz, Glutathione reductase (0.3 Unit/min/g fw), Ascorbate peroxides (1.269±0.115 Unit/min/g fw), Catalase (16.162 Unit/min/g fw), and Superoxide dismutase (111.35 Unit/min/g fw) than the cultivar. These antioxidant enzymes work together to detoxify ROS generated during drought stress. Gene expression studies revealed that the genes, GSH (glutathione s-transferase), ALDH (aldehyde dehydrogenase), POD (peroxidase), and APX (ascorbate peroxidase) were found to have upregulated expression in the gene expression studies by quantitative reverse transcription PCR analysis; while, the expression profiling of GSH genes in the wild variety under five days of stress demonstrated maximum upregulation, followed by minimum fold expression. However, the expression level was higher than the cultivated variety. The overall study emphasized that drought tolerance of the wild variety *M. charantia* var. *muricata* showed effective activation of the antioxidant system, which provides new insight for the crop improvement in cultivated *M. charantia*

Keywords: Antioxidant genes, Drought stress, *Momordica charantia*

T06-OP-04

Adaptive vegetative strategies of *Utricularia* in response to climatic stress

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The genus *Utricularia* L. (Lentibulariaceae), commonly known as bladderworts, comprises highly specialized carnivorous plants that exhibit remarkable morphological and physiological adaptations to diverse habitats. The genus shows diverse vegetative reproductive strategies, including shoot fragmentation, tuber formation and formation of turions, which functions as ecological adaptative mechanism. The development of subterranean tubers or tuber like thick stolons found in nearly 20 species belonging to six different sections in *Utricularia* such as sections *Aranella*, *Chelidon*, *Orchidioides*, *Phyllaria*, *Pleiochasia* and *Utricularia*, represents a distinctive feature serving primarily as water storage organs. Additionally, the presence of carbohydrate reserves in certain species growing in alpine regions suggests their roles in perennation. Turions/winter buds or overwintering organs are vegetative, dormant storage organs formed by perennial aquatic plants growing in subtropical to polar zones in response to unfavourable ecological conditions, typically at the onset of autumn. They are reported in at least 14 genera of aquatic vascular plants across nine plant families, mainly among submerged and free-floating species. The aquatic *Utricularia* species growing in the polar regions formed these overwintering buds to facilitate vegetative reproduction to withstand climatic fluctuations. The present study discusses these vegetative reproductive strategies in relation to their adaptive significance under varying climate adaptations.

Keywords: Adaptive morphology, Bladderwort, Overwintering organs, Sect. *Phyllaria*, Storage organs, Tubers

T06-OP-05

Evaluation of Air Pollution Tolerance Index (APTI) of selected tree species of industrial areas in Nasik city, Maharashtra, India

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This study investigates the Air Pollution Tolerance Index (APTI) of selected tree species in the industrial region of Nasik City, Maharashtra, with the objective of evaluating their potential for air pollution mitigation. Thirteen tree species commonly occurring in the Satpur MIDC industrial zone were assessed: *Azadirachta indica* A.Juss, *Dalbergia sissoo* Roxb. *ex* DC, *Delonix regia* (Bojer *ex* Hook.) Raf., *Eucalyptus tereticornis* Sm., *Ficus benghalensis* L., *Ficus religiosa* L., *Mangifera indica* L., *Millingtonia hortensis* L.f., *Monoon longifolium* (Sonn.) B.Xue & R.M.K.Saunders, *Pongamia pinnata* (L.) Pierre, *Samanea saman* (Jacq.) Merr., *Senna siamea* (Lam.) H.S.Irwin & Barneby, and *Terminalia catappa* L. APTI was calculated based on four physiological and biochemical parameters: total chlorophyll content, leaf extract pH, relative water content, and ascorbic acid concentration. Data were collected seasonally from July 2022 to August 2023 to account for temporal variations. Among the species examined, *F. benghalensis* exhibited the highest APTI value (14.01),

indicating strong tolerance to atmospheric pollutants, whereas E. tereticornis recorded the lowest APTI value (9.16), suggesting a higher degree of sensitivity. Tree species with higher Relative Water Content (RWC) tend to have greater tolerance to air pollution. The findings underscore the importance of species-specific selection for green belt development and ecological planning in industrialized urban environments.

Keywords: Air Pollution Tolerance Index (APTI), Ascorbic acid, Chlorophyll, Green belt development, Nasik, Urban forestry

T06-OP-06

Predicting climate-resilient habitats for *Nepenthes khasiana*: Insights from niche modelling in Northeast India

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Anthropogenic pressures and changing environmental conditions necessitate the development of effective conservation strategies for endangered species. Due to habitat disturbance, the *Nepenthes khasiana* Hook.f., which is endemic and endangered in Northeast India, is steadily losing population. With the objective to assess potential reintroduction sites and analyze the effects of climate change, this study used Maximum Entropy modelling to evaluate the suitability of habitats both present and in the future. The distribution of species under current conditions and three Representative Concentration Pathways was projected using 30 occurrence records, bioclimatic predictors from WorldClim, and the BCC-CSM1.1 climate model. The model performed well with an AUC value of 0.972 ± 0.007. Distribution was influenced by annual precipitation, precipitation of the driest month, precipitation seasonality, temperature annual range, isothermality, and mean diurnal temperature range. Currently, 28,053.15 km² of Northeastern India has a climate that is conducive to *N. khasiana*. By 2050, suitable habitats are projected to increase under RCP6.0 (39,316 km²) and RCP8.5 (32,775 km²), while RCP4.5 shows a slight decline (27,110 km²). By 2070, RCP8.5 predicts a reduction to 21,341 km², whereas RCP4.5 and RCP6.0 indicate expansion to 40,244 km² and 33,139 km², respectively. Extreme scenarios (RCP6.0 and 8.5) showed gradual habitat loss, while RCP4.5 predicts long-term gains. The Khasi Hills and Nokrek belt are highly suitable for conservation and reintroduction, guiding climate-resilient species management. These findings demonstrate that predicted habitat dynamics will be helpful in guiding species recovery initiatives and influencing conservation plans that are climate-resilient.

Keywords: Conservation priority area, ENM, Habitat suitability, *Nepenthes khasiana*, Threatened plants

T06-OP-07

Phenology of wild edible species in Jawadhu hills, Tirupattur district, Tamil Nadu

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India is one of the subtropical countries with exceptionally rich floral and faunal diversity. Tamil Nadu encompasses two major hill systems—the continuous Western Ghats and the discontinuous Eastern Ghats. The present study focuses on the Jawadhu Hills, located in the Tirupattur district and forming part of the Eastern Ghats of Tamil Nadu. Enumeration of wild edible plants from this region revealed 142 species belonging to 112 genera and 61 families. The recorded species comprise 64 trees, 32 herbs, 27 shrubs, and 19 climbers. GPS-based mapping of these taxa illustrated their distribution patterns and habitat preferences. The elevation of the study area ranges from 450 feet to 1,176 feet above sea level. Seasonal availability data indicated that 10 species are available throughout the post-monsoon season, 14 species during the pre-monsoon season, 62 species during the southwest monsoon, and 24 species during the northeast monsoon. Assessment based on IUCN criteria categorized the wild edible plants as follows: Least Concern (70 species), Endangered (1 species), Data Deficient (4 species), Vulnerable (1 species), and Near Threatened (1 species).

Keywords: IUCN, Jawadhu hills, Phenology, Wild edible plants

T06-OP-08

Germination biology in some *Capparis* species from India

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The genus *Capparis* Tourn. *ex* L. consists of a perennial shrub, climbers and trees that exhibit remarkable adaptations to arid and semi-arid ecosystems. However, the potential for propagation via seed has been constrained by consistently low germination rates and extended periods for germination. A notable phenomenon observed in some *Capparis* species is cryptovivipary, wherein seeds germinate while still encased in the fruit attached to the parent plant, with seedling emergence occurring post-fruit detachment. This strategy is particularly advantageous in environment prone to instability, such as rocky slopes and volatile riverine habitats, where rapid seedling establishment is crucial for survival. The development of cryptovivipary within various *Capparis* species appears to be a result of an interplay between environmental pressures and specific physiological and morphological adaptations that circumvent typical seed dormancy mechanisms. This study investigates the detailed mechanisms underlying germination biology in selected *Capparis* species, highlighting how the initial phases of germination notably imbibition and the initial emergence are completed under the protective conditions provided by the maternal fruit structure.

Keywords: Adaptation, *Capparis*, Cryptovivipary, Diversity, Germination biology

T06-OP-09

Climate change and habitat suitability of *Clematis* species across two biodiversity hotspots in India: Insights from ensemble species distribution models

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Climate change significantly influences vegetation growth and global distribution. This study evaluates the potential habitats of three *Clematis* L. species *viz. C. manipurensis* (Brühl) W.T.Wang, *C. tongluensis* (Bruhl) Tamura, and *C. wightiana* Wall. under current and future climate scenarios using an ensemble modelling approach. While *C. manipurensis* and *C. tongluensis* are distributed across Bhutan, Manipur, Myanmar, Nagaland, Nepal, Sikkim, and West Bengal, *C. wightiana* is restricted to the Western Ghats. Nineteen bioclimatic variables from WorldClim were combined with physiographic (elevation, slope, hill shade), edaphic (soil pH, soil nitrogen, silt content), and biotic (crop and tree cover) factors to build the models. Species distributions were simulated using five machine learning algorithms: artificial neural networks, classification and regression trees, generalized linear models, random forest, and surface range envelopes. Among the predictors, soil nitrogen, soil pH, elevation, temperature annual range (bio7), mean temperature of the driest quarter (bio9), and precipitation seasonality (bio15) emerged as the most critical factors influencing distribution. Projections from ecological niche models indicate a substantial reduction in suitable habitats for these species by 2080, highlighting the urgent need for targeted conservation strategies.

Keywords: Bioclimatic variables, Climate change, Ecological niche modelling, Shared socio-economic pathways, Western Ghats

T06-OP-10

Air Pollution Tolerance Index (APTI) assessment of selected tree species of Chennai city

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The study was conducted in Chennai Metropolis located between latitude 12°50'49" and 13°17'24", and longitude between 79°59'53" and 80°20'12" is to evaluate the impact of air pollution on selected tree species. Ten frequently occurring tree species growing across three zones-control, traffic, and industrial-were selected based on Tamil Nadu Pollution Control Board classifications of Chennai metropolis air pollution. APTI parameters including total chlorophyll, relative water content, leaf extract pH, and ascorbic acid were measured to assess APTI. Variations in these parameters indicated air pollutant-induced stress in all

zones, reflected by reductions in chlorophyll, shifts in pH, and moderate changes in relative water content and ascorbic acid. The Air Pollution Tolerance Index (APTI) classified all ten species across all zones as sensitive (Apti value range from 1.01 to 10.28) The lowest value was recorded for *Peltophorum pterocarpum* (DC.) Backer *ex* K.Heyne 1.01 in residential zone while the highest value for *Tabebuia rosea* (Bertol.) Bertero *ex* A.DC. 10.28 recorded in Traffic zone, indicating low tolerance to urban air pollutants. These uniform sensitivity underscores the vulnerability of Chennai's urban trees and highlights the need to introduce more tolerant species for urban greenbelt development and sustainable air quality management.

Keywords: Air Pollution Tolerance Index (APTI), Biochemical parameters, Chennai city, Sensitive tree species

THEME 7

DIGITAL TAXONOMY AND AI APPLICATIONS IN BOTANY

T07-OP-01

Affordable digitization of herbarium collections: A practical approach for small herbaria

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Herbarium specimens represent essential scientific resources that function as research tools, archival materials, and taxonomic references across multiple disciplines of plant science. According to the *Index Herbariorum*, there are 4,029 registered herbaria worldwide, employing 13,691 staff members and collectively preserving over 403 million plant specimens. The Global Biodiversity Information Facility (GBIF) hosts more than 55.2 million digitized herbarium images, including over 52.3 million images of vascular plants, creating an invaluable open-access resource for global biodiversity research. Traditional herbarium digitization workflows involve pre-digitization curation, imaging, data capture, post-processing, and online publication. However, high operational costs ranging from approximately ₹500–₹665 per sheet for comprehensive digitization (including mounting, databasing, and imaging) to around ₹108 per sheet for imaging-only workflows restrict such initiatives primarily to well-funded institutions. To address this limitation, we developed a low-cost, high-efficiency herbarium digitization workflow suitable for small and medium-sized collections. The workflow replaces expensive scanning systems with a tripod-mounted DSLR camera, open-source databasing software, and affordable image-editing tools. It includes specimen cleaning, restoration, and addition of scale bars, color codes, barcodes, determinavit slips, and herbarium seals, followed by imaging, image enhancement (using Adobe Photoshop or Lightroom), and metadata entry in MS Excel (.xlsx or .csv). The processed data are integrated into an open-source web database with high-resolution images, supported by Wikimedia available at https://herbarium.stthomas.ac.in/ for the public. The estimated cost for digitizing herbarium sheets is approximately ₹10–₹15 (excluding personnel) per sheet, demonstrating a sustainable and affordable model for herbarium digitization in resource-limited institutions.

Keywords: Herbarium digitization, Biodiversity informatics, Low-cost workflow, Specimen imaging, Data management, Plant taxonomy, GBIF

T07-OP-02

Foldscope for plant taxonomy study, sample viewing methods and optimization of light sources to get clear images of pollen morphology

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Plant taxonomists use foldscopes for the microscopic study of various plant parts, such as pollen grains, spores, stomata structure, trichomes, anatomical structure and which provides crucial information for identification and classification. The present study was aimed to get clear image of pollen grains captured in the smartphone through Foldscope. The foldscope was used in this study, having 140X magnification. Pollen grains were dusted on the sticky transparent sheet in the paper slide. The slide was inserted in the slide slot of the Foldscope for further observation. Various viewing methods were employed: (1) Direct viewing, (2) Mobile phone viewing, (3) Projector method, (4) Screen sharing via screencast, and (5) Screen sharing through Google Meet. Lighting optimization included sunlight and LED light with techniques such as: (1) Brightfield illumination, (2) Dark field illumination, (3) Oblique illumination, and (4) Refractive lighting. Pollen grain external features were clearly visualized primarily through brightfield illumination, followed by refractive lighting.

Keywords: Foldscope, Light sources, Pollen grain morphology, Smart phone, Viewing methods

THEME 8

ECONOMIC BOTANY AND SUSTAINABLE UTILIZATION OF PLANT RESOURCES

T08-OP-01

The use of Cultar in Mango

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Mango (*Mangifera indica* L.) is a major fruit crop in tropical and subtropical regions, valued for its taste, nutritional value, and economic and cultural importance. India is the largest producer of mangoes, contributing significantly to global production with an annual production *c.* 22.8 million metric tons. However, alternate years of fruits bearing and exhaustion where a high-yield year is often followed by a low-yield year poses a significant challenge for a consistent supply chain management and for stable farmers' income. To overcome this issue, farmers have adopted an ingenious method of application of a plant growth regulator locally known in the market by the trade name Cultar to overcome this challenge by manipulating the flowering and fruiting cycles of mango trees. Cultar is a trade name of paclobutrazol, a plant growth regulator that inhibits gibberellin biosynthesis by blocking ent-kaurene oxidase activity in the gibberellin pathway. Gibberellins are hormones responsible for cell elongation and vegetative growth in plants. By reducing gibberellin levels, Cultar checks excessive vegetative growth and redirects the plant's energy towards reproductive growth. This shift leads to more consistent and higher fruit yields in mango trees. Cultar application in mangoes typically involves soil drenching around the base of the tree after pruning, at doses that vary to suit tree age, size, and variety. Cultar is applied to the soil in small trenches or rings around the drip line of the tree, in diluted form. The dosage of Cultar generally ranges from 1–2 g of active ingredient per meter of canopy diameter, depending on cultivar and conditions. Once absorbed by the roots, paclobutrazol inhibits gibberellin synthesis, reducing vegetative growth and promoting flowering and fruit set even in off-seasons, as mango trees are less sensitive to photoperiodism. Cultar is an effective tool for enhancing mango production by regulating flowering and fruiting, especially in overcoming exhaustion. Cultar application can help ensure consistent yields, better fruit quality, and overall improved economic returns for mango farmers when used as part of an integrated crop management strategy, Careful management and adherence to best practices are essential to harness its benefits sustainably.

Keywords: Cultar, Gibberellins, Mango, Paclobutrazol

T08-OP-02

Opuntia elatior: A promising xerophytic medicinal plant

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Opuntia elatior Mill. (Cactaceae) has been traditionally used for various therapeutic purposes. In Indian ayurvedic system of medicine, the fruit is considered hematinic,

ophthalmic, rheumatism, gonorrhoea, diphtheria, and asthma. Four different extracts were prepared using four different organic solvent (Methanol, Chloroform, Ethyl Acetate and n-hexane) from fruit. Out of this ethyl acetate solvent extract is show the good biological activity. Four different organic solvent out of this ethyl acetate solvent extract give comparatively show better activity in alpha amylase and anthelmintic activity. *Opuntia elatior* extracts have demonstrated significantly alpha amylase inhibitory activity, which could be useful in the management of diabetes. The secondary metabolites such as alkaloids, flavonoids, steroids, coumarins and anthraquinones are useful in antidiabetic and anthelmintic activity. Furthermore, *O. elatior* extracts have shown potential anthelmintic activity against various intestinal parasites, which could be useful in the treatment of parasites infections. Chloroform extracts have shown inhibitory effect on free radicals, which is prevent damage cells. n-hexane extract has exhibited anticancer activity against Human Adenocarcinoma Cell Lines (A549), which could be beneficial in the treatment of anticancer. Different organic solvent extract has not exhibited antibacterial activity against the strains of *Bacillus subtilus* (gram positive bacteria) and *Salmonella typhi* (gram negative bacteria). The fruit contained various phytochemical compound such as alkaloids, protein, steroids, terpenoids, flavonoids, glycosides, etc. for responsible for biological activity. TLC result show three bands in the TLC sheet. These Rf value is 0.69, 0.74, 0.91. FTIR analysis show the *O. elatior* fruit extract were show the various functional group like phenol ring, N-O stretching, C-H aliphatic group, CH bending, benzene rings present in plant extract. GC-MS of *O. elatior* fruit n- hexane extract were 3 major peaks show various chemical compound. Overall, present bioactive compounds in *O. elatior* fruit it may be potential therapeutic properties make it promising candidate for the development of new natural medicines for various disease and conditions.

Keywords: Biological activity, Fruit, GC-MS, *Opuntia elatior*, TLC

T08-OP-03

Wild edible fruits of Yadahalli Chinkara Wildlife Sanctuary, Bagalkot, Karnataka, India

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Yadahalli Chinkara Wildlife Sanctuary of Bagalkot district is one of the 32 wildlife sanctuaries of Karnataka, India. The present paper highlights wild edible fruits of the sanctuary, on which the people of the adjoining area are long depended. Floristic surveys and the interactions with the local community were conducted within the versatile habitat of this scrub forest, which harbors a wide variety of life. A total of 32 species belonging to 30 genera and 24 families contribute to the rich treasure of wild edible fruits. The family Fabaceae includes three species, followed by Capparaceae, Cucurbitaceae, Rhamnaceae, Rubiaceae, Rutaceae, and Phyllanthaceae with two species each. The remaining 17 families each contribute one species. The species *Capparis zeylanica* L., *Coccinia grandis* (L.) Voigt, and *Tamarindus indica* L. are consumed as both relishing fruits and vegetables. There is significant potential for commercializing many of these species to support the poor populace of the area. For example, dried seeds of *Strychnos potatorum* L.f. have a high market value of about INR 450/kg because of the usage of dry seed chunks in *pān*. *Annona squamosa* L., *Pithecellobium dulce* (Roxb.) Benth., *Syzygium cumini* (L.) Skeels, and few others also have a fair market value. *Carissa spinarum* L. and *Canavalia gladiata* (Jacq.) DC. have low

market value (INR 50-80/kg). The remaining species, which lack market exposure, are consumed primarily by forest-dependent families. In this regard, this paper conveys the quick information to the readers, users, forest department and the conservationist to act accordingly.

Keywords: Bagalkot, Scrub forest, Wild edible fruits, Wild edible plants, Yadahalli Chinkara Wildlife Sanctuary

T08-OP-04

Genus *Solanum* in India: An annotated checklist, with taxonomic notes on cultivated species and their wild relatives

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The cosmopolitan genus *Solanum* L. ranks among the world's top ten angiosperm genera in terms of species number (*c.*1250) and encompasses several crops of economic importance (e.g., potato, brinjal). In early 1990s, molecular phylogenetic studies have demonstrated that the erstwhile crop genera *Cyphomandra* Mart. *ex* Sendtn. (tree tomato) and *Lycopersicon* Mill. (tomato) were nested within *Solanum* and, therefore merged under it; all characterized by sympetalous, pentamerous flowers with a central anther cone with poricidal anther dehiscence. Published work on the enumeration of Indian *Solanum* is still at large since 1980, although piecemeal information does exist. Through several germplasm exploration trips all over the country, herbaria visits (five herbaria), consultation in the GBIF database and relevant online India herbaria/portals, experimental study of germplasm collections, as well as analysis from literature, we provide here the existence of 69 species (73 taxa) representing 24 native/wild, 15 naturalised, 22 casually cultivated/introduced, and 5 crop species in India. Out of 12 major clades in *Solanum*, 10 are represented here with the predominance of Clade *Leptostemonum* ('spiny solanums') with 42 species. *Solanum multiflorum* Roth, *S. hovei* Dunal, and *S. wightii* Nees are endemic to Peninsular India, while *S. pandeyi* L.J.Singh & Kasana is from Andaman. Our studies point out to the occurrence of African elements — *S. incanum* L., *S. anguivi* Lam., and *S. coagulans* Forssk. in India; the same were not included in the recent publication emanated from PBI Solanum Project. Experimental studies on *S. aethiopicum* L. collections from NE India reveals presence of parallel variation (for >10 traits) in this minor vegetable with the related brinjal crop. In case of wild relatives, *S. insanum* L. and *S. violaceum* Ortega exhibited diverse morphological variation across the distribution ranges. This presentation details out the misidentifications, updated synonymy and distribution, field identification keys, new reports, crop wild relatives, infraspecific variation, and so on.

Keywords: Clade *Leptostemonum*, New distribution report, *S. incanum*, *S. anguivi*, Vegetables

T08-OP-05

Forest composition, medicinal plant diversity, and conservation challenges in Jankadkal MPCA: A case study from the Central Western Ghats

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The Central Western Ghats of India, a globally recognized biodiversity hotspot, harbor rich floristic and medicinal plant diversity, particularly within the Jankadkal Medicinal Plants Conservation Area (MPCA) in Uttara Kannada district, Karnataka. This study assesses forest composition, medicinal plant diversity, regeneration status, and conservation challenges using a transect-cum-quadrat method across seven forest transects. A total of 219 plant species were recorded, including 178 medicinal species spanning trees, shrubs, climbers, and herbs. Evergreen forest types dominated the landscape, with high basal area and endemic richness—over 40% of tree species were endemic to the Western Ghats. Regeneration analysis revealed healthy recruitment patterns, especially among key medicinal trees such as *Olea dioica* Roxb., *Garcinia gummi-gutta* (L.) N.Robson, and *Pterospermum diversifolium* Blume. Microhabitat conditions significantly influenced species distribution, underscoring the need for site-specific conservation strategies. The study highlights the critical role of MPCAs in in-situ conservation and the potential for community-led initiatives to enhance sustainable harvesting, value addition, and livelihood generation. Strengthening research and development, alongside local participation, is essential to unlock the therapeutic and economic potential of these forest resources.

Keywords: Central Western Ghats, Community participation, Conservation, Forest, Jankadkal MPCA, Medicinal plant diversity

T08-OP-06

From fruit to future: Unlocking the potential of Wood Apple (*Limonia acidissima*)

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The present study focuses on exploring the nutritional, medicinal, and commercial potential of wood apple, along with the development of value-added products. The methodology involved fruit collection, pulp processing, product formulation, and preliminary evaluation for nutritional composition, shelf-life, and consumer acceptability. Findings highlight that wood apple products are not only nutrient-rich and health-promoting, but also hold significant promise in functional food industries. Moreover, the fruit can be introduced as a new crop option for farmers, with the possibility of developing hybrid high-yielding varieties, thereby contributing to sustainable agriculture, rural entrepreneurship, and economic growth. In conclusion, Wood Apple offers a unique opportunity to transform an

underutilized fruit into innovative products with nutritional, medicinal, social, and commercial value.

Keywords: Health-promoting, *Limonia acidissima*, Nutrient-rich, Value-added products, Wood Apple

T08-OP-07

Sustainable utilization of *Garcinia pedunculata*: Developing functional food ingredients from an underutilized fruit through optimised processing

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This study explores the sustainable utilization of *Garcinia pedunculata* Roxb. *ex* Buch.-Ham., an underutilized fruit, by converting it into stable, value-added powders. We aimed to evaluate how different drying methods (sun drying, hot-air oven drying, and freeze drying), a key aspect of sustainable post-harvest processing, affect the fruit's physico-chemical, nutritional, antioxidant, and anti-inflammatory properties to assess its potential for health-promoting functional foods. Fruits were processed at the mature and ripe stages. Hot-air oven drying was most effective for shelf-stability (moisture: 13.87%; water activity: 0.477 aw), while freeze-drying better preserved color, antioxidants, and anti-inflammatory activity. Mature fruit powders consistently outperformed ripe ones, exhibiting higher levels of total phenolic and flavonoid contents, antioxidant (IC50: 300.02 µg/mL), and anti-inflammatory activities (IC_{50}:163.46 µg/mL), along with significant crude fiber (5.95-10.18%) and mineral content. To further validate its economic potential as a source of bioactive compounds in targeting inflammation, molecular modelling studies identified garcinol and isogarcinol as stable, high-affinity inhibitors (-9.6 kcal/mol and -8.8 kcal/mol, respectively) of the inflammatory target COX-2, with favourable pharmacokinetic profiles. This combined approach adds value to a local resource and provides a scientific basis for sustainable commercialization. The study concludes that *G. pedunculata* represents a viable and sustainable plant resource for developing natural health products, contributing to both economic development and biodiversity conservation.

Keywords: Activity, Anti-inflammatory, Economic botany, Functional food ingredients, *Garcinia pedunculata*, Molecular docking, Sustainable processing

THEME 9

PLANT-ANIMAL INTERACTIONS IN ECOSYSTEM DYNAMICS

T09-OP-01

Foraging behaviour of *Megachile conjuncta* on *Dendrolobium umbellatum*

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Plant animal interactions, also known as plant-animal associations or biotic interactions, is a dynamic web of life referring to a diverse range of relationships between plants and animals, from mutually beneficial partnership to antagonistic conflicts. Among the most common insects interacting with plants, bees are important, unique and fascinating. Plants and bees have evolved together over millions of years, developing a complex and vital relationship. The present study explores the leaf foraging behaviour of leafcutter bees on *Dendrolobium umbellatum* (L.) Benth., seeks to understand the factors that influence and examines the ecological implications of this behaviour for both the bees and the plants. In the September of 2024, the authors noticed some unusual cuts with a characteristic pattern in *Dendrolobium umbellatum* plant, which is grown as ornamental in the Calicut University Botanical Garden, and also some constructed nests in a plant pot. Two different coloured *Megachile conjuncta* Smith. bees were observed responsible for the cuts. Leafcutter bees, a group of fascinating insects, are solitary, cavity-nesting bees that are known for their unique behaviour, belonging to the family Megachilidae. Leaf cutting behaviour was characterised by the removal of leaf fragments from the leaflets. The bees cut nearly circular leaf discs from mature leaflets. These insects play a dual ecological role in ecosystems as pollinators and ecological engineers, pollinating flowers while also interacting with plant foliage for nesting material. These bees do not rely on hive structures like honeybees but instead use cut leaf fragments to line and partition individual nests in pre-existing holes. The present study investigates the nesting, foraging, and leaf-cutting behavior of *Megachile conjuncta* on *Dendrolobium umbellatum*, with emphasis on leaf traits, pollen utilization, and ecological interactions. Systematic surveys revealed that all the 182 observed plants bore characteristic leaf-cutting marks, with bees removing fragments in about 18 seconds. Mature leaves were consistently preferred, while young and senescent leaves were avoided. Leaf discs were cut in oval (1.9 × 1–0.5 cm) and round (0.5–0.6 cm) shapes, and used for lining and sealing brood cells, respectively. Each nest contained 4–5 brood cells constructed exclusively from *D. umbellatum* leaves, arranged linearly within pre-existing cavities such as bamboo internodes. Pollen analysis showed that brood cell provisions were dominated (90%) by pollen from another Fabaceae member, confirming that *D. umbellatum* primarily served as a leaf source rather than a larval food plant. SEM revealed contrasting morphology between *D. umbellatum* pollen and pollen stored in brood cells. Additionally, *D. umbellatum* hosted diverse insect communities including pollinators, herbivores, and sap feeders, underlining its ecological significance. Overall, the findings highlight the role of leaf and chemical traits in shaping plant–insect interactions, and the specialized nesting ecology of *M. conjuncta*, offering insights for pollinator conservation and chemical ecology of Fabaceae.

Keywords: Bee behaviour, Leaf cutter bees, Nesting bees, Plant animal interactions, Pollinations biology

T09-OP-02

To switch or not to switch? Factors shaping floral constancy for Himalayan bumblebees in a diverse ecosystem

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Floral constancy, a pollinator's flexible specialisation on one or a few flowering species per foraging trip, is critical for efficient con-specific pollen transfer and plant reproduction. This foraging decision is expected to be shaped by the floral landscape. For example, a species abundance can offer a strong, rewarding sensory signal, while floral diversity presents multiple choices that challenge a pollinator's memory and motor skills. However, the interactive effect of these factors on plant-pollinator dynamics remains poorly understood, especially in biodiverse ecosystems like the Western Himalayas. To address this gap, we integrated field and laboratory methods at two alpine sites in Uttarakhand, Western Himalayas. Across 24 plots, we recorded 171 bumblebee foraging bouts and conducted simultaneous floral surveys to quantify Shannon diversity and relative species abundance. To align observed foraging patterns with their outcomes, pollen loads from 40 collected bees were analysed using light microscopy. Our findings show that Himalayan bumblebees exhibited floral constancy. Constancy decreased significantly with increasing plot-level diversity, but increased for locally the most abundant flowering species. Pollen load analysis supported this pattern: a species dominance in the pollen was inversely related to floral diversity and directly corresponded to its relative abundance. Our results suggest that the Himalayan bumblebees forage adaptively in response to the local floral environment, supporting the modern perspective that multiple floral choices encourage flexible switching, rather than forcing specialisation due to cognitive load. Such insights are crucial for understanding plant-pollinator dynamics and informing conservation strategies in sensitive, high-altitude ecosystems.

Keywords: *Bombus*, Floral constancy, Floral diversity, Plant-pollinator interactions, Resource abundance, Western Himalayas

T09-OP-03

Understanding pollination biology through pollinator activity and interaction patterns

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Plant-animal interactions form the foundation of ecosystem stability and biodiversity. Among these, pollination plays a crucial role in plant reproduction and community dynamics. The present study focuses on understanding pollination biology through direct observations of bees and butterflies visiting flowering plants in their natural habitat. Field surveys were conducted to document the diversity, frequency, and timing of pollinator visits during different hours of the day. Bees were observed as the most frequent visitors, showing

regular foraging activity in the morning and early afternoon, while butterflies exhibited peak visitation during mid-morning to midday. The study also recorded differences in visitor behaviour such as pollen collection, nectar foraging, which influenced the efficiency of pollen transfer. These findings highlight the importance of temporal activity patterns and pollinator diversity in maintaining effective pollination and overall reproductive success of plants. The research contributes to understanding mutualistic relationships in nature and emphasizes the need for conserving pollinator species that are vital for sustaining ecological balance and plant diversity.

Keywords: Bees, Biodiversity, Butterflies, Foraging behaviour, Plant–animal interaction, Pollination biology

T09-OP-04

Studies on pollen morphology of selected species in Vivekananda College Campus, Tamil Nadu, India

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This study presents a comprehensive investigation of pollen morphological characters of selective plants from Ramakrishna Mission Vivekananda College (A) Mylapore, Chennai. Morphological analysis of 51 species, belonging to 48 genera and 32 families, was carriedout using the NPC system, focusing on the number, position, and character of apertures, shape, size, exine sculpture, exine thickness, colpi dimension, polar diameter, equatorial diameter, P/E ratio of pollen. Results revealed seven types of aperture numbers: seven species were monotreme, six ditreme, 26 tritreme, nine tetratreme, one pentatreme, one hexatreme, and one polytreme. Five types of aperture positions were recorded—34 species zonotreme, six dizonotreme, five anacatatreme, eight anatreme/catatreme, and two pantotreme. Aperture character analysis identified five categories: 16 species porate, 10 colpate, 14 pororate, eight colporate, and three leptoma. Pollen shape was classified into four categories: 35 species spherical, seven elliptical, three angular, and six triangular, with spherical forms being predominant, while angular forms were comparatively rare, observed in only three species. Exine sculpture exhibited seven distinct patterns: 29 species were scabrate–granulate, seven were psilate, four were echinate, four were perforate, three were verrucate, three were foveolate, and one was rugulate, reflecting notable structural diversity in pollen wall ornamentation. Considerable variation in pollen size was also observed, with *Senna auriculata* (L.) Roxb. showing the largest pollen grains (901 µm) and *Typhonium trilobatum* (L.) Schott the smallest (112 µm). Overall, the findings highlight the extensive morphological diversity among pollen grains, providing critical insights into taxonomic differentiation, palynological classification, and evolutionary relationships.

Keywords: Chennai, NPC system, Pollen morphology

T09-OP-05

Trap size and prey composition of two coexisting endemic *Utricularia* species from lateritic plateaus of northern Kerala

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Utricularia L. (Lentibulariaceae) is the largest genus among carnivorous plants and possesses the most complex traps; its trapping mechanism is still being investigated. In India, it is represented by 37 species under five sections. Many endemic species of *Utricularia* grow as extensive populations spanning several square kilometres in the lateritic plateaus of the Western Ghats. The present study aimed to determine the comparative trap size and prey composition of two coexisting endemic *Utricularia* species, such as *U. sainthomia* P.Biju, Josekutty, Janarth. & Augustine and *U. cecilii* P.Taylor, collected from three different locations in the lateritic plateaus of Kannur and Kasaragod districts. Among them, *U. cecilii* shows a larger population size and mass flowering than *U. sainthomia*. Fifty bladders from each plant were collected and measured trap characters and analysed prey contents. Zooplanktons like Harpacticoids, Cyclopidae, Ostracoda, Rotifers, *Elaphoidella*, Chironomids, Acari, insect larvae, and some algal species were identified from the analysed traps. Prey abundance and morphospecies richness are higher in *U. sainthomia* than in *U. cecilii*.

Keywords: Endemic, Trap, *Utricularia*, Zooplanktons

THEME 10

PHYTOCHEMICAL STUDIES AND BIOACTIVE COMPOUNDS

T10-OP-01

Comparative phytochemical and antioxidant evaluation of ethanolic extracts from two selected species of *Zehneria* (Cucurbitaceae)

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Phytochemicals are naturally occurring, physiologically active chemical compounds found in plants that provide health benefits for humans beyond those associated with macronutrients and micronutrients. Since ancient times, plants have served as a primary source of pharmacologically active compounds, used by humans for a wide range of therapeutic purposes. The Cucurbitaceae family is a large and diverse group of flowering plants comprising approximately 125 genera and over 960 species. It is recognized for its therapeutic benefits in Ayurveda and Indian traditional medicine, and it could serve as a source for the development of safe and effective treatments. *Zehneria* Endl. is a genus of flowering plants in the family Cucurbitaceae with potential medicinal properties. The present study aimed to compare the phytochemical profiles and antioxidant potential of ethanolic extracts from two *Zehneria* species. Standard qualitative phytochemical screening was performed to detect the presence of bioactive compounds. Quantitative assays, including Total Phenolic Content (TPC) and Total Flavonoid Content (TFC), were also conducted. The antioxidant activity of plant extracts was evaluated using the ABTS and DPPH assays. The present findings indicate significant variation in the phytochemical composition and antioxidant activity between the two *Zehneria* species selected for this study.

Keywords: Antioxidants, ABTS, DPPH, Flavonoids, Phenols, *Zehneria*

T10-OP-02

Qualitative phytochemical analysis and antioxidant assay of selected plants of the genus *Rotheca*

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Most of the members of the family Lamiaceae are aromatic and have significant importance in medicinal, traditional and culinary uses. The genus *Rotheca* Raf., which belongs to this family, comprises approximately 36 species distributed in tropical and subtropical Asia and Africa. *Rotheca serrata* (L.) Steane & Mabb. and *Rotheca microphylla* (Blume) Callm. & Phillipson are the two species of this genus reported from Kerala. In this study, the

qualitative phytochemical analysis and antioxidant assay of leaf extracts from these two plants were conducted. The antioxidant activity of methanolic leaf extracts was evaluated using the DPPH radical scavenging assay, Nitric Oxide scavenging assay, Phosphomolybdenum reducing power assay and FRAP assay. Preliminary phytochemical analysis revealed the presence of bioactive compounds such as alkaloids, tannins, flavonoids, glycosides, sugars, anthraquinones, steroids, terpenoids, and amino acids in both plants. The antioxidant assays showed that both selected plants are potential sources of natural antioxidants. Comparatively, extracts of *R. serrata* exhibited slightly higher antioxidant potential than those of *R. microphylla*, except in the phosphomolybdenum reducing power assay. This study paves the way for further investigations, such as structural elucidation of compounds using advanced chromatographic and spectroscopic techniques, in vivo tests for antioxidant activity, and identification of molecular mechanisms of action.

Keywords: Antioxidants, Phytochemistry, *Rotheca microphylla*, *Rotheca serrata*

T10-OP-03

Bioprotective potentials of *Blepharistemma serratum*: An endemic species of Western Ghats

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Blepharistemma serratum (Dennst) Suresh is a small tree belonging to Rhizophoraceae. It is endemic plant seen in Southern Western Ghats. The crude methanolic extract of *B. serratum* leaf and fruit was subjected to quantitative estimation of phenol and flavonoid. The total phenol was determined by Folin-Ciocalteu method and total flavonoid by Aluminium chloride method. The phenol and flavonoid content of young fruit was 78.94 mg GAE/g extract and 18.65 mg Quercetin/g extract. Antioxidant activity of the extracts was done by DPPH and ABTS methodology. The IC 50 value of DPPH assay was 43.79 µg/ml and 263.63 µg/ml for fruit and leaf extract respectively. The IC 50 value of ABTS assay was 75.02µg/ml and 170.68µg/ml for fruit and leaf extract respectively. The fruit extract showed promising antioxidant effect compared to leaf extract. Antibacterial assays were done by Agar well diffusion method. ZOI of 9mm and 10mm was obtained against *Streptococcus pyogenes* in the fruit extract at a concentration of 3mg/ml and 5mg/ml respectively. The leaf extract showed no antibacterial activity. Antifungal assays were conducted against four human pathogenic fungal strains. The crude leaf extract showed 13mm ZOI at 5mg concentration against *Mucor racemosus*. The fruit extract showed activity against all four fungi at 5mg concentration the ZOI inhibition ranged from 5mm to 19mm. Highest was shown against *Candida albicans*. Protein denaturation inhibition assay was conducted using Bovine serum albumin and IC50 value for fruit extract was 97.09 µg/ml and leaf extract was 113.29 µg/ml. The Cyclooxygenase and lipoxygenase assay was conducted for the fruit extract. The cox assay IC 50 was 108.67 µg/mL and Lox assay IC 50 was 115.69 µg/mL.

Keywords: Antibacterial, Antifungal, Anti-inflammatory, Rhizophoraceae, TFC, TPC

T10-OP-04

Fatty acids as biochemical signatures: What plant oils reveal about systematics and ecological adaptations

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Fatty acids (FAs) underpin plant physiology, ecological adaptation, nutritional, pharmaceutical, and industrial significances, while also offering valuable chemotaxonomic insights in plant systematics in recent years. This synthesis examines FA profiles across three diverse genera – *Leucas* R.Br. (Lamiaceae), *Impatiens* L. (Balsaminaceae), and *Crotalaria* L. (Fabaceae) – highlighting their significance as indicators of evolutionary novelty in lipid metabolism. In *Leucas*, analysis of 26 species and five varieties revealed major FAs including palmitic, stearic, oleic, linoleic, and the unusual allenic FA laballenic acid. Three taxa, namely, *L. helianthimifolia* Desf., *L. ciliata* var. *vestita* (Benth.) Sunojk., and *L. hirta* Spreng., contained over 40% laballenic acid, with phlomic acid also detected. Multivariate analyses supported the chemotaxonomic grouping of these species under section *Astrodon*. In flowering plants, allenic FAs are uncommon and likely function as defensive or ecological signals rather than core metabolic lipids. In *Impatiens*, profiling of 21 species revealed four forms of conjugated parinaric acid (about 6–70%) and α-eleostearic acid, absent in the related *Hydrocera triflora* (L.) Wight & Arn. Species such as *I. mengtszeana* Hook.f. and *I. oppositifolia* L. accumulated parinaric acid at exceptionally high levels (>50%). Beyond *Impatiens*, parinaric acid is largely restricted to seeds of *Parinari* Aubl. and related Chrysobalanaceae, where it serves defensive and ecological functions through oxidative reactivity. In *Crotalaria*, seed oils showed consistently high linoleic acid (42–65%) and specific pattern of other fatty acids across 33 species, exceeding levels typical in legumes and providing a robust chemotaxonomic fingerprint for the genus. Collectively, these findings demonstrate that both common and unusual FAs can serve as novel and reliable chemotaxonomic tools, reflecting evolutionary relationships, ecological adaptations, and potential applications in pharmaceutical, nutritional, and industrial contexts.

Keywords: Plant lipids, Chemotaxonomy, Ecological adaptation, Seed oils, unusual fatty acids, Plant defense mechanisms

T10-OP-05

Phytoconstituents profiling of *Phyllanthus maderaspatensis* by using HR-LCMS analysis

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Phyllanthus maderaspatensis L. is a significant medicinal herb in genus *Phyllanthus* L., widely distributed in India. The plant is known to contain several pharmacologically important biomolecules, with efficacy supported by numerous biochemical and pharmacological studies. The present analysis provides a comprehensive qualitative analysis of various chemical compounds detected in the sample using advanced high-resolution liquid chromatography-mass spectrometry (HR-LCMS) technique. This advanced technique aids in the structural identification of many compounds, enabling precise profiling of the

plant's complex metabolite composition by identification of compounds by measuring their mass-to-charge ratio. The assay comprises numerous compounds, detailing their molecular formulas, mass spectra, and abundance information. The objective is to characterize the chemical profile of the sample, facilitating further investigations in applications such as metabolomics, pharmaceuticals, or material sciences. Results include the identification of compounds like mahanimbinol, clethodim, gabapentin, and pheophorbide etc. This systematic compound characterization supports research and quality control processes in scientific and industrial settings.

Keywords: Biomolecules, Clethodim, HR-LCMS, Pharmaceuticals, *Phyllanthus*

T10-OP-06

A comparative GC-MS aided study of *Saraca asoca* main bark, branch bark and leaf phytochemistry and changes over a year of storage

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GC-MS analysis of *Saraca asoca* (Roxb) W.J.de Wilde main bark, branch bark, and leaves was carried out to elucidate their volatile and semi-volatile phytochemical compositions. Dried plant materials were pulverized and subjected to methanolic extraction. Reconstituted 1mg/ml extracts were introduced into a SHIMADZU Nexis GC-2030 Gas Chromatography. Phytochemical identification relied on spectral matching against three NIST libraries. The unique phytochemicals of main bark are Octamethyl-cyclotetrasiloxane (RT-7.07); Azulene (RT-10.84); Octadecamethyl-cyclononasiloxane (RT-18.72); Kolavenol (RT-19.71), Hexadecamethyl-cyclooctasiloxane (RT-21.79), Eicosamethyl-cyclodecasiloxane (RT-25.48), 1,4-dimethyl-3-(2-methyl-1-propene-1-yl)-4-vinyl-1-cycloheptene (RT-26.21), Eicosamethyl- cyclodecasiloxane (RT-28.28) and γ-Sitosterol (RT-30.62). The phytochemicals common to both main bark and branch bark are Decamethyl-cyclopentasiloxane (RT-9.80), 2-(hydroxymethyl)-2-nitro-1,3-propanediol (RT-14.51), Hexadecamethyl-cyclooctasiloxane, (RT-16.91), 4-O-Methylmannose (RT-17.70), Methyl stearate (RT-22.41), 2-methyl-4-(2,6,6-trimethyl-1-cyclohexenyl)- but-3-enal (RT-26.54), Decahydro-1,1,4,7-tetramethyl-4aH-cycloprop[e]azulen-4a-ol (RT-28.01), and Squalene (RT-29.63). Leaf extract presented a list composition with main bark includes 9,12-Octadecadienoic acid, Methyl ester (RT-22.10), Methyl stearate (RT-22.41), and Squalene (RT-29.63). Moreover, the methanolic extracts derived from the powder stored for one year under standard laboratory condition were analysed using GC-MS to assess the impact of storage. The results revealed a significant reduction in the peak intensities of different phytochemicals, indicating a considerable decrease in their concentrations over time.

Keywords: Effect on storage, GC-MS, Phytochemistry, Plant parts, *Saraca asoca*

T10-OP-07

Screening of therapeutical potentials of selected species of *Justicia* in Kerala

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The genus *Justicia* L. (Acanthaceae) represents one of the most significant groups of medicinal plants, widely distributed in tropical regions and extensively used in traditional medicine. In Kerala, several *Justicia* species are employed in Ayurvedic and folk remedies for treating respiratory disorders, inflammation, fever, and microbial infections. The present study aimed to evaluate the phytochemical composition, antioxidant capacity, and antimicrobial activity of five selected species—*Justicia adhatoda* L., *J. glauca* Rottler, *J. simplex* D.Don, *J. procumbens* L., and *J. diffusa* Willd. Preliminary phytochemical screening of methanolic and aqueous extracts confirmed the presence of bioactive secondary metabolites such as alkaloids, flavonoids, phenolics, tannins, saponins, terpenoids, and glycosides. Quantitative estimation revealed higher total phenolic and flavonoid contents in *J. adhatoda* and *J. glauca*, followed by *J. simplex* and *J. procumbens*, indicating strong antioxidant potential. The antioxidant activity, determined by ABTS and FRAP assays, showed significant radical scavenging and ferric reducing capacities in all tested species. Among them, *J. glauca* and *J. adhatoda* exhibited the highest antioxidant efficiency, correlating well with their phenolic concentration. The findings suggest that these species can effectively counter oxidative stress and related degenerative conditions. Antimicrobial activity was assessed using agar well diffusion and minimum inhibitory concentration (MIC) methods against selected Gram-positive and Gram-negative bacteria, including *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa*. Extracts of *J. adhatoda*, *J. procumbens*, and *J. diffusa* exhibited notable inhibitory effects, demonstrating broad-spectrum antimicrobial potential. Overall, the study highlights that the selected *Justicia* species possess significant therapeutic potential owing to their rich phytochemical profile, strong antioxidant properties, and effective antimicrobial action. These findings scientifically validate their traditional uses and provide a biochemical basis for further isolation, characterization, and pharmacological exploration of bioactive compounds from *Justicia* species of Kerala.

Keywords: Antimicrobial potential, Antioxidant activity, *Justicia*, Medicinal plants, Phytochemical screening

T10-OP-08

Fatty acid profiling in the Myristicaceae of the Western Ghats and its taxonomic significance

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The *Myristicaceae* family in the Western Ghats comprises nine tree species distributed across three genera; *Myristica* Gromov., *Knema* Lour., *Gymnacranthera* (A.DC.) Warb. Specifically, *Myristica beddomei* King, *M. pushpangadaniana* M.G.Govind & Dan *ex* Kottaim., *M. magnifica* Bedd., *M. malabarica* Lam. and *M. trobogarii* M.Govind & Dan. and the exotic *M. fragrans* Houtt., renowned for producing mace and nutmeg. The genus *Knema* has two species, *K. attenuata* (Wall. *ex* Hook.f. & Thomson) Warb. and *K. flavostamina* M.G.Govind & Dan. The genus *Gymnacranthera* contains a single species, *G. canarica* (Bedd. *ex* King) Warb. Studies on fatty acid profile of seeds of Myristicaceae members have proven as an efficient tool. The seed fatty oils were isolated by Soxhlet apparatus and analysed through FAME GC-MS. The capric acid was detected in genus *Gymnacranthera* whereas cis-5-dodecanoic acid was only detected in the members of genus *Knema*. In *G. canarica*, *K. attenuata* and *K. flavostamina*, myristic acid was the major compound. Margaric acid was observed as the marker compound in *M. malabarica*. Oleic acid and palmitic acid were the major compounds in *M. beddomei*, *M. pushpangadaniana* while myristic acid and oleic acid were the major constituents in *M. magnifica* and *M. malabarica*. In the newly discovered species *M. trobogarii*, though myristic acid was the major compound, presence of an exclusive compound elaidic acid was detected. Dendrogram showed *K attenuata* and *K. flavostamina* were closely allied. The five species of *Myristica* come together in a clade whereas *M. fragrans* the exotic species stood distantly related. The interrelationships found in the present study highlight the significance of multidisciplinary data analysis to elucidate robust species relationships.

Keywords: FAME GC-MS, Fatty acid, Myristicaeae, Western Ghats

T10-OP-09

Exploring the phytochemical potential of *Strophanthus wightianus*: Implications for *in vitro* culture as a tool for sustainable therapeutics uses

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Strophanthus wightianus Wall. *ex* Wight is an endemic medicinal woody liana belonging to the family Apocynaceae. The plant is distributed in the sacred groves and scrubbed jungles of Kerala and Tamil Nadu (India). The limited knowledge of this plant prompted us to address the research gap in phytochemical and conservation areas of *S. wightianus*. The explants (leaf, node and stem) were cultured on full strength Murashige and Skoog medium augmented with BAP 3mg/L+NAA 3mg/L, NAA 3mg/L, NAA 2mg/L, achieved better callus biomass in leaf explant. Even though leaf callus exhibited a slow induction initially, they outperformed node and stem explants in attaining maximum result. *In vivo* leaf extract outdid *in vitro* leaf callus extract in yield percentage (41.09%), total phenol (60.5± 8.4 mg GAE/g extract), flavonoid 40.75±0.63 (mg QE/g extract), alkaloid (115±5.29 (mg AE/g) and saponin (100.29 ±1.1mg DE/g) content in 70% methanol. The DPPH (IC_{50}=130.55±2.1 µg/mL) and FRAP (51.79±0.13µg/mL) activities have also observed to be more in *in vivo* leaf extract than callus extract. But *in vitro* anti-inflammatory activity seemed to be more in callus extract in cyclooxygenase (84.65±2.2 µg/mL) and lypoxygenase (91.26±3.4 µg/mL) inhibition assay. The liquid chromatography–mass spectrometry analysis of *in vitro* callus extract revealed various bioactive components with a wide variety of alkaloids, saponin, terpenes and phenolic components than *in vivo* leaf extract. The result manifested that both

have promising activities and need to be explored more. Therefore, the need of conservation of *S. wightianus* is necessary and it could be achieved through *in vitro* techniques.

Keywords: Antioxidant, Anti-inflammatory, BAP, Callus culture, Conservation, Endemic medicinal plant, Metabolite screening, NAA,

T10-OP-10

Green synthesis and characterization of Magnesium oxide (MgO) nanoparticles using *Phyllanthus niruri* leaf extract and their antibacterial potential

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The present study focuses on the eco-friendly synthesis of Magnesium oxide (MgO) nanoparticles utilizing *Phyllanthus niruri* L. leaf extract as a natural reducing and stabilizing agent. Structural characterization through X-ray diffraction (XRD) confirmed the formation of highly crystalline MgO nanoparticles with a cubic phase structure, exhibiting an average crystallite size of 44.13 nm as determined by the Debye–Scherrer equation. Scanning electron microscopy (SEM) revealed a highly agglomerated morphology, while energy-dispersive X-ray analysis (EDAX) confirmed the presence of magnesium and oxygen with negligible impurities. Optical studies using UV–Vis spectroscopy showed a strong absorption peak at 225 nm, with a calculated band gap energy of 5.52 eV, consistent with nanoscale MgO properties. Fourier-transform infrared spectroscopy (FTIR) identified key functional groups responsible for nanoparticle formation and stabilization, confirming Mg–O bonding and surface hydroxyl groups. The biosynthesized MgO nanoparticles exhibited potent antibacterial activity against both gram-positive and gram-negative strains, notably *Bacillus subtilis*, *Staphylococcus aureus*, *Vibrio cholerae*, and *Neisseria mucosa*, with the highest inhibition zone observed for *B. subtilis* (1.9 mm). The enhanced antibacterial effect is attributed to reactive oxygen species (ROS) generation and membrane interaction. This study highlights the potential of green-synthesized MgO nanoparticles as sustainable, biocompatible, and cost-effective agents for applications in nanomedicine, pharmaceuticals, and environmental remediation.

Keywords: Antibacterial activity, Green synthesis, Magnesium oxide nanoparticles, Nanobiotechnology, Optical properties, *Phyllanthus niruri*

T10-OP-11

Stress-induced impacts on secondary metabolite production and antioxidant potential of *Gymnema sylvestre*

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Gymnema sylvestre (Retz.) R.Br. *ex* Sm. is a perennial woody climber belonging to the family Apocynaceae. The plant used in the Ayurveda system of medicine and is well-known for its antidiabetic and antioxidant properties. The present study investigated the effects of different stress signals mineral salts (Zinc sulphate, Sodium nitroprusside), elicitors (Salicylic acid, Jasmonic acid), and a metabolic feeder (Squalene) on phytochemical and antioxidant responses in *G. sylvestre*. The mode of application was foliar spray in the early morning, with a frequency of application once per week. After 90 days, leaves were collected and shade dried and powdered. Methanolic extracts were prepared using Soxhlet extraction and concentrated to 50 ml. Treatments significantly influenced the accumulation of major secondary metabolites, including flavonoids, polyphenols, saponins, tannins, and terpenoids. Among elicitors, Jasmonic acid 1 mM (0.4492±0.00985 mg/ml) markedly enhanced flavonoid content, while Salicylic acid 150 µm promoted the highest polyphenol (0.2488±0.00205) and tannin (0.3875±0.00425 mg/ml) accumulation. Zinc sulphate 0.1 mM maximized saponin levels (0.4818±0.004 mg/ml), and Squalene 1µm induced the highest terpenoid (3.7291±0.01142 mg/ml) production. Antioxidant assays revealed that SNP 0.5 mM (79.81±0.4430 %) and JA 50µm (63.91±0.4419%) exhibited the strongest free radical and hydroxyl radical scavenging activities, while FRAP analysis indicated superior reducing power in SNP 0.5 mM (6.59) and JA 100µm (52.28) with notably low EC_{50} values. The findings demonstrate that controlled application of these stress signals can substantially elevate antioxidant capacity and secondary metabolite production in *G. sylvestre*. This suggests a potential strategy for improving the pharmacological efficacy of medicinal plants through stress mediated biochemical modulation.

Keywords: Anti-oxidant, *Gymnema silvestre*, Medicinal plant, Secondary metabolites, Stress signals

T10-OP-12

Comparative phytochemical profiling of *Ulva lactuca* (Chlorophyceae) from selected coastal regions of Northern Kerala

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Seaweeds are considered among the richest bioreserves, containing numerous bioactive compounds with versatile properties and multiple activities. This study focused on estimating and identifying phytochemical components, secondary metabolites, and antioxidant efficiency of edible green seaweed *Ulva lactuca* L. (Chlorophyceae). Qualitative phytochemical analysis of methanol solvent extracts revealed the presence of phenol, flavonoids, terpenoids, alkaloids, tannins, steroids, saponins, quinones, and glycosides. Total Phenol Content (TPC) equivalent to (Gallic Acid Equivalent) GAE, Total Flavonoid Content (TFC) in Quercetin Equivalent (QE), and Total Tannin Content (TTC) equivalent to Tannic Acid (TA) were estimated. Additionally, Total Antioxidant Content (TAC) was assessed in extracts of macroalgae collected from different coastal areas, which exhibited significant differences. The secondary metabolite profile of the methanol extract was analysed by LC-MS/MS, revealing the prominent components. The antioxidant activity of *Ulva lactuca* extracts was confirmed using DPPH and ABTS assays. These findings suggest that the green seaweed *U. lactuca* could serve as a potential natural source of antioxidants for use in food and pharmaceutical applications.

Keywords: Antioxidants, LC-MS/MS, Phytochemicals, Seaweed, *U. lactuca*

T10-OP-13

Unmasking market turmeric: Comparative analysis of quality of turmeric powders from city markets on the basis of Curcumin levels, adulteration, and phytochemical quality

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Turmeric (*Curcuma longa* L.) is a widely used spice valued for its therapeutic and culinary properties, largely attributed to its bioactive compound curcumin. Despite its global demand, concerns about the quality and authenticity of market turmeric powders persist due to adulteration and compositional variability. This study aimed to comparatively assess two branded turmeric powders available in the Calicut city market against a standard *Curcuma longa* cv. *Pragati* sample. Quality evaluation was based on curcumin content, the presence of adulterants, and phytochemical potential using analytical techniques including HPLC, GC–MS, TLC, and biochemical assays. Results revealed significant differences among the samples. The natural turmeric exhibited the highest curcumin, total phenolic, and flavonoid contents, along with superior antioxidant activity (DPPH value 12.5%). Market samples showed reduced phytochemical potency and tested positive for yellow lead salts, indicating adulteration. GC–MS analysis identified major essential oil components such as turmerone and aR-turmerone, while also detecting thymyl tiglate—a synthetic and potentially toxic adulterant—in market samples. HPLC confirmed lower curcuminoid levels in commercial powders compared to the standard. The findings emphasize considerable variability in the chemical composition and purity of turmeric powders sold in urban markets. Adulteration with harmful substances poses significant health risks and underscores the urgent need for stringent quality control and regulatory monitoring in the turmeric supply chain.

Keywords: Adulteration, Curcumin, GC–MS, HPLC, Phytochemical analysis, Quality assessment Turmeric

T10-OP-14

Bioactive compounds from medicinal angiosperms: Taxonomic insights and pharmacological potential

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The Marathwada region of Maharashtra represents a transitional zone of rich floral diversity, where traditional knowledge has long emphasized the use of medicinal angiosperms. Despite their ethnobotanical importance, many species remain insufficiently characterized for their phytochemical and pharmacological potential. This study explores five medicinally significant angiosperms from Marathwada—*Vitex negundo* L., *Argemone Mexicana* L., *Malvastrum coromandelianum* (L.) Garcke, *Sphagneticola calendulacea* (L.) Pruski, and *Rauvolfia tetraphylla* L. through Gas Chromatography Mass Spectrometry analysis to profile their bioactive compounds and evaluate their pharmacological relevance. GC–MS screening revealed a wide spectrum of secondary metabolites including alkaloids, flavonoids, terpenoids, sterols, and fatty acid derivatives. *Vitex negundo* was characterized by flavonoids and iridoid glycosides with anti-inflammatory and antioxidant potential.

Argemone mexicana exhibited benzophenanthridine alkaloids, well-documented for antimicrobial and analgesic effects. *Malvastrum coromandelianum* contained phytosterols and fatty acids supportive of wound-healing and anti-ulcer activities. *Sphagneticola calendulacea* demonstrated sesquiterpene lactones with anticancer and hepatoprotective prospects, while *R. tetraphylla* yielded indole alkaloids such as reserpine, recognized for antihypertensive and sedative properties. From a taxonomic standpoint, the distinct metabolite profiles provide chemotaxonomic markers that strengthen species delimitation and support systematic classification, particularly in taxa with morphological overlap. The pharmacological insights derived from bioactive compounds reaffirm the ethnomedicinal claims of local communities and highlight their potential for novel drug discovery. This study emphasizes the significance of integrating taxonomy with phytochemical metabolomics to advance both biodiversity documentation and pharmacological research. It also reinforces the need for conservation-driven bioprospecting of medicinal angiosperms in the Marathwada region, ensuring sustainable utilization of these valuable genetic resources.

Keywords: Bioactive compounds, Chemotaxonomy, GC–MS, Pharmacological potential

T10-OP-15

Natural dye sensitized solar cells using red dye yielding plants

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Various natural red dye-yielding species were selected, including roots of *Beta vulgaris* L., leaves of *Lawsonia inermis* L., fruits of *Punica granatum* L., bark of *Kirganelia reticulata* (Poir.) Baill., and flowers of *Delonix regia* (Boejr *ex* Hook.) Raf. These dyes were collected from Panamarathupatty, Salem District, Tamil Nadu, India, and used as natural sensitizers for dye-sensitized solar cells. The study evaluated the current intensity of the dye sensitized solar cells, green synthesis of silver nano particles of selected dyes, characterization of dyes such as Fourier transform infrared (FT-IR) spectrometry were analysed. Physical parameters of the dye sensitized solar cells such as global efficiency, short circuit, current density, open circuit voltage, fill factor and maximum input of light energy was evaluated. Among the dyes tested, *Delonix regia* demonstrated the highest current intensity at 119.430 cm^{-1}. UV–Visible spectral analysis of the dyes exhibited a sharp absorption peak at 400 nm in all samples. In the green synthesis of nanoparticles using the dyes, *D. regia* showed maximum absorbance. The analysis of IR spectra of *P. granatum* clearly show the purified nanoparticles showed broad absorption spectra between 3375.20 cm^{-1} and 3359.77cm^{-1} due to the presence of O-H stretching bands (carboxylic group) of intermolecular hydrogen bonding. This study presents a sustainable, clean, affordable, and effective approach for DSSC energy production using natural dyes.

Keywords: *Delonix regia*, Dye, Nanoparticles, Solar cells

T10-OP-16

Phytochemical analysis of some species of genus *Cajanus* from Maharashtra

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Phytochemicals are natural bioactive compounds present in plants and are classified into two groups: primary and secondary compounds. According to their functions in plant metabolism, the primary compounds include amino acids, sugars, proteins, and chlorophyll, while secondary compounds consist of alkaloids, terpenoids, and phenolic compounds. Five species of genus *Cajanus* Adans, were selected for phytochemical screening and proximate analysis. The species studied were Cajanus *cajan* (L.) Huth., *C. lineatus* (Wight & Arn.) Maesen., *C. platycarpus* (Benth.) Maesen., *C. scarabaeoides* (L.) Thouars., and *C. sericeus* (Benth. *ex* Baker) Maesen. The highest amount of flavonoids (5.25) was recorded in *C. scarabaeoides*, and the lowest (3.95) in *C. cajan*. The maximum amount of alkaloids (5.90) was recorded in *C. scarabaeoides*, and the minimum (2.10) in *C. cajan*. The highest amount of glycosides (2.80) was found in *C. scarabaeoides*, and the lowest (2.40) in *C. lineatus*. *Cajanus scarabaeoides* also revealed the highest amount of saponins (5.95), while the lowest was 4.80 in *C. lineatus*. The highest amount of phenols (17.30) was observed in *C. scarabaeoides*, and the lowest (14.10) in *C. cajan*.

Keywords: Alkaloids, *Cajanus*, Phenolics, Phytochemical analysis, Terpenoid

T10-OP-17

Isolation of Letrozole from *Glycosmis pentaphylla* and its novel role in mitigating neurodegeneration and neuroblastoma pathogenesis

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Glycosmis pentaphylla (Retz.) DC. is an ethnomedicinal plant employed in Ayurvedic medicine for the treatment of neuronal disorders, though molecular validation of its neuroactive properties is lacking. This study aimed to scientifically evaluate the neuro-oncological and neuroprotective potential of *G. pentaphylla*. A bioactivity-guided fractionation of the pharmacologically active leaf ethanolic extract was performed. Column chromatography yielded four fractions (F1-F4). Subsequent screening identified a fraction with pronounced acetylcholinesterase (AChE) inhibitory activity. Spectroscopic analysis of the active lead compound revealed its identity as letrozole, a dibenzonitrile compound. This was a significant finding, as letrozole is a known aromatase inhibitor used in breast cancer therapy and is implicated in GABAergic metabolism, suggesting a plausible mechanism for neuronal effects. The neuroprotective efficacy of isolated letrozole was assessed against oxidative and proteotoxic stress. Letrozole pre-treatment significantly enhanced cell viability in models of H_2O_2-induced toxicity and amyloid-beta (Aβ) insult. This protective effect was corroborated at the transcriptional level by the downregulation of Alzheimer's disease-associated genes, BACE1 and ApoE4. Furthermore, letrozole effectively quenched intracellular reactive oxygen species (ROS), as confirmed by NBT and DCFDA assays. The anti-proliferative effects of letrozole on IMR-32 neuroblastoma cells were then investigated.

An IC_{50} value of 24.64 µg/mL was established via MTT and LDH assays. Subsequent analyses employed sub-IC_{50} (20 µg/mL) and supra-IC_{50} (30 µg/mL) concentrations. Flow cytometric cell cycle analysis demonstrated a letrozole-induced arrest in proliferation, with the higher dose showing superior efficacy. This anti-proliferative effect was mechanistically linked to the significant downregulation of key cell cycle regulators, Cyclin D1 and PCNA, confirmed at both mRNA and protein levels. Critically, letrozole's cytotoxicity was specific to cancerous cells while exhibiting protective effects on neuronal function. Treatment upregulated the expression of neuronal-specific markers (NF-200, MAP-2, NeuN), indicating a promotion of neuronal differentiation and health. Concurrently, letrozole induced cellular senescence in neuroblastoma cells, as evidenced by the upregulation of HSP70 and Mortalin. Pro-survival signaling pathways were modulated by letrozole, with an observed upregulation of NF-κβ, pAKT-1, c-fos, and c-jun, suggesting the activation of compensatory survival mechanisms in stressed cells. Conversely, letrozole promoted apoptotic and autophagic pathways in cancer cells. It downregulated the anti-apoptotic marker Bcl-xL and induced autophagy, as measured by LC3 conversion, indicating its role in facilitating the degradation of toxic protein aggregates like Aβ. This study provides the first evidence for the natural occurrence of letrozole in *G. pentaphylla*. Our findings scientifically validate the plant's traditional use by demonstrating that the isolated compound, letrozole, possesses dual efficacy: it confers neuroprotection against oxidative and proteotoxic stress, and it exerts cytotoxic effects on neuroblastoma cells through mechanisms involving cell cycle arrest, induction of senescence, and promotion of apoptosis/autophagy. These promising in vitro results warrant further investigation in animal models to authenticate the therapeutic potential of letrozole in neuro-oncology and neurodegenerative disorders.

Keywords: *Glycosmis pentaphylla*, Letrozole, Neuroblastoma, Pathogenesis

T10-OP-18

Extraction of essential oil, GC-MS analysis and insecticidal potential of *Ocimum basilicum*

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Indiscriminate use of chemical pesticides resulted in environmental degradation, the development of pest resistance, which has adverse effect on variety of nontarget species. The creation of alternative methods and use of conventional botanical insect pest control agents, is of growing interest worldwide. Plant-based biopesticides are attracting significant attention in this context due to their target specificity, eco-friendliness, biodegradability, and safety for humans and other life forms. Higher plants have a variety of "secondary plant compounds," or biochemicals with defense properties. They consist of diverse organic acids, essential oils, alkaloids, flavonoids, phenolics, saponins, and other substances. Due to environmental concerns and an increase in insect populations that are resistant to traditional pesticides over the past several years, interest in botanical insecticides has grown tremendously. Insecticides that are produced spontaneously from plants are known as biopesticides. Secondary plant metabolites have a variety of potential effects, including adulticidal, larvicidal, and stimulants or inhibitors of feeding and oviposition deterrent activity against *Callosobruchus chinensis*. Botanical insecticides can have a wide range of applications, be safe to use, have a different mechanism of action. In present investigation, GC-MS analysis *Ocimum basilicum* L. essential oil extracted by hydro distillation method. It

showed total thirty-one chemical constituents and total sixty percent chemical constituents were identified and was evaluated for its properties. It showed potent adulticidal and oviposition deterrent property against *Callosobruchus*.

Keywords: Essential oil, GC-MS, Insecticidal, TLC

T10-OP-19

Phytochemical profiling, antioxidant activity, and bioassay-guided fractionation of *Syzygium mundagam*

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Syzygium mundagam (Bourd.) Chithra, a Western Ghats endemic species, possesses traditional medicinal value yet lacks comprehensive scientific investigation. This study systematically evaluated the phytochemical composition and antioxidant potential of *S. mundagam* bark through sequential extraction and bioassay-guided fractionation. Authenticated bark samples (JNTBGRI voucher TBGT 104085) from Bonacaud forests underwent Soxhlet extraction using hexane, chloroform, and methanol, yielding three extracts: SMH, SMC, and SMM. Comprehensive phytochemical screening identified secondary metabolites including alkaloids, carbohydrates, phytosterols, flavonoids, saponins, phenols, tannins, proteins, and amino acids. Total phenolic content (TPC) and total flavonoid content (TFC) were quantified spectrophotometrically, while antioxidant activity was assessed using DPPH radical scavenging assay. The chloroform extract underwent silica gel column chromatography, producing five fractions (SMCA1-SMCA5) for antioxidant evaluation. Extraction yields were 1.06±0.02% (SMH), 1.06±0.05% (SMC), and 9.13±1.05% (SMM). Phytochemical distribution varied significantly across solvents, with chloroform extract showing optimal recovery of bioactive compounds. Quantitative analysis revealed SMC possessed superior phenolic content (36.70 ± 0.173 mg GAE/g) and flavonoid content (31.79 ± 0.358 mg QE/g) compared to other extracts. Correspondingly, SMC demonstrated the strongest antioxidant activity (IC_{50} = 45.19 µg/mL), followed by SMM (50.74 µg/mL) and SMH (932.15 µg/mL). Column fractionation successfully enriched antioxidant potency, with SMCA3 displaying exceptional activity (IC_{50} = 31.94 µg/mL). These findings validate the ethnomedicinal significance of *S. mundagam* and demonstrate chloroform extraction's effectiveness in concentrating bioactive polyphenolic compounds. The strong correlation between phytochemical content and radical scavenging capacity establishes a scientific foundation for developing therapeutic formulations targeting oxidative stress-related disorders, with fraction SMCA3 representing a promising candidate for bioactive compound isolation.

Keywords: Column chromatography, DPPH assay, Flavonoids, *Syzygium mundagam*, Western Ghats

T10-OP-20

Screening of endophytic microbes associated with *Piper nigrum* for bioactive molecules

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Endophytes are microorganisms that reside within healthy plant tissues without inducing disease symptoms and represent a valuable source of bioactive compounds. Among Piperaceae species, *Piper longum* L. and *P. nigrum* L. have received considerable attention in endophytic bacteria, particularly regarding their roles in plant growth promotion, pathogen inhibition and synthesis of bioactive compounds. This study investigated amylase-producing endophytic microbes associated with *P. nigrum* (black pepper), a spice of high economic significance widely cultivated in tropical regions. Healthy root tissues were collected, surface sterilized, and inoculated onto starch-containing medium for primary screening. Isolates showing amylase activity were subjected to secondary screening in starch broth, and crude enzyme extracts were obtained. Amylase activity was quantified using the 3,5-dinitrosalicylic acid (DNS) assay, which measures reducing sugars released from starch hydrolysis. Several endophytes displayed promising enzymatic activity, highlighting their potential as alternative microbial sources for industrial amylase production. These findings emphasize the importance of screening endophytes for novel enzymes and provide a basis for future work involving purification, biochemical characterization, and genomic analysis to enhance their biotechnological utilization.

Keywords: Amylase, DNS assay, Endophytic microbes, *Piper nigrum*

T10-OP-21

Characterization of antioxidant and α-amylase inhibitor peptides from seeds of *Phaseolus lunatus* and *P. vulgaris* for its potential use in regulation of antioxidant and carbohydrate metabolism

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Food-derived bioactive peptides are recognized as prominent sources for treatment of health problems from sugar uptake. They delay carbohydrate digestion by inhibiting α-amylase activity, thereby reducing plasma glucose level in the human body. In the present study, phaseolin proteins were isolated from two species, *Phaseolus lunatus* L. and *P. vulgaris* L., to identify peptides with antioxidant and α-amylase inhibitory properties. The proteins were extracted from the seeds and purified by eluting band protein from SDS-PAGE. The molecular mass of phaseolin proteins was determined by comparing it with standard protein ladder (range 10–200 kDa). The secondary structure of each purified phaseolin protein was quantified by using FTIR spectroscopy and curve fitting analysis, revealing notable structural differences. Further, these phaseolin proteins were digested using proteinase K enzyme and through LCMS/MS analysis, the resulting peptides were identified by using label free targeted proteomics. Then antioxidant and α-amylase inhibition activities were evaluated from these peptides. The high abundance of specific peptides demonstrates the compositional difference in each purified protein that makes them different from each other. The binding site of peptides on α-amylase enzyme was determined through Pepsite-2 analysis. Overall, the results indicate that the peptides characterized from the phaseolin proteins of *P. lunatus* and *P. vulgaris* are potential sources for application as α-amylase inhibitors and antioxidant agents in biomedical fields.

Keywords: α-Amylase, α-Amylase inhibition, Antioxidant, Phaseolin

T10-OP-22

Phytochemical and DNA phylogenetic analysis of *Mesua thwaitesii*

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Mesua thwaitesii Planch. & Triana, is an economically and medicinally important tree belonging to the family Calophyllaceae, is renowned for its diverse bioactive compounds and traditional therapeutic applications. The present study aimed to evaluate the phytochemical composition and establish DNA-based phylogenetic relationships of *M. thwaitesii*. Preliminary phytochemical screening of leaf extracts revealed the presence of alkaloids, flavonoids, tannins, saponins, phenols and terpenoids, highlighting its potential pharmacological significance. Quantitative estimation indicated higher concentrations of phenolic and flavonoid compounds, which are associated with antioxidant and antimicrobial properties. Parallelly, molecular characterization was carried out using gene sequencing to assess phylogenetic placement of *M. thwaitesii* within Calophyllaceae. Phylogenetic analysis confirmed the close evolutionary relationship of *M. thwaitesii* with allied genera, validating its taxonomic position. The integration of phytochemical profiling with DNA phylogenetics provides a comprehensive approach to understanding both the therapeutic potential and evolutionary lineage of this species. These findings contribute to the conservation, sustainable utilization, and bioprospecting of *M. twaitesii* for future pharmacological applicationss.

Keywords: Calophyllaceae, DNA phylogeny, *Mesua twaitesii*, Phytochemicals

T10-OP-23

A comparative study of anthelmintic and larvicidal activities of essential oils in selected species of Zingiberaceae

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The present study investigates and compares the anthelmintic and larvicidal activities of essential oils derived from *Zingiber nimmonii* (J.Graham) Dalzell and *Z. neesanum* (J.Graham) Ramamoorthy. Both essential oils were extracted from rhizomes and evaluated for their effectiveness against helminth parasites and mosquito larvae. Anthelmintic activity was assessed using adult Indian earthworm model due to their anatomical and physiological resemblance to human intestinal roundworm parasite of human beings. Larvicidal screening was performed against *Anopheles aegypti* mosquito larvae. The findings revealed significant anthelmintic properties for both species, evidenced by time- and dose-dependent paralysis and lethality of model helminths. Additionally, both essential oils exhibited larvicidal activity, with *Z. nimmonii* essential oil showing potent effects against vectors such as *A. aegypti*, as evidenced by low LD50 values. Comparative analysis indicated variations in efficacy, suggesting species-specific differences in bioactive constituents. The results support the potential of *Z. nimmonii* and *Z. neesanum* essential oils as eco-friendly agents for controlling parasitic infections and mosquito-borne diseases, warranting further phytochemical and *in vivo* studies to elucidate their applications in integrated pest and parasite management programs.

Keywords: Anthelmintic activities, Larvicidal activities, Essential oils, *Zingiber neesanum*, *Zingiber nimmonii*

T10-OP-24

Chemical profiling and mosquito larvicidal efficacy of an aromatic plant, *Atalantia monophylla* (Rutaceae)

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Atalantia monophylla (L.) DC., commonly known as wild lime, is a small medicinal and aromatic tree belonging to the family Rutaceae. It is widely distributed throughout India and serves as a rich source of bioactive metabolites with pharmacological potential. With growing interest in plant-derived insecticides as sustainable alternatives to synthetic chemicals, the present study explores the potential of *A. monophylla* leaf essential oil. Anatomical and histochemical characterization of the secretory structures in leaves, stem, petiole, and fruit revealed localized secretory structures and accumulation of various bioactive metabolites. Histochemical tests employing specific reagents were conducted to identify key metabolites. The essential oil from leaves was extracted by hydrodistillation, and its chemical profile was determined through gas chromatography-mass spectrometry (GC-MS). Bioactivity assays were performed to assess the larvicidal efficacy of the leaf essential oil on third-instar larvae of *Culex quinquefasciatus* under laboratory conditions. Anatomical and histochemical analyses confirmed the presence of essential oil storage cavities in the plant tissues. GC-MS analysis identified major constituents of the leaf essential oil, including limonene (5.7%), caryophyllene (4.1%), beta-pinene (1.29%), beta-elemene (3.67%), beta-copaene (2.81%). The leaf oil demonstrated significant mosquito larvicidal efficacy. These findings support *A. monophylla* as a promising source of a sustainable larvicidal agent.

Keywords: Anatomy, Essential oil, GC-MS, Histochemical, Hydrodistillation, Larvicidal activity

THEME 11

MICROSCOPY IN TAXONOMY AND STRUCTURAL BOTANY

T11-OP-01

Perennation strategies in *Henckelia* (Gesneriaceae): Anatomical, biochemical and ecological study

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Perennating organs play a key role in the survival of herbaceous perennials in seasonally unfavourable environments, yet their adaptations remain poorly understood in *Henckelia* Spreng. (Gesneriaceae) of the Western Ghats. This study examined the rootstocks of five taxa —*Henckelia humboldtiana* (Gardner) A.Weber & B.L.Burtt, *H. incana* (Vahl) Spreng. (two populations), *H. repens* (Bedd.) A.Weber & B.L.Burtt, and *H. wayanadensis* Janeesha & Nampy— from distinct habitats in Kerala to understand their structural, biochemical, and ecological features. All species occurred in acidic, sandy loam soils with high sand content and variable moisture regimes. Anatomical observations revealed thick-walled parenchyma, well-developed vascular tissues, and protective epidermal layers, suggesting structural resilience. Phytochemical screening and FTIR analysis detected reducing sugars, phenolics, and flavonoids across taxa, while starch, alkaloids, and proteins were absent; lipids showed inconsistent presence. The absence of starch indicates reliance on soluble carbohydrates and phenolic compounds as alternative energy reserves and protective metabolites. Ecological assessment linked these traits to adaptation in rocky, shaded habitats with fluctuating water availability. This integrated perspective provides the first comprehensive account of perennation in South Indian *Henckelia*, offering insights into adaptive strategies and highlighting conservation priorities for lithophytic and mesophytic taxa of the Western Ghats.

Keywords: FTIR, Gesneriaceae, *Henckelia*, Perennation, Phytochemistry, Rootstock, Western Ghats

T11-OP-02

Achene micro-morphology and its taxonomic implications in genus *Cyperus* (Cyperaceae) from Kerala, India

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The infrageneric taxonomy of the genus *Cyperus* L. is debatable due to its complex morphology and the presence of multiple convergent evolutionary lineages. The members of the genus exhibit considerable morphological variation, even at the species level. The present study aims to redefine the taxonomic boundaries among *Cyperus* species occurring in Kerala based on achene micromorphology. Surface ornamentation patterns of achenes were analyzed using Scanning Electron Microscopy (SEM). Photographs were taken at two

magnifications —one to capture the entire nut, another at a higher magnification to reveal the surface features. The study revealed that different species have distinct achene surface micromorphology, in terms of their epidermal cell size, shape, the type of periclinal wall, thickness, sinuosity of anticlinal walls, and the presence and absence of silica bodies. Three types of achene epidermal cells were recognized: (1) polygonal cells with straight walls, (2) polygonal cells with sinuate walls, and (3) elongated zonate cells. The sinuosity of the epidermal cells was characteristic of the C3 *Cyperus* species, while the elongate zonate type belongs to the species of the core *Pycreus* clade. Interpretation of achene morphological characters enabled accurate identification and delimitation of several *Cyperus* taxa at both species and infraspecific levels. These results are consistent with recent sectional classifications and affirm the value of achene micromorphology as a reliable diagnostic tool for resolving taxonomic relationships within *Cyperus*.

Keywords: Cyperaceae, *Cyperus*, Kerala, SEM Study

T11-OP-03

Morphological characterization of inflorescence and utricle structures in *Carex* (Cyperaceae) from Southern Kerala, India

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Carex L. (Cyperaceae) is recognized as one of the most taxonomically diverse and morphologically intricate genera among flowering plants. The present study provides a comparative morphological assessment of reproductive structures, such as inflorescences and utricles, which serve as critical diagnostic features for species-level identification. During the course of study, eight species were collected from various localities across Southern Kerala. Detailed morphological analyses were conducted focusing on key reproductive traits, including the number and spatial arrangement of spikes, the overall architecture of the inflorescence, presence and morphology of bracts, as well as utricle attributes such as size, shape, beak formation, surface texture, and venation patterns. The results revealed significant interspecific variation in both inflorescence and utricle morphology. Notable differences were observed in spike arrangement, bract characteristics, and utricle morphology, underscoring the diagnostic value of these traits. These findings emphasize the taxonomic utility of reproductive morphological characters in distinguishing among *Carex* species and contribute valuable data to the underexplored flora of the region. This study highlights the importance of comprehensive morphological investigations in regions like Kerala, where systematic studies on *Carex* remain limited. The results support the adoption of an integrative taxonomic approach that combines morphological, ecological, and molecular data to achieve robust species delimitation in this complex and diverse genus.

Keywords: *Carex*, Cyperaceae, Inflorescence morphology, Utricle morphology

T11-OP-04

Micro-morphological and anatomical studies on some selected species of *Psychotria* in Peninsular India

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The genus *Psychotria* L. belongs to the family Rubiaceae (subfamily Rubioideae: tribe Psychotrieae). The genus comprises more than 1,500 species of shrubs, small trees, and some perennial herbs, distributed in wet to seasonal tropical environments across America, Africa, Madagascar, Asia, Australia, and the Pacific Islands. In India, *Psychotria* is represented by 44 taxa, majority of which are endemic to the evergreen and semi-evergreen forests of the Western Ghats in Peninsular India. Despite the diversity, the genus has received limited attention in systematics, and determining the infrageneric relationship is challenging because the delimitation of some species remains obscure. This study primarily examines the micro-morphological and anatomical traits used for the identification and delimitation of *Psychotria* from Peninsular India.

Keywords: Biodiversity, Peninsular India, *Psychotria*, Rubiaceae

T11-OP-05

Beyond beauty: Understanding aspects of structural innovation and significance of petal-folds in funneliform corollas

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This study highlights petal-folds as a generalized and recurrent structural feature in funneliform flowers, rather than a taxonomic peculiarity. We show how one can link petal folding with multi-scale cuticular microstructures across diverse angiosperm lineages, emphasizing their functional and evolutionary significance. Petal folds, fine in- and out-folds concentrated mainly in the corolla throat, are associated with differential cuticular ornamentation. We show that folds increase the effective contact surface between petals and pollinators without enlarging the floral outline or corolla outer size, potentially enhancing pollen transfer and pollinator grip. Microstructural variation between inward and outward folds may further influence tactile cues, wettability, and light scattering. Imaging in *Ruellia* L. demonstrates that water droplets persist in specific folds after rainfall, suggesting a role in moisture regulation and microclimate control. Evolutionarily, folds coupled with fine-scale surface structures may represent adaptive innovations balancing mechanical stability, environmental pressures, and pollinator interactions. The repeated occurrence of petal folds in Acanthaceae, and more broadly across Asterid clades, suggests functional convergence, highlighting their ecological significance. Funneliform flowers themselves are derived traits, and the integration of folds and microstructuring highlights synorganization in corollas as a pathway of evolutionary innovation. This work raises new questions: Are petal folds developmentally and phylogenetically conserved or convergently evolved? Do they enhance pollen transfer efficiency beyond visitation rates? What is special about funneliform species who lack them? By framing petal folds as functional and evolutionary innovations, the work

encourages deeper investigation into how subtle floral architectures can shape plant–pollinator interactions and adaptation to abiotic challenges.

Keywords: Angiosperm, Funneliform flowers, Petal-folds, Floral evolution, Ecological interactions, Surface microstructure

T11-OP-06

Micromorphological, anatomical and histochemical analysis of *Tabernaemontana alternifolia* (Apocynaceae), a potential ethnomedicinal plant

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Tabernaemontana alternifolia L. (Apocynaceae) is a widely distributed medicinal plant valued in traditional systems of medicine for its use in treating skin ailments, wounds, and inflammatory conditions. The present work was undertaken to provide a comprehensive micromorphological, anatomical and histochemical profile of various parts of *T. alternifolia* to establish diagnostic characters useful for authentication and quality control. Fresh leaves and stems were subjected to transverse sectioning and examined under a microscope for anatomical features. The leaf exhibited a dorsiventral structure with well-defined palisade and spongy parenchyma, the presence of laticifers, and abundant calcium oxalate crystals. Stem sections showed a thick cortex, conspicuous medullary rays, and the occurrence of non-articulated laticifers. Histochemical tests were performed using standard reagents to localize primary and secondary metabolites, revealing the presence of alkaloids, phenolics, tannins, starch and lipids distributed in specific tissues. Fluorescence microscopy was employed to observe the natural autofluorescence of secondary metabolites. Powder microscopy of the plant material was also carried out to observe characteristic cellular structures. These anatomical and histochemical findings provide reliable diagnostic features that can aid in the identification and standardization of *T. alternifolia*. This information is valuable for pharmacognostic authentication and for the correlation of anatomical traits with the plant's known medicinal properties. This study thus contributes to the scientific documentation of *T. alternifolia* and supports its further exploration in phytochemical and biological investigations.

Keywords: Apocynaceae, Histochemistry, Micromorphology, Pharmacognosy, Plant anatomy, Secondary metabolites

T11-OP-07

Taxonomic implications of seed morphology in Indian 'Rose Mallow' (*Hibiscus*: Malvaceae)

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Malvaceae members show high diversity in seeds, possessing diverse morphology, anatomy, chemical composition and dispersal mechanism. The fruit and seed morphology plays a key

role in diversification and spread in the mallows. *Hibiscus* L. popularly known as 'Rose Mallow' is one of the largest genera in Malvaceae, apart from its diversity it has multipurpose values in food, horticulture, medicines, and textiles. India is home to 35 species of *Hibiscus*, with maximum diversity in the Deccan Peninsula. In support with vegetative and floral characters, seed morphology also plays an important role in the taxonomy of *Hibiscus*. The seed dimensions, shape, testa ornamentation, tubercles, appendages and hilum are taxonomically significant characteristics. The present investigation highlights the taxonomic implications of seed macro and micromorphology in Indian *Hibiscus* in support to the sectional classification, interrelationship and evolutionary studies.

Keywords: Dendrogram, Micromorphology, Rose Mallow, Spermoderm, Testa, Trichomes

T11-OP-08

Comparative morpho-anatomical analysis on selected species of *Oxalis* (Oxalidaceae) from South India

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Oxalis L. (Oxalidaceae) is a cosmopolitan genus that comprises 500–800 species, with notable species diversity in tropical regions such as Brazil, Mexico, and South Africa. In India, ten species are known to exist; out of these, eight species are known to be found in Peninsular India. The taxonomy of the genus is challenging due to the high morphological variability among its many varieties. The present study aimed to examine the morphological and anatomical features of five *Oxalis* species from South India by using Light Microscopy (LM) and Scanning Electron Microscopy (SEM). Anatomical observations revealed distinct, though slight, interspecific variations, with the configuration of the stem pericycle emerging as a key diagnostic feature, particularly in caulescent taxa. Additionally, pollen characters such as shape, size, aperture type and exine sculpture were also analysed, which indicates that *Oxalis* is a stenopalynous taxon. These findings also contribute valuable morpho-anatomical insights for the taxonomic delineation of *Oxalis* species in South India.

Keywords: Anatomy, Morphology, *Oxalis*, South India

T11-OP-09

Taxonomic and evolutionary implications of capsule and seed micromorphology in Podostemaceae

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Podostemaceae, the largest family of strictly aquatic angiosperms, display remarkable diversity in fruit and seed morphology, yet these traits remain underexplored for their taxonomic and evolutionary significance. In this study, capsule and seed characters of selected Indian taxa were examined using light and scanning electron microscopy to assess their diagnostic value and evolutionary patterns. Seeds are tiny, mostly ovoid, with colour of

little taxonomic value, whereas micromorphological features —such as testa cell shape, periclinal wall curvature, cuticular folds and hilum form, provide more reliable diagnostic characters. Ancestral reconstructions suggest ellipsoid capsules, ovoid seeds and ribbed fruits as ancestral, with repeated independent evolution of obovoid capsules, reduced seed output and wall variation reflecting homoplasy. Seed micromorphology and capsule traits are reliable for generic delimitation, while population-level variation often reflects ecological influence.

Keywords: Capsule, Character evolution, Podostemaceae, Scanning electron microscopy (SEM), Seed, Taxonomy

T11-OP-10

Implication of scanning electron microscopy in the seed coat morphology of selected species in the genus *Rotala* (Lythraceae) in India

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The genus *Rotala* L. is one of the largest genera in the family Lythraceae, comprising aquatic or amphiphytic taxa. Most members inhabit in permanent or temporary lateritic pools; some grow in paddy fields, while others are found in marshy areas. Globally, there are about 75 species of *Rotala*, and in India, the genus is represented by 36 species. The taxonomic identification from other genera is straightforward; however, its identification within the genus often challenging. This genus is characterised by seed sculpturing types such as reticulate, undulate and verrucate patterns. Accordingly, this study focuses on the taxonomic identification of selected *Rotala* species distributed in India, based on their seed coat morphological features.

Keywords: Identification, India, Lythraceae, Morphology, *Rotala*, Scanning Electron Microscope, Seed coat

T11-OP-11

Seedling morphology and cotyledon development in *Jerdonia indica*, an endemic enigmatic Gesneriaceae from India

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Anisocotyly, the unequal post-germination growth of cotyledons, is common in Old World Gesneriaceae, while isocotylous development is typical of New World taxa. In some species, anisocotyly appears in subtle forms that may not be evident morphologically and can be mistaken for isocotyly. *Jerdonia indica* Wight, an endemic Gesneriaceae of South India, seems unusual in producing seedlings with apparently isocotylous morphology despite its Old-World affiliation. Whether this represents true isocotyly, a reduced form of anisocotyly, or an environmentally influenced condition remains unresolved. The present study was undertaken to critically evaluate seedling development in *J. indica*, with emphasis on cotyledon growth patterns and basal meristem activity. Seeds were germinated under varied conditions of light intensity and spectral quality to assess the role of external cues in shaping

cotyledon behaviour. Morphometric parameters such as cotyledon area, hypocotyl elongation, vein initiation, timing of plumule development, and germination success were recorded. The study aims to provide insight into the adaptive significance of its seedling morphology and to contribute to the understanding of developmental plasticity in Old World Gesneriaceae.

Keywords: Anisocotyly, Gesneriaceae, Isocotyly, *Jerdonia indica*, Seedling development

T11-OP-12

Pollen morphology of genus *Abutilon* (Malvoideae: Malvaceae) in India

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Pollen morphology of 12 species and two varieties of *Abutilon* Mill. occurring in India was studied using light and scanning electron microscopy. Major general features of the pollen grains in the genus were observed as echinate, trizonocolporate, medium sized, and shape sub-oblate to spheroidal. Quantitative characters examined includes the length of the polar and equatorial axes and its ratio, spine length, interspinal distance, and number of spines. The multiple variables examined in present study were statistically evaluated using Principal Component Analysis. Based on spine length, Indian *Abutilon* species were categorized into the two groups: those with 'spinose' pollen grains (spine length >3 µm) and another group of two species with 'spinulose' pollen grains (spine length <3µm). This distinct grouping based on pollen morphology may reveal interesting species interrelationship, as the 'spinulose' species are distributed in tropical Asia only and are believed to be primitive members of family Malvaceae.

Keywords: Indian mallow, India, Palynology, PCA, Spinose, Spinulose

GENERAL POSTERS

GENERAL POSTER PRESENTATIONS

PP-01

Grass flora of the central Western Ghats, Karnataka, India

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The Western Ghats, recognized as one of the eight "Hottest Hotspots" of global biodiversity, a UNESCO World Heritage Site, and one of the 18 mega biodiversity centers worldwide, extend about 1,600 km across seven Indian states. The study area-Central Western Ghats, located in Karnataka, covers the districts of Shivamogga, Chikkamagaluru, Kodagu, Uttara Kannada, Hassan, and parts of Udupi and Dakshina Kannada. The family Poaceae is the fifth largest among flowering plants, ranks top in ecological and economic significance due to its role in sustaining life and ecosystems. A floristic survey was conducted from 2017-2022 using opportunistic sampling. Collected specimens were identified through morphological characteristics using standard floras and literature. Over 2,500 field samples were collected and herbarium specimens of each species were deposited at CES, IISc-Bengaluru and one new variety at CAL. The study documented 231 taxa representing 95 genera, 18 tribes, and nine subfamilies. Amid, one variety described as new to science, and four species were new records for Karnataka. This work serves as an updated district-level grass flora for the Central Western Ghats, providing detailed data on phenology, distribution, habitat, field notes, morphological descriptions, and high-resolution images. Among the documented species, The Panicoideae was the most represented subfamily contains 168 species. Andropogoneae was the dominant tribe contains 100 species and *Ischaemum* L. were the most represented genus including 15 species. Thirteen different habitat types were recorded, with open grasslands and hill slopes showing the highest species diversity including 46 species.

Keywords: Elevation, Floristics, Phenology, Poaceae, Vegetation, Western Ghats

PP-02

Quantitative indices analysis of ethnomedicinal trees used by Malayali tribal of Chitteri Hills, India

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An ethnobotanical survey was conducted to document medicinal trees used by the Malayali tribal community of Chitteri hills, Dharmapuri District, Tamil Nadu, India. The study revealed that the tribal utilize 183 tree species belonging to 129 genera and 49 families in their daily lives. Of these, 156 species from 112 genera and 45 families were identified as ethnomedicinal sources, with detailed information recorded on plant parts used, mode of preparation and ailments treated. These trees were employed to treat 82 human illnesses, grouped into 18 categories. Data were collected from farmers, shepherds, cowherds,

traditional healers and local tribal people. The ethnomedicinal information was evaluated by quantitative indices method using. Use Value (UV), Family Use Value (FUV), Relative Frequency Citation (RFC), Fidelity Level (FL), Informant Consensus Factor (ICF) and Plant Part Value (PPV), were applied for analysis. Results showed that three species had the highest UV (0.95), while Ulmaceae emerged as the top family with the highest FUV (0.95). *Azadirachta indica* A. Juss. recorded the highest RFC (0.25), and *Ficus religiosa* L. exhibited the maximum FL (100%). The highest ICF was observed for gynecological disorders (1.0). Leaves were the most frequently used plant part (0.278), commonly prepared as paste for medicinal use. Quantitative indices help convert traditional plant knowledge into measurable data, highlight key species and families, validate tribal knowledge, guide drug research, support conservation of plant and show commonly used plant parts and preparation methods.

Keywords: Chitteri hills, Eastern Ghats, Malayali tribe, Medicinal trees, Quantitative indices, Traditional knowledge

PP-03

Effect of Climatic Variations on Phenological Changes in Some Threatened and Endemic Plants of Indian Thar Desert, Rajasthan (India)

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Rajasthan is the largest state of the country covering an area of 3,42,239 km^2 categorized into two biogeographic zones i.e. Arid and Semi-arid zones (Rodgers & Panwar 1988). The arid zone lies in the North-Western part of the State and spreads over an area of 2,08591 km^2.The State has a total forest cover of ca. 4.62%, most of which (9%) falls under Semi-arid region and the scrub forest cover is around 4,564 km2 (FSI 2011) The arid zone has been recognized as one of the important phytogeographic regions of India since the time of Sir J.D. Hooker (1906) The forest type in arid region is scrub forest and the dominant species are *Calotropis procera* (Aiton) W.T.Aiton, *Ziziphus nummularia* (Burm.f.) Wight & Arn., *Calligonum polygonoides* L., *Leptadenia pyrotechnica* (Forssk.) Decne. etc. This paper has focus on the threatened species and their habitat conservation, out of the 44 threatened plants species viz. *Ephedra foliata* Fisch. & C.A.Mey. and *Tecomella undulata* (Sm.) Seem. are studied in details with respect to their response to the climate change and details shall be presented.

Keywords: Arid and Semi-arid zones, Endemic plants, Thar desert, Threatened plants

PP-04

Molecular, morphological, cytological and biochemical diversity of *Justicia* species in Kerala

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The genus *Justicia* L. (Acanthaceae) is taxonomically and pharmacologically important, with several species widely distributed in Kerala and used in indigenous medicine. Despite

its significance, integrated studies encompassing morphology, cytology, molecular genetics and phytochemistry are limited. This study explores the multidimensional diversity of *Justicia* species in Kerala to clarify their taxonomy, evolutionary relationships and medicinal potential. Morphological analyses highlighted extensive interspecific variation in leaf shape, venation, inflorescence architecture and floral traits, indicating both genetic diversity and phenotypic plasticity driven by environmental conditions. Cytological investigations, including chromosome counts and karyotype analysis, revealed diploid and polyploid cytotypes (2n = 20–42) and structural features such as satellite chromosomes, providing cytotaxonomic markers and insights into genome evolution within the genus. Molecular diversity was assessed through DNA barcoding (rbcL, matK, ITS) and RAPD/ISSR profiling. The resulting phylogenetic groupings corresponded broadly with morphological and cytological patterns, resolving ambiguous taxa and identifying distinct species clusters. These findings supply a baseline for conservation genetics and future phylogeographic research. Biochemical profiling quantified phenolics, flavonoids, alkaloids and terpenoids, coupled with antioxidant and antimicrobial activity tests. Species such as *Justicia adhatoda* L. and *J. glauca* Rottler showed particularly high phenolic and flavonoid contents with strong antioxidant potential, while several taxa displayed broad-spectrum antimicrobial activity. These results validate ethnomedicinal uses and reveal promising candidates for pharmacological development. Together, the integrative approach uncovers substantial diversity at morphological, cytological, molecular and biochemical levels. Morphology and cytology enhance taxonomic resolution, molecular markers clarify genetic relationships, and phytochemical assays link diversity to functional attributes. This combined framework provides a valuable reference for taxonomists, conservationists and phytochemists, underscoring the need to conserve *Justicia* species as reservoirs of genetic and therapeutic resources and opening pathways for sustainable utilization and molecular breeding.

Keywords: Conservation, Diversity, *Justicia*, Molecular markers, Morphology, Phytochemistry

PP-05

A novel flavonoid from *Crotalaria paniculata* (Fabaceae) with therapeutic cytotoxic and antioxidant potential

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The Genus *Crotalaria* L. (Fabaceae) is known for diverse biological activities, particularly cytotoxic and antioxidant effects. *Crotalaria paniculata* Willd., is a sticky and foetid undershrub with silky pubescence, and the research remains underexplored for its bioactive compounds. This study aimed to isolate, characterize and evaluate the biological activities of a novel flavonoid from the ethanolic extract of *C. paniculata* twigs. The extract was prepared and subjected to antioxidant and cytotoxic screening. Bioassay-guided fractionation yielded a novel flavonoid, 6-(3-methylbut-2-enyloxy)-2, 3-dihydro-2-(4-hydroxyphenyl) chromen-4-one, obtained as a white crystalline solid. Structural confirmation was achieved through TLC, IR, GC-MS, and NMR analyses. Antioxidant activity (DPPH and total antioxidant) and cytotoxicity (MTT assay on MCF-7 and Vero cells) were evaluated in vitro. The compound exhibited strong antioxidant activity, with 90.15 ± 0.17% DPPH inhibition (IC_{50} = 43.79 ± 0.09 µg mL^{-1}) and potent cytotoxicity against MCF-7 breast cancer cells (IC_{50} = 34.01 ± 0.23 µg mL^{-1}), with no detectable toxicity toward Vero cells. These findings identify *C. paniculata* as a promising source of

bioactive molecules, reporting for the first time this novel flavonoid with significant antioxidant and anticancer potential. Further studies are warranted to elucidate its mechanisms and therapeutic applications.

Keywords: Antioxidant, Bioactive compounds, Bioassay-guided fractionation, *Crotalaria*, Cytotoxicity, Flavonoid

PP-06

The study of endangered species in Chitradurga district, Karnataka, India

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Chitradurga district is a unique and unexplored district in the Karnataka state. It is situated in the middle of the Karnataka state and expecting the species from Western and Eastern ghats of the country, this district ecologically very interesting and receiving less rainfall and experiencing high temperature. These climatic and edaphic factors affecting on the diversity of the species. The present study deliberates on threatened Angiosperms in Chitradurga District. The threatened plants were categorized based on information gathered from IUCN website and other research papers. Enumerated plants were categorized in to Critically Endangered (CR), Endangered (EN), Vulnerable (VU), and Near threatened (NT). The district has more than 500 species of angiosperms, among these 14 species belongs to various categories of endangered species as per IUCN. One species belongs to Critically endangered; three species belong to Endangered; eight species belong to Vulnerable and two species falls under Near Threatened category. Plants which illustrated their botanical name, local names, red data categorized species such as *Aquilaria malaccensis* Lam. (CR), *Decalepis hamiltonii* Wight & Arn., *Pterocarpus indicus* Willd. (EN), *P. marsupium* Roxb., *Canarium strictum* Roxb. (EN), *Santalum album* L., *Dalbergia latifolia* Roxb., *Erinocarpus nimmonii* J.Graham, *Soymida febrifuga* (Roxb.) A.Juss, *Celastrus paniculatus* Willd., *Pterocarpus indicus* Willd., *Chloroxylon swietenia* DC., *Garcinia indica* (Thouars) Choisy (VU), and *Aegle marmelos* (L.) Corrêa (NT). Besides the IUCN category the species such as *Ceropegia candelabrum* L., *C. juncea* Roxb., *C. spiralis* Wight have less populations rarely seen in the district these species also considered endangered categories by some workers.

Keywords: Chitradurga, Endangered, Vulnerable species

PP-07

Morphotaxonomic, phytochemical and anthelminthic efficacy of *Canavalia gladiata*

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The current study investigated the morphotaxonomic characteristics, phytochemical profile, and *in vitro* anthelmintic activity of *Canavalia gladiata* (Jacq.) DC. (Fabaceae), commonly known as the sword bean, a plant traditionally used in folk medicine. Morphotaxonomic evaluation confirmed the plant's identity, detailing its distinguishing features, such as the

characteristic large, strap-like pods and oval or oblong seeds, consistent with the species' classification. Preliminary phytochemical screening of the plant extract revealed the significant presence of various secondary metabolites, particularly saponins, tannins, alkaloids, and phenolics. These compounds are known for their broad biological activities and are hypothesized to be the source of the plant's medicinal properties. The aqueous extract of *C. gladiata* was evaluated for its anthelmintic activity against a model organism (e.g., *Pheretima posthuma*). The results demonstrated significant dose-dependent anthelmintic activity, comparable to the standard reference drug (e.g., Albendazole). The observed effects, including time of paralysis and time of death of the worms, indicate potent vermifugal and or vermicidal potential. The correlation between the observed anthelmintic activity and the abundant presence of key phytochemicals, especially tannins and saponins, suggests that these components likely contribute to the plant's biological efficacy. These findings support the traditional use of *C. gladiata* and indicate its potential as a source for developing a natural, effective anthelmintic agent.

Keywords: Anthelminthic, *Canavalia gladiata,* Morphotaxonomic, Phytochemical, *Pheretima Posthuma,* Secondary metabolites

PP-08

Orchids diversity in Rajasthan (India) and its conservation

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Rajasthan is the largest state of the India covering an area of 3,42,239 km^2 categorised into two biogeographic zones *i.e.* Arid and Semi-arid zones (Rodgers & Panwar 1988). During the present investigation a detailed study on orchids was conducted in the state. Rajasthan harbours a remarkable diversity of orchids despite its arid climate. Periodic field surveys were performed to study their morphology in natural conditions and document the range of characteristics such as diversity in leaf shape, inflorescence variation and floral characteristics. A comprehensive field and literature survey identified 23 orchid species in Semi-arid regions, whereas single species of *Zeuxine strateumatica* (L.) Schltr was reported in Arid region of Rajasthan. Three species, namely *Peristylus lawii* Wight, *Pecteilis gigantea* (Sm.) Raf., and *Acampe rigida* (Buch.-Ham. *ex* Sm.) P.F. Hunt, are reported as new distributional records for Rajasthan in the present investigation. *Habenaria gibsonii* var. *foetida* Blatt. & McCann was reported from Sitamata Wildlife Sanctuary of Rajasthan, India for the first time. Ecological parameters were also noted to reveal habitat-specific distribution patterns. An attempt has been made to document natural and anthropogenic threats/pressure in the study area. In the present investigation, a list of recommended sites/paths has been prepared for orchids conservation. conservation actions have been recommended.

Keywords: Conservation, Diversity, Orchids, Rajasthan

PP-09

Breaking seed dormancy of *Hibiscus lobatus* (Magnoliopsida: Malvales: Malvaceae) - a native plant of the central Western Ghats

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Hibiscus lobatus (Murray) Kuntze is a medicinal plant of the Malvaceae family, very sparsely and seasonally distributed, particularly in the Western Ghats of Karnataka. This species, known for its ethnopharmacological uses, especially in wound healing, faces a declining population due to habitat loss, overexploitation, and poor seed germination. Seed dormancy has been identified as a major factor limiting its natural regeneration. In this study, the distribution, habitat, and taxonomic diagnostic features of *H. lobatus* were investigated across different floristic regions of the central Western Ghats. Seed viability and dormancy-breaking treatments were assessed both in the field and in vitro. Tetrazolium testing confirmed seed viability, but field germination rates were low (4–6%), indicating strong dormancy. Among the treatments tested, sulfuric acid scarification combined with GA_3 application proved most effective, substantially enhancing germination and reducing germination time. These findings establish an optimised protocol for overcoming seed dormancy in *H. lobatus*, which can be applied to conserve and propagate this important medicinal species, addressing its declining population.

Keywords: Native clora conservation, Propagation techniques, Seasonal germination, Seed viability, Western Ghats biodiversity

PP-10

Plant-animal interactions and biodiversity of Kallupara Island, Kozhikode district, Kerala: A rapid survey for conservation planning

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A rapid biodiversity survey was conducted at Kallupara Island (Chombala Rock Island) in Azhiyur Panchayath, Kozhikode District, Kerala, India, upon the request of the Kerala State Biodiversity Board (KSBB). The study documented seven species of algae, including *Enteromorpha compressa* (Linnaeus) Nees, *Chaetomorpha antennina* (Bory) Kützing, *Grateloupia indica* Børgesen, *Grateloupia lithophila* Børgesen, *Gracilaria corticate* (J.Agardh) J.Agardh, *Gelidium pusillum* (Stackhouse) Le Jolis, and *Padina tetrastromatica* Hauck. Key faunal elements recorded included barnacles (*Amphibalanus amphitrite*, *Megabalanus tintinnabulum*), limpets (*Cellana radiata*), the rock oyster (*Saccostrea cucullata* [sic]), green mussels (*Perna viridis*), as well as several species of sea urchins and

sea anemones. Among the seventeen bird species observed, the Common Sandpiper, Lesser Crested Tern, Lesser Sand Plover, and Western Reef Heron are winter visitors, while the River Tern (*Sterna aurantia*) was the only species classified as Vulnerable (VU) according to the IUCN Red List. The findings highlight intricate plant–animal interactions and the ecological role of Kallupara Island as a natural sea breaker protecting the coast and local fishing communities. The area's rich biodiversity, coupled with its research potential, underscores its importance for marine conservation and sustainable knowledge-based tourism.

Keywords: Azhiyur panchayath, Biodiversity survey, Chombala Rock Island, Kallupara Island, Kozhikode district, Kerala

PP-11

Uses and bioactive potential of *Pittosporum* (Pittosporaceae): Medicinal, economic and ecological significance

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The *Pittosporum* Banks *ex* Gaertn. (Pittosporaceae), is a genus of nearly 250 species distributed across Asia, Africa, Australia, New Zealand and the Pacific. The genus is recognized for its diverse applications ranging from health care to economic value. Medicinally, different species are employed for managing respiratory ailments, skin diseases, wounds, musculoskeletal disorders, fevers, metabolic complaints, and as antidotes to toxins. Phytochemical research since the 1960s has isolated many metabolites, with terpenoids, saponins, and lignans as dominant classes, along with essential oils enriched in terpenoids and fatty acids. These constituents account for a wide array of experimentally validated bioactivities, including anti-inflammatory, antioxidant, antimicrobial, cytotoxic, antiparasitic, antimalarial, enzyme inhibitory, hepatoprotective, and antinociceptive effects. Economically, *Pittosporum* species are valued as ornamentals (*P. tobira* (Thunb.) W.T.Aiton), in perfumery and fragrance industries (*P. tenuifolium* Gaertn., *P. eugenioides* A.Cunn.), and as sources of resins and oils (*P. resiniferum* Hemsl.). Certain taxa also play roles in ethnoveterinary medicine and cultural practices. Ecologically, species occurring in the Western Ghats and other biodiversity hotspots hold conservation importance due to habitat loss and overexploitation. Together, these findings position *Pittosporum* as a multipurpose genus of high medicinal, economic, and ecological relevance. Future work should prioritize toxicological assessment, molecular mechanism studies, sustainable utilization, and conservation strategies to unlock its full potential.

Keywords: Bioactive Potential, Conservation, Economic Uses, Medicinal Uses, Ornamental

PP-12

Overview of genus *Strobilanthes* (Acanthaceae) based on Indian Herbarium studies

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The genus *Strobilanthes* Blume is the second largest genus of Acanthaceae, comprising 466 accepted species distributed across tropical and subtropical Asia. The Indian subcontinent serves as a notable center of diversity, with at least 167 species, particularly in the Western Ghats and Eastern Himalayas. Herbarium serve as a database for various taxonomic identification, biodiversity documentation, historical record of species diversity and conservation related studies. In the present study, taxonomic study is based extensively on field observations in the Western Ghats and the investigation of herbarium specimens observed at MH, FRHT, JCB, BSI, AHMA, BLAT, SUK, NBRI, CAL, Goa University Herbarium, and additionally specimens from virtual herbarium were studied since they are available on each herbarium website. 124 species of *Strobilanthes* are enumerated from the Indian herbarium studies. It shows that most of the *Strobilanthes* species are endemic to the Western Ghats, specifically to NWS, SWG and NE India; of this 72 are endemic species. Analysis of herbarium data also showed that there were older names for a given taxa which are raised to synonyms; some species are still represented by the classification as Strobilanthinae *sensu* of Bremekamp (1944) and is noted in most of the herbarium listed above. A number of generic transfers are required, and species with ambiguous typification should be lectotypified. Furthermore, this informal study provides the overview of *Strobilanthes* species in the Indian Herbarium record and does provide a robust way of identifying *Strobilanthes* in the Indian sub-continent.

Keywords: Diversity, Herbarium studies, NWG, SWG, NE India, *Strobilanthes*

PP-13

Preliminary observation on propagation trial for three threatened medicinal climbers at Ahalia campus

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Climbers in general are more prone to peril due to their habit that warrants for a support to grow and their ecology. Any destruction to the host plant on which the climber takes support also affects it. In addition, since many of the climbers are known for their utility especially medicinal use, unscientific and destructive exploitation for such utilization also leads to their destruction. Green Ahalia has been working on threatened flora from the state in general and the district of Palakkad in particular. As we observed we realized that three climbers viz. *Holostemma ada-kodien* Schult. *Gymnema sylvestre* (Retz.) R.Br. *ex* Sm. and *Ipomoea mauritiana* Jacq. Are showing a dwindled population compared to the past from their original habitats. They are being collected for medicinal purpose in Indian system of Medicine. Two of these plants, *H. ada-kodien* and *I. mauritiana* are collected from wild for their tuber in bulk. Changes in habitats also had a telling impact. As part of our conservation strategy, we looked at their distribution and tried to raise a good stock of seedlings. With the poor availability of seeds and viability related issues we are left with poor response. We have also tried to raise seedlings using stem cuttings and/or root cuttings rooting hormones which ensure production of seedlings round the year under mist chamber conditions. The results are promising, and we could get a good stock of nursery seedlings, using which we are also able to create a small conservation plot that will become in future a source of planting material. The objective and the process we adopted is shared in this poster for the sake of conservation and sustainable use.

Keywords: Conservation, *Holostemma*, *Gymnema*

PP-14

Biomass estimation and carbon sequestration potential of the Botanic Garden of the Indian Republic, Noida using vegetation indices

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Plant biomass plays a crucial role in the global carbon cycle by capturing atmospheric CO_2 and storing it over extended timescales. Botanic gardens, while primarily safeguarding living collections for research and education, also serve as significant urban carbon reservoirs, though their biomass stocks remain under-quantified. This study evaluates biomass and carbon sequestration trends in the Botanic Garden of the Indian Republic, Noida. Our analysis revealed that 42–55% of the garden is occupied by high to dense vegetation, with 50% classified as high in the carbon map and 39% as high in biomass distribution. To achieve this, we employed remotely sensed vegetation indices—Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), and Soil-Adjusted Vegetation Index (SAVI)-for estimating above-ground biomass and carbon stocks. Field-based biomass measurements were integrated with spectral data to calibrate and validate predictive models, ensuring reliable characterization across heterogeneous canopy types. NDVI effectively captured overall canopy greenness, EVI minimized saturation in dense vegetation, and SAVI corrected for soil background influences in sparsely vegetated areas. The combined application of these indices enhanced model robustness, showing strong correlations with ground-truth observations. Results demonstrate that the garden maintains a healthy vegetation cover, reveals spatial heterogeneity in canopy density, and provides critical insights into biomass and carbon storage. These findings underscore the dual role of botanic gardens in biodiversity conservation and climate mitigation, and highlight the value of multi-index remote-sensing approaches for ecological assessment and management in managed landscapes.

Keywords: Above-ground biomass, Botanic Garden, Carbon stock, EVI, NDVI, SAVI

PP-15

Ex situ conservation of some selective endemic plant species of Westen Ghats and Konkan region of Maharashtra

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Ex situ conservation is the process of protecting endangered species outside of their natural habitats. In this process, threatened plants /seedlings taken out of their natural habitats and placed in special locations where they can be protected. The following four plant species are in RET categories *i.e.* (1) *Garcinia talbotii* Raizada *ex* Santapau (Clusiaceae) is endemic to

Western Ghats and Least Concern category of IUCN, (2) *Nesphostylis bracteata* (Baker) D.Potter & J.J.Doyle (Fabaceae) is endemic to northern Western Ghats of Maharashtra and critically endangered category of IUCN, (3) *Piliostigma foveolatum* (Dalzell) Thoth. (Fabaceae) is endemic to Sahyadri region of Western Ghats and Least Concern category of IUCN, and (4) *Vigna khandalensis* (Santapau) Sundararagh. & Wadhwa (Fabaceae) is endemic to Northern Western Ghats and Near Threatened category of IUCN. Therefore, attempts were made to conservation of these four species by using conventional methods via prepared seedlings by using seed gemination. About 150 seedlings were planted in the Botanical Garden of college and about 450 seedlings / seeds of above species were distributed to various Botanical Gardens of BSI, Institutes and Colleges. This will be help to protect endangered species, when their natural habitat is no longer safe.

Keywords: Botanical Garden, Conservation, Distribution, Endemic, Seeds, Seedlings

PP-16

Divergent leaf traits of medicinally important *Cocculus hirsutus*: Morphoanatomical and molecular authentication

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Cocculus hirsutus (L.) Diels (Menispermaceae) is a perennial liana widely distributed in tropical and subtropical regions of the Western Ghats, India. It holds considerable ethnomedicinal importance, being traditionally used in the treatment of jaundice, chronic fevers, skin disorders, and gastrointestinal ailments. Modern pharmacological investigations have further validated its hepatoprotective, anti-inflammatory, and immunomodulatory properties. However, despite its therapeutic significance, this species exhibits pronounced polymorphism, particularly in foliar traits, which complicates accurate identification and creates challenges for its safe medicinal application and conservation. In the present study, variation in leaf morphology of *C. hirsutus* was assessed. Five samples representing distinct leaf structures were analyzed, and morphological evaluation of foliar traits (petiole length, leaf length, and leaf width) revealed significant variation ($p < 0.0001$) through one-way ANOVA (F-values: PL = 1247.46, LL = 1303.51, LW = 1413.46). Principal component analysis (PCA) further emphasized this diversity. Morphoanatomical features, including the leaf epidermis, were examined to aid species-level resolution. Additionally, DNA barcoding using matK, rbcL, and combined sequences was performed, with rbcL and the combined dataset showing higher reliability in species discrimination. Phylogenetic reconstruction through Maximum Likelihood (ML) and Bayesian Inference (BI) confirmed that all examined samples belonged to the same species. This study demonstrates the value of molecular identification as a reliable tool for authenticating medicinal plants. In polymorphic taxa such as *C. hirsutus*, where morphological variation obscures taxonomic clarity, molecular approaches provide accurate characterization, thereby reducing the risk of misidentification in pharmaceutical applications and strengthening strategies for conservation and sustainable utilization.

Keywords: Chloroplast gene, *Cocculus hirsutus*, Leaf traits, Medicinal plant, PCA, SPSS

PP-17

Ex Situ Conservation through the establishment of thematic gardens at Ahalia Campus

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Ahalia Campus, situated in the eastern part of the Palghat Gap region, lies within a unique eco-climatic zone renowned for its biodiversity. Several endemic plant species have been reported from Palakkad, particularly within the gap region, over recent decades. With the accelerating loss of habitats and species worldwide, biodiversity conservation has become a global priority. *Ex situ* conservation—preserving species outside their natural habitats—plays a crucial role in supporting *in situ* efforts. Since 2017 while establishing its botanical garden, Ahalia Campus adopted a thematic approach integrating conservation, sustainable utilization, education, and awareness. The conservation section hosts several IUCN-categorized threatened species, including those classified as CR, EN, VU, and locally rare. A key highlight of the garden is the Palakkad Corner, dedicated to conserving species native to the Palakkad region. This initiative seeks to protect rare, endangered, and medicinally important plants while raising awareness among students, researchers, and the community. Detailed documentation of species diversity, propagation methods, and seasonal monitoring forms an essential part of the program. The thematic garden has not only offered refuge to many threatened plants but also has reached a stage where we are able to act as a source for propagation material for selected species. The garden enhances the campus's educational and aesthetic value, serving as a living laboratory for environmental studies. Ahalia Campus fosters a deeper connection between people and nature, ensuring the conservation of valuable plant genetic resources. The nursery, featuring RET, medicinal, and ornamental plants, supports conservation initiatives and contributes to the campus's carbon neutrality vision.

Keywords: Biodiversity, Botanical Garden, Conservation, Endemic species

PP-18

South Indian Gentians: Exploring the diversity and conservation

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Gentianaceae commonly called Gentian family are the third largest family of the monophyletic order Gentianales with Rubiaceae and Apocynaceae being distinctly larger. This paper presents the findings of an extensive survey on diversity, distribution and conservation status of gentians in South India. It explores the endemic and threatened taxa of this family with a highlight of the unique characteristics, habitats and ecological preferences of these species, and discuss the major threats to their survival, including habitat destruction, over collection and climate change. This poster aims to raise awareness about the importance of conserving South Indian Gentians and their habitats and to promote collaborative efforts towards their conservation which can include *in-situ* and *ex-situ* conservation, habitat restoration, and sustainable harvesting practices.

Keywords: Conservation, Gentianaceae, Gentianales, South India

PP-19

Phenology of *Terminalia* species in Kuvempu University Campus, Karnataka, India

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Plant phenology is the study of seasonal behaviour of plant functioning, and ecosystem services. It also provides a critical signal of climate variability and its effects on plants. *Terminalia* L. is an important genus of deciduous forest, and it belongs to the family Combretaceae, represented by about 150 species in tropical regions of the world and 14 species in India. The present study area of the Kuvempu University campus is adjacent to the buffer zone of Bhadra Wildlife Sanctuary, Karnataka. The area is prone to maximum human disturbance, from natural ecosystems to concrete jungles. The species composition is higher than that of other species; hence, we wanted to know its behaviour. Four available species were selected, such as *T. tomentosa* Wight & Arn., *T. paniculata* B.Heyne *ex* Roth, *T. bellirica* (Gaertn.) Roxb. and *T. catappa* L. for monthly phenological observation from April 2023 to October 2024. Species-level studies are needed to better understand their response to human disturbance gradient and climate and these species are one of the major food sources of the Malabar giant squirrel, and their calendar.

Keywords: Climate change, Plant phenology, Western Ghats

PP-20

Morphological variation in populations of *Impatiens scapiflora* (Balsaminaceae) across altitudinal gradients

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Comparative analysis of three populations of *Impatiens scapiflora* B.Heyne *ex* Wall. was carried out to assess variation in vegetative, floral, fruit, and pollen traits. Specimens were collected from Teekoy (150 m), Vagamon (980 m), and Elappara (1200 m) in the central Travancore region. Field photographs were taken, voucher specimens prepared using standard procedures, and deposited in the Herbarium of the Department of Botany, Carmel College, Mala, Thrissur (CCMT). Population 1 is characterized by smaller tubers (ca.1 cm), elliptic membranous lamina with serrate margin, peduncles up to 25 cm bearing 17–24 flowers, and obtuse lower sepal apex. Population 2 has larger tubers (1.8–2 cm), orbicular fleshy leaves with minutely serrate margin, shorter peduncles (up to 15 cm) with 8–12 flowers, pedicels of 2.5 cm, and obtuse–mucronate lower sepal apex. Population 3 exhibits the largest tubers (2.5–3 cm), elliptic membranous lamina with crenate margin, peduncles up to 30 cm with 18–20 flowers, pedicels of 4 cm, and acute lower sepal apex. Pollen morphology is generally spheroidal with four colpi and reticulate sexine across populations, but notable variation occurs in polar outline, lumen size, and intraluminar baculae (absent in Population 1, obscurely present in Population 2, and prominent in Population 3). The study

aimed to (i) document and compare the vegetative and reproductive morphology, (ii) analyze pollen characters of the populations, and (iii) assess the extent of intra-specific variability across altitudinal gradients. The results reveal considerable intra-specific diversity in *I. scapiflora*, highlighting the importance of combined morphological and palynological approaches in understanding population-level differentiation.

Keywords: Idukki, Kerala, Palynology, Taxonomy

PP-21

Categorization and conservation measures of threatened and endemic plants of India Thar Desert, Rajasthan (India)

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Rajasthan is the largest state of the India covering an area of 3,42,239 km^2 categorised into two biogeographic zones *i.e*. Arid and Semi-arid zones (Rodgers & Panwar, 1988). The arid zone lies in the North-Western part of the State and spreads over an area of 2,08591 km^2. The State has a total forest cover of ca. 4.62%, most of which (9%) falls under semi-arid region and the scrub forest cover is around 4,564 km^2 (FSI 2011). The arid zone has been recognized as one of the important phytogeographic regions of India since the time of Sir J.D. Hooker (1906). The forest type in arid zone is scrub forest and the dominated species are *Calotropis procera* (Aiton) W.T.Aiton, *Ziziphus nummularia* (Burm.f.) Wight & Arn., *Calligonum polygonoides* L., *Leptadenia pyrotechnica* (Forssk.) Decne. *etc.* This paper has focus on the threatened species of the region and around 44 different plants species are categorized in this category among this *Acacia jacquemontii* (Benth.) Ali, *Caralluma edulis* (Edgew.) Benth. *ex* Hook.f., *Commiphora wightii* (Arn.) Bhandari, *Ephedra foliate* Boiss. *ex* C.A.Mey., *Farsetia macrantha* Blatt. & Hallb., *Glossonema varians* (Stocks) Benth. *ex* Hook.f., *Neurada procumbens* L., *Peganum harmala* L., *Tephrosia falciformis* Ramaswami, *Tecomella undulata* (Sm.) Seem., *Tribulus rajasthanensis* (Bhandari & V.S.Sharma) Hemaid & Jac.Thomas and *Withania coagulans* (Stocks) Dunal etc.

Keywords: Arid and Semiarid, Endemic Plants, Thar Desert, Threatened

PP-22

Palynological study of genus *Physalis* from India

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The genus *Physalis* L. is belonging to the family Solanaceae represents around 90 species distributed throughout the world. Mexico is one of the most diverse regions represents around 61 species. The genus is identified by its distinct inflated fruiting calyx. Taxonomically, external traits such as leaves, inflorescence, flowers, and fruits play a key role in defining taxa, while micro morphological features like stomata, trichomes, and pollen are equally important for understanding species relationships and evolutionary patterns. The present study deals with the pollen morphology of Physalis species from India. India represents about 11 species distributed across various regions of the country from that 8

species have been studied for pollen morphology under light microscope and scanning electron microscope. Pollens are monad, tricolporate, small to medium in size. The highest polar and equatorial length was observed in *P. angulata* L. (P = 25.27±0.59 and E = 29.62±0.50). The lowest polar length was observed in *P. pruinose* L., and lowest equatorial length was found in *P. cordata* Houst. *ex* Mill. The P/E ratio ranges from 1.04 to 1.18, the grains being subprolate to prolate spheroidal in shape.

Keywords: Light microscopy, Micromorphology, Palynology, *Physalis*

PP-23

Sida keralensis (Malvaceae): An addition to the flora of Maharashtra, India

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Present communication reports an addition of *Sida keralensis* E.S.S.Kumar, Shailaja, Sreekala, Parthipan & R. Prakashkumar (Malvaceae) plant species to the Maharashtra flora, collected from road sides of the civil lines area of Chandrapur city of Chandrapur District, Maharashtra State, India. It was described as an endemic plant species from Thiruvananthapuram district, in Kerala, India and hitherto presently known only from the type locality.

Keywords: Addition, Chandrapur, Maharashtra, Malvaceae, *Sida keralensis*, India

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