



Botanical Survey of India

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Website: <http://bsi.gov.in>



ANNUAL REPORT

2024–2025



भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

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Ministry of Environment, Forest & Climate Change

Government of India

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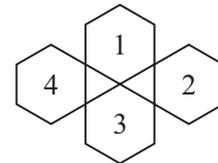
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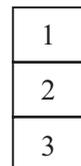
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FROM THE DIRECTOR'S DESK



It gives me immense pleasure to present the Annual Report 2024–25 of the Botanical Survey of India (BSI). The report highlights the institute's diverse achievements in the field of taxonomic research, blended with cutting-edge technologies and modern scientific approaches. Apart from its core mandate of taxonomic exploration and documentation, the institute has remained actively engaged in outreach initiatives, awareness programmes, and public engagement activities throughout the year. As recommended by the Research Advisory and Monitoring Committee (RAMC), BSI implemented 80 projects under the Annual Research Programme (ARPs) focusing on various aspects of flowering and non-flowering plant taxonomy across the country. Under these projects, 62 floristic surveys were conducted in different phytogeographical regions, along with 03 Herbarium Consultation Tours (HCTs) in major herbaria across India. A total of 3524 plant specimens were collected and identified. In pursuit of completing the inventory of the nation's floral diversity, BSI updated numerical strength of floristic wealth in the country by compiling the 'Plant Discoveries' series this year as well. Currently India has 56177 documented floristic elements including 22,368 angiosperms, 83 gymnosperms, 1,325 pteridophytes, 15,986 fungi, 9,117 algae, 2,850 bryophytes, and 3,151 lichens. In alignment with the Global Strategy for Plant Conservation (GSPC) targets on ex situ conservation, a total of 2,676 plants were propagated and conserved across botanical gardens maintained by BSI's regional centres. Additionally, 150 fungal cultures were preserved during the reporting year. Further, in line with the institute's vision for digitization and open access to scientific data, a total of 1,32,519 herbarium sheets were digitized and 1,92,730 metadata records were created at different Regional Centres and Units of BSI during the reporting period.

During the year, the scientists and researchers of the Botanical Survey of India (BSI) made significant contributions to botanical science by publishing 37 taxa new to science and 35 taxa as new additions to the Indian flora. The research excellence and scholarly dedication of the institute's scientific personnel were further reflected through the publication of 38 books, 8 e-books, and 232 research papers in peer-reviewed journals. In addition, BSI brought out three periodicals—NELUMBO (Vol. 66: Issues 1 & 2), Plant Discoveries (2024), and Vanaspati Vani (Vol. 33).

Notably, the 18th volume of Plant Discoveries (2024), released on 1st July 2025, documented details of 433 taxa newly described or reported as distributional novelties.

Botanical Survey of India celebrated its 136th Foundation Day on 13th February 2025 at the Dhano Dhanyo Auditorium, Alipore, Kolkata. To mark this occasion, BSI organized the 3rd International Symposium on Plant Taxonomy, Ethnobotany, Botanic Gardens and Biodiversity Conservation (ISPTEBG&BC 2025) from 13th to 15th February 2025. The symposium served as an important platform for researchers, policymakers and industry practitioners to exchange original research findings and practical insights on plant taxonomy, floristic studies, ethnobotany and biodiversity conservation techniques. The event witnessed participation from about 520 delegates, including 45 invited speakers, 6 foreign participants, and 470 researchers from across the country.

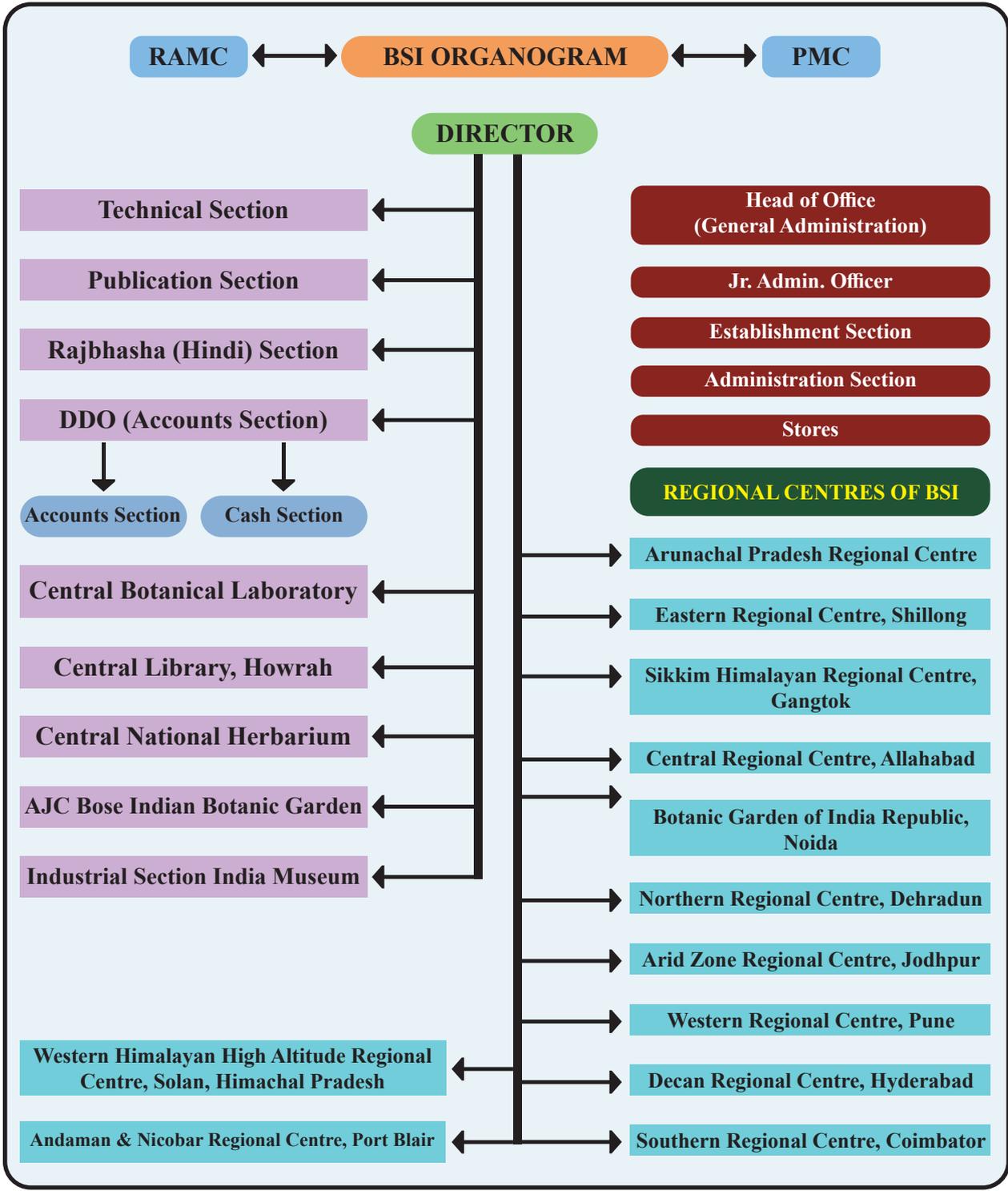
This year BSI conducted 'Two weeks in-service training programme for the Botanical Assistants in BSI' at BSI-CNH, Howrah from 02.12.2024–16.12.2024. The training included a 4 days field tour to the Buxa Tiger Reserve, New Alipurduar, West Bengal. The in-service training was attended by 35 Botanical Assistant posted at the different regional centres of BSI.

In recognition of their remarkable contributions to the field of plant taxonomy, scientists of the Botanical Survey of India received several national awards and honours from distinguished professional societies and organizations. Furthermore, the institute actively contributed to public service by promoting awareness and understanding of plant diversity and conservation through various outreach initiatives and educational programmes.

My sincere congratulations to all the scientists, technical staff, and administrative colleagues for their invaluable collaboration and tireless efforts in enhancing our work-environment through dedication, teamwork, innovation, and creativity. I extend my heartfelt gratitude to the entire staff for their unwavering commitment to achieving the institution's objectives and upholding the esteemed reputation of the Botanical Survey of India, which continues to lead in taxonomic and floristic studies, surveys, documentation, and conservation of the nation's rich plant resources.

Jai Hind

Kanad Das





भारतीय वनस्पति सर्वेक्षण
BOTANICAL SURVEY OF INDIA

ANNUAL RESEARCH PROGRAMME

AJC BOSE INDIAN BOTANIC GARDEN, BSI, HOWRAH

Project 1: Development and Maintenance of aquatic plant section in AJCBIBG

Executing Officials: Dr. R. Saravanan, Botanist (With Assistance of Two garden staff)

Duration of the Project: Ongoing (Final report to be submitted in March, 2025)

Background: Aquatic plants play an important role in aquatic ecosystem, not only as service provider but also as phytoremediation. Rapid urbanization, industrial expansion and ineffective protective measures had a cumulative effect on the loss of aquatic biodiversity. The conservation and awareness of these plants therefore becomes necessary. With this view an aquatic section was developed at AJC Bose Indian Botanic Garden, Howrah. The aquatic section is built in an area of more than 12000 sq.ft. to enrich visitors with different species and cultivars of aquatic plants at the same time serving as an *ex-situ* conservatory of aquatic plants germplasm. Different types of *Nelumbo* including both wild and cultivars, *Nymphaea* including cultivars plus wild species, aquatic ferns, hydrophytes and *Nymphoides* and others are conserved in this newly developed aquatic plant section.

Area & Locality: Aquatic plant section of AJCBIBG (approx. 12000 sq.ft.)

Objectives:

1. Introduction of 10 species in each quarter.
2. Maintenance of the aquatic plant section.
3. Conservation strategies involved.

Achievements:

- During the collection from Western Ghats and West Bengal, a total no. of 38 aquatic plant species have been collected and introduced in the aquatic plant section of AJCBIBG.
- Introduced the different cultivars of 11 lotus and 13 lilies in the aquatic plant section of AJCBIBG.
- A total no. of 62 aquatic plant species have been collected and introduced in the year 2024-2025.
- Aquatic plant section is extended by addition of 17 tanks, 82 Lily pots, and 10 nos of wide pits with the total no. of 142 different aquatic plant species and cultivars.
- Seeds of *Victoria amazonica* and *Euryale ferox* has been harvested and seed viability is maintained by inducing germination at regular interval.
- More than 12 forest area and BSI gardens has developed the *V. amazonica* in first time (first time record in Andaman Nicobar Islands *V. amazonica* established with blooming) Under the ex-situ conservation project through the seeds of Aquatic section, AJCBIBG.
- Documented the flower dissection of *V. amazonica* and *Euryale ferox* first time in AJCBIBG.
- More than 20 timelapse videos of *V. amazonica* and *Nymphea* night bloomer has been recorded in the aquatic section of AJCBIBG.
- One paper has been accepted from the South African Journal of Botany, titled with “*Nutritional Analysis and Antioxidant Activity of Victoria amazonica* Seeds: Evaluating Its Potential as A Future Food Source” on January 09, 2025.

Collection of Aquatic Plants from the Wild



Collected Aquatic Macrophytes and Their Habitats



Addition of New Water Tanks & Pots for Conserving More Species



Regular Maintenance of Aquatic Plant Section



Interaction with Students, Visitors at Aquatic Plant Section



Seed Harvesting & Germination of *Euryale ferox* Salisb.



Seed Harvesting & Germination of *Victoria amazonica* (Poepp.) Klotzsch



Ex-Situ Conservation of Several Nymphaea Species & Other Aquatic Plants



Project 2: Introduction and ex-situ conservation of EET species in AJCBIBG, BSI, Howrah

Executing Officials: All scientific staff up to level of Preservation Assistant cum Garden Overseer

Duration of the Project: Ongoing

Background: To enrich AJCBIBG with different species and cultivars of plants with major objective of AJCBIBG serving as an *ex-situ* conservatory of plant germplasm.

Area & Locality: AJC Bose Indian Botanic Garden, Howrah

Objectives:

1. Collection of Live Wild Edible, Medicinal, Economical, Endemic and Threatened Plant species throughout India by conducting plant collection tours in different phytogeographic regions of India.
2. Multiplication of several notable EET species in nurseries.
3. Plantation of thousands of saplings in different divisions of AJCBIBG.

Achievements:

- **Plant Collection:**
 - **No. of Tours:** a total **10 tours** were conducted in different phytogeographic regions (Western Ghats, Eastern Ghats, Tamil Nadu, Uttarakhand, Dehradun, Madhya Pradesh, Lucknow, Uttar Pradesh, Odisha, Darjeeling Himalaya, Sikkim, Meghalaya, Arunachal Pradesh).
 - **Total no of species collected:** more than **753 species** were collected.
 - **Total no of species under IUCN red list:** **102 species** were collected during the tour.
 - **Total no of Endemic Species:** Total **110 species** were collected.
 - **Total no of species newly introduced to garden:** Total **120 species** were new to garden. They were initially kept under observation in Nurseries and after their successful acclimatization they have been successfully planted in different divisions of AJCBIBG.
- **Plant multiplication in Nursery No. 1 and 2:** Mass propagation and multiplication of plants by grafting, cutting, budding, seedling collection and seeds germination etc. Multiplied more than **60 species including 15 EET species**.
- **Mass Plantation:** More than **4913 plant saplings** belonging to Wild Edible, Medicinal, Economical, Endemic and Threatened Plant species were planted in different divisions (Division 1, 17, 22, Conservation Hedge, Garjan math area, Palmetum), on different occasions like Ek Pedd Ma K Naam, World Environment Day, Van Mahotsav etc.
- More than **3000 mangroves of 7 different species** are planted in the Hooghly River side from guest house to foliage section area. Some of the major planted species are *Heritiera fomes* Banks, *Excoecaria agallocha* L. *Bruguiera gymnorhiza* (L.) Lam. ex Savigny, *Sonneratia alba* Sm. etc.
- **Development of New plant avenues:** White Sanders (*Santalum album*), Branched palm (*Hyphaene thebaica*), Neem (*Azadirachta indica*), Agarwood (*Aquilaria malaccensis*), *Elaeocarpus serratus* avenues have been prepared.
- **Development of an Orchidarium:** More than 2000 sqft area developed for orchid growth and multiplication in which 34 species of orchids are conserved.

- **Development of New Sections:**
- **Plant Taxonomic Section:** 500 different species of plants were planted in Plant taxonomic section belonging to 143 families of Dicotyledons, 29 families for Monocotyledons, 3 beds are dedicated for Gymnosperm and 5 beds for Cryptogams (Algae, Fungi, Bryophyte, Pteridophyte) have been prepared representing plants from different taxonomic families based on Classification by Bentham & Hooker located in Division no- XXV.
- **Butterfly Section:** This section includes 50 butterfly attracting plant species located in Division no. II with an area of 0.5 acre.
- **Tea Section:** More than 1000 saplings of Tea (*Camellia sinensis* (L.) Kuntze) species including six most renowned varieties of tea have been planted in this section in division no. XXII.
- **Expansion of Charaka Udyan:** More than 300 beds were prepared and 150 species of medicinal plants were planted in those beds.
- **Conservatory Hedge:** 120 species were conserved along the roadside in division I & II.



Butterfly Section



Charaka Udyaan



Conservatory Hedge



Orchidarium



Mass Plantation

Project 3: Legumes of AJC Bose Indian Botanic Garden, Howrah, West Bengal, India.

Executing Officials: Dr. V.K. Mastakar (Botanist), Dr. J. Swamy (Scientist - C) and Dr. Devendra Singh (Scientist - E)

Duration of the Project: 2023–2025

Background: A botanic garden not only acts as a place of aesthetic beauty attracting tourists and nature lovers but also offers ample opportunities to botanists, horticulturists and other researchers to study various aspects of plant biology. The botanic gardens are engaged in *ex-situ* conservation of a wide range of threatened species, a majority of which have today no known commercial value but may have high potential as a future food, medicinal or any other industrial value plant. Presently AJC Bose Indian Botanic Garden is serving as a centre of conservation of plant resources. This garden serves as a living repository of plants of the country and also of selected exotic species, and a “safe abode” for the endemic and threatened plants. As a result, it houses of about 1400 species germplasm collections of selected economic, ornamental and medicinal plants and their wild progenitors. The family Fabaceae has 19500 species belonging to 765 genera and distributed throughout the world. In India, the family represented by 1368 taxa (incl. 1110 sp. and 256 infraspecific) belonging to 174 genera. Out of 1400 species of the garden, the family Leguminosae or Fabaceae is represented 175 taxa (incl. 173 sp. and 02 ssp.) including 11 endemic species belonging to 85 genera of the family. The above study was about trees, shrubs, lianas and some of the climbers but not herbs, twiners, etc. Hence, to document entire legume diversity including herbs and twiners and bring out user friendly pictorial guide on legumes of the AJC Bose Indian Botanic Garden the present work is proposed.

Area & Locality: AJC Bose Indian Botanic Garden, Howrah

Objectives:

1. To survey of legume diversity of AJC Bose Indian Botanic Garden.
2. To generate data on phenology of the legumes.
3. To collect germplasm of endemic and threatened legumes for multiplication by traditional methods.
4. To bring out user-friendly pictorial guide, which will be useful in identification for researcher, visitors and who are engaged in Botany background.

Achievements:

- The present legumes investigation of the garden, reveals that the legume diversity of the AJCBIBG is represented by a total of the 116 taxa belonging to 77 genera (Table 1). During the present study 02 species (*Pterocarpus rotundifolius* (Sond.) Druce subsp. *rotundifolius* and *Swainsona formosa* (G.Don) Joy Thomps.) were added to the Indian legume flora.
- On analysis of the habit forms it is found that trees were dominate with 69 species followed by shrubs 22, climbers 13, under shrubs, lianas and herbs 4 each. The dominant genera are *Bauhinia* (6 taxa), followed by *Pterocarpus* and *Senna* (5 taxa each), *Alibizia*, *Brownea*, *Dalbergia*, and *Saraca* (04 taxa each), *Cassia*, *Clitoria*, *Flemingia*, and *Mucuna* (03 taxa each), *Cynometra*, *Enterolobium*, *Libidibia*, *Senegalia*, *Vachellia*, *Vigna* (02 taxa each), and remaining 60 genera are represented by single species.
- IUCN Red Listed Species *Amherstia nobilis* Wall., commonly known as Tree of Heaven or Dancing Doll, which already Extinct in the Wild (EW) in Indo—Burma region. The tree successfully propagated through air layering method and introduced in the *Amherstia* avenue.

- The species *Pterocarpus rotundifolius* (Sond.) Druce subsp. *rotundifolius* is reported first time from India from this garden, the species might have introduced 100 years before into this garden and another species *Sindora wallichii* Benth. is also represented by single species in India in division 1. The later species were propagated through seeds and raised more than 100 saplings and planted in garden. The former species fell down during the cyclone in 2025. *Baphia nitida* G.Lodd. is also represented by single individual in garden and more than 100 saplings successfully raised and planted in the garden.



Amherstia nobilis Wall.



Bauhinia acuminata L.



Libidibia coriaria (Jacq.) Schtdl.



Senna polyphylla (Jacq.) H.S.Irwin Barneby

Project 4: Sustainable Management of water bodies of Acharya Jagdish Chandra Bose Indian Botanic Garden.

Executing Officials: Dr. R. Saravanan, Botanist and Mr. Sattom Dasgupta, Preservation Assistant cum Garden Overseer

Duration of the Project: 2024–2026

Background: Despite the importance of aquatic biodiversity, they are continuously being degraded and forced to degrade by the very act of the human. Rapid urbanization, industrial expansion and ineffective protective measures had a cumulative effect on the loss of aquatic biodiversity. Restoration and preservation of aquatic diversity is surely one of the strategies to check the genetic erosion of such highly productive ecosystems. However, aquatic environments take years to evolve and develop, so every strategy to protect them must be used (Ferreira & al., 2023). Apart from the usual ecosystem services, in recent trends, aquatic plants are used in phytoremediation of wastewater. Aquatic plants have the ability to absorb organic and inorganic contaminants and heavy metals present in agricultural, domestic and industrial waste water. Among the aquatic plants, *Salvinia molesta* D. Mitch. and *Pistia stratiotes* L. have been widely used for the treatment of agricultural, domestic and industrial waste water (Hauwa & al., 2021). The conservation and awareness of these plant groups, therefore becomes even more necessary for the better as well as effective management of aquatic ecosystem not only for its ecosystem services but also for sustainable development of the human society for posterity.

Area & Locality: AJC Bose Indian Botanic Garden, situated in the district of Howrah has an area 273 acres with 24 interconnected lake systems, which varies in types of aquatic plants.

Objectives:

1. Study of Limnological parameters of the water bodies of AJCB Indian Botanic Garden.
2. Identify lakes with maximum eutrophication.
3. Comprehensive documentation of aquatic macrophytes of the garden.

Achievements:

- Water samples were collected from all major lakes of AJCBIBG for analysis.
- During sample collection, the plants located near the collection sites were identified & documented properly.
- Using multiparameter calibrated probe Temperature, pH, Conductivity, Total Dissolved Solids (TDS), Salinity of the water samples were calculated and noted for further analysis.
- Different aquatic macrophyte species present in various waterbodies of AJCBIBG were identified.
- During different site visiting of garden, photographs were taken for identification and documentation of the macrophytes for further studies & pictorial guide.



Plate 1 (A–D): Different water sample collection sites of Leram Lake; **(E–F):** Different water sample collection of Lake of Division No. 2, near Bamboosetum

Project 5: Ex-situ conservation, Propagation Techniques and Taxonomic studies of the Genus *Thunbergia* Terz. (Acanthaceae) in India.

Executing Officials: Dr. J. Swamy (Scientist - C), Sri. R.D. Barman (Bot. Asst.) and Dr. Devendra Singh (Scientist - E)

Duration of the Project: 2024–2027

Background: Native plants with potential decorative qualities are commonly referred to as “wild ornamental plants”. They are the wild ancestors of modern garden plants and offer a wide array of horticultural benefits for native landscaping and gardening. Wild ornamentals help connect people with nature and serve as prospective reservoirs of genetic stocks that can be utilized for hybridization and quality improvement program. Despite being a tropical country, India often relies on exotic ornamentals, including climbers, for gardens and landscapes, overlooking the potential of native ornamental resources. Interestingly, many native endemic and threatened species have the potential to be valuable horticultural plants, and their conservation could be ensured by incorporating them into garden settings. Among wild ornamental plants, Acanthaceae climbers are particularly interesting and often neglected. However, these unrecognized climbers significantly contribute to the beauty of landscapes as they climb over trees, hedgerows, or rocks. In India, the genus *Thunbergia* has high ornamental potential and is represented by 12 species and 2 varieties (Arisdason & al., 2020), of which 3 species, namely. These species are under threat due to various anthropogenic activities. Given the rapid disappearance of many ornamental species due to natural and human activities, it is imperative to rear a variety of ornamental plants for both ex-situ and in-situ conservation. Proper exploitation and promotion of these species are essential to prevent their elimination from their habitats. Therefore, we propose a taxonomic study focusing on the genus *Thunbergia* in India as a step towards ex-situ conservation at AJC Bose Indian Botanic Garden, Howrah.

Area & Locality: India.

Objectives:

1. To revise the entire genus *Thunbergia* for India.
2. To undertake ex-situ conservation and propagation endemic and important species.
3. To prepare high quality photographs and diagnostic keys based on the field observations.
4. To identify and document the species, providing valid names, with synonymy, citation, descriptions with good photographs and to building diagnostic keys based on field observations.

Achievements:

- Out of 12 species five species has been collected and introduced in Nursery number 1. Description and photo plates were made for 5 species after successful introduction in garden.
- More than 100 individuals of two species [*Thunbergia coccinea* Wall. ex D.Don and *Thunbergia erecta* (Benth.) T.Anderson] were propagated and introduced in Conservation Hedge and Nursery 1.
- Specimens images of *Thunbergia* have been received from BSI regional centres (ERC, Shillong; NRC, Dehradun; APRC, Itanagar; WRC, Pune; CRC, Allahabad, AZRC Jodhpur and examined specimens at BSID.



Thunbergia alata Bojer ex Sims



Thunbergia fragrans Roxb.



Thunbergia coccinea Wall. ex D. Don



Thunbergia grandiflora Roxb.

ANDAMAN AND NICOBAR REGIONAL CENTRE, PORT BLAIR

Project 1: Cyanobacteria and microalgae of Andaman and Nicobar Islands, India

Executing Officials(s): Dr. Sudipta Kumar Das, Scientist-E, BSI-ANRC and Dr. Sukumar Bhakta, Botanist, BSI-ANRC

Duration of the Project: 2024–2026



Collection of Planktonic algae from the Great Nicobar Islands



White surf waterfall, a typical habitat for freshwater microalgae

Background: The union territory of Andaman and Nicobar Islands constitutes the farthest and the remotest part of India, representing one of the richest repositories of biodiversity in the whole of South and Southeast Asia. The Bay of Bengal surrounds the archipelago with neighbouring countries such as Burma in the east and Singapore, Malaysia and Indonesia in the southeast. These Islands are situated between 6° and 14° North latitude and 92° and 94° East longitude, forming a broken row of 572 continuous islands from North to South direction. Earlier studies to document the freshwater algal flora from this archipelago were confined to few approachable localities only which are well connected by sea or road. However, more than 70% of the Union and Territory are yet to be explored. Hence, the present study is intended to make thorough base line survey of this region which will help future researchers and policy makers.

Area and Locality: Andaman and Nicobar Islands (8,249 sq. km.)

Achievements:

A total of 3 field exploration tours were conducted to the Great Nicobar Islands (15.06.2024 to 05.07.2024), North Andaman (28.09.2024 to 10.10.2024) and Little Andaman (03.11.2024 to 16.11.2024) during the years 2024-2025. A total of 224 cyanobacterial and microalgal samples were collected from different freshwater habitats. One (01) herbarium consultation tour was also conducted to Agharkar Research Institute, Pune to study the diatom collections. A total of 75 cyanobacteria and microalgal taxa were identified. Some of the important genera of cyanobacteria and microalgae sampled so far are *Synechococcus* sp., *Aphanothece* sp., *Chroococcus* sp., *Merismopedia* sp., *Gloeocapsa* sp., *Synechocystis* sp., *Leptolyngbya* sp., *Jaaginema* sp., *Oscillatoria* sp., *Lyngbya* sp., *Phormidium* sp., *Cylindrospermum* sp., *Dichothrix* sp., *Nostoc* sp., *Scytonema* sp., *Tolypothrix* sp., *Spirogyra* sp., *Closterium* sp., *Euastrum* sp., *Ankistrodesmus* sp., *Cosmarium* sp., *Ulothrix* sp., *Cladophora* sp., *Pediastrum* sp., *Desmodesmus* sp., *Chaetophora* sp., *Trentepohlia* sp., *Oedogonium* sp., *Chara* sp. *Trachelomonas* sp., *Lepocinlis* sp., *Phacus* sp., *Euglena* sp., *Navicula* sp., *Gomphonema* sp., *Achnanthes* sp., *Planothidium* sp., *Pleurosigma* sp., *Pinnularia* sp., *Cymbella* sp., *Encyonema* sp., *Nitzschia* sp., *Rhopalodia* sp., *Surirella* sp., and others. About a total of 366 photographs were taken with GPS data from the localities.

Project 2: Macrofungi of Andaman & Nicobar Islands

Executing Officials (s): Dr. Mahadevakumar, S. Scientist C

Duration of the Project: 2023–2027



Mycena sp. (Bioluminescent Fungus)



Pleurotus sp. (Wild edible fungus)

Background: Research on the taxonomy and variety of macrofungi is becoming more and more important since environmental degradation is putting many macrofungi at risk of going extinct. Wild mushrooms have significant effects on biology and the economy. Since ectomycorrhizal fungi play a vital role in both natural and organized eco-schemes, information on mushroom diversity is important. The fungus community forms an important part in reforestation initiatives. They are also important as a source of food for both humans and animals. India is a rich source of macrofungal resources and has been investigated by several researchers in search of bigger fungus. Taxonomy research on Indian macrofungi is declining, yet it is still necessary to comprehend their biodiversity and conservation. Numerous forest forms with diverse biodiversity found all over the world have mostly been undiscovered by fungi. Recent studies have made it clear that many species remain undiscovered, and in many regions, efforts to explore the microbial world have not yet begun. Much research on India's macrofungal diversity has been done in the Western Ghats, Western Himalaya, Jammu and Kashmir, Central India, and North Eastern Parts. Many workers have expended a lot of effort into documenting and harnessing their uses as food, medications, pharmaceuticals, ectomycorrhizal relationships, toxic mushrooms, and other things. However, there haven't been any current scientific studies on the Andaman Islands' macrofungal resources. From this angle, it is imperative that the fungal diversity of the Andaman and Nicobar Islands be investigated right now. The planned effort will provide the groundwork for future researchers to investigate and conduct Bioprospection on the macrofungi of the Andaman and Nicobar Islands. The baseline data for future study and advancement will come from the suggested endeavor.

Area and Locality: Andaman and Nicobar Islands: c. 8249 sq. km.

Achievements:

Three field tours were conducted in the year 2023-24. First field tour was conducted to Great Nicobar Islands 15.06.2024 to 05.07.2024, the second field tour to North Andaman during 28.09.2024 to 10.10.2024 and the third field tour to Nancowry band Nicobar group of Islands from 27.12.2024 to 17.01.2025. During these tours, a total of 430 numbers Macrofungal specimens from all three field tours. Important genera of macrofungi collected during Great Nicobar tour include, *Agaricus sp.*, *Cookeina sp.*, *Coprinopsis sp.*, *Favolus sp.*, *Marasmiellus sp.*, *Lentinus sp.*, *Macrocybe sp.*, *Pleurotus sp.*, *Schizopora sp.*, *Xylaria sp.* and others. Important genera of macrofungi collected from North Andaman includes *Agaricus sp.*, *Auricularia sp.*, *Cookeina sp.*, *Coprinopsis sp.*, *Coniophora sp.*, *Daldania sp.*, *Favolus sp.*, *Ganoderma sp.*, *Hexagonia sp.*, *Hypoxylon sp.*, *Lentinus sp.*, *Marasmiellus sp.*, *Microporous sp.*, *Pleurotus sp.*, *Schizophyllum commune*, *Schizopora sp.*, *Xylaria sp.* and others. Publications: 02.

Project 3: Ethnobotanical Study of Ranchi community/ settlers of Andaman Islands

Executing Official (s): Dr. Pankaj A. Dhole, Botanist, Shri Gautam Anuj Ekka, Bot. Assistant and Dr. Lal Ji Singh, Scientist-F

Duration of the Project: 2023–2026



Champereia manillana (Blume) Merr. –
MEETHA BHAI



Daily needs shop made up of Bamboo and *Licuala peltata* leaves.

Background: The ANI's are rich and unique in terms of plant diversity in India with higher number of endemism. This part of India is famous for its indigenous and authentic traditions. During British period a large number of tribal people (Munda, Oraon, Kharia, Ho and Santhal) from Chota Nagpur region Jharkhand brought to Andaman as forest laborers. As their recruitment station was Ranchi, these people are commonly known as RANCHI in Andaman Nicobar Islands. The most

interesting feature associated with these indigenous and ethnic has been found that, they live in localities which are immensely rich in biodiversity. Virtually their requirements ranging from food, fuel, fodder, medicine, and various other domestic needs are met from the local vegetation. So far, the existing information on ethnobotanical knowledge of these communities reveals that although there is a great floristic diversity in the region, very few are reported for their ethnobotanical and economic value. The culture of the Ranchi communities as well as traditional knowledge of uses of plant wealth are dwindling day by day. Hence, it is proposed to undertake a detailed Ethnobotanical study of Ranchi community / settlers of Andaman Islands to document their precious knowledge before complete extinction.

Area and Locality: Andaman Islands: c. 6408 sq. km.

Achievements:

- Total three (03) field exploration tours were conducted in the areas of Middle Andaman from 04.05.2024 to 14.05.2024, North Andaman from 28.09.2024 to 10.10.2024 and Little Andaman from 03.11.2024 to 16.11.2024.
- During the field trip a total of 113 field numbers of specimens were collected with a total of 584 ethnobotanical information (Broom–07, Decoration–11, Edible–66, Fiber/Rope–2, Fodder–19, Fuel–03, Magical-belief–50, Mat–04, Medicine–271, Miscellaneous–22, Religious–26, Socio-economic–34, Timber/Wood–28, Tooth Brush–10, Veterinary–31).
- A total of 13 exhibits were collected for museum.

Project 4: Flora of Cinque Wildlife Sanctuary, South Andaman

Executing Official (s): Dr. Anil Kumar Midigesi, Botanist, Shri Gautam Anuj Ekka, Bot. Assist., Dr. Lal Ji Singh, Scientist-F

Duration of the Project: 2023–2025



Dichapetalum gelonioides subsp. *andamanicum* (King) Leenh.



Scolopia parkinsonii N.Balach., Gastmans & Chakrab.

Background: Andaman and Nicobar archipelago is a group of 572 Islands which are situated in Bay of Bengal which are rich in florist diversity. The islands have been floristically explored time to time by many workers, but still some of the remote islands are unexplored, the study area is one of them comes under Andaman group of Islands. The study area ‘Cinque Wildlife Sanctuary’ is located at southeast to the Rutland Island, it consist a pair of islands namely North Cinque Island and South Cinque Island. The Cinque group of Islands is lies on the north side of Duncan Passage, between Rutland Island and Passage Island. The Cinque group of islands are uninhabited islands, belongs to the South Andaman Administration. Both North and South Cinque Islands are belongs to Rutland Archipelago, located 5.5 km and 7 km southeast of Rutland island respectively. The Islands are known for its unique flora, marine fauna and natural beauty. Since, the islands are remote so far there is no comprehensive work has been done. There are few collections from North Cinque since it is accessible somehow, but from the South Cinque the collections are very few. It is very tough to reach South Cinque because of the heavy tidal current from the open sea. If one can want to reach there need to be get down in the 5 ft. of sea waters. It is sure that around 90% of the South Cinque Island area not yet been explored, hence the Cinque Island has been selected for the present study.

Area and Locality: Cinque Island is one of the remote Islands of group of Andaman Islands and designated as Cinque Wildlife Sanctuary in the year of 1987. Cinque Wildlife Sanctuary a place endowed with spectacular natural beauty and encompasses three small adjoining remote Islands *viz.* Passage (0.62 sq. km); Sisters – North & South (0.36 sq. km.); Brothers - North & South (1.99 sq. km.). These proposed study area Cinque Wildlife Sanctuary (North and South Islands) covers about 9.53 Sq. km area. This sanctuary is an uninhabited set of two Islands and houses a great biodiversity in terms of flora and fauna. Till date there is no floristic survey on Cinque Wildlife Sanctuary. Hence, we are proposing the present work to carry out the complete floristic inventory of the same.

Achievements:

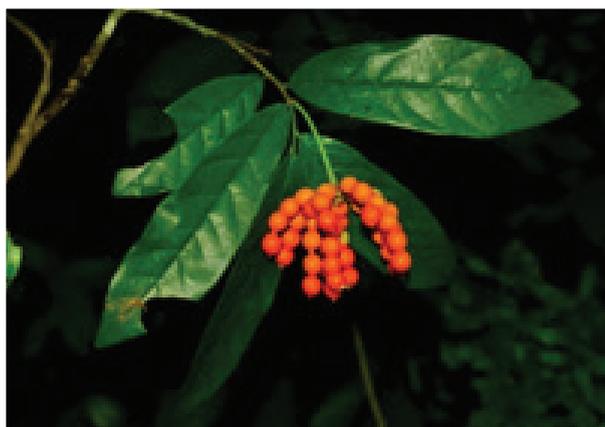
- Three field tours were conducted to the Cinque Wildlife Sanctuary, South Andaman. First field tour was conducted during 09.05.2024 to 18.05.2024, the second was during 17.09.2024 to 26.09.2024 and the third was during 05.12.2024 to 17.12.2024. As an outcome of the tour, a total of 58 herbarium specimens (in quadruplicates), 58 herbarium specimens (in quadruplicates) and 61 herbarium specimens (in quadruplicates) were vouched respectively.

- Morphological characterization of collected specimens is in progress and specimens identified in to spp. Of *Actephila*, *Adenia*, *Agonop*, *Amorphophallus*, *Ancistrocladus*, *Atalantia Barringtonia*, *Caesalpinia*, *Calamus*, *Capparis*, *Cissus*, *Cleistanthus*, *Combretum*, *Cyathostemma*, *Cynanchum*, *Dichapetalum*, *Derris*, *Diacorea*, *Diopyrus*, *Dipterocarpus*, *Drypetes*, *Euphorbia*, *Ficus*, *Goodenia*, *Guettarda*, *Ipomoea*, *Litsea*, *Memecylon*, *Mitrasacme*, *Pandanus*, *Pothos*, *Psychotria*, *Rinorea*, *Scaevola*, *Scolopia*, *Vincetoxicum* and identification remaining specimens is in progress.

Project 5: A pictorial guide to Flora of Mount Manipur National Park, South Andaman

Executing Official (s): Dr. Pankaj A. Dhole, Botanist, Shri Gautam Anuj Ekka, Bot. Asstt. and Dr. Lal Ji Singh, Scientist-F

Duration of the project: 2023–2025



Desmos chinensis Lour.



Strongylodon lucidus (G. Forst.) Seem

Background: Andaman and Nicobar Islands (ANI's) are located about 1200 km from the Mainland, India, comprising 572 Islands and Islets and has a geographical area of 8,249 sq. km, constituting 0.25% of the total geographical area of the country. The ANI's are rich and unique in terms of plant diversity in India with higher number of endemism (Singh & al., 2014, 2021a, b). Considered as a centre of plant endemism, the flora has been explored and recorded time to time by various workers (Parkinson, 1923; Mathew, 1998; Sinha, 1999; Dixit & Sinha, 2001; Pandey & Diwakar, 2008; Singh & al., 2014, 2020 a & b, 2021 a & b; Murugan & al., 2016; Singh & Misra, 2020; Naik & al., 2020). However, some of the forest areas including protected forests and national parks of these Islands require intensive floristic surveys that will contribute to the knowledge of Indian flora. A floristic research report by Mr. S. P. Mathew in 1993, a checklist of plants of this National Park is only available resource, in his documentation a very few plant species were listed. Apart from that there is no comprehensive authenticate floristic account on this national park and it seems that intensive floristic surveys are still required. Hence, we are proposing the present work to prepare the A pictorial guide to the Flora of Manipur National Park, South Andaman.

Area and Locality: Mount Manipur National Park was formerly known as Mount Harriet National park, located in the ANI's, Union territory of India. The National park was established in 1969 which covers an area about 46.62 Sq. km. The general topography of the hill is highly irregular and undulating. The elevation of the National park ranges from zero at the coast to 481 metres at highest peak. The National park has tropical evergreen forests, and moist deciduous forests. It represents one of the floristically rich diversified areas which generated a lot of interest among naturalists and taxonomists.

Achievements:

- Total three (03) field exploration tours were conducted in areas of Mount Manipur National Park, South Andaman from 13.06.2024 to 24.06.2024, 02.09.2024 to 11.09.2024 and 21.11.2024 to 02.12.2024. During the field trip total 1400 high quality digital photographs of plants & forest views taken with GPS data. As mentioned below, 20 species were identified for wild germ plasm and introduction.
- Also wild germ plasm of *Adenia heterophylla*, *Aeschynanthus* sp., *Ammomum* sp., *Boesenbergia* sp., *Ceropegia andamanica* Sreek. & al., *Davallia* sp., *Dicliptera* sp., *Dillenia andamanica*, *Dimorphocalyx* sp., *Dioscorea* sp., *Ipomoea mauritiana* Jacq, *Lasianthus* sp., *Liparis* sp., *Malaxis* sp., *Mangifera andamanica* King, *Myristica andamanica* Hook.f., *Solanum* sp., *Staurogyne* sp., *Vanilla* sp. etc was collected and introduced in the Garden as a part of ex-situ conservation.

Project 6: A pictorial guide to Flora of Shaheed Dweep (Neil Island), South Andaman

Executing Official (s): Dr. Pankaj A. Dhole, Botanist and Dr. Lal Ji Singh, Scientist-F

Duration of the project: 2023–2025



Cordia subcordata Lam.



Vegetation at Second Natural bridge Laxmanpur II

Background: Shaheed Dweep (11.83°N & 93.04°E) was formerly known as Neil Island situated in the South Andaman of Andaman and Nicobar Islands, Union territory of India. The Island is located between Swaraj Dweep (Havelock Island) and Netaji Subhas Chandra Bose Island (Rose Island) with an elevation of 101 m. Shaheed Dweep lies 36 km from the northeast of Port Blair and south of Fusilier Channel. Mageswaran & al., (2015) reported that the forest area covers about 735.17 ha which contributes 40% of the Island. Only a few studies assessed the mangrove floristics and associated plant species of Shaheed Dweep (Immanuel & al., 2016; Kannan & al., 2021). The floristic study of this Island remains unexplored. Therefore, the proposed work will provide the detailed floristic account of Shaheed Dweep, South Andaman.

Area and Locality: The Island covers a total area of 13.7sq.km.

Achievements:

Total three (03) field exploration tours were conducted in areas of Shaheed Dweep (Neil Island) South Andaman from 23.05.2024 to 03.06.2024, 05.08.2024 to 19.08.2024 and 09.12.2024 to 19.12.2024. During the field trip total 1300 high quality digital photographs of plants & forest views taken with GPS data. Also wild germ plasm of *Bouea oppositifolia* (Roxb.) Meisn., *Cordia subcordata* Lam., *Cymbidium* sp., *Cynanchum* sp., *Diospyros* sp., *Harpullia cupanoides* Roxb., *Hernandia nymphaeifolia* (C. Presl) Kubitzki, *Hybanthus enneaspermus* (L.) F. Muell., *Intsia bijuga* (Colebr.) Kuntze, *Rauvolfia sumatrana* Jack, *Rinorea bengalensis* (Wall.) Kuntze, *Syzygium samarangense* (Blume) Merr., *Tacca leontopetaloides* (L.) Kuntze, etc was collected and introduced in the Garden as a part of ex-situ conservation.

ARID ZONE REGIONAL CENTRE, JODHPUR

Project 1: Vegetation of Indian desert of Rajasthan and Gujarat: present scenario, GIS mapping and IUCN Assessment of Endemic, Endangered and regionally rare species.

Executing Officials: C.S. Purohit (Scientist-D); S.L. Meena (Sci.-E); Amit Kumar (Sr. Pres. Asstt.)

Duration of the Project: July, 2023 to 31st March, 2027

Background: Thar Desert or the Great Indian Desert is situated in the arid western part of Rajasthan state (India) and includes the adjoining sandy terrain of Pakistan up to the Indus River. It forms a distinct but integral part of the arid lands of western India that runs through the state of Punjab, Haryana, Rajasthan and Gujarat. The eastern limit of Thar Desert is defined by the moisture availability index, which divides the arid from semi-arid tract. This boundary roughly passes through the foot hills of the degraded Aravalli Hills Range through Rajasthan. In the west, the desert extends up to the fertile alluvial plains of the Indus River in Pakistan. In the South, the Thar boundary lies along the Great Rann of Kachchh (GRK) and the sandy plain and sand dunes system of north Gujarat. About 85% of Thar Desert is located within India and it covers about 170,000 km². The area consisting of sandy and saline plains is the driest part of the state having thorny scrub type vegetation. Total angiospermic flora of western Rajasthan including both indigenous and naturalised plants, comprises about 775 species and 48 varieties belonging to 384 genera under 90 families (Jain, 1972; Bhandari, 1990). Beside this, there are about 50 taxa of Angiosperms and one species of Gymnosperm which are considered to be rare and threatened in Rajasthan [Pandey & al. (1983), Sharma (1983), Pandey & al. (2012) and Kumar and Purohit (2015)].

Area & Locality: The study area the Great Indian Desert of Rajasthan and Gujarat, has been demarcated to north and western part of the Rajasthan which includes 14 districts and in Gujarat state, it covers 4 districts.

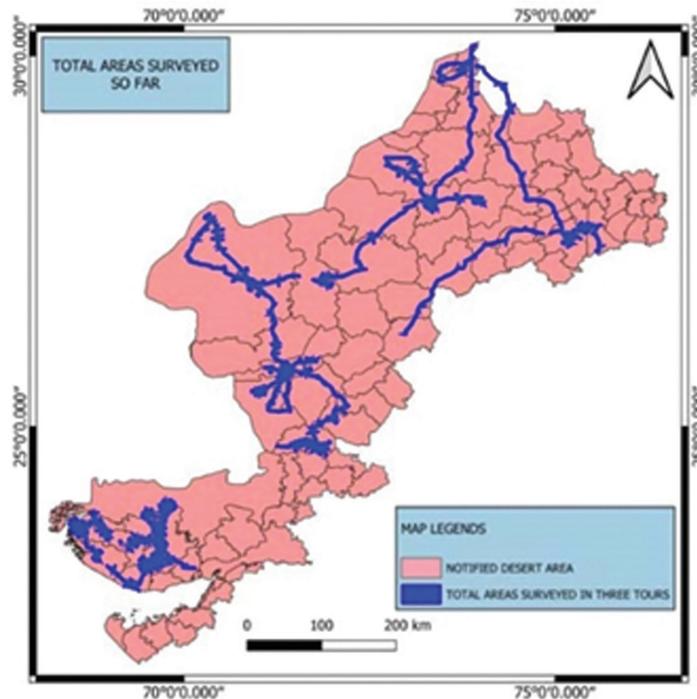
Objectives:

1. Finalizing list of Flowering plant species of Indian desert with the help of literature consultation and herbarium.
2. Survey, collection and identification of these species in the area reported in literatures as well as from other localities.
3. Providing means of identification to the floral components from family to infra-specific level through diagnostic descriptions.
4. Standardization of nomenclature of plants according to the ICN, along with local names.
5. Macro and micro photography will be taken with the help of dissected live plant in respect of leaf, stem, flower, fruits, etc.
6. Status, distribution and GIS mapping of Endemic, Endangered and locally rare species of the study area with the help of Arc-GIS / Quantum GIS Software.
7. Assessment and Finalizing of Endemic, Endangered and locally rare species according to IUCN red list guideline (ver. 14, 2019).
8. Finalizing the report including Floristic wealth, GIS maps and final IUCN category assessed with the help of IUCN Red List Guideline (ver. 14, 2019) and submission of related manuscript.

9. To prepare a handbook of flowering plants of the Great Indian Desert to enable easy identification of plant species.

Achievements:

- Two extensive field tours from 08.02.24 to 24.02.24 and 07.10.24 to 18.10.24 were carried out to Rajasthan and Gujarat desert in total **549** field numbers collected.
- During the year total **388** field numbers were identified. Prepared species distribution maps for 15 plant species and prepared 12 photo-plates with the help of macro and microscopic photographs of live plants and plant parts for easy identification. Taxonomic descriptions for 21 plant species prepared along with incorporation of distribution data of 21 species. Label data writing completed on 525 herbarium sheets of this project.
- Among the entire collection, 22 species were identified as threatened taxa i.e. *Capparis cartilaginea* Decne. [Capparaceae]; *Chrysopogon aucheri* (Boiss.) Stapf. [Poaceae]; *Commiphora stocksiana* (Engl.) Engl. [Burseraceae]; *Commiphora wightii* (Arn.) Bhandari [Burseraceae]; *Corallocarpus epigaeus* (Rottler) Hook.f. [Cucurbitaceae]; *Ephedra ciliate* Fisch. and C.A.Mey. [Ephedraceae]; *Euphorbia jodhpurensis* Blatt. & Hallb. [Euphorbiaceae]; *Farsetia heliophila* Bunge ex Coss. [Brassicaceae]; *Farsetia macrantha* Blatt. & Hallb. [Brassicaceae]; *Helichrysum cutchicum* (C.B. Clarke) R.S. Rao & Deshp. [Asteraceae]; *Ipomoea kotschyana* Hochst. ex Choisy [Convolvulaceae]; *Ipomoea tuberculata* Ker Gawl. [Convolvulaceae]; *Maerua oblongifolia* (Forssk.) A. Rich. [Capparaceae]; *Moringa concanensis* Nimmo ex Dalzell & Gibs. [Moringaceae]; *Pavonia arabica* var. *glutinosa* Blatt. & Hallb. [Malvaceae]; *Periploca aphylla* Decne. [Apocynaceae]; *Seddera latifolia* Hochst. & Steud. [Convolvulaceae]; *Taverniera cuneifolia* (Roth) Arn. [Fabaceae]; *Tecomella undulata* (Sm.) Seem. [Bignoniaceae]; *Tribulus rajasthanensis* Bhandari & V.S. Sharma [Zygophyllaceae]; *Ziziphus truncata* Blatt. & Hallb. [Rhamnaceae]; *Zygophyllum simplex* L. [Zygophyllaceae].



Maps show surveyed area in the study area (Indian Desert)

Project 2: Landscape Analysis and Floristic Diversity of Keoladeo National Park and Sambhar Lake - Ramsar Sites of Rajasthan, India

Executing Officials: Ravi Kiran Arigela, Scientist-C, S.L. Meena, Scientist-E and Purushottam Kumar Deroliya, Bot. Asst.

Duration of the Project: 2023–24 to 2025–26 (Three Years)

Background: Wetlands receive protection from several central rules and regulations such as provisions of the Indian Forest Act, 1927, the Forest (Conservation) Act, 1980 and the Indian Wildlife (Protection) Act, 1972. It is urgent that we raise national and global awareness about wetlands in order to reverse their rapid loss and encourage actions to conserve and restore them. A few taxonomists from Botanical Survey of India worked the floral components (Prasad & al., 1988, 1989, 1991, 1996; Haque, 1997; Kumar, 2007; Singh & al., 2009) of the Keoladeo National Park and Sambhar Lake Ramsar sites of Rajasthan and no exclusive documents on flora of these 2 Ramsar sites. Present research will bring out the capacious account of plants of Keoladeo National Park and Sambhar Lake Ramsar sites which is essential for long time monitoring and conservation at species level.

Area & Locality: Keoladeo National Park or Keoladeo Ghana National Park (formerly known as the Bharatpur Bird Sanctuary) is a famous avifauna sanctuary in Bharatpur district of Rajasthan, India. It is a complex of ten artificial, seasonal lagoons, varying in size which is situated in a densely populated region. It was declared a protected sanctuary in 1971 and established as a national park on 10 March 1982. The area was designated as a bird sanctuary on 13 March 1976 and a Ramsar site under the Ramsar Convention in October 1981 and with the Reference site number 230. Because of its exceptional avian biodiversity, in 1985 Keoladeo National Park was also declared a UNESCO World Heritage Site in 1985, under criteria iv but, after 2005 criteria update it fell under criteria x. Keoladeo National Park is 2 km (1.2 mi) south-east of Bharatpur and 55 km (34 mi) west of Agra. It is spread over approx 28.73 km². One third of the Keoladeo National Park is wetland with mounds, dykes, and open water with or without submerged or emergent plants. Generally, water is fed into the marshes twice a year from inundations of the Gambhir and Banganga rivers, which are impounded on arable land by means of an artificial dam called Ajan Bund, to the south of the park. The uplands have grasslands with tall grass species together with scattered trees and shrubs present in varying density (Ramsar Convention Listed Sites). Mean maximum temperature ranges from 20.9 °C in January to 47.8 °C in May, while the mean temperature varied from 6.8 °C in December to 26.5 °C in June. The diurnal temperature variation ranged from 5 °C in January to 50 °C in May. Mean relative humidity varied from 62% in March to 83.3% in December. The mean annual precipitation is 662 mm.

The Sambhar Lake, India's largest inland salt lake occupies 240 km² geographical area lies between 26°52'-27°02'N, 74°54'-75°14'E (Singh & Sen, 2023) and located in Jaipur, Ajmer and Nagaur districts of Rajasthan (Figure 1 B). It is surrounded by sand flats and dry thorn scrub and fed by seasonal rivers Mendha, Runpangarh, Khandel, and Karian and streams. Sambhar lake has been designated as a Ramsar site on 23 March 1990 with reference site number 464 (recognized wetland of international importance) because the wetland is a key wintering area for tens of thousands of pink flamingos and other birds that migrate from northern Asia and Siberia. The vegetation present in the catchment area is mostly xerophytic type dominated by thorn scrub. The temperature reaches 45 °C in summer and goes as low as 5 °C in winter and annual precipitation is 500-600 mm.

Objectives:

1. Survey for higher plants that gives vegetation types, species association, plant diversity and comprehensive list of plants of the Keoladeo National Park and Sambhar Lake.

2. Characterize the habitats of the keystone and threatened plants as an attempt to identify the threat factors to the vegetation and prepare species specific taxon data sheets, including description, habitat and other information like commercial and ecological value.
3. Mapping the vegetation resources of Keoladeo National Park and Sambhar Lake using remote sensing and GIS.
4. Submission of a complete report covering the invasive species, salt tolerant plants, swamp resistance plants, keystone species in wetlands of international importance wetlands, plant-bird & plant-animal interactions and conservation strategies.

Achievements:

- Conducted two field tours to Keoladeo National park and Sambhar Lake and collected total **100** field nos. from Keoladeo National park and **60** field nos. from Sambhar Lake. (**Total: 160**)
- Identified total **221** field nos. collected from Keoladeo National park and **182** field nos. collected from Sambhar Lake.
- Prepared checklist.
- Described **25** species in brief.
- Prepared photoplates of **57** species.



Ruellia tuberosa L.



Rauwolfia tetraphylla L.



Diospyros melanoxylon Roxb.



A view of Keoladeo National Park

Project 3: Floristic studies in Ramgarh Vishdhari Tiger Reserve, Rajasthan, India

Executing Officials: Dr. Rajeev Kumar Singh, Botanist, Dr. S.L. Meena, Scientist E & HoO. Sh. Ramesh Kumar, Bot. Asstt.

Duration of the Project: 2024–2027

Background: The Ramgarh Vishdhari Tiger Reserve is the newly notified 4th Tiger Reserve in the Rajasthan State on 16 May, 2022 and the second largest tiger reserve of the state in terms of area. With this new addition, India has a total of 53 tiger reserves (NTCA, 2022). The previously established and well-known three tiger reserves in Rajasthan namely, Ranthambore Tiger Reserve (RTR) in Sawai Madhopur, Sariska Tiger Reserve (STR) in Alwar, and Mukundra Hills Tiger Reserve (MHTR) in Kota are hosting approximately over 90 Tigers.

Area & Locality: It lies between 25°59'0"N to 25° 53'0"N latitudes and 75° 19'0"E to 76° 49'0"E longitudes. The total area of Ramgarh Vishdhari Tiger Reserve is 1501.89 km² including 225.62 km² core area first, 256.28 km² core area second and 1019.98 km² buffer area (NTCA, 2022).

Objectives: Survey and study of plant diversity and comprehensive list of plants of the Tiger Reserve, Characterize the habitats and threat factors of the endemic and threatened plants and study of the invasive species and its impact on forest ecosystem, keystone species, endemic and threatened species, and their conservation strategies.

Achievements:

- Conducted **one** field to Ramgarh Vishdhari Tiger Reserve.
- Collected total **405** field nos.
- Identified total **198** field nos.
- Prepared checklist.
- Collected and identified two endemic species - *Oropetium roxburghianum* (Schult.) S.M.Phillips and *Syzygium salicifolium* J.Graham
- Collected and identified three threatened species - *Boswellia serrata* Roxb., *Butea superba* Roxb. ex Willd. and *Catharanthus pusillus* (Murray) G.Don



Boswellia serrata Roxb.



Catharanthus pusillus (Murray) G.Don

Project 4: Grasses of Rajasthan

Executing Officials: Dr Pushpa Kumari

Duration of the Project: 2023–2026

Background: Project was allotted by HQ, BSI

Area & Locality: Rajasthan is the largest Indian state by area covering 342,239 square kilometres or 10.4 per cent of India's total geographical area with 50 districts within ten divisions - Ajmer State, Bagar, Hadoti, Dhundhar, Gorwar, Shekhawati, Mewar, Marwar, Vagad, and Mewat.

Objectives:

Taxonomic Study and documentation of Grasses occurring in the State.

Achievements:

- 2 Local trips were carried during 2024 in nearby Jodhpur areas Kailana and Mandore and 7 species were collected.
- During this year 15 grass species were collected by other officials from different AAP tours to Rajasthan. Description for 17 species were made.

Project 5: Metadata Preparation and Digitization of Herbarium specimens

Executing Officials: Dr. R.K. Singh, Botanist , Dr. P.K. Deroliya, Bot. Asstt., Sh. Ramesh Kumar, Bot. Asstt., Sh. Amit Kumar, Sr. Pres. Asstt.

Duration of the Project: Ongoing

Objectives: Completion of metadata, Digitization of herbarium specimens and identification of unidentified specimens.

Achievements:

- Metadata Entry: **628**
- Scanning of Herbarium specimens: **3335**
- Specimens identified: **212**

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

Project 1: Metadata preparation and Digitization of ARUN Herbarium.

Executing Officials: Dr. Ranjit Daimary, Botanist.

Duration of the Project: Ongoing.

Background: The ARUN Herbarium of BSI, APRC, Itanagar is holding more than 42650 herbarium specimens which include more than 35000 angiosperms, 5000 Pteridophytes, 40 Gymnosperms and 125 TYPE specimens. Most of the herbarium specimens deposited in ARUN herbarium are collected from the state of Arunachal Pradesh which is the jurisdiction of this centre.

Area & Locality: The ARUN Herbarium is located in the office building of BSI, APRC, Itanagar.

Objectives: The objective of this project is to complete the digitization and metadata preparation of all the herbarium specimens of ARUN Herbarium.

Achievements: Digitization and metadata preparation completed for **3910** herbarium specimens of ARUN Herbarium with Barcode serial numbers

ARUN000019290 to ARUN000019365 (76 nos.); ARUN00001602 to ARUN00002769 (1138 nos.); ARUN00003311 to ARUN00003781 (354 nos.); ARUN000005047 to ARUN000005051 (5 nos.); ARUN000005089 to ARUN000005123 (34 nos.); ARUN000005149 to ARUN000005178 (29 nos.); ARUN000015946 to ARUN000016049 (103 nos.); ARUN000016050 to ARUN000016325 (275 nos.); ARUN000029844 to ARUN000029850 (6 nos.); ARUN000030317 to ARUN000030342 (25 nos.); ARUN000030349 to ARUN000030353 (5 nos.); ARUN000030346 to ARUN000030356 (10 nos.); ARUN000030375 to ARUN000030389 (14 nos.); ARUN000030398- ARUN000030399 (2 nos.); ARUN000030414 to ARUN000030448 (34 nos.); ARUN000030469 to ARUN000030546 (77 nos.); ARUN000030550 to ARUN000030558 (8 nos.); ARUN000033744 to ARUN000033747 (3 nos.); ARUN000033789



Crotalaria juncea L.



Clitoria mariana L.

to ARUN000033818 (29 nos.); ARUN000033932, ARUN000034011 to ARUN000034048 (37 nos.); ARUN000034098 to ARUN000034155 (57 nos.); ARUN000034200 to ARUN000034202 (2 nos.); ARUN000034218 to ARUN000034224 (6 nos.); ARUN000034337 to ARUN000034383 (47 nos.); ARUN000034450 to ARUN000034452 (2 nos.); ARUN000034476 to ARUN000034502 (26 nos.); ARUN000034550 to ARUN000034552 (3 nos.); ARUN000034556 to ARUN000034557 (2 nos.) ARUN000034563 to ARUN000034565 (3 nos.); ARUN000034589 to ARUN000034590 (2 nos.); ARUN000034969 to ARUN000034988 (19 nos.); ARUN000036799 to ARUN000036808 (9 nos.); ARUN000036811; ARUN000036851 to ARUN000036869 (18 nos.); ARUN000036905 to ARUN000036938 (33 nos.); ARUN000003782 to ARUN000004042 (260 nos.); ARUN000004405 to ARUN0000036591; ARUN000004043 to ARUN000004404; ARUN000005673 to ARUN0000037397.

Project 2: Taxonomic studies on Wild Edible Mushrooms of Arunachal Pradesh

Executing Officials: Dr. Arvind Parihar, Sci-C, BSI, APRC, Itanagar

Duration of the Project: 2023–2026

Background: The history of using Wild Mushrooms as food and in medicine is well documented across many countries, including India. However, reports describing the collection of Wild Edible Mushrooms are rather limited and sporadic in nature. Wild mushrooms are an important nutrient source in rural areas of India. Worldwide, an estimated 1,069 species of mushrooms are reported to be used for food purposes. Arunachal Pradesh, a state in northeastern India, is known for its rich biodiversity and extensive forest cover. The forests cover more than 50% of the total landscape and encompass three major forest types: coniferous forests, broadleaf forests, and mixed forests. These forests provide suitable Host and climate for the Growth of different types of Mushroom species, many of them are edible in nature and play a crucial role in the dietary practices of the local communities in Arunachal Pradesh. These mushrooms are collected from the forests and are known for their nutritional and medicinal properties. However any comprehensive account of Wild Edible Mushrooms of Arunachal Pradesh is unavailable. To address this gap and document the diversity of these mushrooms, a project entitled “Taxonomic Studies on Wild Edible Mushrooms of Arunachal Pradesh” was undertaken in the year 2023-24 under the Annual Research Programme of Botanical Survey of India.

Area and Locality: Arunachal Pradesh

Objectives: To undertake extensive field surveys for the collection of Wild Edible Mushroom specimens from different forest areas of the Arunachal Pradesh

1. To prepare a comprehensive taxonomic account with macro and micro- morphological characters of Wild Edible Mushroom of the study area
2. To undertake phylogenetic studies on critical and interesting macrofungi specimens.
3. To prepare identification manual with morphological illustrations and important key characters for Wild Edible Mushrooms.

Achievements (2024-25):

- Two Survey field tours were undertaken: **07.06.2024 to 24.06.2024** to the Eastern Arunachal Pradesh (Districts covered – **Longding, Tirap, Changlang, Anjaw**) and **15.07.2024 to 30.07.2024** to the Eastern Arunachal Pradesh (Districts covered **Lower Dibang Valley, Dibang Valley and Namsai**)
- **One Herbarium Consultation Tour** to CAL, Howrah was undertaken w.e.f. 28.10.2024 to 08.11.2024 for the Microscopic studies of the Specimens Macro and Micro Morphological Characterization and identification for the 21 samples was done. One Herbarium Consultation tour to CAL, Howrah will be taken up during first week of March 2025
- Detailed description with illustrations and Drawing is prepared with the help Microscope is prepared for 26 specimens.



Ramaria stricta (Pers.) Qué!



Macrolepiota procera (Scop.)
Singer



Auricularia delicata (Mont. ex Fr.) Henn.



Termitomyces heimii
Natarajan

Project 3: Taxonomy and Ecology of *Gesneriaceae* of Arunachal Pradesh

Executing Officials: Dr. Krishna Chowlu, Sci-D, BSI, APRC, Itanagar, Mr. Akshath Shenoy, Senior Preservation Assistant, BSI, APRC Itanagar

Duration of the Project: 2024–2026

Background: The Gesneriaceae is a pantropical plant family that comprises around 152 genera and over 3500 species. In India, the Gesneriads are predominantly found in Western Himalaya, North East India, West Bengal, Bihar, Orissa Maharashtra, Western Ghats, Kerala, Karnataka, Tamil Nadu, Andaman and Nicobar Islands. The family Gesneriaceae has exhibited maximum species diversity in North-Eastern India and the highest number of species diversity was recorded from Arunachal Himalayan region. Of the total species reported from India, 32 species have been found confined to Arunachal Pradesh, and 18 species have been found narrowly endemic to Arunachal Pradesh. The great species diversity, high degree of endemism, insufficient taxonomic data, with probable presence of many new species and lack of ecological notes on species had necessitated to conduct a project of taxonomic and ecological studies on the family Gesneriaceae in Arunachal Pradesh.

Area and Locality: Arunachal Pradesh

Objectives:

1. To survey and document the Gesneriaceae diversity of Arunachal Pradesh
2. To prepare a detailed taxonomic account of the family
3. To analyse the ecology of the Gesneriaceae members.
4. GIS Mapping of Endemic plants
5. To analyse the distribution pattern of the species documented.
6. A comprehensive book on the family Gesneriaceae of Arunachal Pradesh with descriptions and color photoplates which will be helpful for the public as well botanists.

Achievements:

- Thorough literature survey was carried out to determine the reported Gesneriaceae from the state of Arunachal Pradesh. Herbarium specimens were consulted from ARUN. A list of the reported species of Arunachal Pradesh have been prepared, a total of 80 species have been enlisted.

- Two field tours were conducted in the western and Eastern parts of Arunachal Pradesh respectively w.e.f, 09.07.2024 to 22.07.2024 and 10.09.2024 to 27.09.2024.
- A total of 216 field numbers were collected which had 530 specimens.
- Based on live as well as from herbarium specimens, 35 descriptions were prepared. Photo plates of the respective species are being prepared from photographs clicked during the field tours; around 20 photo plates have been prepared so far.
- All the plant species collected during the field were mapped using GIS tools. GIS maps of plant's geographical distribution will be helpful in conserving the individual plant species as well as the whole habitat which home for more number of endemic taxa.
- Collected Gesneriaceae members include *Aeschynanthus acuminatus* Wall. ex A. DC., *A. bracteatus* Wall. ex A. DC., *A. chiritoides* C.B. Clarke in A. DC., *A. gracilis* Parish ex C.B. Clarke, *A. hookeri* C. B. Clarke, *A. lineatus* Craib, *A. micranthus* C.B. Clarke, *A. parasiticus* (Roxb.) Wall., *A. parviflorus* (D. Don) Spreng, *A. stenosepalus* J. Anthony, *A. superbus* C.B. Clarke, *Boeica filliformis* C.B. Clarke, *Henckelia dibangensis* (B.L. Burtt, Srivastava & Mehrotra) D.J. Middleton & Mich. Möller, *H. lallanii* Taram, D. Borah, R. Kr. Singh & Tag, *H. lallanii* Taram, D. Borah, R. Kr. Singh & Tag, *H. umbellata* Kanthraj & K.N. Nair, *H. peduncularis* (Burtt) Middleton & Möller, *H. pumila* (D. Don) A. Dietr., *Loxostigma puhoatense* N.D. Do, N.S. Ly, D.H. Nguyen & T.H. Le, *L. griffithii* (Wight) C.B. Clarke, *Lysionotus serratus* D. Don, *Rhynchotechum obovatum* (Griff.) B.L. Burtt, *Rhynchoglossum obliquum* Blume, *R. ampliatum* (C.B. Clarke) B.L. Burtt, *Stauranthera umbrosa* (Griff.) C.B. Clarke.
- During 2024-25, **Two new species** have been published under the project, Gesneriaceae (*Aeschynanthus chayangtajoensis* Chowlu, A. Shenoy & A. Ray, *Petrocosmea arunachalensis* Chowlu and A. Shenoy)



Aeschynanthus chayangtajoensis Chowlu,
A. Shenoy & A. Ray



Petrocosmea arunachalensis Chowlu and A.
Shenoy

BOTANIC GARDEN OF INDIAN REPUBLIC, NOIDA

Project 1: QR based plant modelling-based plant labelling for the Plant species in entire woodland of BGIR, Noida

Executing officials: Dr. Sandeep Kr. Chauhan, Scientist F, Dr. Giriraj Singh Panwar, Scientist-E, Dr. Priyanka A. Ingle, Scientist D & Dr. Mahendra Kumar Singhadiya, Botanist

Duration of the Project: April 2023–March 2025

Background of the project: The woodland section of BGIR is presently conserving the live specimens of c. 172 tree species of around 134 Genera. It occurs in the peripheral areas of the Botanic Garden of Indian Republic (BGIR), Noida in 3 rows since its inception. These areas are divided in to eight zones which depicts the different phytogeographic zones of India. **Presently c. 5760** trees of different species are growing in different zones of the garden. Besides the representative species of different phytogeographic zones, 21 threatened species are also conserved in the garden viz. *Commiphora wightii*, *Hildegardia populifolia*, *Rauwolfia serpentine* (CR), *Commiphora stocksiana*, *Pterocarpus santalinus*, *Tecomella undulata*, *Syzygium stocksii*, *Dysoxylum malabaricum*, *Kingiodendron pinnatum*, *Radermachera xylocarpa*, *Lagerstroemia hypoleuca*, *Cynometra bourdillonii* (EN), *Dalbergia latifolia*, *Santalum album*, *Saraca asoca*, *Pterocarpus dalbergioides* and *Cleistanthus collinus*, *Calophyllum apetalum*, *Garcinia indica*, *Saraca asoca* (VU); *Pterocarpus santalinus* (Near Threatened). Many endemic tree species are also conserved in the garden such as *Dolichandrone falcata*, *Hardwickia binata*, *Indopiptadenia oudhensis*, *Wrightia tinctoria*, etc. For the effective management of species in different zones particularly the EET species spatial assessment study has been conducted in the project for 21 threatened plant spp. Further, to make the public aware about the biodiversity & its significance, role of plants in our life and economic importance of plant for the wellbeing of mankind, detail information will be compiled for each species and made available for the public through QR codes.

Area and locality of the allotted Project: BGIR

Objectives:

The project was proposed with the objectives as Development of QR code for all woodland species, identification of plant species, recording of demographic data and mortality assessment, GPS modelling of the entire woodland.

Summary/ Progress of the work done in 2023-2024: As per the objectives of the project, the basic factsheet details were compiled for the 172 species and QR codes were developed for the 172 species. Zonation survey was conducted for the zones 4, 5, 6 & 7 and recorded the demographic data for each species in different zone. The geocoordinates (latitude & longitude) were collected for the 300 hundred tree individuals of different species of the woodland section. Downloaded the shapefiles of BGIR for the spatial assessment of the tree species.

Achievements/Outcomes of the project:

- Zonation survey was conducted for the entire Zone 1-8 and recorded the demographic data for each species.
- Factsheet data were compiled for the 172 species of the woodland section.
- QR codes were developed for the 172 species of the Woodland section.

- The geocoordinates (latitude & longitude) were collected for the 300 hundred tree individuals of 21 threatened plant species of the woodland section and visualized the points in the shapefile of BGIR.



Fig. 1: QR codes prepared and attached on garden plants

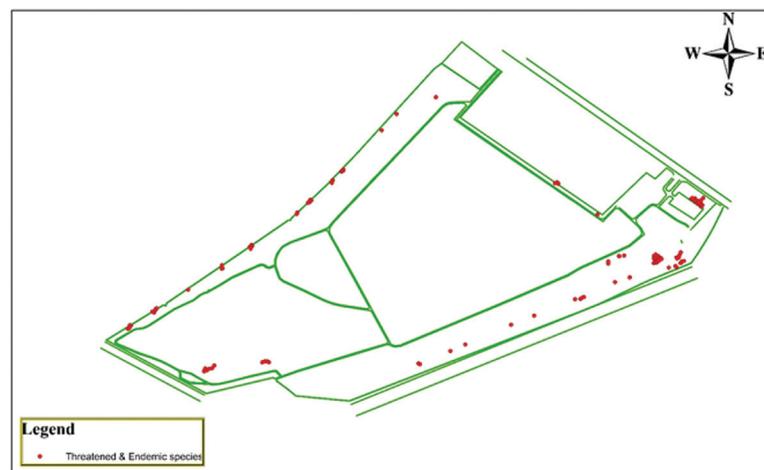


Fig. 2: GPS analysis of threatened and endemic species in different phytogeographic zones of BGIR.

Project 2: Establishment of Seed bank lab unit and studies of seed germination protocol of endemic and threatened plant species vis a vis setting of Plant conservatoires and vermicomposting unit at BGIR Noida

Executing officials: Dr. Sandeep Kr. Chauhan, Scientist F, Dr. Giriraj Singh Panwar, Scientist-E, Ms. L. I. Chanu, Botanist, Mr. Suman Halder, Botanist and Mr. Yogesh Lahane, Botanist

Duration of the Project: April 2023–March 2026.

Objectives: The project was proposed with the objectives as collection of seeds from the garden species and maintenance of seeds in the seed bank. To conduct the seed germination study for the collected seeds and development of seed database

Area and locality of the allotted Project: BGIR, Noida

Summary/ Progress of the work done in 2023–2024:

Collected the seeds of following species from the garden -

No.	Plant Name	Quantity (gm/kg)
1.	<i>Pittosporum eriocarpum</i>	-
2.	<i>Stereospermum suaveolens</i>	-
3.	<i>Terminalia bellirica (Gaertn.) Roxb.</i>	300 gm
4.	<i>Spondias pinnata (L. f.) Kurz</i>	500 gm
5.	<i>Nyctanthes arbor-tristis L.</i>	200 gm
6.	<i>Dalbergia lanceolaria L.f.</i>	50 gm
7.	<i>Guettarda speciosa L.</i>	50 gm
8.	<i>Bauhinia acuminata L.</i>	300gm
9.	<i>Bridelia retusa (L.) A. Juss.</i>	150gm
10.	<i>Grewia optiva J.R. Drumm. Ex Burret</i>	500 gm
11.	<i>Lagerstroemia speciosa (L.) Pers.</i>	250 gm
12.	<i>Mimusops elengi L.</i>	100 gm
13.	<i>Cassia fistula L.</i>	200 gm
14.	<i>Bauhinia variegata L.</i>	200 gm
15.	<i>Santalum album L.</i>	50 gm
16.	<i>Acacia moniliformie</i>	100 gm
17.	<i>Aegle marmelos (L.) Correa</i>	50 gm
18.	<i>Feronia limonia (L.) Swingle</i>	50 gm
19.	<i>Sterculia urens Roxb.</i>	50 gm
20.	<i>Gmelina arborea Roxb.</i>	100 gm
21.	<i>Plumbago zeylanica L.</i>	100 gm
22.	<i>Artocarpus lacucha Buch.-Ham.</i>	100 gm
23.	<i>Pithecellobium dulce</i>	200 gm
24.	<i>Madhuca indica</i>	300 gm
25.	<i>Carea arborea</i>	100 gm
26.	<i>Senna sulfurea (DC. ex Collad.) H.S. Irwin & Barneby</i>	100 gm
27.	<i>Terminalia arjuna (Roxb. ex DC.) Wight & Arn.</i>	700 gm
28.	<i>Putranjiva roxburghii Wall.</i>	15 kg
29.	<i>Elaeocarpus sphaericus (Gaertn.) Heer</i>	15 kg

30.	<i>Ricinus communis</i> L.	200gm
31.	<i>Oroxylum indicum</i> (L.) Kurz	150gm
32.	<i>Guilandina bonduc</i> L.	650gm
33.	<i>Jatropha curcas</i> L.	260gm

Seeds of 26 species were sown in three different media (i.e. soil and cocopeat) to assess the germination percentage viz. *Pittosporum eriocarpum*, *Pterospermum acerifolium*, *Thespesia populnea*, *Withania somnifera*, *Rauvolfia macrophylla*, *Entada rheedii*, *Hardwickia binata*, *Dalbergia latifolia*, *Gmelina arborea*, *Oroxylum indicum*, *Tectona grandis*, *Holoptelea integrifolia* (Roxb.) Planch., *Aegel marmelos*, *Ceiba pentaandra*, *Tamarindus indica*, *Spondias pinnata* and *Cassia fistula*, *Abrus precatorius*, *Pithecellobium dulce* (Roxb.) Benth., *Acacia auriculiformis*, *Albizia odoratissima* and *Albizia lebbeck*.

Sl. No	Name of Plant spp., kept for Germination	Quantity (gm)	Media used for Germination	Percentage Germination	No. of saplings
1.	<i>Pittosporum eriocarpum</i>	100	Cocopit	20%	50
2.	<i>Pterospermum acerifolium</i>	150	Cocopit	12%	500
3.	<i>Thespesia populnea</i>	200	Soil	70%	1500
4.	<i>Withania somnifera</i>	100	Soil	50%	426
5.	<i>Rauvolfia macrophylla</i>	150	Cocopit	40%	264
6.	<i>Entada rheedii</i>	400	Soil	60%	100
7.	<i>Hardwickia binata</i>	300	Soil	8%	200
8.	<i>Dalbergia latifolia</i>	200	Cocopit	45%	200
9.	<i>Gmelina arborea</i>	250	Cocopit	23%	500
10.	<i>Oroxylum indicum</i>	500	Cocopit	70%	700
11.	<i>Tectona grandis</i>	400	Soil	55%	1000
12.	<i>Holoptelea integrifolia</i>	260	cocopit	65%	300
13.	<i>Aegel marmelos</i>	400	Soil	90%	800
14.	<i>Ceiba pentaandra</i>	100	Soil	85%	600
15.	<i>Tamarindus indica</i>	300	Soil	91%	1100
16.	<i>Spondias pinnata</i>	250	Soil	18%	400
17.	<i>Cassia fistula</i>	100	Soil	60%	1000
18.	<i>Abrus precatorius</i>	300	Soil	40%	700
19.	<i>Pithecellobium dulce</i>	100	Soil	25%	200
20.	<i>Acacia auriculiformis</i>	100	Soil	33%	200
21.	<i>Albizia odoratissima</i>	100	Cocopit	40%	600
22.	<i>Albizia lebbeck</i>	200	Soil	50%	400
23.	<i>Terminalia bellerica</i>	100	Cocopit	70%	800
24.	<i>Putranjiva roxburghii</i>	50	Soil	30%	450
25.	<i>Bauhinia variegata</i>	100	Soil	12%	800
26.	<i>Mimusops elengi</i>	150	Soil	20%	900
27.	Total				13690

Achievements/Outcomes of the project:

- Collected the seeds of 33 garden species from different phytoecographic zones of the woodland section.

- Seed germination study was conducted for 26 plant species of the garden.
- Factsheet of seed data of BSI, BGIR drafted for 65 species.



Fig. 1: Fruits of different species collected from garden for the segregation of seeds.



Seeds of different species exhibited in Seed Bank.



Fig. 1: Three different mediums used for the seed germination study viz. soil, sand and cocopeat.



Fig. 2: Seed germination response of different species in the cocopeat medium

Project 3: Mass germination and multiplication of Horticultural and ornamental plants/ season flowers in BGIR

Executing officials: Dr. Sandeep Kr. Chauhan, Scientist F, Ms. L. I. Chanu, Botanist and Mr. Yogesh Lahane, Botanist

Duration of the Project: April 2023–March 2026.

Area Surveyed: Plants collected, studied from BSI, BGIR, NOIDA

Objective: The objective of this report on the mass germination and multiplication of horticultural and ornamental plants, particularly seasonal flowers, in the Botanical Garden of the Indian Republic is to systematically evaluate and implement effective propagation techniques that enhance plant diversity and sustainability. This includes assessing various seed germination protocols, such as biopriming methods, which have been shown to significantly improve germination rates and seedling vigor in a variety of horticultural species. The report aims to document best practices for in vitro propagation and macropropagation techniques, focusing on optimizing conditions for different plant species to ensure high survival rates and rapid multiplication. Additionally, it seeks to promote the conservation of native

plant species through targeted breeding programs and the establishment of genetic repositories. By fostering an understanding of these methodologies, the report will contribute to the enhancement of biodiversity within the garden, support educational initiatives for visitors, and align with national efforts towards sustainable horticultural practices.

Background: The Botanic Garden of Indian Republic (BGIR), situated in Noida within the National Capital Region (NCR), serves as a botanical heritage site and biodiversity preservation hub. The garden showcases over 560 plant species, adding up to around 7550 plants including trees, shrubs, climbers, and wild and cultivated herbs. It is divided into 10 sections. BGIR is committed to conserving endangered plant species and promoting sustainable land management practices. Visitors are engaged through educational programs, workshops, and guided tours. This project focuses on the maintenance of BGIR’s heritage, including plant species enrichment, nursery management, and updating garden signage.

Methodology:

- **Inventory Preparation for Ornamental and Horticultural Plant Species:** A survey at BGIR documented ornamental and horticultural species, including plant identification, quantity, and location. This inventory will guide future research and management.
- **Fruit Section Enrichment:** Hybrid and low-chilling sub-temperate fruit cultivars (20 varieties) were introduced based on adaptability and productivity assessments from IARI, New Delhi. Disease-free saplings were sourced from IARI for planting.
- **Collection and Germination/Multiplication of Ornamental Plant Species and Annual Flowers:** Standardized protocols for seed germination were developed, focusing on sowing mixture, and seed treatment. Preventive fungicides (Bavistin and Amistar) were used to control fungal diseases. Seasonal time studies were conducted for bulb germination, contributing to a reliable protocol for winter ornamental flowers.
- **Mass-Scale Nursery Development:** Nurseries for seasonal flowers and ornamental plants were established using standardized propagation protocols. Seed germination was tested with GA3 treatment versus untreated seeds. Healthy seedlings were transplanted into larger pots for further growth.

Achievements:

- **Ornamental and Horticultural Plant Inventory:** An inventory documenting 62 ornamental and horticultural species at BGIR was created. This serves as a resource for biodiversity conservation and horticultural management. Notable species include

Sl. No.	Plant species	Sl. No.	Plant species
1.	<i>Mandevilla splendens</i>	2.	<i>Strelitzia reginae</i>
3.	<i>Dracaena trifasciata</i>	4.	<i>Roystonea regia</i>
5.	<i>Chlorophytum comosum</i>	6.	<i>Serenoa repens</i>
7.	<i>Dracaena fragrans</i>	8.	<i>Rhapis excelsa</i>
9.	<i>Dracaena 'Marginata'</i>	10.	<i>Bismarckia nobilis</i>
11.	<i>Passiflora incarnata</i>	12.	<i>Tarlmounia elliptica</i>
13.	<i>Codiaeum variegatum</i>	14.	<i>Arauca2ria columnaris</i>
15.	<i>Epipremnum aureum</i>	16.	<i>Tecoma s43tans</i>
17.	<i>Ficus elastica</i>	18.	<i>Campsis radicans</i>
19.	<i>Hibiscus rosa-sinensis</i>	20.	<i>Nerium oleander</i>

21.	<i>Crassula ovata</i>	22.	<i>Plumeria obtusa</i>
23.	<i>Hibiscus schizopetalus</i>	24.	<i>Plumeria rubra</i>
25.	<i>Hibiscus acetosella</i>	26.	<i>Canna indica</i>
27.	<i>Euphorbia tirucalli</i>	28.	<i>Lawsonia inermis</i>
29.	<i>Ficus lyrata</i>	30.	<i>Syngonium podophyllum</i>
31.	<i>Philodendron xanadu</i>	32.	<i>Mussaenda erythrophylla</i>
33.	<i>Cycas revoluta</i>	34.	<i>Bougainvillea spectabilis Willd</i>
35.	<i>Thuja occidentalis</i>	36.	<i>Tradescantia pallida</i>
37.	<i>Ixora coccinea</i>	38.	<i>Callisia fragrans</i>
39.	<i>Juniperus communis</i>	40.	<i>Combretum indicum</i>
41.	<i>Cordyline fruticosa</i>	42.	<i>Euphorbia cotinifolia</i>
43.	<i>Jatropha integerrima</i>	44.	<i>Duranta erecta</i>
45.	<i>Jasminum sambac</i>	46.	<i>Hamelia patens</i>
47.	<i>Melaleuca bracteata</i>	48.	<i>Callisia repens</i>
49.	<i>Callistemon citrinus</i>	50.	<i>Dyopsis lutescens</i>
51.	<i>Jasminum officinale</i>	52.	<i>Tradescantia spathacea</i>
53.	<i>Kalanchoe blossfeldiana</i>	54.	<i>Dieffenbachia seguine</i>
55.	<i>Tecomaria capensis</i>	56.	<i>Adenium obesum</i>
57.	<i>Catharanthus roseus</i>	58.	<i>Rosa species Grandiflora</i>
59.	<i>Rose x hybrida</i>	60.	<i>Rose setigera</i>
61.	<i>Rose chinensis var. minima</i>	62.	<i>Ravenala madagascariensis</i>

- **Fruit Section Enrichment:** The fruit section of the garden has been enriched with a diverse array of hybrid and low-chilling fruit cultivars, significantly enhancing its genetic diversity and horticultural value.
- **Hybrid cultivars-** The hybrid fruit 11 cultivars and 21 varieties were introduced.

Sr. No.	Plant species	Varieties
1.	<i>Artocarpus heterophyllus</i>	Siddu and Honey Gold
2.	<i>Malus sieversii</i>	Ball Sundri, Thi Green Ber, and Kashmiri Red Apple Ber
3.	<i>Annona reticulata</i>	VNR Madhur, NMK Gold, and Saraswati-7
4.	<i>Selenicereus polyrhizus</i>	Red-Fleshed Dragon Fruit
5.	<i>Syzygium jambos</i>	Rose Apple
6.	<i>Annona muricata</i>	Green Soursop
7.	<i>Passiflora edulis</i>	Thi Passion Fruit
8.	<i>Citrus aurantiifolia</i>	Sai Sarbati and Pramalini Lime
9.	<i>Artocarpus altilis</i>	Breadfruit-JNTBGRI
10.	<i>Psidium guajava</i>	Allahabad Sardar, Thailand Red Guava, and Black Diamond
11.	<i>Manilkara zapota</i>	Cricket Ball

- **Low-chilling fruit cultivars -** In addition, low-chilling fruit 7 cultivar and 14 varieties have been introduced. These cultivars enhance the garden's diversity and provide invaluable resources for research, conservation, and sustainable horticultural practices.

Sr. No.	Plant species	Varieties
1.	<i>Malus domestica</i>	Anna, Dorsett Golden, and HRMN-99
2.	<i>Averrhoa carambola</i>	Starfruit -1
3.	<i>Ficus carica</i>	Poona, Kala, and Dinakar
4.	<i>Vitis vinifera</i>	Thompson Seedless and Sharad Seedless
5.	<i>Carica papaya</i>	Pusa Dwarf and Pusa Delicious
6.	<i>Mangifera indica</i>	Kesar and Miyazaki
7.	<i>Persea americana</i>	Pinkerton

- **Propagation of annual Vegetable & flower cultivars grown via seed germination Methods:** The study aims to showcase a demonstration plot of annual flowers and vegetables in a garden. The plot was established using seeds and saplings purchased from IARI, New Delhi. The seed varieties were carefully chosen based on their adaptability and disease resistance. Before sowing, the procured seeds underwent pre-sowing treatments, which included fungicide application and hot water soaking. Certain crops, such as spinach, okra, red lettuce, and peas, were directly sown in the field, while others were grown in seed trays and transplanted into the field after establishment saplings. During the growing season, crops received consistent irrigation, pest control, and nutrient management.

Sl. No.	Annual Vegetable & flower cultivars grown in Garden
1.	Tomato (<i>Solanum lycopersicum</i>)
2.	Cabbage (<i>Brassica oleracea</i>),
3.	Cauliflower (<i>Brassica oleracea var. botrytis</i>),
4.	Capsicum (<i>Capsicum annum</i>),
5.	Brinjal (<i>Solanum melongena</i>),
6.	Carrot (<i>Daucus carota</i>),
7.	Okra (<i>Abelmoschus esculentus</i>)
8.	Spinach (<i>Spinacia oleracea</i>)
9.	Pea (<i>Pisum sativum</i>)
10.	Red lettuce (<i>Lactuca sativa</i>)
11.	Marigold (<i>Tagetes spp.</i>),
12.	Sunflower (<i>Helianthus annuus</i>)
13.	Cosmos (<i>Cosmos bipinnatus</i>).

- **Propagation of Ornamental Plant Cultivars via Vegetative Methods:** Chrysanthemum and Red Kalanchoe were propagated using shoot-cutting techniques. Approximately 2,000 saplings were developed from these cuttings. Additionally, 14 ornamental cultivars were propagated using stem cuttings treated with indole-3-butyric acid (IBA)-based phytohormones (e.g., Root-X) to enhance rooting. Preventive fungicides such as Bavistin and Amistar were incorporated to protect against fungal infections. Overall, approximately 10,000 ornamental plant saplings were successfully transplanted.

Sl. No.	Ornamental plant cultivars multiply via vegetative propagation	No. of Saplings were developed
1.	<i>Dracaena trifasciata</i>	200
2.	<i>Epipremnum aureum</i>	200
3.	<i>Bougainvillea</i>	2000
4.	<i>Hibiscus schizopetalus</i>	200

5.	<i>Plumeria pudica</i>	1000
6.	<i>Tabernaemontana divaricate</i>	1000
7.	<i>Lawsonia inermis</i>	100
8.	<i>Eranthemum red</i>	300
9.	<i>Crassula ovata</i>	200
10.	<i>Hamelia patens</i>	200
11.	<i>Jatropha curcas</i>	2000
12.	<i>Phyllanthus sp</i>	100
13.	<i>Dracaena fragrans</i>	100
14.	<i>Syngonium podophyl</i>	200
15.	<i>Chrysanthemum spp.</i>	2000
16.	<i>Kalanchoe blossfeldiana</i>	200

- **Nursery Production for Winter Seasonal Flower Ornamental Plant Cultivars:** This study focuses on establishing a large-scale nursery for winter seasonal ornamental flowers by germinating seeds and bulbs of 40 flower cultivars. To enhance seed germination and sapling health, seeds were treated with Bavistin fungicide and GA3 (5 PPM) before being sown in coco peat trays or raised and flat, seedbeds. For bulb propagation, Irises, Ixia, Ranunculus, Hyacinths, and Anemone bulbs were used, with treatments of Bavistin and M125 fungicides to prevent diseases.

Sr. No.	Cultivars Name	Sr. No.	Cultivars Name	Sr. No.	Cultivars Name
1.	Alyssum,	16.	<i>Cleome</i>	31.	Dianthus Mix.
2.	Antirrhinum	17.	<i>Pansy,</i>	32.	Sunflower
3.	Aster	18.	<i>Paper Flower</i>	33.	Cosmos
4.	Brachycome	19.	<i>Petunia,</i>	34.	Dianthus Mix.
5.	Candytuft	20.	<i>Phlox,</i>	35.	Sunflower
6.	Cineraria	21.	<i>Poppy</i>		Bulb Cultivars Name
7.	Cosmos,	22.	<i>California Poppy</i>	1.	Irises
8.	Daisy,	23.	<i>Salvia</i>	2.	Ixia
9.	Dianthus	24.	<i>Sweet Pea,</i>	3.	Ranunculus
10.	Hollyhock	25.	<i>Sweet William</i>	4.	Hyacinths
11.	Impatiens,	26.	<i>Sweet Sultan</i>	5.	Anemone
12.	Kale,	27.	<i>Verbena</i>		
13.	Larkspur	28.	<i>Ice Flower</i>		
14.	Lupin,	29.	<i>Marigold Orange</i>		
15.	Nasturtium,	30.	<i>Marigold Yellow</i>		

- Established seedlings, 25 days old, were transplanted into the field, with approximately 10,000 saplings placed across a 3-acre area. The plants were provided with ongoing care, including regular watering, fertigation weeding, and trimming, to ensure healthy growth and a vibrant display for the upcoming event.
- **Pest Management and Maintenance:** Effective management of stem borer and termite infestations was achieved through treatments involving Chlorantraniliprole, Carbofuran, and Dichlorvas. Regular pruning and training operations in the EPS and arboretum sections optimized plant canopy development.



Fig. 1: Winter seasonal ornament flower plants grown and transplanted in field, pot and poly bags.



Fig. 2: Ornamental species multiplication via vegetative propagation

Project 4: Maintenance of existing Forest Types and Phytodiversity at BGIR, Noida

Executing officials: Dr. Priyanka A. Ingle, Scientist-D and Mr. Yogesh Lahane, Botanist

Duration of the project: Ongoing

Area Surveyed: Plants collected, studied from BSI, BGIR, NOIDA

Background: Botanic Garden of Indian Republic (BGIR), Noida conserves more than 560 plant species in different sections of BGIR i.e., Forest zones 1-8, Economic Plant Section (EPS), Medicinal Plant Section (MPS), Phytogeographic Section, Arboretum, Fruit Plant Section (FPS), Rose Section,

Xerophytic Section, etc. In the extreme climatic conditions of Noida to maintain this phytodiversity is a challenging task however, all the conserved plants are growing extremely well in BGIR.

Objectives:

1. Maintenance of the plants conserved at BGIR.
2. To record phenology data of BGIR plants as flowering and fruiting.
3. Preparation of the plant inventory for the plants conserved at different sections of BGIR.

Achievements:

- During the period one plant collection tour was conducted from 31st July to 6th August 2024 at JNTBGRI, Kerala. Altogether **769 saplings belonging to 137 taxa** have been procured. All the saplings are shifted in grow bags for acclimatization. Prepared the Zone/Section wise inventory of trees present in forest zones 1-8 and adjoining areas, Economic Plant Section (EPS), Medicinal Plant Section (MPS), Phytogeographic Section, Arboretum and Fruit Plant Section (FPS). The inventory includes 172 angiosperm taxa which belongs to 134 genera of 37 families (**Annexure I**). Prepared the compendium of 175 trees growing in BGIR with description. During the year recorded flowering-fruiting data of 150 taxa present in different sections/zones of BGIR with photographs (**Annexure III**). Introduced 10 saplings of *Dipcadi ursulae* Blatt. in BGIR as a part of ex-situ conservation. Collected *Colocasia esculenta* (L.) Schott, *Curculigo orchioides* Gaertn., *Curcuma decipiens* Dalzell, *Garcinia indica* (Thouars) Choisy, *Artemisia absinthium* L., *Breynia androgyna* (L.) Chakrab. & N.P.Balakr., *Curcuma* spp. (2), Araceae plant (*Ariopsis* sp.), *Passiflora* sp. (Cuttings) from Goa and planted in BGIR for Ex-situ conservation. Conducted regular training and pruning operations in Zone 1-8, EPS, phytogeographic and arboretum sections for optimal plant canopy development.
- Conducted regular training and pruning operations in EPS and arboretum sections for optimal plant canopy development. Successfully implemented control measures for stem borer and termite infestations, utilizing Chlrorrantraniliprole, Carbofuran, and Dichlorvas treatments. Transferred more than 400 saplings of different plant species which is collected from different parts of India to grow bags from net house for future introduction in respective sections in BGIR.

CENTRAL BOTANICAL LABORATORY, HOWRAH

Project 1: Flora and Ethnobotany of Debrigarh Wildlife Sanctuary, Bargarh district, Odisha

Executing Officials: Dr Manas Ranjan Debta, Dr Dinesh Kumar Agrawala, Dr S.S. Dash

Duration of the Project: April 2024–March 2027

Background: Biodiversity, with its three primary attributes of composition, structure and process, is organized into a nested hierarchy from genes to species, populations and ecosystems. But recently, these vital ecosystems are being threatened by population growth and agricultural expansion. It has therefore become very imperative to assess the in situ biodiversity of any geographic region.

The floristic diversity of Debrigarh WLS is being taken up to provide baseline information in this regard in terms of richness with respect to total number of families, genus and species occurring in the sanctuary with an aim to document and come out with its comprehensive floristic inventory.

Area & Locality: Debrigarh Wildlife Sanctuary was notified as a Wildlife Sanctuary on 8th February 1985 and is located in the Bargarh district of Odisha covering a total area of 346.91 km². The sanctuary area stretches between 83°30'54" E to 83°46'10" E longitude and 21°28'23" N to 21°43'02" N latitude and the elevation ranging from 217m to 605m asl. It is flanked by the Hirakud reservoir, a Ramsar site, from its East and North side. The West and South face of the sanctuary is contiguous with other localities of the Bargarh district. Major wild animals noted from the sanctuary area are Indian leopard, Indian elephant, porcupine, sambar, chital, gaur, etc. It also harbors the Vulnerable Four-horned antelope, *Tetracerus quadricornis*, a Schedule-I species under Wildlife (Protection). The flora of the sanctuary predominantly belongs to the Dry deciduous forests type.

Objectives:

1. Intensive survey and exploration from the Wildlife Sanctuary and documentation of the floristic database in the form of a Flora.
2. Morpho-taxonomic study of collected as well as herbarium specimens.
3. Delimitation of each taxon based on updated nomenclature and description.
4. Maximum efforts will be put to present the flora in a pictorial form to enable students and foresters for use as a Field Guide.
5. Collection of ethnobotanical information as a part to explore the traditional knowledge.
6. Collection of live ET plants, if any, for ex-situ conservation in the AJCBIBG garden.
7. Sharing of data with the stakeholder organizations for enabling them in better management planning.

Achievements:

- One Field survey tour conducted to the study area; about 400 specimens collected; 183 Field numbers collected; identified 112 species; no. of threatened taxa collected: 02

Project 2: Diversity of Cyanoprokaryotes and Algae in East Kolkata Wetland (Newly assigned Project (Ref. BSI letter File No. 288/1/ARP/2024-25-Tech./1103/9866 dtd. 24.06.2024)

Executing Officials: Dr. Pratibha Gupta

Duration of the Project: 2 Years (from July 2024–July, 2026)

Background: The East Kolkata Wetlands (EKW) is situated at 88° 20' E - 88° 35' E and 20° 25' N - 20° 35' N. The East Kolkata Wetlands (EKW) comprises a large number of water bodies located in the districts of 24 Parganas North & South, West Bengal. It is adjacent to the eastern part of Kolkata and borders on the Salt Lake Township on the one hand and the upcoming new township at Rajarhat on the other hand. The multifunctional wetland ecosystem consists of an area of 12,500 hectares. It comprises 254 sewage fed fisheries, small agricultural plots and solid waste farms. Besides, there are also some built up areas. The EKW nurtures the world's largest wastewater fed aquaculture system. East Kolkata Wetland shows huge diversity of flora and fauna. Flora includes various forms that range from microscopic Cyanoprokaryotes and Algae to macrophytes. In aquatic ecosystem, Cyanoprokaryotes and Algae play a major role in maintaining the floral diversity because they are the fonder of aquatic food chain. However, very few works dealt with the taxonomy and diversity study of Cyanoprokaryotes and Algae. Cyanoprokaryotes and Algal diversity of this area are still a hidden asset that needs to be explored because only few studies are available which are fragmentary.

Area & Locality: East Kolkata Wetland

Objectives:

1. The main aims and objective of this study is to assess the diversity of Cyanoprokaryotes and Algae in different water bodies of various areas of East Kolkata Wetlands and produce the factual Cyanoprokaryotes and Algal Profile of such an important group.
2. As many reports of EKW include management programmes to conserve this wetland which spans over the entire eastern outskirts of a metropolitan city, Kolkata for the human benefit but not much attention paid to work on microalgae.
3. The work done on microalgae is still in very nascent stage and very less number of publications. Hence, exploration of diversity of Cyanoprokaryote and Algae of East Kolkata Wetland is also in dire need for detailed scientific studies.
4. Thus, the scope of exploration work of this area is demanding. Keeping this in view studies were initiated on diversity of Cyanoprokaryote and Algae of water bodies of East Kolkata Wetlands and its importance.

Achievements:

Area covered: Chowbaga, Basanti Road, Dhapa, Dhapa Manpur, Tardaha Kapashati, Pratapnagar, Matiari, Garal, Samukpota, Tardah, Kolkata, W.B.

During survey in 06 field tours 2801 field Photographs and 130 Videos were taken.

GPS readings were recorded from the sample collected areas of different water bodies.

Total 93 numbers of samples were collected from East Kolkata Wetlands for Microscopic studies.

Maximum samples were collected in the month of November, 2024 followed by August, July, October, December and September. Area wise maximum samples were collected from Tardaha Kapasati.

All the samples were brought into the Laboratory and preserved in Formalin and properly maintained for identification. Samples were analysed under Leica DM 2500 sophisticated Research Microscope using Leica Qvin 3.2 Image Analysis Software and Leica Application Suit V4 Software with annotation for Identification and 354 Photomicrographs were taken.

Altogether 93 species of different classes - Cyanophyceae / Cyanobacteria / Cyanoprokaryota, Bacillariophyceae, Chlorophyceae, Euglenophyceae, Mediophyceae and Trebouxiophyceae have been identified.

Out of 93 species, 01 species - *Nitzschia flexoides* Geitler is new record from India.

a) Photographs (requested to send separately in .jpeg format with proper legends and mentioning the corresponding project name)

Project 3: Nutraceutical value of wild edible plants of North-East Region in India

Executing Officials: Dr. Tapan Seal, Scientist 'E', Dr. Kausik Chaudhuri, Plant Chemist & Ms Basundhara Pillai, Botanist

Duration of the Project: 01.04.2022–31.03.2025

Background: Vegetables, as key components of human diets, are generally consumed after undergoing various cooking processes, such as boiling, frying, or microwaving. These processes can induce significant chemical changes in the vegetables, affecting the concentration, availability, and bioactivity of beneficial components. While cooking can have both positive and negative impacts on the nutritional profile of vegetables, it is essential to understand how these changes influence their bioavailability and overall health benefits. The physical properties of vegetables, such as texture and color, also undergo alterations during cooking, which can impact consumer acceptance and market preferences. While there is accumulating evidence suggesting that cooking certain vegetables may enhance the bioavailability of beneficial compounds, much of the existing research is limited to specific vegetables or phytochemicals. A more comprehensive investigation into the effects of different cooking methods on the nutritional and antioxidant properties of vegetables, including the preservation of key nutrients and the reduction of anti-nutrients, is currently lacking. This gap in knowledge calls for a broader study on how various cooking methods affect the nutritional and functional qualities of vegetables, particularly in the context of both common and wild edible plants.

Area & Locality: North–Eastern region in India

Objectives: The primary objective of this study is to assess the impact of different cooking methods such as boiling, microwave heating, on the nutritional composition (including protein, fat, carbohydrates, minerals, vitamins, and anti-nutrients) and antioxidant capabilities of vegetables. By focusing on wild edible plants, the research aims to identify which cooking method best preserves the phytochemical content and overall nutritional value of these plants. Specifically, the study will analyze the effects of these cooking processes on both the nutritive and anti-nutrient qualities of 100 wild edible plant species previously collected from India's north-eastern region. The findings will contribute to a better understanding of how cooking methods influence the retention of beneficial compounds in vegetables and provide valuable insights into the most effective cooking strategies for maximizing the health benefits of these plants.

Achievements:

- Effect of boiling and microwave cooking on protein, carbohydrate, and fat content in thirty five wild edible plants were studied.
- Effect of boiling and microwave cooking on percent concentration of various minerals like Na, K, Ca, Cr, Mg, Cu, Zn, Mn and Fe in thirty five wild edible plants were studied.
- Effect of boiling and microwave cooking on the antioxidant properties (TPC, TFC, RP, DPPH and ABTS) in thirty five wild edible plants were studied.
- Effect of boiling and microwave cooking on the antinutritional properties (Oxalate, tannin, saponin, phytate and cyanogenic glycoside) in twenty five wild edible plants were studied.

CENTRAL NATIONAL HERBARIUM, HOWRAH

Project 1: Molecular phylogeny, morphology and taxonomy of Boletoid mushrooms in India

Executing Officials: Dr. Kanad Das, Scientist 'F' & Dr. Sudeshna Datta, Botanist

Duration of the Project: 2022–2026

Background: Boletoid mushrooms are fleshy, readily decaying (putrescent) poroid macrofungi (mushrooms) in the order Boletales of Agaricomycotina (Basidiomycota). They belong to three families namely: Boletaceae, Suillaceae and Gyrosporaceae. They are reported to be most popular edible fleshy mushrooms and appreciated widely around the globe. As ectomycorrhizal fungi they are also known to play the key role in forest ecosystem by establishing mutual association with forest trees. These fungi also protect host trees (ectomycorrhizal partners) from attack by parasites, predators, nematodes and other soil pathogens. Thus, most of our forest trees are highly dependent on their fungal partners (including Boletaceae) and could possibly not exist without them in areas of poor soil quality. Some of these mushrooms are also poisonous. Presently Boletoid mushrooms comprise over 1050 species from the world belonging to about 73 genera. Earlier, systematics of these mushrooms was mainly established considering their macro- and micromorphology. But this scenario has drastically changed during past one decade when molecular phylogeny was applied in combination with morphology to revise the systematics of these mushrooms. This resulted in the discovery of several novel genera and numerous new species from all over the world especially in Boletaceae.

Mycobiota of India is exceptionally diverse in terms of ectomycorrhizal macrofungi as evidenced in numerous relevant literatures. Boletoid mushrooms represent the dominant ectomycorrhizal mycobiota and controls the growth and development of forest trees in India. Present project will be a pioneer and holistic study in applying combined approach of molecular phylogeny and morpho-taxonomy of immensely important Boletoid mushrooms of India. This will reveal 1) the diversified mycobiota of the valuable group of wild mushrooms 2) unveil evolutionary relationship among the existing genera 3) uncover novel genera and new species from this state 4) resolving species complexes (if any).

Area & Locality: Throughout India.

Objectives: To undertake thorough macrofungal explorations to different parts of India focusing on the families Boletaceae, Suillaceae, Gyrosporaceae; To undertake macro- and micromorphological characterization with the aid of latest taxonomic tools; To conduct one-gene to multi-gene molecular phylogeny to reveal the systematics and elucidate evolutionary relationship with allied and ancestral taxa; To identify all the collected samples by undertaking combined approach of molecular phylogeny and morphology followed by thorough literature consultation; To prepare a complete documentation including the detailed description coupled with relevant illustrations of all the identified taxa by placing them in their proper taxonomic position; To prepare a distribution map (based on the GPS data) for every taxon in India; To record of ethnomycological data as far as possible (wherever available/applicable).

Achievements:

- A macrofungal exploration of 22 days duration was undertaken to four districts of **Uttarakhand** (Almora, Champawat, Rudraprayag and Pauri) from 19.07.2024 to 10.08.2024. One hundred (100) field numbers were collected. All the collections were macro-morphologically worked-out in the field itself. Macro-chemical colour tests were performed with 10% KOH and FeSO₄. All the samples are well preserved and under study.

- A macrofungal exploration of 9 days duration was undertaken to different forests of Shimla district in **Himachal Pradesh** from 23.08.2024 to 01.09.2024. Thirty nine (39) field numbers were collected. All the collections were macro morphologically worked-out in the field itself. Macro-chemical colour tests were performed with 10% KOH and FeSO₄. All the samples are well preserved and under study.
- **Micromorphological characterization, Micro-photography, Micromorphological drawings:**
- Micromorphological characterization, Micro-photography, Micromorphological drawings of 42 field numbers were completed.
- **Molecular Phylogeny:** Multigene molecular phylogenetic analyses were conducted for 31 species to confirm their identity.
- **Identification:** 43 field nos. belonging to 31 species were identified with the help of morphophytotaxonomy and molecular phylogeny.

Project 2: Morpho-molecular and Phytochemical identification of 30 CITES-listed Plants in high International Trade

Executing Officials: Dr Avishek Bhattacharjee, Scientist-E, Dr Ranjith Layola M R, Botanist, Ms Farheen Banu, Preservation Assistant cum Garden Overseer, Dr Tapan Seal, Scientist-E, CBL

Duration of the Project: 2023–2026

Background: The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade of 37,000+ listed species and India is one of the Parties of this International Convention. The purpose of CITES is to ensure that wild fauna and flora in international trade are not exploited unsustainably. Species subject to CITES regulation are divided amongst three Appendices, viz. Appendix I, II and III. Therefore, Indian plants and their derivatives which are under CITES Appendices are regulated by CITES. However, due to lack of proper identification manual of the majority of CITES listed plants of India, it is very difficult for the CITES Management Authority of India (MoEF&CC, Government of India) to represent the country in world forum (CITES CoPs) with proper scientific evidence. Also, BSI used to receive several plant parts (without flowers and fruits) from the Customs which are seized for illegal trade, and due to lack of authentic molecular or phytochemical libraries many times it is very difficult to identify those plants. For better management of CITES related matters, the Government of India introduced the ‘Wild Life (Protection) Amendment Act, 2022’ with intension to strengthen the protection of threatened species and to enhance the enforcement of strict regulations against the illegal wildlife trade. This amendment includes a new schedule for species listed in the Appendices under CITES. Hence, there is an urgent need for the country to develop identification manuals of the CITES listed plants, especially which are in high trade.

Area & Locality: Throughout India.

Objectives: The proposed study focuses on developing morphological, molecular (using nuclear and chloroplast markers) and phytochemical (using HPLC profiling) signatures based on authentically identified specimens of 30 CITES-listed plant species.

Achievements:

Field Survey

- A field tour was conducted to Nagaland and North Bengal (Northeast India/ Eastern Himalaya) from 06.06.24 to 19.06.24.

- Collected 15 (New collections: 8) species (22 field numbers) during this tour.
- A field tour was conducted in different parts of Sikkim (Eastern Himalaya) from 13.09.24 to 26.09.24.
- Collected 10 (New collections: 4) species (15 field numbers) during this tour.

Morphological study

- Study and dissection of 12 species were completed.

Molecular Study

- Genomic DNA has been extracted for 37 accessions collected during the field tours.
- PCR amplification and sequencing of 10 accessions were completed using four markers (ITS, *trnLF*, *matK*, and *trnH-psbA*).
- PCR amplification and sequencing of 15 accessions were partly done (1 – 3 markers).

Herbarium consultation

- Sikkim Himalayan Regional Centre (BSHC), Gangtok, Sikkim
- Lloyd Botanical Garden, Darjeeling, West Bengal

Phytochemical Study

- Photochemical analysis of 12 species (27 accessions) was completed and HPLC profiles were generated.

Sample Authentication

- With respect to the request letter no. W-24/75-24/WCCB (ER)/468, dated 04/10/2024 from the WCCB, Eastern Region, we have authenticated the identity of the seized samples using DNA barcoding and issued the certificate.

Publications

- A manuscript entitled ‘Phylogenetic analysis of Critically Endangered *Aquilaria khasiana* Hallier f. (Thymelaeaceae) using barcode markers and chloroplast genome, with updated conservation status’ is under review.
- Assessment of conservation status (Global) of *Aquilaria khasiana* Hallier f. (Thymelaeaceae) has been accepted by IUCN and will be uploaded by IUCN with Digital Object Identifier (DOI) on IUCN website.
- Communicated an abstract entitled ‘DNA barcoding and phytochemical profiling: applications in the management of CITES-listed plants’. (for BSI International Symposium, BSI-ISPTBG, 2025).
- Two species of Orchids collected during the field trip to Northeast India were found as new record to Nagaland. One manuscript is under review and the other one is in process of submission.

Other achievements

- Nine species collected during the field trips were introduced at the CNH roof top conservatory.

Project 3: Taxonomic Revision of *Meconopsis* Vig. (Papaveraceae) in India

Executing Officials: Dr Kumar Avinash Bharati, Scientist-D, Dr Anand Kumar, Botanist, Dr Rajib Gogoi, Scientist-F

Duration of the Project: 2023–2026

Background: The members of the genus *Meconopsis* are confined to Indian Himalayan regions. The latest taxonomic account of the genus in the Indian context was published by Debnath & Nayar (1993) in ‘Flora of India, vol. 2’ about 30 years back and the work was with insufficient nomenclature citation, without precise information on distribution, without any information on types and other specimens examined, no information on conservation status and threats, no information on uses or their potential scope for sustainable utilization, with only a few line drawings and photographs. After Debnath & Nayar’s work, no revisionary studies / comprehensive work covering all species of *Meconopsis* have ever been attempted in Indian context. So, it is thus imperative to have a proper documentation of current status of the genus *Meconopsis* in India for proper management planning for their conservation and economic utilization.

Area & Locality: Throughout India.

Objectives: To undertake thorough explorations to different parts of Indian Himalayan region focusing on the genus *Meconopsis*; To identify all the collected samples by undertaking approach of morphology followed by thorough literature consultation; To prepare a complete documentation including the detailed description coupled with photo-plates, illustrations of all the identified taxa by placing them in their proper taxonomic position; To prepare a distribution map (based on the GPS data) for each taxon in India.

Achievements:

Field Survey

- **Tour 1:** A field tour was conducted in Tawang and Shi-Yomi districts of Arunachal Pradesh from 28th June to 24 July, 2024. A total of 9 taxa were collected from Arunachal Pradesh in between 3200 and 4400 m elevation.
- **Tour 2:** A field tour was undertaken in East Sikkim, West Sikkim and South Sikkim from 8th July to 4th August, 2024. A total of 8 taxa were collected from Sikkim.
- A total of **10 species, 1 subsp. and 3 varieties** were collected from two tours. Further, a total of **3 species** were commonly collected in Arunachal Pradesh and Sikkim.

Identification

Identified a total of 10 species, 1 subsp. and 3 varieties: *Meconopsis discigera* Prain, *M. gakyidiana* Tosh.Yoshida Yangzom & D.G.Long, *M. horridula* Hook.f. & Thomson, *M. ludlowii* Grey-Wilson, *M. merakensis* Tosh.Yoshida, *M. merakensis* var. *albolutea* T. Yoshida, R. Yangzom & D. G. Long, *M. paniculata* (D. Don) Prain, *M. paniculata* var. *rubra* Grey-Wilson, *M. simplicifolia* (D.Don) G.Don, *M. simplicifolia* subsp. *grandiflora* Grey-Wilson, *M. sinuata* Prain, *M. villosa* (Hook.f.) G.Taylor, *M. wallichii* Hook., *M. wallichii* var. *fusco-purpurea* Grey-Wilson

Collection after 90 years

- *Meconopsis ludlowii* Grey-Wilson.

New addition

- *M. paniculata* var. *rubra* Grey-Wilson
- *M. simplicifolia* subsp. *grandiflora* Grey-Wilson
- *M. wallichii* var. *fusco-purpurea* Grey-Wilson

Other achievements

- *Meconopsis ludlowii* Grey-Wilson was described based on Ludlow & Sherriff collection which was collected from Arunachal Pradesh in 1934 and housed at BM. We have collected this species first time after type collection.
- Goecha La in Sikkim (about 4600 m) was explored and first time *Meconopsis discigera* Prain was collected from type location in flowering.
- Prepared photo-plate of *Meconopsis discigera* Prain and *M. simplicifolia* subsp. *grandiflora* Grey-Wilson
- Recorded GPS data of each collected species.

Project 4: Taxonomic Revision of *LIGULARIA* Cass. (Asteraceae) in India

Executing Officials: Dr. Partha Pratim Ghoshal, Botanist & Dr. Shyam Biswa, Botanical Assistant

Duration of the Project: 2023–2026

Background: *Ligularia* is a rhizomatous perennial herb belongs to the family Asteraceae, with couple of ornamental plants with revolute leaves. This genus has known medicinal value because of the presence of eremophilane sesquiterpenoids, which has cytotoxic properties (Xie et al. 2010). The proposed project aims to undertake a comprehensive taxonomic revision of the genus *Ligularia* Cass. in India. *Ligularia*, also known as the Leopard plant distributed in Temperate Eurasian region (mostly in China) represented by 125 spp. India is known to harbour 21 taxa of *Ligularia*: 17 spp., 1 subsp., 2 var. and 1 forma (Karthikeyan & al., 2020) with varying morphological characteristics. There has been no revisionary study done in India to date. So, it is thus imperative to have a proper documentation of current status of the genus *Ligularia* in India which will contribute to a better understanding of the genus within the Indian region and proper management and planning for their conservation and economic utilization.

Area & Locality: Throughout India.

Objectives: To survey extensively in different parts of Indian Himalayan region; To prepare description of all the collected plants; To identify all the collected plants through morphological characterization and literature consultation; To prepare a complete documentation with detailed description, photo-plates, illustrations; To prepare distribution map

Achievements:

Field surveys:

Tour 1: Undertaken a field cum herbarium consultation tour to West Kameng, Tawang, Upper Siang and Lower Dibang valley districts of Arunachal Pradesh from 22nd July to 13th August 2024 (23 days). Collected 10 species under 16 field numbers.

Tour 2: Field tour was undertaken to East Sikkim, West Sikkim and South Sikkim from 26th October to 14th November, 2024 (20 days). Collected 5 species under 12 field numbers.

Other achievements

- *Ligularia discoidea* S.W. Liu & *Ligularia amplexicaulis* DC. were reported new to India, merely based on the photos (Bharali & al; 2018) and we have collected the specimens (along with good photographs) first time from India.
- Put det. Slip on *Ligularia* (unidentified) species in ARUN and BSHC

- GPS data of 175 localities were recorded for all collected species during field tours. Prepared 3 route maps (for 3 districts) of the explored area from coordinates.
- A total of 4000 photos were taken during the field tours.
- Furthermore, associated species were also collected.
- Dissected some interesting species. Plate made afterwards.

Project 5: Digitization of herbarium specimens (about 15000) belonging to the family Asteraceae

Executing Officials: Dr Kumar Avinash Bharati, Scientist-D and Dr Anand Kumar, Botanist,

Duration of the Project: 2024–2025

Background: The Central National Herbarium holds about 2 million specimens. Type specimens are stored separately which are available on IVH portal (<https://ivh.bsi.gov.in/>). From the General Herbarium, all Ranunculaceae and Balsaminaceae specimens and representative specimens of the species appeared in Flora of India vols. 1–5, 12, 13 & 23 have been digitized and available on IVH portal. Asteraceae is one of the largest plant families and CAL holds about 55000 specimens. So, the assignment has been taken to digitize specimens of Asteraceae.

Area & Locality: NA.

Objectives: To digitize the herbarium specimens (about 15000) belonging to the family Asteraceae.

Achievements: A total of 15321 specimens belonging to the family Asteraceae have been digitized. This starts from *Mikania* Willd. (G.P. No. 67) and ends with *Pulicaria* Gaertn. (G.P. no. 289) which includes a total of 145 genera. The genera include *Achyrocline* Less., *Adenostyles* Cass., *Allagopappus* Cass., *Amellus* L., *Ammobium* R. Br., *Amphidoxa* DC., *Amphiglossa* DC., *Anaphalis* DC., *Anaxeton* Gaertn., *Angianthus* J.C. Wendl., *Antennaria* Gaertn., *Aphanostephus* DC., *Aster* L., *Athrixia* Ker Gawl., *Athroisma* DC., *Baccharis* L., *Bellis* L., *Bellium* L., *Blepharispermum* DC., *Blumea* DC., *Bojeria* DC., *Boltonia* L'Hér., *Brachyactis* Ledeb., *Brachychaeta* Torr. & A.Gray, *Brachycome* Cass., *Brachylaena* R. Br., *Brickellia* Elliott, *Caesulia* Roxb., *Callistephus* Cass., *Calocephalus* R. Br., *Calostephane* Benth., *Calotis* R.Br., *Carphephorus* Cass., *Carpchochaete* A. Gray, *Cassinia* R. Br., *Celmisia* Cass., *Cephalipterum* A. Gray, *Ceruana* Forssk., *Chaetopappa* DC., *Charieis* Cass., *Chevreulia* Cass., *Chrysocoma* L., *Chrysopsis* (Nutt.) Elliott, *Chrysothamnus* Nutt., *Codonocephalum* Fenzl., *Conyza* Less., *Corethrogyne* DC., *Cyathocline* Cass., *Denekia* Thunb., *Diaperia* Nutt., *Dichrocephala* L'Hér. ex DC., *Diplostephium* Kunth, *Disparago* Gaertn., *Egletes* Cass., *Elytropappus* Cass., *Epaltes* Cass., *Ericameria* Nutt., *Erigeron* L., *Evax* Gaertn., *Facelis* Cass., *Felicia* Cass., *Garuleum* Cass., *Gnaphalium* L., *Gnaphalodes* A. Gray, *Gnephosis* Cass., *Grangea* Adans., *Gymnosperma* Less., *Haplopappus* Cass., *Helichrysum* Mill., *Helipterum* DC., *Heterolepis* Cass., *Heteromma* Benth., *Heteropappus* Less., *Heterothalamus* Less., *Hinterhubera* Sch. Bip, *Humea* Sm., *Hysterionica* Willd., *Ifloga* Cass., *Inula* L., *Iphiona* Cass., *Ixiolaena* Benth., *Ixodia* R. Br., *Jasonia* Cass., *Kanimia* Gardner, *Keerlia* DC., *Kuhnia* L., *Lachnophyllum* Bunge, *Lachnospermum* Willd., *Lagenophora* Cass., *Laggera* Sch. Bip ex Benth., *Lasiopogon* Cass., *Leontonyx* Cass., *Leontopodium* R. Br., *Lessingia* Cham., *Liatris* Schreb., *Mairia* Nees, *Metalasia* R. Br., *Microglossa* DC., *Micropus* L., *Mikania* Willd., *Millotia* Cass., *Minuria* DC., *Myriactis* Less., *Myriocephalus* Benth., *Nanothamnus* Thomson, *Nestlera* Spreng., *Nidorella* Cass., *Nolletia* Cass., *Olearia* Moench., *Pegolettia* Cass., *Petalacte* D. Don, *Phaenocoma* D. Don, *Phagnalon* Cass., *Pithocarpa* Lindl., *Pluchea* Cass., *Podocoma* Cass., *Podolepis* Labill., *Podotheca* Cass., *Printzia* Cass., *Psiadia* Jacq., *Psilactis* A. Gray, *Pterigeron* (DC.) Benth., *Pterocaulon* Elliott, *Pteronia* L., *Pterygopappus* Hook.f., *Pulicaria* Gaertn., *Quinetia* Cass., *Relhania* L'Hér., *Rhynchospermum* Reinw., *Rutidosis* DC., *Sachsia* Griseb., *Sericocarpus* Nees, *Solidago* L., *Sphaeranthus* L., *Stuartina* Sond.,

Tarchonanthus L., *Tessaria* Ruiz. & Pav., *Tetramolopium* Nees, *Thespis* DC., *Townsendia* Hook., *Trilisa* (Cass.) Cass., *Vicoa* Cass., *Vieraea* Webb, *Vittadinia* A. Rich. and *Waitzia* J.C. Wendl.

The images and associated metadata have been uploaded on the Indian Virtual Portal (<https://ivh.bsi.gov.in/>).

Project 6: Wild edible mushrooms of West Bengal: Multigene molecular phylogeny, morpho-taxonomy, nutritional profile, in vitro culture and cultivation (selected taxa)

Executing Officials: Dr. Sudeshna Datta, Botanist, Dr. Kanad Das, Scientist 'F' & Dr. Tapan Seal, Scientist 'E'

Duration of the Project: 2024–2026

Background: There has been increasing worldwide attention on the use of wild edible fungi and biochemical investigations supporting their merit as a food item. From ancient times, these diverse kinds of mushrooms have been considered as good source of food all over the world having high nutritional value. The organoleptic qualities make mushrooms a great meat substitute for vegetarians. Indigenous communities of this country including West Bengal have used wild edible mushrooms as an additional source of food. Other than nutritional purpose, wild mushrooms are reported to be a good source of essential antioxidants which are secondary metabolites that have a role in antibacterial functions and lifestyle disease control (Barros et al., 2008). Furthermore, mushroom protein contains all the nine essential amino acids required by humans. In addition, mushrooms are a relatively good source of phosphorus, iron and vitamins including thiamine, riboflavin, ascorbic acid, ergosterol and niacin. They are low in calories, fat and calcium. These are used in the prevention and treatment of various health ailments including modern lifestyle diseases. The nutritional analysis of different species of mushrooms are reported to be rich in Protein (30-48%), carbohydrates (125-40%), fat (1-4%), ash (7-17%) and fiber (16-20%) (Pushpa and Purushothama, 2010) and therefore recommended as perfect human dietary supplement by several nutritionists. The discoveries of their anticarcinogenic, anticholesteromic, hepatoprotective, antiviral, immuno-modulatory properties enhanced their worth as protective food items. But unfortunately, there is no authentic identification guide of edible mushrooms in West Bengal. Therefore, every year, consumption of poisonous mushroom unknowingly claims life in several parts of India including West Bengal as the poisonous mushrooms can't be differentiated easily from the edible mushrooms (3 died in Meghalaya in 2023; 9 died in Assam in 2022; 1 died in Sikkim in 2020; 3 died in Manipur in 2019; 5 died in West Bengal in 2018, etc.) and poisonous lookalikes of edible mushrooms are quite common everywhere.

Area & Locality: Throughout West Bengal.

Objectives: To undertake macrofungal survey of wild edible mushrooms (and medicinal mushrooms) from forested areas of West Bengal; To collection and characterization (macro- and micromorphological) of these mushrooms; To undertake single to multigene molecular phylogeny based on the sequence data of barcoding genes (nrITS, nrLSU, *rpb2* and *tef 1- α*); To identify with the combined analyses of morphology and multigene molecular phylogeny; To develop a culture collection of these valuable mushrooms by growing them in various artificial culture media; To investigate the nutritional properties of these mushrooms.

Achievements:

Survey tours undertaken:

A total of two macrofungal survey tours were undertaken; one to Lodhashuli and surrounding forested areas (Medinipur district, W.B.) and another to Joypur Forest and surrounding forested areas (Bankura

district, W.B.). In total (14 + 20) 34 field numbers of wild mushrooms were collected. All the samples are well preserved and under study.

Micromorphological characterization, Micro-photography, Micromorphological drawings: Micromorphological characterization, Micro-photography, Micromorphological drawings of 15 field numbers were completed.

Molecular Phylogeny: Multigene molecular phylogenetic analyses were conducted for 12 species to confirm their identity.

Identification: 29 field nos. belonging to 15 species were identified with help of morpho-taxonomy and molecular phylogeny.

Nutritional Profile: Nutraceutical properties (Antioxidant properties, Phenolic and flavonoid contents, nutritional values, HPLC based quantification of phenolics, flavonoids and water soluble vitamins, mineral estimation, antinutritional compounds) were analyzed for following 10 species.

Laetiporus sp.; *Grifola frondosa* (Dicks.) Gray; *Hericium* sp.; *Amanita ochracea* (Zhu L. Yang) Y.Y. Cui, Q. Cai & Zhu L. Yang; *Lactarius subpurpureus* Peck; *Russula kanadii* A.K. Dutta & K. Acharya; *Lycoperdon perlatum* Pers.; *Apioperdon pyriforme* (Schaeff.) Vizzini; *Macrolepiota procera* (Scop.) Singer; *Termitomyces* sp.

Culture: Successfully established cultures of 4 species: *Pleurotus* sp.; *Lentinus* sp.; *Termitomyces* sp.; *Astraeus asiaticus* Phosri, M.P. Martín & Watling

CENTRAL REGIONAL CENTRE, ALLAHABAD

Project 1: Flora of Amangarh Tiger Reserve, Bijnor, U.P.

Executing Officials: Dr. O. N. Maurya, Scientist E

Duration of the Project: 2024–2027

Background: Amangarh Tiger Reserve is a tiger reserve under ‘Project Tiger in India’ notified in 2012. Amangarh Tiger reserve forms an extension of and buffer to Jim Corbett National Park, so lying adjacent to Corbett Tiger Reserve is now a corridor to Asiatic Elephant, Tiger and other wild life. It includes forest of Raninangal, Jaspur and Kothiro forest areas. The boundries of this tiger reserve in the north encompasses part of forest area of Uttarakhand, Thika river, Patrampur, Cipka and Hajirao population. West area comprises of district Bijnore’s village namely Navabad, Kehripur, Fatehpur Dhara. The north has Corbett National Park core zone and Kandi Road. The south has villages of Bijnore district like Lalpuri, Makarandpur Ghadi, Devanandpur Ghadi, Uttarakhand forest Haspur cabin no- 19 and Makoniya village. The robust Asiatic Elephant and the roaring Tiger among the wild animals are the star attractions of this area. The Cheetal, Sambhar, Kakar, Leopard, Bear, Porcupine. Wild Boar, Jackal, Jungle cat etc., and the avifauna including Spangled Drongo, Golden Backed Wood Pecker, Jungle owlet, Red jungle fowl, grey horn bill and hornbill make this area a prestigious natural heritage.

Area & Locality: It is located in Amangarh in Bijnor district in the state of Uttar Pradesh (29°34’00”N& 78°37’00”E). It has an area of 80.605 km². Amangarh Tiger Reserve was originally part of the famed Jim Corbett National Park, and after the state of Uttarakhand was carved out of Uttar Pradesh, Jim Corbett went to Uttarakhand and Amangarh remained in Uttar Pradesh.

Achievements:

- | | |
|--------------------------------------|-------|
| 1. Number of field tour conducted | : 02 |
| 2. Total field number collected | : 127 |
| 3. Total specimens collected | : 275 |
| 4. Total number of photographs taken | : 495 |
| 5. Field numbers identified | : 42 |
| 6. Number of species identified | : 21 |



Polygonum plebium



Curculigo orchiodes

Project 2: Documentation of Plant diversity of Sur- Sarovar – A Ramsar site, Agra, Uttar Pradesh.

Executing Officials: Dr. Vinay Ranjan and B. Lakshmanudu

Duration of the Project: 2024–2025

Background: Wetland that intends to preserve the natural ecosystem and allow utilization of resources is listed under Ramsar Sites under the Ramsar Convention. Out of the 75 Ramsar Sites in India, Uttar Pradesh has the 10 number of Ramsar Sites considered to be of international significance.

Sur Sarovar Wetland is more popularly known as Keetham Lake, is located in Agra district on Delhi-Agra Highway between 27°15'N 77°50'E, 170 km from Delhi and 30 km from Agra. It covers an area of 431ha (4.3 km²). The Site of different habitat provides aquatic, marshy and terrestrial plant species harbor to resident and migratory birds, and more than 60 species of fish. Threatened species include the vulnerable greater spotted eagle (*Clanga clanga*), sarus crane (*Grus antigone*). The Site is important for bird species which migrate on the Central Asian flyway, with over 30,000 waterbirds known to visit the Sur Sarovar annually. Since, the sites are recognized for its ecological, scientific, and recreational value. It plays a crucial role in maintaining biodiversity, providing habitats for various species, regulating water flow, and supporting local communities.

The designation of Ramsar site helps promote the conservation and wise use of these valuable ecosystems.

Area & Locality: Sur- Sarovar Bird Sanctuary – A Ramsar site, Agra, Uttar Pradesh

Achievements:

1. Number of field tour conducted : 02

1st tour: surveyed around the Sanctuary and the islands of lake area and collected 101 plant spp. of 81601 to 81701 field numbers and captured photographs; all plant specimens are poisoned, mounted, stitched and identified.

2nd tour: surveyed around Sanctuary and the islands of lake area and collected 60 plant species of 81702 to 81762 field numbers and captured photographs of individual plants and landscape; all plant specimens are poisoned, mounted, stitched and identification is under process.

2. Total field number collected : 160
3. Total specimens collected : 422
4. Total number of photographs taken : 380
5. Field numbers identified : 110
6. Number of species identified : 105

Final Technical Report is under preparation.



Abrus precatorius L. (Fabaceae) / रत्ती

Project-3: Assessment of Floristic diversity in Fragile Ecosystem of Sandi Bird Sanctuary: A Ramsar Site in Hardoi District, Uttar Pradesh

Executing Officials: Dr. Nitisha Srivastava, Botanist

Duration of the Project: 2024–2025

Background: Sandi Bird Sanctuary Ramsar site is situated in the district of Hardoi, Uttar Pradesh and was established in the year 1990. The sanctuary covers an area of 309 hectares. It was created in order to protect the natural habitats and aquatic vegetation for the local residents and migratory birds. It has been designated as protected Ramsar site in the year 2019. In ancient time it was named as ‘Dahar Jheel’. River Garra, formerly known as Garun Ganga, passes near the sanctuary.

Sandi Ramsar site is typical of Indi-gangetic plains and receives most of its water from monsoon rains. Sanctuary is rich in aquatic plant diversity and it provides a productive habitat for waterfowl with over 40,000 individuals. It is home to over 1% of the South Asian population of common teal (*Anas crecca*), red-crested pochard (*Netta rufina*) and ferruginous duck (*Aythya nyroca*), while the vulnerable sarus crane (*Grus antigone*) has a population of 200 individuals within the sanctuary.

Area & Locality: Sandi Bird Sanctuary: A Ramsar Site in Hardoi District, Uttar Pradesh

Achievements:

- | | | |
|--------------------------------------|---|----|
| 1. Number of field tour conducted | : | NA |
| 2. Total field number collected | : | NA |
| 3. Total specimens collected | : | NA |
| 4. Total number of photographs taken | : | NA |
| 5. Field numbers identified | : | NA |
| 6. Number of species identified | : | NA |

Project 4: Curatorial work at herbarium and digitization of herbarium specimens of CRC (BSA), Prayagraj

Executing Officials: Dr. Sanjay Mishra, Scientist ‘D’, Dr. S. Muthukumar, Botanist, Smt. Neelima A. M, Botanist and Shri. B. Lakshmanudu, Senior Preservation Assistant

Duration of the Project: 2024–2026

Background: Process of digitization started in the year 2018 by preparing an excel sheet with the data available in the accession register. Hence, the metadata available with BSI, CRC, Prayagraj was not in the format prescribed by BSI, HQ, Kolkata. Herbarium scanner Epson Expression 12000 model was purchased in BSI, CRC, Prayagraj in the year February 2022. There were no project/full time manpower allotted for the digitization process. Hence, the data/images generated over the years are not systematically stored. From December 2023, the process of digitization initiated in a systematic way to rectify the shortcomings found in the already generated data. A pilot study was conducted and the data is analysed accordingly (Please see the Appendix) to design the roadmap for digitization of BSA. The herbarium houses lichen collections from almost all the states of the country with a special focus on the Northeast region. BSA lichens have contributed significant publications on lichen taxonomy including several new species and new records from India. A database on BSA Lichen Herbarium will be useful for lichen taxonomy studies as well as applied aspects of lichen research.

Area & Locality: N.A

Achievements:

1. Scanning of Herbarium sheets- 16,036
2. Metadata preparation (Angiosperm)- 18,604
3. Metadata preparation (Lichen)- 958
4. Re-stitched/Fumigated and Dusted: 80/344/2246
5. No. of Genus/species covers changed/Envelopes: 24/37/ 22
6. 293 new cardboard sheets added in Lichen section
7. Specimens segregated- 230
8. 672 specimens of lichens mounted on herbarium cardboard sheets

1. Segregating old specimens
2. Scanning of herbarium sheets
3. Maintenance of herbarium specimens
4. Tiff images of the scanned herbarium specimens



Project 5: Flora of Madhav National Park, Shivpuri (Madhya Pradesh)

Executing Officials: Dr. Sanjay Mishra, Scientist-D

Name of the Regional Station: Central Regional Centre, Prayagraj (Uttar Pradesh)

Duration of the project: 2024–2027

Background: Madhav National Park is situated in the northern part of Madhya Pradesh in Shivpuri district, on the northern fringe of the Central Highlands of India, forming a part of the upper Vindhyan Hills intermixed with plateaus and valley sections. The area spreading over almost 375.233 sq. kms. was notified as National Park in the year 1958. Located in the ecoregion of Khathiar-Gir dry deciduous forests, the park represents the northern tropical dry deciduous mixed forest as well as dry thorn forest, typical of north-western Madhya Pradesh. Madhav National Park is a natural wonder that boasts a diverse terrain of forested hills and flat grasslands around its two crucial reservoirs, Sakhya Sagar (Ramsar site) and Madhav Sagar, in the southern part of the park. These lakes are a permanent source of water to the wildlife and a fine wetland habitat to the aquatic flora & fauna, including thousands of migratory waterfowls. Marsh Crocodiles are in abundance in Sakhya Sagar Lake, and the lake looks like a “Crocodile Safari.” Madikhera Dam is situated in the north western part of the park. The diverse terrain of the national park makes ideal habitat for various species of animals such as tigers, leopards, chinkara, blackbuck, sambar deer, wild boar, sloth bear etc. The national park is also undergoing the process of reintroduction of tigers. Other attractions in the park include Chinkara Sanctuary, scenic waterfalls, ancient temples and Castle.

Work Plan

- To conduct floristic exploration tours in all seasons.
- Collection, identification and documentation of the collected plant species

Objectives & Outcome

- Assessment of floral diversity of National Park including the fragile ecosystem of Sakhya Sagar wetland
- To prepare a pictorial flora of Madhav National Park
- To assess the status of endemic, rare and threatened species of the area along with plants of economic importance.
- To suggest conservation strategies.

Area & Locality:

General Information:	Total Park Area: 375.23 sq km. (Shivpuri district, M.P.)
Legal Status:	National Park was established in 1958, Area extended in 1982 and 1999
Geographic Location	Latitude : 25°20'E 77°35'E Longitude: 77°38'E 77°57'E
Altitude:	380 to 480 m (MSL)
Atmospheric Parameters	Precipitation: 800 mm
Temperature (Max.–Min.)	47°C – 03°C

Achievements:

1. Number of field tour conducted : 02
2. Total field number collected : 323
3. Total specimens collected : 915
4. Total number of photographs taken : 900
5. Field numbers identified : 190
6. Number of species identified : 187

After tour, processing (proper drying, periodic poisoning, mounting & stitching) is on progress.



National Park Landscape



Gloriosa superba L.



Ceriscoides turgida (Roxb.) Tirveng.

Project 6: Pictorial Flora of Madhya Pradesh (Ranunculaceae to Poaceae)

Name of the Scientist & Designation: Dr. Vinay Ranjan, Scientist-E, Dr. O.N. Maurya, Scientist-E & Dr. Sanjay Mishra, Scientist-D (Following officials may be included in the project from next FY: *Smt. Neelima A.M, Botanist & * Shri. B. Lakshmanudu, Senior Preservation Assistant)

Duration of the project: 2024–2027

Background of the project: The biodiversity of Madhya Pradesh owns rich and diverse floral diversity. The biodiversity of Madhya Pradesh varies with the presence of forest areas in Madhya Pradesh. Madhya Pradesh hosts more than 2500 plant species. The Central, eastern and southern parts of the state are forested and have greater floral diversity. Variability in climatic and edaphic factors also impacts the forest types and flora diversity of Madhya Pradesh. Madhya Pradesh has four important forest types- namely tropical moist deciduous, tropical dry deciduous, tropical thorn, and subtropical broad-leaved hill forests. Based on composition, three forest formations exist in M.P. namely, teak forest, sal forest and miscellaneous forest. The state also has Bamboo bearing areas with multiple different varieties of bamboo. More than 20 years have passed since the publication of the flora of Madhya Pradesh. The state of Madhya Pradesh was divided in 2000 and after the creation of Chhattisgarh; the updated flora has not been published. More over the earlier published flora lack ample plant photographs. Therefore, this project has been proposed to prepare an updated checklist of the flora of Madhya Pradesh along with maximum possible plant photographs in the form of Pictorial flora. This updated pictorial flora will be helpful in field identification for all the stack holders and for planning the future conservation strategies.

Study Area: Madhya Pradesh

General Information:	Total Area: 308,252 km ² • Length - 605 km • Width - 870 km
Geographic Location	Latitude 21.6°N–26.30°N, Longitude 74°9'E–82°48'E
Altitude:	Elevation: 90 m- 1,352 m (Peak- Dhupgarh, Pachmarhi)

Work Plan

- To conduct floristic exploration tours of the diversity rich regions in all seasons.
- To take Photographs, Collection, identification and preparation of pictorial flora.

Objectives & Outcome

- Assessment of floral diversity of Madhya Pradesh after the separation of Chhattisgarh.
- To prepare an updated pictorial flora of Madhya Pradesh.

f) Achievements:

1. Number of field tour conducted : 02
2. Total field number collected : 86
3. Total specimens collected : 75
4. Total number of photographs taken : 460
5. Field numbers identified : 55
6. Number of species identified : 105

After tour, supervision of processing (proper drying, periodic poisoning, mounting & stitching) is in progress.



Biancaea decapetala (Roth) O.Deg.



Laggera alata (D.Don) Sch.Bip. ex Oliv.



Lobelia nicotianifolia Roth



Rotula aquatica Lour.

DECCAN REGIONAL CENTRE, HYDERABAD

Project 1: Flora of Pakhal Wildlife Sanctuary (839 sq.km), Telangana

Executing Officials: Dr. L. Rasingam, Scientist-E & Dr. Peddi Harikrishna, Botanist.

Duration of the Project: June, 2023 to March, 2026

Background: One of the primary mandates of the Botanical Survey of India (BSI) is to conduct floristic surveys and documentation within Protected Areas (PAs). Given the Deccan Regional Centre of BSI's location in Telangana, a comprehensive floristic survey of the state's rich biodiversity is crucial. Telangana encompasses three National Parks (Kasu Brahmananda Reddy, Mahavir Harina Vanasthali, and Mrugavani), two Tiger Reserves (Kawal and Amarabad), and seven Wildlife Sanctuaries (Eturunagaram, Pakhal, Pranahita, Kinnerasani, Manjira, Pocharam, and Shivaram). These PAs collectively represent a significant portion of the state's diverse flora.

Area & Locality: Pakhal Wildlife Sanctuary, situated adjacent to Pakhal Lake – an artificial water body constructed in 1213 AD by the Kakatiya ruler Ganapati Deva – is a key focus area. Located in Bhupalapally district, Telangana, the Sanctuary spans 839 km² between 17°57' N and 79°59' E. The elevation ranges from 280 to 300 meters above sea level, with temperatures fluctuating between 15°C and 45°C and an annual rainfall of approximately 1,225 mm. Established in 1952, Pakhal Sanctuary comprises a vast plateau bordered by low hills and harbors a diverse array of vegetation, including tropical dry deciduous mixed forests and mixed teak-bamboo forests. The Sanctuary also provides habitat for a variety of animal species. The scenic beauty and natural landscape of Pakhal Wildlife Sanctuary attract numerous tourists throughout the year.

Objectives: Survey, Collection and Identification of Flora of Pakhal Wildlife Sanctuary (839 sq.km), Telangana.

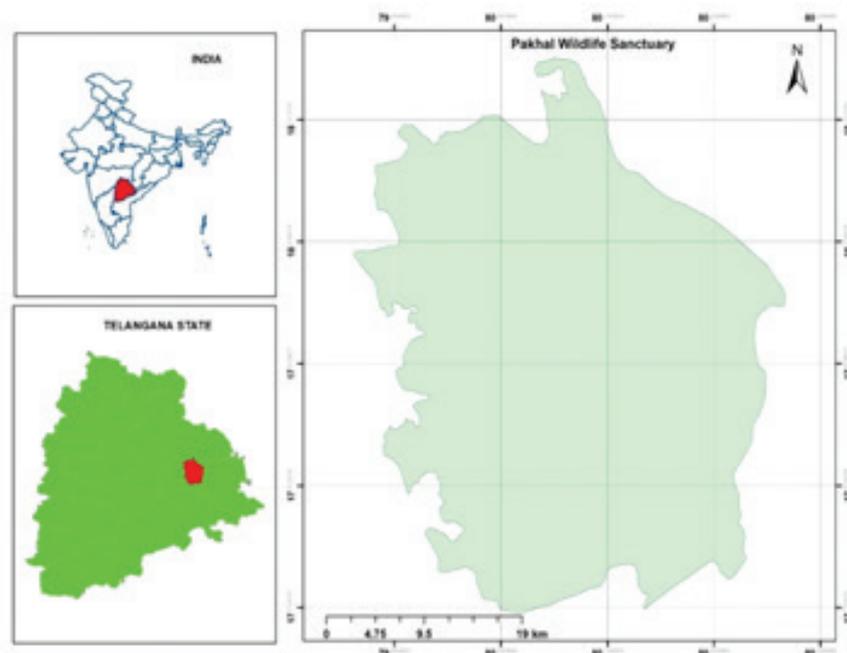


Fig.1. Pakhal Wildlife Sanctuary map

Achievements:

- Three field tours were conducted, spanning from March 31st to April 6th, September 23rd to 30th, and December 12th to 22nd, 2024 (Fig. 2.). These expeditions resulted in the collection of 299 field numbers in 2024. A total of 329 species have been identified, encompassing both current and previous year collections. Notably, one research paper on a novel grass species was communicated for inclusion in the Flora of Telangana State.
- **Field Tours:** Conducted 03 field tours from 31.03.2024 to 06.04.2024, 23.09.2024 to 30.09.2024 & 12.12.2024 to 22.12.2024
- **Collections:** Total Collections: 469 field numbers
2024 Collections: 299 field numbers
- **Species Identification:** Identified 329 species (including previous year collection)

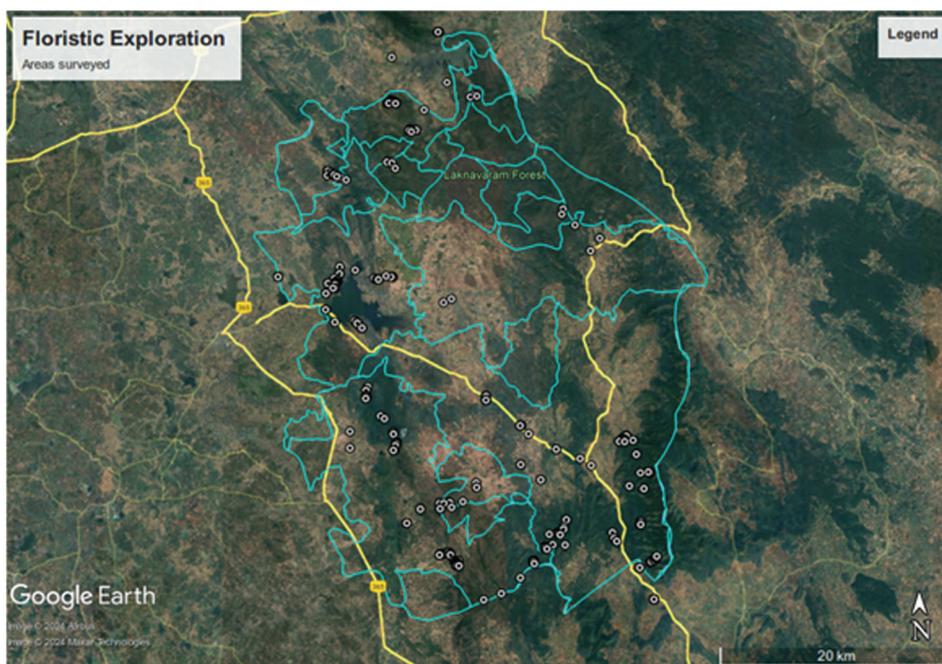


Fig. 2. Details of the floristic exploration at Pakhal WLS, Telangana 2024-2025.

Project 2: Flora of Sri Lankamalleswara Wildlife Sanctuary (464.42 sq.km) Kadapa District, Andhra Pradesh

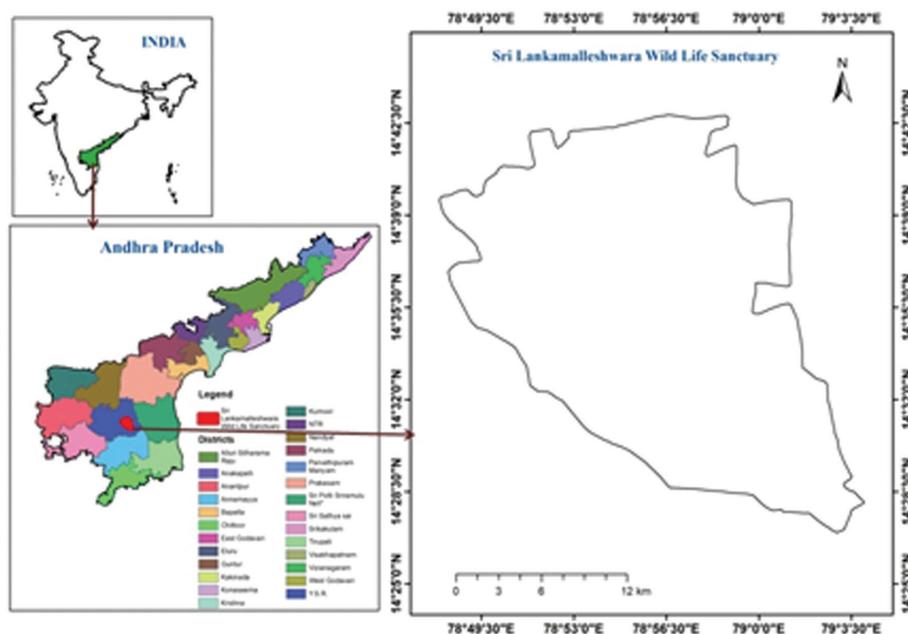
Executing Officials: Dr. Sankararao Mudadla, Scientist-D & Dr. Peddi Harikrishna, Botanist.

Duration of the Project: 11th November 2022 to March 2025.

Background: India possesses a substantial forest cover, encompassing 21.3% of its total geographical area. Within this, a network of 106 National Parks, 573 Wildlife Sanctuaries, 220 Community Reserves, and 115 Conservation Reserves constitutes 5.29% (173,966.7 km²) of the total area under protection (wii.gov.in). Wildlife Sanctuaries, covering a significant area of 122,560.85 km² (3.78%), are typically designated within existing reserve forests to safeguard specific rare species or unique habitats). Historically, these protected areas, originating from reserve forests, have experienced varying degrees of human exploitation. Traditional rights granted to local communities, such as the collection of non-timber forest products, have contributed to disturbances within these ecosystems, alongside natural disturbances

(Tripathi & Singh, 2009). To effectively implement the Reducing Emissions from Deforestation and Forest Degradation (REDD+) mechanism under the United Nations Framework Convention on Climate Change 1 (UNFCCC), which emphasizes forest conservation, carbon stock maintenance, and the socio-economic well-being of forest-dependent communities, comprehensive information on plant resources and their environmental relationships is crucial (Aye & al., 2014). A thorough understanding of plant diversity within protected areas is paramount for developing robust conservation strategies. By integrating local communities into conservation efforts, these strategies can be effectively implemented and strengthened.

Area & Locality: Sri Lankamalleshwara Wildlife Sanctuary, established in 1998, is one of the 13 sanctuaries in Andhra Pradesh. Covering an area of 464.42 sq. km (Fig. 1), the Sanctuary was primarily designated to protect the habitat of the critically endangered Jerdon's Courser. However, the conservation efforts within the Sanctuary have likely benefited a broader range of species beyond the target species.



Objectives: Survey, Collection and Identification of Flora of Sri Lankamalleshwara Wildlife Sanctuary (464.42 sq.km) Kadapa District, Andhra Pradesh

Achievements: To comprehensively assess the sanctuary's flora, three intensive field tours were conducted across different seasons: June 20–26, 2024 (76 collections), September 29–October 6, 2024 (54 collections), and December 2–12, 2024 (107 collections). These surveys resulted in the collection of 237 plant specimens. Additionally, 113 plant specimens from previous tours were successfully identified, significantly expanding the recorded flora of the sanctuary. A total of 110 plant species were documented during this period (Plate 1.).

Field Surveys:

- Conducted 3 intensive field tours across different seasons to capture a comprehensive picture of the sanctuary's flora:
 1. June 20–26, 2024 (76 field numbers collected)
 2. September 29 - October 6, 2024 (54 field numbers collected)
 3. December 2–12, 2024 (107 field numbers collected)

Species Collection and Identification:

- Collected a total of 237 plant specimens during the field tours.
- Successfully identified 113 plant specimens collected in previous tours, expanding the documented flora of the sanctuary.

Species Documentation:

- Documented a total of 110 plant species (Plate 1.).

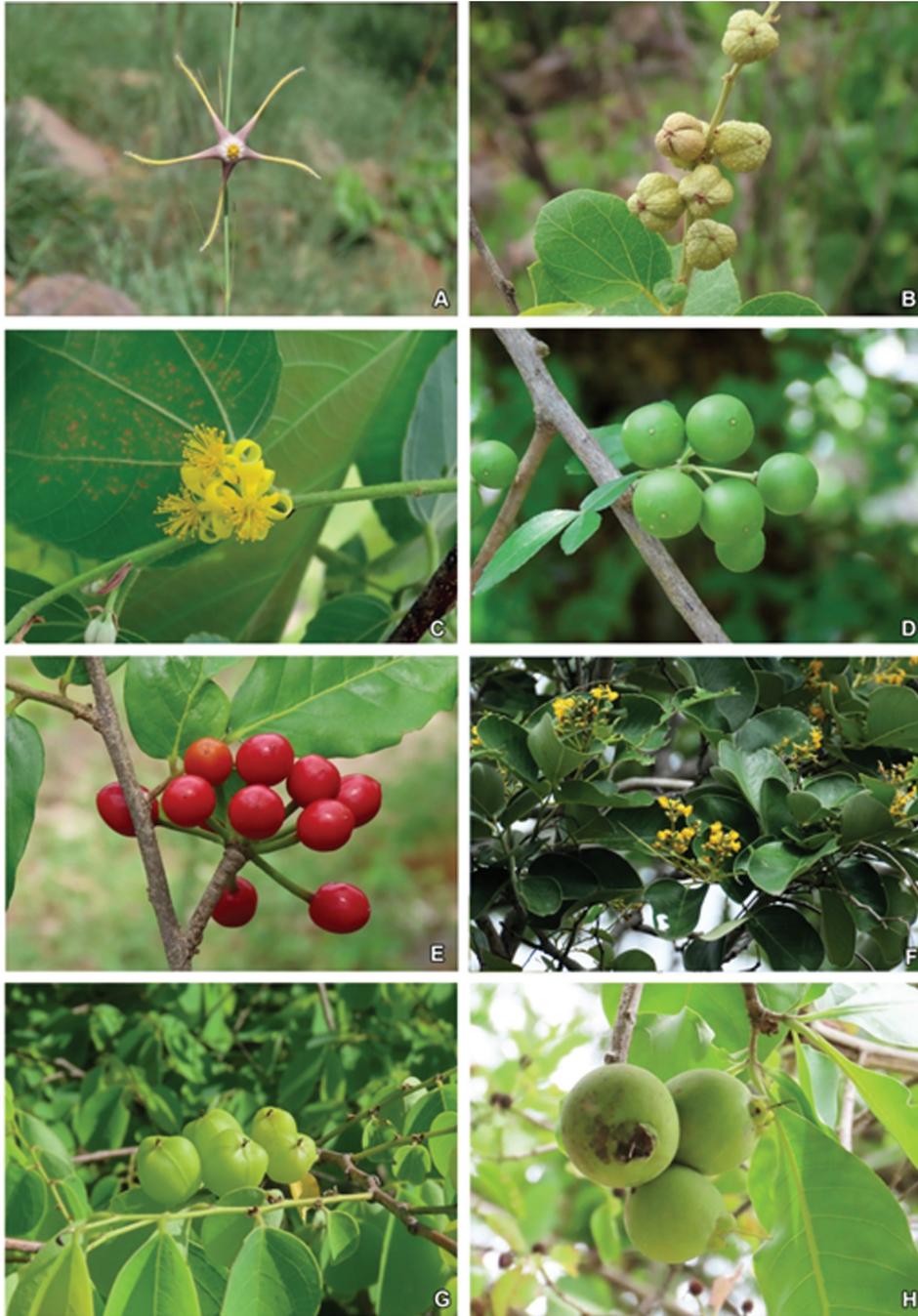


Plate 1. A. *Brachystelma pullaiyahii*; B. *Croton scabiosus*; C. *Grewia tiliifolia*; D. *Naringi crenulata*; E. *Polyalthia cerasoides*; F. *Pterocarpus santalinus*; G. *Cleistanthus collinus*; H. *Careya arborea*

Project 3: Lichens of Telangana State

Executing Officials: Dr. G. Swarnalatha, Botanist

Duration of the Project: November 2022 to March 2026.

Background: As far as Lichens of Telangana state is concerned there is no noteworthy contribution. Limited work has been done and only few species i.e. 23 species under 11 genera have been reported by Manoharachary (1979); Venugopal Rao & Manoharachary (1980); Sujatha (2014); Sujatha & al. (2016); Manoharachary & Nagaraju (2017). Of which, 16 species under eight genera are macrolichens. However, a vast part of the state remains unexplored with respect to the lichens and moreover, neither the precise diversity inventory of lichens of the state is available. Therefore, detailed survey and study of lichens from the state is needed. Thus, this project has been proposed for detailed survey and study of lichens and to provide a thorough and comprehensive account of lichens of the state.

Area & Locality: Telangana State: Telangana, is situated on the Deccan Plateau and in the center of the Indian peninsula. It lies between 77°14' E to 81°19' E longitude and 15°50' N to 19°55' N latitude with its area of 1,12,077 sq. km. Politically the state has been divided in to 33 districts. The forest area in the states is 21,213 sq. km, which is 18.93% of the state geographical area (India State of Forest Report, 2021). Telangana has four National Parks, 08 Wild life Sanctuaries

Objectives: Detailed survey and study of lichens and to provide a comprehensive account of lichens of the Telangana state.

Achievements:

- For the first time, 131 lichen specimens were collected from Mulugu and Sangareddy districts, marking a significant addition to the biodiversity records of the region. Prior to this, no lichens had been documented from these districts.
- These 131 specimens, collected from Mulugu and Sangareddy districts of Telangana State, have now been incorporated into the BSID Herbarium, enriching its collection with valuable contributions from previously unexplored areas.
- Identified 46 specimens up to the species level and 18 specimens were identified up to the genus level.
- 07 species were identified as new for Telangana.
- **Field Surveys:** Conducted two field tours to Mulugu and Sangareddy districts of Telangana State:
 1. 06.08.2024 to 14.08.2024 (83 field packets collected)
 2. 17.12.2024 to 27.12.2024 (48 voucher specimens collected)
- **Species Collection and Identification:**
 - Specimens collected during the field tours were processed and were placed in the freezer for pest control.
 - Collected a total of 131 voucher specimens of lichen during the field tours.
 - Identified 46 specimens up to the species level and 18 specimens were identified up to the genus level.



A. Forest in Dulapuram Range, Venkatapuram Forest Division, Mulugu dist., Telangana; **B.** *Parmotrema proesorediosum* (Nyl.) Hale. **C.** *Parmotrema tinctorum* (Despr. ex Nyl.) Hale. Project: Lichens of Telangana State

Project 4: Development of Museum of DRC, Hyderabad

Executing Officials: Dr. G. Swarnalatha, Botanist

Duration of the Project: November 2021 to March 2025.

Background: This project was initiated in November 2021 with the goal of enhancing and expanding the existing museum at DRC, Hyderabad. The initiative began with the procurement of a wooden display cabinet and five custom display boards. Additionally, LED lighting was installed in one of the display units to improve visibility. The project also involved updating the fluid preservatives for museum specimens as needed. A thematic reorganization of the museum specimens was carried out across several racks, and new labels were created wherever necessary. Furthermore, several new specimens were added to the collection to enrich the museum.

Objective: Development of Museum of DRC, Hyderabad

Area and Locality: BSI, DRC, Hyderabad

Achievements:

- As part of the museum development, seventeen new specimens were successfully added, and proper labeling was carried out for both new and existing collections.
- Preservation standards were improved by segregating and refilling six specimens with appropriate liquid preservatives, while older specimens needing better storage were carefully assessed and transferred to new containers.
- Additionally, a comprehensive specimen database for BSI, DRC, Hyderabad is currently being developed in Excel format.

Project 5: Floristic studies in the Bhitarkanika Wildlife Sanctuary, Odisha, India

Executing Officials: Dr. S.P. Panda, Scientist-D

Duration of the Project: November 2024 to March 2028.

Background: Bhitarkanika is formed from two words of Odia i.e. Bhitara + Kanika. “Bhitara” meaning interior and “Kanika” meaning that which is extraordinarily beautiful. The Bhitarkanika Mangroves were Zamindari forests until 1952, when the Government of Odisha abolished the Zamindari system and brought the Zamindari forests under the administrative control of the State Forest Department. But

next 10-15 years saw heavy influx of immigrants and this took a heavy toll of the mangrove forests along with other floral elements. Large scale encroachment on forest land took place due to vast expansion of agriculture in subsequent years. Fortunately in the year 1975, an area of 672 sq. km was declared as the 'Bhitarkanika Wildlife Sanctuary'. It is in this period when real wildlife management started. Dr. H.R. Bustard, Chief Technical Advisor to Government of India under the United Nations Development Programme (UNDP / FAO) initiated famous 'Crocodile Conservation Project' and also reported mass nesting of Olive ridley sea turtles on the Gahirmatha coast. An area of 145 sq. km, the core area of Bhitarkanika wildlife sanctuary was declared as 'Bhitarkanika National Park' in September 1998. Bhitarkanika Mangroves were designated as 'Ramsar Wetland of International Importance' in 2002.

Objective:

1. Survey, collection, identification and documentation of the angiospermic taxa of Bhitarkanika Wildlife Sanctuary.
2. Recording of phenology of flowering and fruiting of mangrove and associates.
3. Preparation of herbarium specimens
4. Compilation of the Flora of the Bhitarkanika Wildlife Sanctuary

Area and Locality: Bhitarkanika Wildlife Sanctuary, Kendrapara District, Odisha

Achievements:

- Requests has been made for forest permission from the PCCF (WL), Odisha and collecting literature pertains to the Wildlife Sanctuary.
- Literature references are in progress h) Photographs (requested to send separately in .jpeg format with proper legends and mentioning the corresponding project name).

EASTERN REGIONAL CENTRE, SHILLONG

Project 1: Maintenance of the Experimental Botanic Garden BSI, ERC, Barapani

Executing Officials: Mr. B. B. T. Tham, Botanist. Dr. L. R. Meitei Botanist & Dr. Saurabh Sachan, Bot. Asstt.

Duration of the Project: Ongoing

Background: The NER is very rich in Plant species diversity and is home to many rare, endangered and endemic species. Considering the present scenario of threats from Climate change and Anthropogenic activities leading to destruction of nature through deforestation and land acquisition, Ex-situ conservation of these species is of utmost priority for BSI.

Area & Locality: North East India.

Objectives: The Experimental Botanic Gardens being a Repository of Endemic, Endangered, Threatened and Economically important plant species of North-east India. Its objective is to conserve and maintain such species and also to create awareness of the importance for their conservation.

Achievements:

- Conducted 1 field tour to Garo Hills, Meghalaya and 5 local field trips in Meghalaya for Live plants collection during the period.
- Literature references are in progress h) Photographs (requested to send separately in .jpeg format with proper legends and mentioning the corresponding project name).
- EET plant species viz. *Aerides multiflora* (4 nos.), *Aquilaria malaccensis* (5 nos.), *Begonia silletensis* (2 nos.), *Brainia insignis* (3 nos.), *Bulbophyllum careyanum* (14 nos.), *Cephalantheropsis obcordata* (4 nos.), *Coelogyne viscosa* (3 nos.), *Crepidium acuminatum* (2 nos.), *Dendrobium aphyllum* (3 nos.), *Dendrobium jenkinsii* (11 nos.), *Dendrobium transparens* (4 nos.), *Eria coronaria* (3 nos.), *Gymnosphaera gigantea* (3 nos.), *Ilex khasiana* (3 nos.), *Impatiens acuminata* (3 nos.), *Impatiens racemulosa* (3 nos.), *Mycaranthes floribunda* (4 nos.), *Nephelaphyllum cordifolium* (6 nos.), *Oberonia acaulis* (1 no.), *Pholidota articulata* (3 nos.), *Pholidota imbricata* (1 no.), *Pinalia acervata* (1 no.), *Rhynchostylis retusa* (8 nos.) and *Taxus wallichiana* (9 nos.).
- Transplantation of 3797 numbers of plant seedlings into sapling bags for storage and distribution.
- Observed and recorded phenological data of flowering and fruiting of 137 plant species.
- 1718 plant saplings / seedlings are distributed for plantation to different stakeholders (institutions / organisations/villages/individuals).
- Supervision and general maintenance of works carried out in the EBG, BSI, ERC, Barapani.
- Guided and assisted 945 visitors who visited the garden during the period.



Bulbophyllum careyanum collected from Rynkang
Khla Ribhoi District



Impatiens porrecta collected from Moopun Falls East
Jaintia Hills District



Coelogyne viscosa collected from David Scott Trail
East Khasi Hills District



Mycaranthes floribunda collected from Umtasor,
Ribhoi District

Project 2: Curatorial works at Herbarium of ERC, Shillong (ASSAM)

Executing Officials: Smt. Nandita Sarma, Bot. Asstt., Mr. Vijay, Bot. Asstt., Ms. Debala Tudu, Bot. Asstt., Dr. Harekrushna Swain, Sr. Presr. Asstt. and Dr. Y. Mahesh, Sr. Presr. Asstt. under the supervision of Dr. R. Manikandan, Scientist 'E'.

Duration of the Project: On-going project

Background: The Herbarium of Botanical Survey of India, Eastern Regional Centre, Shillong (Acronym: ASSAM) is largest herbarium in North-east India. It has a total of 1,14,522 herbarium specimens of Angiosperms including 88925 specimens of Cotyledons and 25597 Monocotyledons. Further, a total of 8,414 Pteridophytes, 576 Gymnosperms and 779 Type specimens available in ASSAM. This herbarium is having many historical collections including Gustav Mann, U.N. Kanjilal, P.C. Kanjilal, N.L. Bor, C.E.C. Fischer, Kingdon Ward etc. Also it has collections from the neighbouring countries like Bhutan, Bangladesh, Myanmar, Nepal, etc.

Area & Locality: Herbarium of Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM)

Objectives: Regular maintenance of herbarium, Preparation of database and incorporation of metadata of all digitized herbarium specimens and Digitization of herbarium specimens of ASSAM.

Achievements:

Repairing of Compactors	Herbarium Hall – I & II
Fumigation of Herbarium	Angiosperms : 1,14,522
	Pteridophytes : 8,414
	Gymnosperms : 576
	Type specimens: 779
	Total 1,24,291
No. of Genus/species/bryophytes packets folders changed	1362/79/37
No. of Genus/species/type/bryophytes packets folders made	565/64/50/67
No. of Barcodes pasted on the Herbarium sheets	41,322
Photo editing	24039 sheets
Metadata prepared/scanning	6.483/29623
Renaming of photos	46873 sheets
Barcode entered in metadata excel sheet	5955
Imaging of herbarium sheets	23958 sheets
No. of herbarium sheets dusted and cleaning	18182



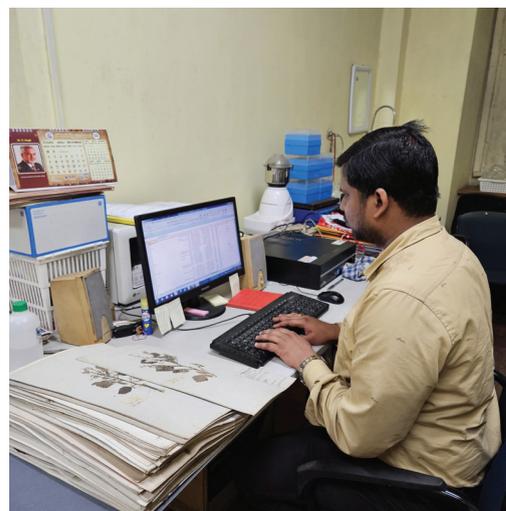
Barcode pasting



Capturing image of herbarium sheet



Genus folder changing



Metadata preparation

Project 3: Backlog Clearance of Unidentified Herbarium sheets at ASSAM

Executing Officials: Smt. Nandita Sarma, Bot. Asstt., Mr. Vijay, Bot. Asstt., Miss. Debala Tudu, Bot. Asstt., Dr. Harekrushna Swain, Sr. Pres. Asstt., Dr. Y. Mahesh, Sr. Pres. Asstt. under the supervision of Dr. R. Manikandan, Scientist 'E'

Duration of the Project: On-going

Background: This project focuses on areas like segregation of herbarium sheets, collecting the field related information, data entry of herbarium sheets, identification of plants, fumigation and incorporation of identified sheets.

Area & Locality: Herbarium of Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM)

Objectives: Segregation, cleaning, identification and data entry of backlog herbarium sheets.

Achievements:

Number of herbarium sheets segregated	974
Number of herbarium sheets cleaned	697
Number of plants identified	974
Data entry on herbarium sheets	314



Genus folder changing



Metadata preparation

Project 4: Morphotaxonomy and Molecular Phylogeny of Wild edible Mushrooms of Meghalaya.

Executing officials: Dr. Dyutiparna Chakraborty, Scientist 'C' and Ms. Debala Tudu, Botanical assistant.

Duration of the Project: April 2023–March 2026.

Background: Local tribal peoples of Meghalaya used to collect and consume wild mushrooms as a staple food during the rainy season. But improper identification of many of those mushrooms leads to severe mushroom poisoning and death every year. Previously about 30 edible mushrooms were reported and recorded from Meghalaya based on mainly local market survey but proper taxonomic identifications were mostly missing. So, keeping in the view the urgency of the situation and to avoid unwanted deaths this project was proposed for proper identification and documentation of wild edibles mushrooms of Meghalaya.

Area and Locality: Meghalaya

Objectives: Collection tour in different areas of Meghalaya and processing of the collected wild edible mushroom specimens towards Herbarium preparation related work; detail macro- and micromorphological characterization of all collected edible mushrooms for taxonomically correct identification and separation from morphologically lookalikes; single to multigene phylogenetic analysis of wild edible mushrooms of Meghalaya; documentation of possible ethnomycological data of wild edible mushrooms; recording the correct distribution of wild edible mushrooms with the help of GPS.

Achievements:

- Seven (7) field tours were conducted spanning 22 days in East Garo Hills, West Garo Hills, South Garo Hills, East Jaintia and West Jaintia Hills, Ri Bhoi and East Khasi Hills.
- Seven districts (East Garo Hills, West Garo Hills, South Garo Hills, East Jaintia and West Jaintia Hills, Ri Bhoi and East Khasi Hills). In Q1 two tours were conducted in Narpuh and Jowai and fresh specimens of wild edible mushrooms were collected. In Q2 One combined field tour has been undertaken to Garo Hills and two local tours were conducted in Sohra and Ishyrwat. In Q3 two local tours were conducted in Weiloi village, East Khasi Hills and Moopun in East Jaintia Hills.
- 45 collections were made during the field tours belong to 16 genera and 26 species. DNA extraction from 3 previously collected specimens were done and phylogenetic analyses were conducted. DNA extraction from 8 newly collected specimens were done and phylogenetic analyses were conducted. Macromorphological characterization of all 26 collected mushrooms was done. Micromorphological characterization of 20 collected mushrooms were done.
- Three manuscripts are under preparation.
- Three new records were documented



Amanita chepangiana



Cantharellus sp.



Lactifluus sp.



Russula kanadii

Project 5: DNA barcoding and Phylogenetic analysis of the endemic genus *Hypericum* of North-East India and Chemical composition, antioxidant activities of the essential oil produced.

Executing officials: Dr. Deepu Vijayan, Scientist-D and Dr. Harekrushna Swain, Senior Preservation Assistant

Duration of the Project: April 2022–September 2024

Background: The proposal seeks to carry out inter specific and intra specific diversity and bioprospecting oils and extracts obtained from different plant parts of Genus *Hypericum* from different geographical locations in Northeast India. There are very few scientific studies on the chemical evaluation of the Genus *Hypericum* and bioprospection. Based on the results, information, marketing strategies as well as scientific knowhow can be extended to other stakeholder such as farmers, local communities, NGOs and forest department.

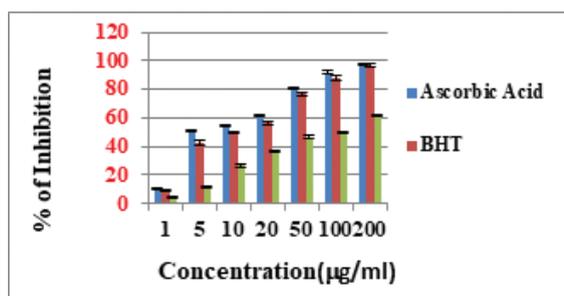
Area and Locality: Meghalaya, Assam and Nagaland

Objectives:

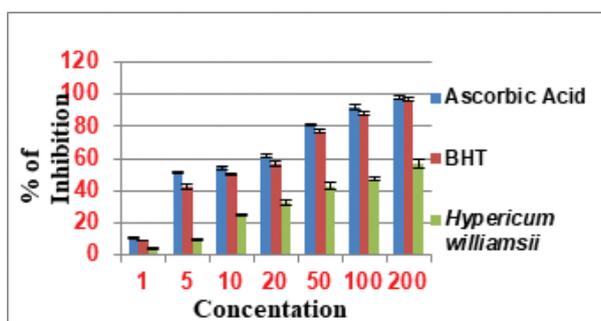
1. Qualitative and Quantitative phytochemical analysis by using plant extracts for GCMS analysis.
2. Estimation of Antioxidant activity of the plant extracts.

Achievements:

- Antioxidant activity of the plant extracts of *Hypericum hookerianum* Wight & Arn., *Hypericum williamsii* N. Robson, *Hypericum gracilipes* Stapf ex C.E.C.Fisch, *Hypericum japonicum* Thunb, *Hypericum elodeoides* Choisy and *Hypericum lobbii* N. Robson was carried out by following *in vitro* assays viz., DPPH assay, ABTS assay.



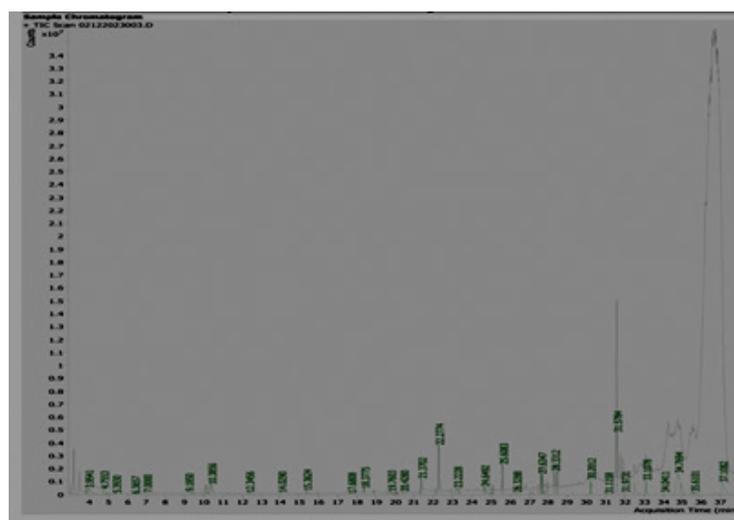
[Antioxidant ability of essential oil of aerial parts of *Hypericum hookerianum* and positive controls (Ascorbic acid and BHT) determined by DPPH free radical scavenging ability.]



[Antioxidant ability of essential oil of aerial parts of *Hypericum williamsii* and positive controls (Ascorbic acid and BHT) determined by DPPH free radical scavenging ability.]

- GC-MS analysis was performed to estimate the essential oil composition extracted from the aerial part of *Hypericum williamsii* N. Robson. There is the presence of 90 compounds. The details for the major compounds and the chromatogram of the GC-MS analysis of essential oil composition extracted from the aerial part are as follows:

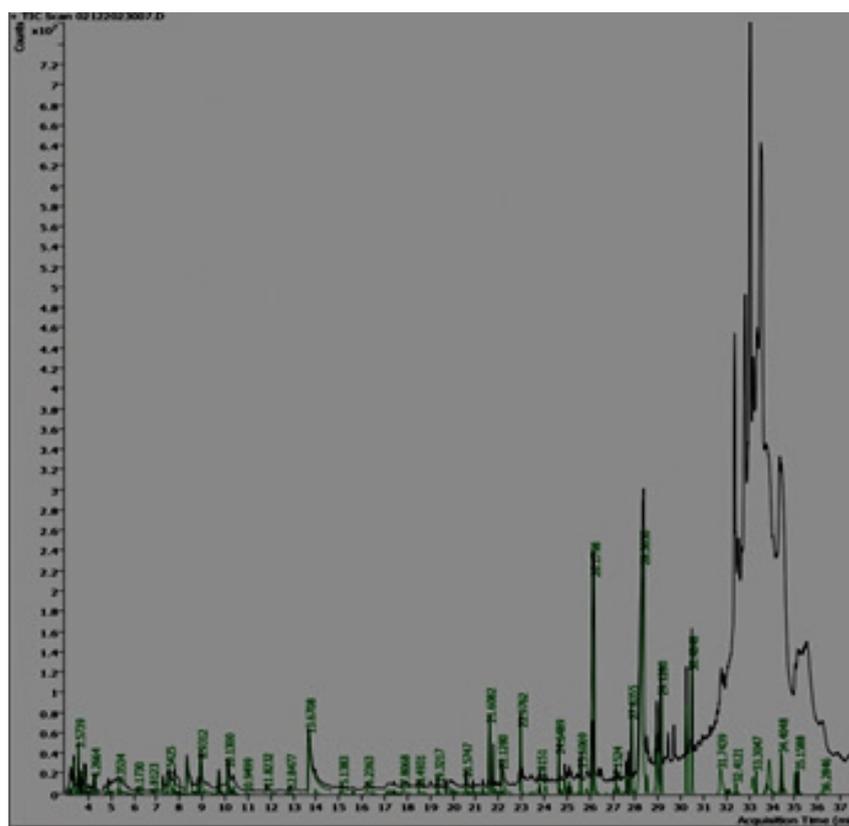
Sl. No.	Compound Name	CAS Number	Formula	Component Area in GC MS Analysis
1	β -Amyrin	559-70-6	C ₃₀ H ₅₀ O	24406922.7
2	Phenol 2,6-bis (1,1-dimethylethyl)-4-mercapto	950-59-4	C ₁₄ H ₂₂ OS	14042475.3
3	Silane, diethylhexyloxyoctyloxy	1000363-07-6	C ₁₈ H ₄₀ O ₂ Si	12947599.0
4	Silane, diethylnonyloxypropoxy	1000363-08-5	C ₁₆ H ₃₆ O ₂ Si	9194178.8
5	Undecane	1120-21-4	C ₁₁ H ₂₄	5607326.4
6	Hexadecanoic acid methyl ester	112-39-0	C ₁₇ H ₃₄ O ₂	4964723.2
7	1,2-Bis(3,5,5-trimethyl-2-cyclohexenylidene) hydrazine	93999-18-9	C ₁₈ H ₂₈ N ₂	4893260.6
8	Nonane	111-84-2	C ₉ H ₂₀	4634231.1
9	Propanoic acid 2-methyl	79-31-2	C ₄ H ₈ O ₂	4355602.4
10	Desaspidinol	437-72-9	C ₁₁ H ₁₄ O ₄	4136818.4



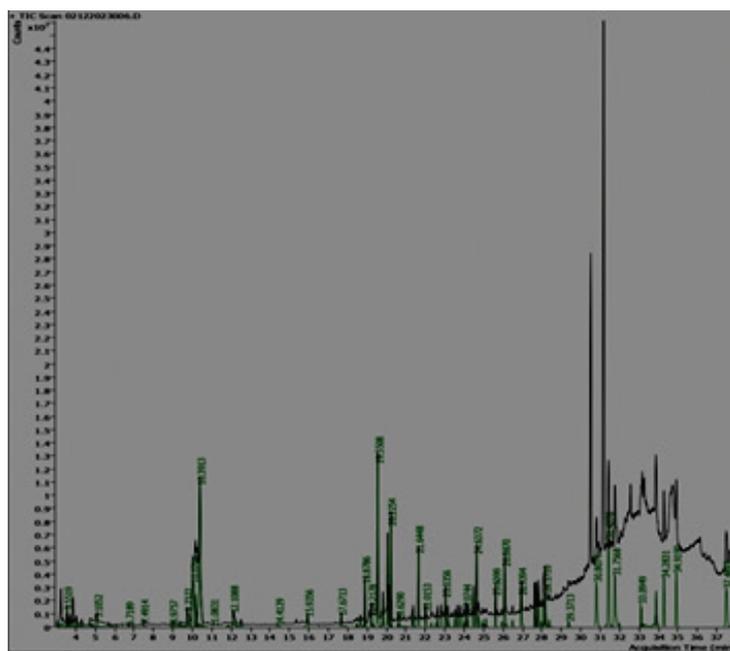
- GC-MS analysis was performed to estimate the essential oil composition extracted from the aerial part of *Hypericum elodeoides* Choisy. There is the presence of 167 compounds. The details for the major compounds and the chromatogram of the GC-MS analysis of essential oil composition extracted from the aerial part are as follows:

Serial No.	Compound Name	CAS Number	Formula	Component Area in GC MS Analysis
1	Undecane	1120-21-4	C ₁₁ H ₂₄	3909165.1
2	cis- β -Farnesene	28973-97-9	C ₁₅ H ₂₄	29177970.9
3	3,4'-Isopropylidenediphenol, bis(trimethylsilyl) ether	1000462-58-0	C ₂₁ H ₃₂ O ₂ Si ₂	25687875.8

4	n-Butyric acid tetrahydrofurfuryl ester	637-65-0	C ₈ H ₁₄ O ₃	24382245.0
5	Naphthalene, decahydro-4a-methyl-1-methylene-7- (1-methylethylidene)-, (4aR-trans)-	515-17-3	C ₁₅ H ₂₄	14653083.9
6	Octacosanol	557-61-9	C ₂₈ H ₅₈ O	15295408.8
7	3,4'-Isopropylidenediphenol, bis(trimethylsilyl) ether	1000462-58-0	C ₂₁ H ₃₂ O ₂ Si ₂	25687875.8
8	4-tert-Butylcatechol, bis(trifluoroacetate)	1000365-44-1	C ₁₄ H ₁₂ F ₆ O ₄	14297568.3
9	Pentadecanoic acid	1002-84-2	C ₁₅ H ₃₀ O ₂	764375.2
10	n-Hexadecanoic acid	57-10-3	C ₁₆ H ₃₂ O ₂	13383582.6



5	2,6,10,14-Hexadecatetraenoic acid, 3,7,11,15- tetramethyl-, methyl ester	42207-88-5	C ₂₁ H ₃₄ O ₂	33581677.1
6	1,1,6-trimethyl-3-methylene-2-(3,6,9,13- tetramethyl-6-ethenyl-10,14-dimethylenepentadec-4-enyl)cyclohexane	1000373-94-5	C ₃₃ H ₅₆	31616206.5
7	μ- Sitosterol	83-47-6	C ₂₉ H ₅₀ O	28042203.5
8	Cyclopropa[5,6]-A-nor-5.alpha.-androstane-3,7- dione, 3',6.beta.-dihydro-17.beta.-hydroxy-3',3'-dimethyl-, acetate	24634-23-9	C ₂₃ H ₃₂ O ₄	27586834.5
9	Cycloheptanone	502-42-1	C ₇ H ₁₂ O	23320189.1
10	Supraene	7683-64-9	C ₃₀ H ₅₀	20097079.5



Project 6: Trees of Meghalaya, India.

Executing Officials: Dr. N. Odyuo, Dr. R. Kottaimuthu, Mr. B.B.T. Tham and Dr. Y. Mahesh

Duration of the Project: 2024–26

Background: Humanity has relied on natural resources for fundamental necessities including food, clothing, housing, and medicine from the beginning of human existence on Earth (Ravikumar & Sankar 2003). Therefore, it is generally acknowledged that biological resources are essential to the development and expansion of every country's economy. The 1992 Rio CBD (Convention on Biological Diversity) placed a strong emphasis on the need to comprehend and protect the biological resources that are now available for the benefit of both current and future generations. In accordance with this pattern, the preservation of biodiversity has emerged as the most current topic in the global context. Given the serious threat of resource extinction, the biodiversity of the tropical globe requires rapid attention. By 2050, over 60,000 species of higher plants are expected to go extinct (Raven 1986). According to Soule (1990), by 2020, 25 percent of the world's tropical plant species roughly 34,000 species will vanish, accounting for 12.5% of the world's flora. For any protected area to be properly managed and conserved,

current biodiversity information is essential. Therefore, creating a species inventory ought to be the first step in the conservation process. According to Prance (1977), scientists should concentrate on a smaller region for a longer amount of time. This kind of inventory would produce valuable data for several fields, such as ecology and conservation biology. Mohanan & Henry (1994) state that a reliable floristic survey is essential for determining the amount of plant diversity in a given area, particularly in nations like India where population pressure is the primary cause of habitat degradation, deforestation, and overuse of plant resources. An inventory of this kind would also assist environmentalists in taking prompt action to safeguard threatened and endangered plant communities, preventing their extinction.

Meghalaya is one of the biodiversity rich states in NE India and known for its high endemism. However, hitherto there is no detailed account on tree flora of the area are available exclusively for the state of Meghalaya excepting a few fragmented works like checklist, general account and sporadic field collections made by earlier workers (Kanjilal 1934-1940; Mao & al. 2016). Therefore, the proposal seeks to carry out intensive floristic surveys in different hill ranges in the state of Meghalaya with the following objectives.

Area & Locality: Meghalaya

Objectives:

1. To explore and document the tree wealth of Meghalaya
2. To recollect the presumably extinct trees of the region
3. To collect and reintroduce the selected RET species of Meghalaya in the ERC and Barapani garden for germplasm conservation
4. To bring out a pictorial field guide on ‘Trees of Meghalaya’

Achievements:

- During the reference period, the team undertaken one Herbarium consultation tour in June 2024 to Central National Herbarium (CAL), Botanical Survey of India, Howrah, West Bengal and consulted 800 herbarium sheets belongs to 280 tree species and also consulted library for protologues, monographs and other literature.
- The team undertaken two field tours to East, West and South west Khasi Hills and East & West Jaintia Hills of Meghalaya in July 2024 and March 2025 respectively and photos of 95 Tree species were taken and collected 80 field numbers (species) for herbarium and identified 45 field numbers.



Ilex khasiana Purkay



Pauldopia ghorta (Buch.-Ham. ex G. Don) Steenis

Project 7: Documentation of Parasitic Angiosperms of Meghalaya, India

Executing Officials: Dr. R. Kottaimuthu, Dr. Y. Mahesh and Dr. Harekrushna Swain

Duration of the Project: 2024–26

Background: The foundation of many ecosystem characteristics and functions, including food webs and nutrient cycling, is provided by interactions between species. Depending on the evolutionary context and environmental factors in which they take place, the nature of these interactions can change (Agarwal 2001). Therefore, it is very challenging to describe and measure ecological interactions between individual organisms and entire species, and these interactions frequently depend on the size and context of the interactions (Harrison & Cornell 2008). However, a number of kinds of interactions between species are existing across a wide range of ecosystems and environments.

Plants are essential to all life, either directly or indirectly (Raven 2021). About 3500 flowering plant species have evolved to parasitize other plants in order to get water and nutrients, abandoning their autotrophic lifestyle during the course of evolution (Rispaal & al. 2007). One of the most interesting forms of heterotrophic terrestrial creatures is parasitic plants. Parasitism is a negative relationship between two species. The heterotrophic feeding mode in angiosperms has evolved at least eleven times from free-living progenitors and several times across the tree of life, according to Barkman & al. (2007). Parasitic plants are often categorized in to two categories based on the ability to photosynthesize (hemiparasites) and those incapable to photosynthesize (holoparasites). Hemiparasites are predominantly xylem feeders and obtain reduced carbon and nitrogen from the host's vasculature. Holoparasites are predominantly phloem feeders that typically also retain a xylem connection, and obtain all mineral nutrients, amino acids, soluble carbon and water from the host. Holoparasites have evolved multiple times from hemiparasitic Orobanchaceae (Joel & al. 2013). Numerous changes have occurred along the transition to increased parasitic dependency, including a loss of autotrophic function, a general trend towards larger genome sizes, major gene loss from the chloroplast, and an increasing occurrence of horizontal gene transfer (Westwood & al. 2010). Nickrent & Vartak (2021) opined that holoparasites exist in 10 among the 12 lineages, and seven of these are composed exclusively of holoparasites. In 11 of the 12 orders, the parasitic members are present in one family, whereas in the order Santalales has about 20 families (Nickrent, 2020).

Area & Locality: Meghalaya

Objectives:

1. To study the parasitic angiosperms and their hosts of Meghalaya.
2. To update the description, nomenclature and distribution data of the parasitic angiosperms of Meghalaya.
3. To provide the taxonomic keys for its easy identification.
4. To resolve the nomenclature and typification problem.

Achievements:

- During the reference period, the team undertaken one Herbarium consultation tour in June 2024 to Central National Herbarium (CAL), Botanical Survey of India, Howrah, West Bengal and consulted 250 herbarium sheets and also consulted library for protologues, monographs and other literature.
- The team undertaken two field tours to East, West and South west Khasi Hills and East & West Jaintia Hills of Meghalaya in July 2024 and March 2025 respectively and taken photos and collected 22 field numbers of parasitic angiosperms for herbarium and identified 8 field numbers.



Balanophora dioica R.Br. ex Royle



Centranthera grandiflora Benth



Aeginetia indica L.



Cuscuta reflexa Roxb.



Helixanthera parasitica Lour

Project 8: Phylogeny and evolutionary history of the genus *Magnolia* L. (Magnoliaceae) in India

Executing Officials: Dr. David Lalsama Biata, Scientist 'D'

Duration of the Project: 2024–2026

Background: India is one of the 12 mega-biodiversity countries of world. It has three biodiversity hotspots viz. the Western Ghats, The Himalayas and the Indo-Burma (Myer & al., 2000). The Northeast India, comprising of the states of Assam, Meghalaya, Mizoram, Sikkim, Arunachal Pradesh, Nagaland, Tripura and Manipur is part of two biodiversity hotspots i.e. the Himalaya and the Indo-Burma. Northeast India harbours c. 50 percent of the flora while occupying only 7.7 percent of India's total geographical area (Rao & Hajra, 1986; Rao, 1994). Geographically, Northeast India represent the transitional zone between the Indian, Indo-Burma-Malaysian and Indo-Chinese regions. Agriculturally, Northeast India is an import part of the Vavilovian centre of biodiversity and origin of many crops (Agarwal, 1996). Owing to its geographical position, climatic conditions and altitudinal variations, the region supports varied ecosystems. These ranges from the mixed wet evergreen, dry evergreen and deciduous forests, low altitude to subtropical broadleaved forest to temperate broadleaved forests at mid altitude, mixed conifer and conifer forests at higher altitude and alpine meadows above the tree line. Takhtajan (1969) described the region as the “cradle of flowering plants” due to the high concentration of primitive flowering plants as well as diversified angiosperms.

Globally, the genus *Magnolia* Linnaeus is represented by c. 219 species (Mabberley, 2017). In India, the genus *Magnolia* is represented by 25 species (Raju, 1993, Kundu, 2009, POWO 2024) out of which 24 species are found in Northeast India. These include two species viz. *Magnolia punduana* (Hook.f. & Thomson) Figlar and *Magnolia pleiocarpa* (Dandy) Figlar & Noot. endemic to the Northeast region (Singh & al. 2015). Members of the genus *Magnolia* have important ornamental values sue to their showy and colorful flowers (*M. grandiflora*, *M. denudate*, *M. stellata* etc) while other members (*M. liliflora* and *M. officinalis*) are known to have been an important part of traditional medicine systems (Wang & al. 2020). *M. grandiflora* is also valued as a timber.

The family Magnoliaceae is considered one of the most primitive flowering plants. There are fossils discovered under this family dating back to 80 million years. Fossils belonging to the genus *Magnolia* are common throughout the Tertiary and late Miocene (Nooteboom, 1993; Mai, 1995). Molecular evidences have suggested that the origin and diversification of the family Magnoliaceae extends back to 100 MYA (Azuma & al., 2001). Species of the family are characterised by primitive flowers with pistils and stamens arranged spirally on a cone-like structure which lack true petals and sepals.

Since the establishment of the family Magnoliaceae by de Jussieu (1789), several botanist have worked on the taxonomy and systematics of the family based on morphology and molecular data. Globally, several studies based on chloroplast and nuclear DNA markers have been undertaken to understand the phylogenetic relationship, evolution and resolving taxonomic incongruencies within the family (Qiu & al., 1993, 1995a, 1995b; Azuma & al., 1999, 2001, 2004, 2011; Jin & al., 1999; Shi & al., 2000a, 2000b; Kim & al., 2001; Wang & al., 2006; Kim & Suh, 2013; Liu & al., 2020c; Nie & al., 2008). Recently, Wang & al. (2020) employ the whole chloroplast genome sequences assembled from the genome skimming reconstruct the phylogeny of Magnoliaceae and revised classification of *Magnolia* s.l. and Magnoliaceae on the basis of molecular, morphological, and geographical evidence. They recognised two subfamilies in Magnoliaceae: Liriodendroideae and Magnolioideae, each with one genus, Liriodendron and *Magnolia*, respectively. *Magnolia* is herein classified into 15 sections: sects. *Magnolia*, *Manglietia*, *Michelia*, *Gwillimia*, *Gynopodium*, *Kmeria*, *Maingola*, *Oyama*, *Rytidospermum*, *Splendentes*, *Talauma*, *Tuliparia*, *Macrophylla*, *Tulipastrum*, and *Yulania*.

In the Indian context, work have been focused on the taxonomic enumeration of the genus *Magnolia* based on morphological data. Khuraijam and Goel (2015) documented 25 species of *Magnolia* in India.

Kundu (2009), Raju (1993) and Brandis (1906) account of the family had varied number of species as they included taxa belonging to genera viz. *Illicium* L., *Kadsura* Kaempf. Ex Juss., *Schisandra* Michx., *Michelia* L., *Pachylarnax* Dandy and *Parkmeria* Hu & W.C. Cheng. The genus *Michelia* L., *Pachylarnax* Dandy and *Parkmeria* Hu & W.C. Cheng were reclassified under *Magnolia* L. by Figlar & Noteboom (2004). In India, the family is represented by only one genus *Magnolia* L.

Due to their primitive origin, members of Magnoliaceae represents model systems for studying plant evolution and past climatic changes. Using complete plastid genomes, Zhao & al., (2022) established a fine time-calibrated phylogeny of southern Asian *Magnolia* section *Michelia* and inferred its ancestral ranges. They were also successful in estimating the evolutionary dynamics of this section through time, determining its diversification rate and the dispersal events that occurred between tropical and subtropical areas as a result of the impact of climatic event in the past. The present study, based on both nuclear and chloroplast markers, therefore, aims to - understand species delimitations, phylogeny and evolutionary history of the evolutionarily important genus *Magnolia* L. in India.

Area & Locality: India

Objectives:

1. Taxonomic studies of the genus *Magnolia* in India based on morphological and molecular data
2. To validate taxonomy, establish phylogenetic relationships and evolutionary history of *Magnolia* in India
3. To circumscribe or resolve any taxonomic ambiguity species in the family, if any.

Achievements:

- Metadata of the genus *Magnolia* from herbarium specimens housed at ASSAM Herbarium.
- Exploration tours were undertaken for collection and documentation. Eight species of *Magnolia* were collected from different parts of Meghalaya, Manipur and Nagaland viz. *Magnolia hodgsonii* (Hook.f. & Thomson) H.Keng, *Magnolia grandiflora* (Hook.f. & Thomson) H.Keng, *Magnolia champaca* (L.) Figlar, *Magnolia* spp.
- The collected species were dissected and digital microscopy were taken. Herbarium specimens were prepared.
- Standardization of genomic DNA extraction and PCR amplification protocols using ITS, matK markers were carried out.



Helixanthera parasitica Lour

HEADQUARTERS, KOLKATA

Project 1: Documentation of economically important seaweeds of the Indian coast

Executing Official: Dr. S.K. Yadav, Botanist

Date of initiation: April 2022

Date of completion: March 2025

OBJECTIVE:

Survey and Documentation of the economically important seaweeds of India.

BACKGROUND:

Seaweeds are one of the important marine natural resources, with great economic potential. It is directly linked with the SDG goals No. 14 *i.e. Life below water*. India is a maritime country with a coastline of c. 7500 km length, spreading into 9 states and 4 Union territories. The Indian coastline supports significant diversity of seaweeds. However, only sporadic and intermittent information is available on the economic aspects of these promising marine resources. Therefore, considering the above facts, the present works has been undertaken.

AREA AND LOCALITY:

Indian coastline (c. 7500 km length)

ACHIEVEMENTS:

The comprehensive studies on the seaweeds resources of the Indian coast revealed *ca* 865 taxa of seaweeds. Among these, *ca* 95 taxa, consisting of 35 taxa of chlorophyta, 17 taxa of phaeophyta and 43 taxa of rhodophyta, are recognized with economic potential in various forms such as food, fodder and in various industries such as Agar-Agar, Algin, Carageenans, textiles, pharmaceuticals, leather, paint, biofertilizers, cosmetics, paper etc. These include 44 taxa as edible, 20 as fodder, 42 as industrially important, 37 as medicinal and 14 as manure (SLF). The analysis also revealed that some of the important places with significant diversity of these seaweed resources along the Indian coasts are Okha, Dwarka, Porbandar, Gulf of Kutch, Veraval, Bombay, Malvan, Ratnagiri, Anjuna, Vagator, Majali, Karwar, Serikuli, Taderi, St. Mary's Island, Surathkal, Manjeshwar, Thikkodi, Somatheeram, Ezhimala, Vizhinjam, Thangassery, Thirumullavaram, Varkala, Kanyakumari, Gulf of Mannar, Rameswaram, Visakhapatnam, Srikakulam, Chilika lake, Sundarbans, and the Islands of Lakshadweep and Andaman Nicobar, which are considered as potential sites for the scope for large scale scientific cultivation of these economically important seaweeds.

Some of the economically important seaweeds, occurring in the Indian coast are the species of *Ulva*, *Cladophora*, *Bryopsis*, *Caulerpa*, *Sargassum*, *Hydroclathrus*, *Porphyra*, *Gracilaria*, *Gelidium*, *Grateloupia*, *Hypnea*, *Rhodymenia*, *Turbinaria*, *Cystoceira*, *Dictyota*, *Padina*, *Sargassum* etc.

ECONOMIC POTENTIAL OF SEaweEDS - AT A GLANCE

- As Food
- As Fodder
- As Manure and Bio fertilizers (Seaweed Liquid Fertilizers)
- As Nutraceuticals and supplements
- Pharmaceuticals values
- Natural source of Phycocolloides– a group of sulfated polysaccharides, used as thickening agents in industries like agar-agar, algin, carrageenans etc.
- Biofuels production
- Textiles, Papers, Cosmetics, Bioplastics etc.

HIGH ALTITUDE WESTERN HIMALAYAN REGIONAL CENTRE, SOLAN

Project 1: Ecological and Ethnobotanical Status of Medicinal and Aromatic Plants of Ladakh (U.T.), India.

Executing Officials: Dr. Kuldip S. Dogra, Scientist- E, Dr. Kumar Ambrish, Scientist- F & Sh. Brajesh Meena, Botanical Assistant

Duration of the Project: 2024–2027 (3 years)

Background: The emerging field of uses of medicinal and aromatic plants and their herbal products industry holds a great potential to the economic development of the Indian region. Many plant species used as a source of food, medicine, fragrance, flavour, dyes and other items in Indian systems of medicine is in increasing trend after the post Covid period. It is estimated that, 95% of the medicinal plants used in Indian herbal industry today are collected from wild. Although there are around 8,000 medicinal plant species used by different communities in India across different ecosystems, only around 10% of them are in active trade. There is need to encourage multiplication and cultivation of these plants. The three basic scientific techniques of conservation of genetic diversity of these plants are legislation, in-situ conservations and ex-situ conservations. Ladakh (U.T.) is located in the Indian Trans-Himalayan region of Northern India. The flora of Ladakh is represented by 1810 plant species which belongs to 530 genera from 91 families of flowering plants (Zargar et al., 2023). In the past, Kachroo et al. (1977) documented 611 species (540 dicots, 65 monocots and 2 gymnosperms) from the region. These species contain many medicinal and aromatic plants which are used by the local inhabitants for many economic uses (medicines, fodder, food etc.) which have also a great potential for pharmaceutical industry in India. In the 21st century many of these species are under threat due to the climate change, habitat loss and introduction of alien plant species. A comprehensive ecological analysis (qualitative and quantitative) is required to propose the conservation strategies for these useful medicinal and aromatic plants of the region. The data generated will be helpful to the local administration especially forest department to conserve useful species on priority basis and it will be also helpful to the researchers and pharmaceutical industries.

A time is being come to prepare ecological database of these medicinal and aromatic plants along with their ethnobotanical status. Therefore, this study is proposed to conserve these plant resources and to formulate conceptual methods and programmes for their timely management and restoration.

Area & Locality: The study will be conducted in the mountainous region of Ladakh, India, located between 32° 15'–36°–15' North and 75° 15'–80° 15' East (Nirmala & al. 2022). The study region covers an area of about 59,147 km² (Kumar & al. 2022). The region is a part of Trans-Himalayas located in the south western edge of Tibetan Plateau sandwiched between Great Himalayan range in south and eastern Karakorum in the North (Kirschner & al. 2020). Ladakh hosts three mighty parallel mountainous ranges of the Himalayas: The Zaskar, the Ladakh and the Karakoram Ranges. The mountainous landscape of Ladakh is traversed by several rivers, notably the Indus and its tributaries including Zaskar, Markha, Shyok, Nubra and Suru (Soheb & al. 2020). The elevation ranges from 2500 ms at Kharul near Kargil in western Ladakh to 7742 ms on the Saltoro Ridge in the north. In Ladakh, the temperature reaches 34 °C in summer and drops to -34 °C in winter (Nüsser & Dickorè, 2002). The region experiences low annual precipitation (80–300 mm) and atmospheric pressure (493 mm Hg) (Phartiyal & al. 2021), with an average relative humidity of 40–50% resulting in aridity (Meena & al., 2015).

Objectives:

1. Collection of medicinal and aromatic plant species from different regions of Ladakh.
2. Qualitative and quantitative analysis of medicinal and aromatic plant species.
3. Collection and documentation of associated traditional knowledge and ethnobotanical status of medicinal and aromatic plant species.
4. Preparation pictorial of medicinal and aromatic plant species of Ladakh.
5. To identify the major threats for existence of medicinal and aromatic plant species.
6. Proposed conservation strategies and formulate conceptual methods and programmes for their timely management and restoration.

Achievements:

- **Secondary data** of 236 medicinal & aromatic plants compiled along with their traditional uses and identifying characters occurring in the Ladakh (literature/ books/journals/published flora) have been collected and compiled.
- **One field tour** conducted to Ladakh from 4th to 15th September, 2024.
- **Map showing the areas surveyed** (star mark pointing sites studied) has been developed.



- **Silent observation of the area and collected plant species:** Ladakh is a region located in the northern part of India, bordering with Tibet and falls in the Trans-Himalayan biogeographic zone (Rodgers & Panwar, 1988). Ladakh is known for its unique geology, extreme climate, and distinctive flora and fauna. It is characterized by high mountain ranges, vast expanses

of barren land and deep river valleys that include, Indus, Nubra, Suru and Zaskar valleys. Compared to other parts of Indian Trans-Himalaya, valleys exhibit much wider altitudinal and topographic variation (Stewart, 1916). In Ladakh river valleys have diverse plant species in contrast, mountainous areas have only low-growing plants like cushion plants. The alpine zones house distinctive vegetation like turf grasses and dwarf shrubs (Nagar & Singh, 2007). The present survey has been conducted to collect the medicinal and aromatic plant species. During this survey Leh district of Ladakh UT has been covered in the span of 12 days.

- **The vegetation of the surveyed region:** The region is enriched with wide range of floral diversity resulted by variations in altitude, temperature, snowfall, rainfall and soil in the region. The vegetation in this region frequently overlaps from temperate, alpine & desert type.
- **Vegetation types in studies/surveyed region throughout Leh district of Ladakh:** The Ladakh Himalaya, which is the highest mountain range in the world, is recognized as a home of variety of medicinal and aromatic plant species (Dar & Khuroo 2020, Rana & al., 2021). The wide spectrum of elevation ranges and diverse climatic conditions from tropical to temperate environment provides a wide variety of habitats that support the variety of floral diversity (Zargar & al., 2023). The region is home to a number of endemic or near-endemic plant species, such as *Rheum webbianum* Royle; *Dactylorhiza hatagirea* (D. Don) Soó; *Inula royleana* DC.; *Aconitum violaceum* Jacquem. ex Stapf; *Aconitum heterophyllum* Wall. ex Royle; *Angelica glauca* Edgew. etc. (Mehta & al., 2020; Behera & al., 2022). During, the present survey we have covered the different areas of Leh district including Nubra valley, Khardungla, Neema, Pang, Tsokar and Tsomirari. A total of 98 plant specimens collected ca. 85 species. Many of the species were identified in the field and rest are under the process of identification. Qualitative and quantitative analysis of the vegetation also done. The local peoples were also asked for the medicinal uses of the plant species. Some of the species collected during the tour are as *Hippophae rhamnoides* L.; *Clematis ladakhiana* Grey-Wilson; *Convolvulus arvensis* L.; *Chenopodium album* L.; *Mentha longifolia* (L.) L.; *Capparis spinosa* L.; *Lonicera* spp.; *Tribulus terrestris* L.; *Solidago canadensis* L.; *Echinops cornigerus* DC.; *Taraxacum officinale* F.H.Wigg.; *Vicia lens* (L.) Coss. & Germ.; *Berberis ulicina* Hook.f. & Thomson; *Pedicularis longiflora* Rudolph etc. (**Annexure-Plant list**)

Project 2: Flora of Himachal Pradesh, Vol-3 (2024-2025), Family: Boraginaceae.

Executing Officials: Dr. Kumar Ambrish, Scientist- F and Dr. Kuldip S. Dogra, Scientist- E

Duration of the Project: 2023–2025 (2 years)

Background: Himachal Pradesh has rich diversity of flora. To compile the flora of Himachal Pradesh in different volumes. Two volumes already completed and submitted.

Area & Locality: Himachal Pradesh.

Objective: To document the floristic diversity of Himachal Pradesh.

Achievements: Described 73 taxa in detail based on herbarium consultation (BSD, DD and other regional herbaria) and literature under the AAP, 2023-25. Detailed description of species, data on distribution, ecology, date of collection, name of collectors, Flowering and Fruiting months and economic uses if any, have been documented. Final manuscript will be submitted in March, 2025.



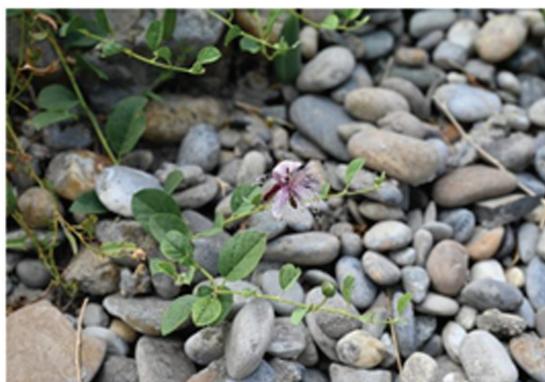
Hippophae rhamnoides L.



Echinops cornigerus DC.



Berberis ulicina Hook.f. & Thomson



Capparis spinosa L.



Lycium ruthenicum Murray



Physochlaina praealta (Decne.) Miers



Aster falconeri (C.B.Clarke) Hutch.



Nepeta floccosa Benth.

INDUSTRIAL SECTION INDIAN MUSEUM, KOLKATA

Project 1: Collections of economically important plants/plant products for enrichment of Botanical gallery, ISIM, BSI with special emphasis on development of new ethnobotanical section

Executing Officials: Dr. Debasmita Dutta Pramanick, Scientist D, Mr. Ranjit Patra Sr. Prev. Asstt.; Dr. M. Bhaumik, Scientist F

Duration of the Project: 2024–2025 (Ongoing)

Background: Industrial Section Indian Museum (ISIM), represented by Botanical Gallery, earlier known as ‘Economic Botany gallery’, has been a part of Botanical Survey of India since 1911. At present Botanical Gallery of Industrial Section Indian Museum holds more than 20,000 economically important plants and plant products which have been classified into eight (08) Bays/ Sections based on their uses: 1. Gum, resin, lac, Indian rubber section; 2. Oil, oil seeds, oil cake section; 3. Dyes & tannin section; 4. Fiber section; 5. Medicinal products and indigenous drugs section; 6. Narcotic section; 7. Food section and 8. Indian timber sections. During documentation of the exhibits and regular maintenance of Botanical Gallery, it is noticed that in each of these eight (08) sections, several specimens became severely damaged by fungal or insect infestation. Recollection of damaged objects as well as collection of new materials along with replacement of old impaired exhibits are a continuous process for Museum. The present project has been proposed for enrichment of Botanical Gallery by field collection along with updating the database on nomenclature, distribution and vernacular names of plant and plant products.

This year it is planned to develop a new ethno-botanical Section in Botanical Gallery by collecting different ethno-botanical plants and plant products used by tribal belts (PVTGs) of South-Western regions of West Bengal along with information on their medicinal, ethnoveterinary, food, fodder, culture, magico-religious believes etc. and good quality field photographs.

Area & Locality:

1. One field tour to Assam and Arunachal Pradesh in Q3, for economically important and Ethnobotanical collection of plants and plant products.
2. One field tour to selected tribal inhabited regions of South-Western Districts of West Bengal for procurement of plant products along with collection of information for new Ethnobotanical Section at Botanical Gallery

Objectives:

Development of new Ethno-botanical Section in Botanical Gallery by collection of economically important plant materials from tribal belts of South-Western Districts of West Bengal along with procurement of ethnobotanical information

Achievements:

One field tour conducted to Assam and Arunachal Pradesh w.e.f. 08.09.2024 to 28.09.2024 (21 days) and thirteen economically important plants and products collected along with 72 field number of plants of taxonomic significance. All economically important collections are processed and displayed in Gallery. Herbarium specimens processed and mounting work in progress.

Another field tour undertaken to tribal inhabited regions of Midnapore w.e.f. 09.01.2025 to 19.01.2025. Report awaited because tour party not return from field yet.

Project 2: A Comprehensive Study on Museum Visitors' Behavior, Numerical Analysis, Statistical Insights, and Modernization of Botanical Gallery - a Pilot study

Executing Officials: Dr. Debasmita Dutta Pramanick, Scientist – D, Mrs. Sushreya Pal, Bot. Asstt. & all Gallery staffs, ISIM, BSI

Duration of the Project: 01.04.2024 to 31.03.2026

Background: ‘A Museum is a non-profit, permanent Institution in the service of society that researches, collects, conserves, interprets and exhibits the tangible and intangible heritage, open to the public, accessible and inclusive, museum fosters diversity and sustainability. They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, reflection and knowledge sharing’ (ICOM, 2022). Visitors are key to development of any museum. Indeed, there is a significant relationship between the museum’s perceived quality and elicited emotions, which in turn influence visitors’ satisfaction. Visitor’s psychology impart great impact on the overall conception of a museum and the way the visitors experience, is chartered and studied towards augmentation of the Gallery. With the paradigm shift in the earlier mandate and concept of museum from traditional role as collection, preservation and exhibition of the artifacts across the world, nowadays museums are becoming a place able to offer a wide range of services that inspire visitors in more friendly and welcoming environment. Accordingly the Industrial Section Indian Museum (ISIM), BSI is also being engaged as an integral part of community, making it as an excellent center of more and more public participation, interaction, awareness, audio-visual display and dissemination of knowledge to different sectors of visitors. Since its inception, the Botanical Gallery is a witness of presence of huge gathering of versatile visitors of various age groups, gender, culture & sense of tastes from different regions of India and beyond and receives average footfall ranging c. 500 – 7000 or even more per day. Analysis of visitors’ experience i.e. their satisfaction, dissatisfaction, experience, suggestion etc. are pivotal components towards modernization of the Gallery. The present project has attempted to understand visitors’ attitude and activities in Botanical Gallery and modernization of the Gallery accordingly through implementation of audio visual appliances.

Area & Locality: Botanical gallery, Industrial Section Indian Museum

Objectives: Interaction with individual visitor of different age groups, culture, and gender even without relevant knowledge to be engaged more and more during their visit in Botanical Gallery, ISIM along with footfall count. Development of Botanical Gallery based upon analysis of visitors’ comments and suggestions throughout the year. Providing diverse museum services i.e. knowledge sharing, organizing seminar, exhibition, distribution of free publication, organizing awareness programme etc. Installation of informative audio-visual devices in each Section of Botanical Gallery is proposed.

Achievements: during 2024–2025

- Prepared Questionnaire on 17 parameters for the Visitors study programme and created Google Form for Visitors’ feedback
- Created QR Code (<https://www.the-qr-code-generator.com/>) for Visitors’ response about Botanical Gallery and installed the QR Code in 08 Bays in the Gallery
- Interacted with 4470 visitors, shared knowledge, interpreted plant and plant products housed in Botanical Gallery; response received from 3385 visitors through Google Form; recorded average footfall data c. 6600
- **Visitor analysis (few parameter) : 2024-25**
- **Gender:** 67.1% male and 31.3% female visited the Gallery

- **Nationality:** 95.8% Indian; 1.4% Bangladeshi; 0.2% Italian; 0.2% German
- **Age group:** 10-20 years: 28.3%; 21-30 years: 51%; 31-40 years: 13.2%; 41-50 years: 5.3%; 51-60 years : 1.2%; above 60 years: 0.4%
- **Profession:** Student-60.4%; salaried employee-17.8%; Govt. employee-8%; businessman -7.4%; non-working 4.2%; others-c. 1.5%

Project 3: Curatorial Works, Maintenance, Barcoding, Database and Photographic Digitization of BSIS Herbarium

Executing Officials: Mrs. Sushreya Pal, Botanical Assistant & Shrabasti Das, Senior Preservation Assistant.

Duration of the Project: 2024 to 2025 (On going).

Background: A herbarium (plural, herbaria) is a storehouse of plant specimens collected from different localities, mounted on appropriate paper (cellulose) sheets, arranged according to some known system of classification and kept in pigeon holes of steel or wooden cup boards specially prepared for the purpose. The mounted specimens are labeled with scientific name, the name of the collector, the place of collection, general observations and their associated collection data. Herbaria are the dictionaries of the plant kingdom and provide comparative material that is indispensable for studies in plant taxonomy and systematics. As per ICN, all plant taxa or species name is associated with type specimen/s on which its description, diagnosis and Latin name are based, so taxonomic disputes are commonly resolved by referencing type specimens in herbarium/herbaria. The herbarium collections are essential for proper identification to confirm the identity of a plant and to determine that it is new to science. They also provide materials and data for revisions and monographs. In addition to their taxonomic importance, herbaria are useful in the fields of biogeography, conservation biology, ecology, economic botany, ethnobotany, plant anatomy, plant morphology, paleobotany and palynology. The herbarium sheets provide biogeographic information that can be used to document the historic ranges of plants, to locate rare or endangered species and to trace the expeditions of explorers/plant collectors. Herbarium specimens are also important sources of materials for chemical analysis, genetic material for DNA analysis and of pollen for palynological studies. Herbarium sheets are often shared among researchers and the specimens of many herbaria have been digitized to further facilitate their uses. From herbarium data we can also find the plants that were once of medicinal value or economic value and extremely important in earlier times are now chiefly of historical interest and are not particularly represented in contemporary collections. Therefore, herbarium/herbaria is/are a veritable goldmine of information. As per old records, about 70,000 herbarium specimens were housed in BSIS.

So it is required the proper maintenance and arrangements of the herbarium sheets according to Bentham and Hooke system of classification, incorporation and identification of old herbarium sheets and of course the documentation and photographic digitization of BSIS herbarium to meet the above mentioned importance and needs.

Area & Locality: Herbarium of BSI, Industrial Section Indian Museum (BSIS).

Objectives: Barcoding of all the herbarium specimens in BSIS. Complete database (hardcopy and softcopy) of all the herbarium specimens in BSIS. In due process, remounting, cleaning dusting, changing of genus and species cover will be carried out. Photographs will be taken for all the herbarium specimens in BSIS from the camera available in ISIM, BSI. Incorporation of herbarium sheets. Identification of unidentified sheets.

Achievements: Annual target was 10000 herbariums.

Till date 5054 sheets barcoded, digitized and Metadata prepared.

NORTHERN REGIONAL CENTRE, DEHRADUN

Project: Grass flora of Western Himalaya

Executing Officials: Dr. Manish K. Kandwal

Duration of the Project: October 2022–March 2025

Background: The Western Himalaya, spanning parts of northern India, from Gilgit in Ladakh to Kumaon in Uttarakhand, is home to a diverse range of grasses, reflecting the region's varied climate, altitude, and soil types. This area includes ecosystems ranging from sub-tropical grasslands at lower elevations to alpine meadows above 3,000 meters. Grasses in this region play a crucial role in maintaining ecological balance, supporting livestock, and preventing soil erosion. Species such as *Chrysopogon gryllus*, *Festuca ovina*, and *Dichanthium annulatum* thrive here, displaying adaptations to survive extreme weather, steep terrains, and limited water availability. Many grasses in the Western Himalaya are also culturally significant, used for fodder, thatching, and traditional medicines. These grasses not only sustain livelihoods but also form an integral part of the fragile Himalayan ecosystem, supporting biodiversity and local communities. The project was undertaken to catalogue the grasses of western Himalaya in India.

Area & Locality: The western stretch of Himalaya starting from Badakhshan in northeastern Afghanistan/southern Tajikistan through India to central Nepal is Western Himalaya. A large part of western Himalaya is located within India covering the states of Jammu & Kashmir, Himachal Pradesh and Uttarakhand and one union territory Ladakh. In India the altitude of western Himalaya varies from low lying valleys with a height of 500 m to Nanga Parvat, the highest peak of India at 8126 m.

Objectives: Documentation of the grasses of entire Western Himalaya and updating its nomenclature & distribution records.

Achievements: During the entire period total 7 short tour of one day each were conducted and 04 long tour of more than one week were conducted in Jammu & Kashmir, Himachal Pradesh, Ladakh and Uttarakhand of western Himalaya. In all 1100 specimens were collected and identified. Illustrations of 86 species is prepared and **621** species have been reported from the study area which fall under 139 genera and 28 tribes in the family Poaceae. More than 2100 specimens from various herbarium like DD, CAL, PUN, PAN, RRLH and IHBT were studied in detail during herbarium visit. In addition, about 600 specimens



A alpine habitat of *Danthonia cachemyriana*

pertaining to Western Himalaya were listed/studied from BSD and DD. During present year Conducted three short tour one to Chansal in Himachal Pradesh, and two each to Jhilmil and Bhardraj in Uttarakhand and collected 120 specimens. 126 species documented, 250 specimens identified and illustration of 26 species completed. Manuscript has been submitted to Head of Office, NRC.



Miscanthus nepalensis



Saccharum rufipilum

Project: SEM study of spores of Fern & Fern allies of Western Himalaya.

Executing Officials: Dr. Brijesh Kumar, Sci.-C, Dr. S.K. Singh, Sci.-F & Ms. Latika Sagarwal, Bot. Asstt.

Duration of the Project: 2023–2026

Background: Spore of Fern & Fern allies are the units of asexual reproduction and function as storehouse of genetic information. Their sporoderm morphology plays a significant role in taxonomy and deciding fern phylogeny, which used as an important tool to understand the generic and specific delimitations of the taxa. Therefore, to understand the above said facts, the present study has been undertaken.

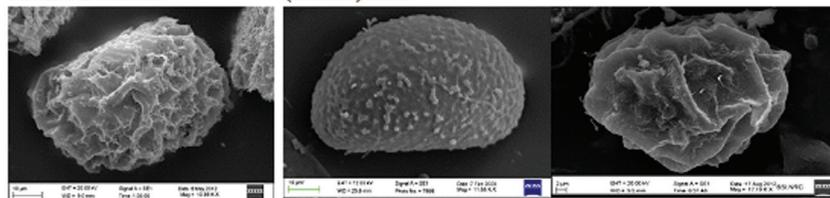
Area & Locality: Western Himalaya

Objectives: To prepare the spore atlas of Fern and Fern allies of the Western Himalayas region.



Asplenium ensiforme Wall.
ex Hook. & Grev.

Lygodium japonicum (Thunb.) Sw. *Pteris cretica* L.



Polystichum nepalense (Spreng.) C. Chr.

Microsorium membranaceum (D. Don) Ching

Athyrium wallichianum Ching

Achievements: During this period, the spore of 44 taxa of Fern and Fern Allies belonging to four families (Polypodiaceae, Aspleniaceae, Pteridaceae, & Schizaeaceae) have been described and documented. In addition, one filed tour to Valley of Flowers and surrounding areas was undertaken *w.e.f.* 29.09.2024 to 02.10.2014, in which 62 species were collected and 250 field photographs of plants were undertaken.

Project: Flora of Himachal Pradesh, Vol. 3 [Rubiaceae- Solanaceae, c. 800 taxa]

Executing Officials(s): Dr. S.K. Singh, Scientist-F; Dr. Puneet Kumar, Scientist-D; Dr. Brijesh Kumar, Scientist-C; Dr. Sameer Patil, Botanist; Dr. Bhavana Joshi, Botanist; Dr. Monika Mishra, Botanist; Ms Poulami Ghosh, Bot. Asst.; Mr. Subhasmit Bhattacharyya, Bot. Asstt.; Ms. Latika Sagarwal, Bot. Asstt.; Mrs. Priti Gangwar, Senior Pres. Asstt.; [Boraginaceae c. 56 taxa, Dr. Kumar Ambrish, Scientist-F; Dr. Kuldeep S. Dogra, Scientist- D (High Altitude Western Himalayan Regional Centre, Solan)]

Duration of the project: April, 2023–March, 2025

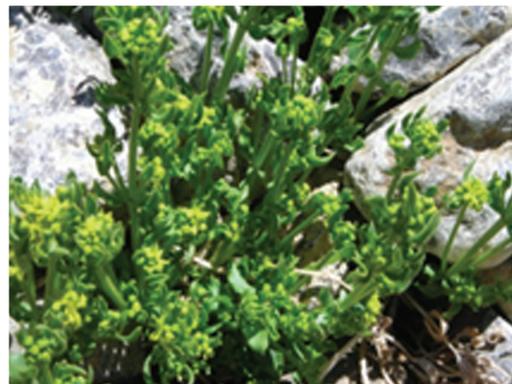
Background: Himachal Pradesh, located in the northernmost part of India, is a region distinguished by its rugged and varied landscape. This includes multiple peaks and extensive river systems, with elevations ranging from as low as 250 meters to as high as 6,700 meters above sea level. The state's undulating terrain, coupled with a wide range of altitudes and climates that span from subtropical to subarctic, fosters a rich diversity of vegetation. At lower altitudes, one can find tropical deciduous and dry scrub forests, while higher altitudes host alpine pastures and cold deserts. Despite the ecological richness of Himachal Pradesh, no exhaustive effort has been made thus far to compile a comprehensive record of its flora. Recognizing this gap, a focused effort has been initiated to document the plant life of the region. This project aims to compile and document the diverse and abundant plant species found throughout the various altitudinal zones of Himachal Pradesh, providing a valuable resource for botanists, ecologists, and conservationists alike.

Area & locality: Himachal Pradesh.

Objectives: Documentation of floral diversity of Himachal Pradesh

Achievements: A total of 317 taxa belonging to twenty two families have been documented. Dr. S. K. Singh & al. documented 156 taxa belonging to Asteraceae. Dr. Puneet Kumar documented 46 taxa belonging to 5 families. Dr. Brijesh Kumar documented 30 taxa belonging to 02 families. Dr. Sameer Patil documented 48 taxa belonging to 06 families. Dr. Bhavana Joshi documented 64 taxa belonging to 08 families. Finalization of manuscript is under process.

Project: Floristic diversity of Jhilmil Jheel Conservation Reserve, Haridwar, Uttarakhand and its environ



Rubia tibetica Hook.f.



Gentiana kurroo Royle



Tricholepis roylei Hook.f.



Ipomoea cairica (L.) Sweet

Executing Officials(s): Dr. Bhavana Joshi, Botanist; Dr. Monika Mishra Botanist & Dr. S. K. Singh, Scientist-F

Duration of the project: April, 2024–March, 2026

Background: Jhilmil Jheel Conservation Reserve is one of the Conservation Reserves fall in the state Uttarakhand. The area was declared as a Conservation Reserve on 14 August 2005. It is saucer shaped which is located between Haridwar–Najimabad highway and the River Ganges, in Chidiyapur Range of Haridwar Division, Uttarakhand, covering an area of 4200 hectares of Reserve Forest and elevation ranging from 200 to 250 meters above MSL. The landscape of the area is assortment of short and tall grasslands, tropical mixed moist deciduous forests, and secondary scrub. The area experiences sub-tropical climate. Annual rainfall averages about 1300 mm and is most prominent during June–September. Temperature soars up to 44°C in May and drops to 2°C in January. The area is rich in faunal and floral diversity including swamp deer, elephant, blue bull, wild boar, mongoose, common leopard and occasionally tiger are seen in the area. There is not a single report is available regarding the floristic diversity of Jhilmil conservation reserve while in some research papers mentioned list of common tree plants species which is dominating in adjacent areas. In adjoining areas of Jhilmil Tantwala villagers strongly promote conservation of Swamp deer (Barasingha). Therefore, Jhilmil Jheel showcase a brilliant example of community based conservation approach and plays the pivotal role of torchbearer in conservation of other wetland regions of our mega-biodiversity country.

Area & locality: Haridwar, Uttarakhand

Objectives:

1. Documentation of floristic diversity of the Jhilmil Jheel Conservation Reserve including up to date nomenclature, vernacular names (wherever available), brief taxonomic description and phenology along with good photographs.
2. Documentation of ethno-botanical information of the plants (if gathered any).
3. Documentation of the rare, threatened and endangered species (if found any) of the area.

Achievements: Conducted 04 filed tours in Q2 (07.09.2024), Q3 (17.10.2024 & 06.12.2024) and Q4 (07.01.2025). Collected 235 field no. of plant species containing *ca.* 702 specimens (in triplicates). Identified 102 plant species and described 82 plant species. Paper writing is in progress.

Project: A pictorial guide to the flowering plants of Dehradun District



Calotropis gigantea (L.) W.T. Aiton



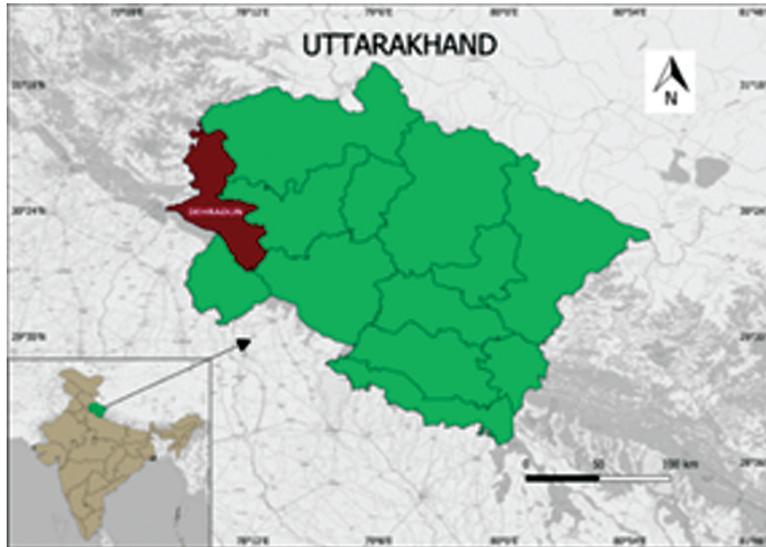
Opuntia tuna (L.) Mill.

Executing Officials: Dr. Puneet Kumar, Scientist-D, Dr. S.K. Singh, Scientist-F, Mr. Subhasmit Bhattacharyya, Bot. Asstt. & Dr. Harminder Singh.

Duration of the Project: 2024–2026

Background: In the past, floristic studies in this region were tailored for professional taxonomists and botany educators. While these studies hold significant value for botanists and ecologists, their heavy use of scientific terminology and lack of visual aids often leave amateur naturalists and students feeling uninspired. This project aims to change that by simplifying field identification methods, focusing on easily observable reproductive, morphological, and vegetative characteristics, and representing them through images. Our goal is to create a pictorial flora of the Dehradun district, making plant identification more accessible and engaging for everyone.

Area & Locality: 3088 sq. km & Dehradun District



Location map of Uttarakhand & Dehradun district

Objectives: To provide a user-friendly pictorial guide to identify the plant species of the Dehradun district based on easily observable reproductive, morphological, and vegetative characters. To compile information on the scientific name, family, common name, distribution, ecology and uses, if any.

Achievements: Prepared an initial list of 2,756 plant species found in Dehradun district, using past studies and herbarium samples from BSD, BSI, and ASSAM. Also conducted ten one-day local tours across



Habenaria intermedia D. Don

Clarkella nana (Edgew.) Hook. f.

Rhododendron arboreum Sm.

various parts of the district, during which 365 (c.730 plant specimens) field numbers of diverse plant species were collected. Furthermore, the project documented around more than 1600 field photographs capturing detailed images of vegetative and floral parts, along with their habitats and overall vegetation.

A total of 725 taxa were successfully identified, greatly enhancing the knowledge of the region's plant diversity.

Project: Flora of Saraswati WLS, Haryana

Executing Officials: Dr. Sameer Patil

Duration of the Project: 2024–2026

Background: The Saraswati Wildlife Sanctuary, located in Kaithal district of Haryana between 29°59'34"N latitude and 76°21'24"E longitude falls in the westernmost edge of Gangetic plains. It has a vegetation type of sub-tropical scrub forests and grassland habitat. The sanctuary is also known as Seonsar Forest. It is named after the holy river Saraswati which once flowed through the region and is now termed as dried up or disappeared. The sanctuary was demarcated out of Seonsar Reserved Forests and Saraswati Plantation (small area of 50 acre) and was declared as sanctuary on 29 July 1988. It is the third largest wildlife sanctuary in Haryana state. It has a diverse floristic composition of arid scrubs, Gangetic grasslands and Shiwalik forests.

Area & Locality: Haryana



Location map of Haryana district & Saraswati Wildlife Sanctuary.

Objectives:

- To prepare an updated comprehensive floristic inventory of the Saraswati WLS.
- To analyze the flora with emphasis on endemic and threatened plants and habits.
- To study the changes in vegetation pattern through GIS & RS.

Achievements:

Collected 133 field no. plant species consisting of 450 herbarium specimens in two field tours. Identified 109 plant species collected from field tour. Described 17 plant species for report writing. Paper writing on resolving taxonomy and nomenclature for one species of *Solanum* is in progress



Abutilon theophrasti Medik.

Commicarpus chinensis (L.) Heimerl

Pergularia daemia (Forssk.) Chiov.

SIKKIM HIMALAYAN REGIONAL CENTRE, GANGTOK

Project 1: Maintenance of Germplasm of *Rhododendron* L., *Impatiens* Riv ex L., Zingiberaceae and Musaceae in EBG, BSI-SHRC.

Executing Officials: Dr. Rajib Gogoi, Scientist F & HoO, Dr. J.H. Franklin Benjamin, Scientist D, Shri. Norbu Sherpa, Sr. Pres. Asst.

Duration of the Project: Ongoing

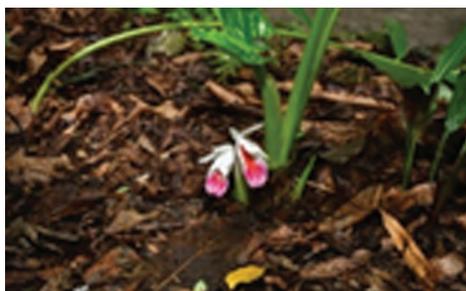
Background: Ex situ conservation of *Rhododendron*, *Impatiens*, Zingiberaceae, Musaceae of Sikkim and Darjeeling Himalayas

Area & Locality: Sikkim & Darjeeling Himalayas

Objectives: Two field tours to North Sikkim and east Sikkim and erstwhile Darjeeling district.

Achievements:

- 15 nos. field collection tours undertaken. Collected and introduced native 201 saplings/ propagules of 45 taxa (18 taxa of Zingiberaceae, 04 species of *Impatiens* spp., 05 species of *Rhododendron* spp., 02 species of *Musa* spp., 1 species of *Ensete* spp. and other 15 species under 14 genera).
- Introduced 13 species new in the EBG (three species of Zingiberaceae, two species belonging to Musaceae, three *Impatiens* spp., one *Rhododendron* and four other species belonging to Begoniaceae, Buddlejaceae, Lardizabalaceae and Hypericaceae).
- Introduced endemic *Caulokaempferia sikkimensis* (King ex Baker) K.Larsen [Zingiberaceae] and *Impatiens bakthangensis* Chhetri, Sherpa & Gogoi [Balsaminaceae] in the EBG.
- **Total Field Numbers Collected:** 467 field numbers.
- **Total Field Numbers Identified:** 382 field numbers.



Boesenbergia hamiltonii Mood, S.Dey & L.M.Prince



Impatiens scitula Hook.f.



Impatiens bakthangensis Chhetri, Sherpa & Gogoi



Impatiens desmantha Hook.f.

Project 2: Flora of Kitam Bird Sanctuary, South District, Sikkim

Executing Officials: Rajib Gogoi, Scientist F & HoO, Monalisa Dey, Scientist 'D' & Basant Kumar Singh, Bot. Asst.

Duration of the Project: 2022–25 (3 years)

Background: Sikkim is part of the 'Eastern Himalayan Agrobiodiversity Region', one of 22 agrobiodiversity hotspots in India and also part of the 'Himalaya' biodiversity hotspot. 82.31 percent of the total geographic area of the State is under the forest cover with 46.93 percent of the total area of the state brought under the Protected Area Network. Gogoi & al. (2021) reported 5068 taxa (including 152 cultivated taxa) under 1491 genera from Sikkim. Kitam Bird Sanctuary (88°20' E and 27°06' N to 88°22' E and 27°07' N) with about 6 km² of area is the only low-elevation (320–875 m) protected area in Sikkim and serves as the refuge for various species of flora and fauna.

The low-elevated parts of Himalayan region are under immense anthropogenic pressure due to less representation in the Protected Area Network. Since most of the lowland areas are human-dominated, Kitam Bird Sanctuary plays a major role in conservation of biodiversity of this part of the region. Though faunal surveys, especially with respect to birds and butterflies have been done by different groups of zoologists, the flora of the sanctuary has not been documented yet. Hence, the present work will not only fill the gap with respect to floral documentation of the sanctuary, it will also fulfil the demand of the State Forest Department for better management of this Protected Area and also by serving one of the mandates of Botanical Survey of India (BSI). In these contexts, the present work is being carried out.

Area & Locality: Kitam Bird Sanctuary, South Sikkim located along the southern boundary of Sikkim state between 27° 06' to 27° 07' North latitude and 88° 20' to 88° 22' E longitude and 320 to 875 amsl within the tropical ecoregion. The total area is 6 sq. km. and total perimeter is 10 km. The sanctuary is located within the south district and bounded by great Rangit river in the south (which is also the boundary of Sikkim state to West Bengal state), Namchi-Manpur SPWD road in north, Goam Khola in the West and Manpur Khola in the East. The sanctuary was established in 2005 for protection of wildlife and its environment. The area was reserve forest before being declared a sanctuary.

Objectives:

1. Preparation of a detailed floristic account of the plants (Angiosperms) found in Kitam Bird Sanctuary based on survey, collection and study/ consultation of relevant literature and herbarium specimens.
2. Preparation of a comprehensive list of economically as well as medicinally important species/ taxa for their conservation and sustainable utilization.
3. Identification/ recognition of threatened/near threatened plant species of the area for proposing effective management measures.
4. Publication of the outcomes in form of user-friendly pictorial guide book targeting a broad range of users like common people, forest officials/ staff, management authorities, botanists/ plant taxonomists/ academicians, students etc.

Achievements:

- Total numbers of field tour conducted: 2 (27.05.2024 to 01.06.2024; 25.08.2024 to 30.08.2024)
- 216 field numbers (550 specimens) collected during the tours. More than 4000 field photographs representing plant species, habitat, landscape, etc. were captured.

- 216 field numbers (550 specimens) collected during the tours. More than 4000 field photographs representing plant species, habitat, landscape, etc. were captured.
- Description of 300 taxa completed
- Key to the Species is being worked on for 92 taxa.
- Key to the genera is being worked on for 68 genera.
- Final report under preparation.
- Publication: 1 Hindi article communicated for Vanaspati Vani 2024 and 1 Abstract submitted for oral presentation in International Symposium 2025 to be organised by BSI.



Gymnema inodorum (Lour.) Decne. of Asclepiadaceae



Hoya lanceolata Wall. ex D.Don of Asclepiadaceae



Picrasma javanica Blume of Simaroubaceae



Schima wallichii (DC.) Korth. of Theaceae

SOUTHERN REGIONAL CENTRE, COIMBATORE

Project 1: Threat Assessment of Palms and Rattans of Southern Western Ghats, India

Executing Officials: Dr. S.S. Hameed, Scientist 'F', Dr. M. Murugesan, Scientist 'D', Dr. M.U. Sharief, Scientist 'F' and Dr. V. Ravichandran, Senior Preservation Assistant

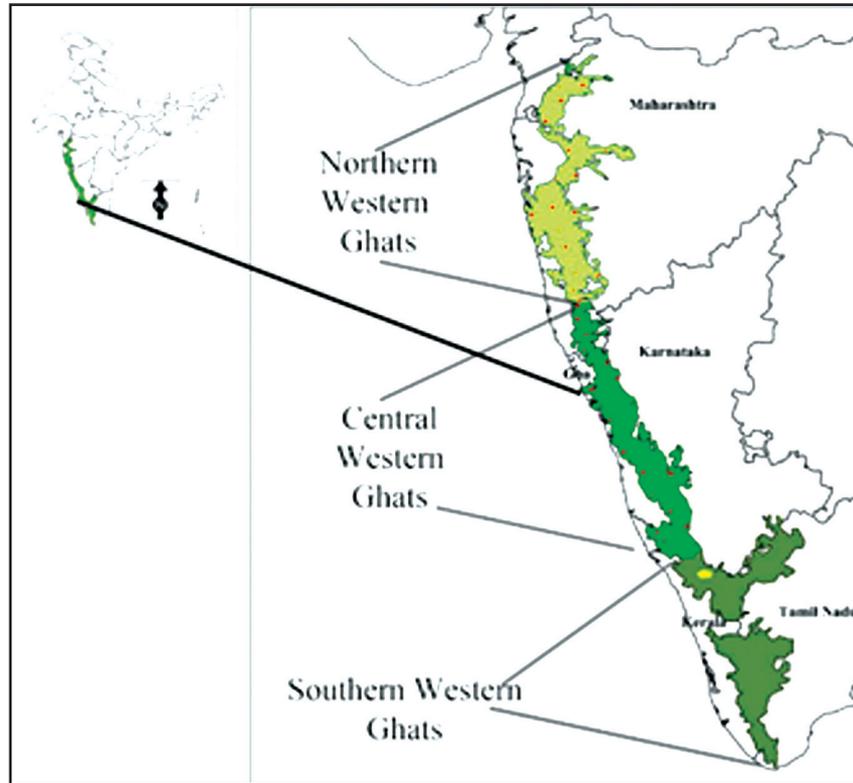
Duration of the Project: Two Years (2024–2026)

Background: Palms are the large and diverse monocotyledonous flowering plants, distributed throughout tropical and subtropical regions of the world. The palm family, Arecaceae comprises 188 genera and about 2,585 species (Palmweb, 2024). Palms are widely regarded as next to grasses in terms of economic importance and constitute a vital component of forest and agricultural ecosystems. In India, it is represented by 20 genera and 110 taxa (106 species and 04 infraspecific taxa), mainly distributed in Western Ghats, Eastern Ghats, Deccan Peninsula, Indo-Gangetic Plains, Himalayan foothills and Assam ranges, and Andaman and Nicobar Islands (Renuka & Sreekumar, 2012; Hameed, 2020).

The Western Ghats (along with Sri Lanka), a mountain range stretching over a distance of about 1,600 km from Tapti River in the north to Kanyakumari in the south, is one among the 36 global hotspots of biodiversity. It lies along the west coast of peninsular India and supports a wide range of habitats that abode unique flora and fauna. According to Nayar & al. (2014), the Western Ghats harbours 7,402 flowering plant species belonging to 1,480 genera and 210 families, of which 5,588 are indigenous. Western Ghats is an abode of 2,116 endemic flowering plant taxa, but no flowering plant family is endemic to this region, however, the Western Ghats harbours 24 endemic genera, of which 16 are confined to southern part and 8 are restricted in the northern part of Western Ghats (Singh & al., 2015).

Western Ghats supports a rich array of palms and rattans that form the integral part of tropical forest ecosystem. According to Hameed (2020), the family Arecaceae is represented by 44 species (mostly rattans) in the Western Ghats. The genus *Calamus* L., commonly known as 'rattans' or 'canes', and regionally known as 'Betha' (Kannada), 'Chural' (Malayalam) and 'Perambu' (Tamil), is predominant and diverse. Rattans are climbing palms, mostly scramblers and the most successfully established palm group in the Indian forests. Rattans also play a vital role in enriching the soil by their leaf litter. Most of the rattans of Western Ghats have multiple rhizomes and multiple stems, due to the reason new plants are continuously produced without human intervention. Some are distributed in wet evergreen forests with an annual rainfall of 5000 mm, while others are found in areas with an average annual rainfall of 750 mm (Lakshmana, 1993).

The southern part of Western Ghats lies in the states of Kerala and Tamil Nadu possesses a unique ecological niche to harbour several endemic and threatened palms. The region harbours about 30 species of palms, and almost all the species experience one or the other way of threats. For instance, *Arenga wightii* Griff., *Bentinckia condapanna* Berry ex Roxb., *Pinanga dicksonii* Blume and the rattan species, namely *Calamus travancoricus* Bedd. ex Hook.f., *C. nagbettaii* R.R. Fernandez & Dey and *C. dransfieldii* Renuka are experiencing varying degrees of threats. Therefore, the present study is proposed to assess the threat status of palms and rattans of southern Western Ghats following the current IUCN Red List Categories and Criteria, accordingly effective conservation strategies will be suggested for the species under threat.

Area and Locality:

Map: Southern Western Ghats

Objectives:

1. Documentation and preparation of checklist of endemic palms and rattans of southern Western Ghats
2. Threat assessment of endemic palms and rattans based on current IUCN Guidelines.
3. Preparation of phenological (flowering and fruiting) data for all endemics, which would be helpful to assess the impacts of climate change on the palms.
4. To bring out the publication on the endemic palms and rattans of southern Western Ghats as a pictorial guide containing up-to-date nomenclature, detail description, taxonomic keys (genera, species and infraspecific taxa), distribution maps, colour photographs and information on the habitats, vegetation types, and flowering and fruiting period.
5. Preparation of distribution maps using the latest version of ArcGIS software for every endemic species.
6. Recommendation of conservation urge species for immediate conservation.

Achievements:

- Checklist of palms and rattans of southern Western Ghats has been prepared by refereeing to various literature, including online resources and consultation of herbaria.
- Consulted holdings of palms and rattans housed in Madras Herbarium, Southern Regional Centre, Coimbatore (MH); Herbarium, Kerala Forest Research Institute, Thrissur (KFRI) on 09.07.2024 and C.E.C. Fischer's Herbarium, Forest Research Centre, Institute of Forest Genetics and Tree Breeding (ICFRE-IFGTB), Coimbatore (FRC) on 12.07.2024.

- Obtained Kerala Forest Department permission and arrangement made for logistic support (due to persisting effort) to undertake the present study in the Kerala part of southern Western Ghats from 2024 to 2026.
- Conducted one field tour along with the team members to the Kerala part of Anamalais from 16.12.2024 to 22.12.2024 covering Periyar Tiger Reserve, Mangaladevi forest areas, Mangladevi hilltop, Vallakkadavu Range, Gavi Dam area, Muthiurundar, Nagarampara, Vairamani forest areas, Kozhikanam, Painavu and Kulamavu Forest Ranges, Panamkooty, Kallarkutty Dam areas, Pambadum Shola National Park, Mankulam Forest Range, Viripparai areas, Anakulam Forest Range, Devikulam forest areas, Eravikulam National Park, Rajamalai and Nemakkad areas of Idukki and Kottayam districts, collected 65 field numbers of specimens either in flowering or fruiting, and recorded the GPS co-ordinates of species, such as *Arenga wightii* Griff., *Calamus brandisii* Becc., *C. gamblei* Becc., *C. hookerianus* Becc., *C. metzianus* Schldl., *C. pseudotenuis* Becc., *C. rheedei* Griff., *C. vattayila* Renuka, *C. wightii* Griff., *Phoenix loureiroi* var. *pedunculata* (Griff.) Govaerts and also located a large population of *Corypha umbraculifera* L., a century palm, native to southern India and Sri Lanka in full bloom.

Project 2: Floristic Assessment of Nellai Wildlife Sanctuary, Tenkasi District, Tamil Nadu

Executing Officials: Dr. K. Karthigeyan (PI) and Dr. S. Arumugam

Duration of the Project: 2024–2027

Background: Nellai Wildlife Sanctuary is one among the 15 wildlife sanctuaries of Tamil Nadu. Nellai Wildlife Sanctuary, established in 2015, encompasses an area that has historically attracted the attention of several renowned plant explorers, including Robert Wight, R.H. Beddome, and Bourdillon. However, since that publication, limited botanical work has been carried out specifically in the Courtallam and Sivagiri forest regions. Therefore, this current survey of the newly established sanctuary aims to provide a comprehensive and updated account of the flora in this ecologically significant area. The proposed study is aimed to document the flora of the Wildlife Sanctuary.

Area and Locality: Nellai Wildlife Sanctuary is located in the Tenkasi district of Tamil Nadu, between 8°30"–9°30" N and 76°10"–78°20" E, covering an area of 35,673.33 ha. It shares the borders with the Grizzled Giant Squirrel Sanctuary to its north, while western side is surrounded by Periyar Tiger Reserve and Reserve Forests of Kerala and the southern side with Courtallam and Puliয়ার Reserve Forests of Tamil Nadu.

Objectives:

1. To identify and document the flora of Nellai Wildlife Sanctuary as per the goals set for Vision 2047 by BSI (to complete the inventory of plants, fungal and algal diversity of the country by undertaking extensive floristic surveys).
2. To document the endemic and threatened plants of Nellai Wildlife Sanctuary.
3. To study and document the medicinal plants and ethonobotanical knowledge of the local community.
4. To identify the threat factors to the existing flora of Nellai Wildlife Sanctuary and suggesting suitable conservation measures.
5. To identify invasive alien species and their impact on the native flora in the Wildlife Sanctuary.
6. To prepare a Pictorial Flora of Nellai Wildlife Sanctuary with detailed description and illustrations for easy identification as per Vision 2047 of BSI (documentation and dissemination of information by publishing flora, facsimiles and brochures).

Achievements:

- Scrutinized the herbarium specimens collected from the Nellai Wildlife Sanctuary by previous workers.
- About 500 specimens collected from the study area were studied and metadata were prepared. Prepared and communicated letters for obtaining forest permission from Tamil Nadu Forest Department. Presented a Power Point Presentation through Google meet (organized by the Tamil Nadu Forest Department) for getting the Forest Department permission on 17.12.2024.
- Received the minutes of the meeting from the Forest Department and submitted a reply clarifying the objectives of the study.
- A total of 793 herbarium specimens that were collected by the earlier workers in the past from the Nellai Wildlife Sanctuary and housed in the Madras Herbarium has been indexed.
- One field tour was conducted in Nellai Wildlife Sanctuary from 17.03.2025 to 28.03.2025, and covered all the five ranges and vouched 311 (164701–165011) specimens.

Project 3: Ex-situ Conservation of Endemic, Endangered and Threatened Plants (Orchids, Medicinal, Economic Important and Ornamental Plants) Ex situ conservation of endemic endangered and threatened plants of the region and recording of phenology of flowering / fruiting of species in garden

Executing Officials: Dr. S. Kaliamoorthy, Scientist 'E', Dr. T.S. Saravanan, Botanical Assistant, Mr. Arjun, S.K., Botanical Assistant

Duration of the Project: 2024–2025

Background: The Megamalai landscape, encompassing Varusanad Hills, Cumbam Valley, High Wavy Mountains, part of the Theni Forest Division, and a portion of the northern slope of the landscape together with Madurai Forest Division has recently been declared as the Megamalai Wildlife Sanctuary, considering the conservation significance of the hill chain in having several endemic and threatened flora and fauna. Forests of this area have been reported as an important wildlife habitat and recently a part of this forest (269.11 km²) has been declared as Megamalai Wildlife Sanctuary. This landscape also forms a buffer to the existing protected areas such as Srivilliputhur Grizzled Squirrel Sanctuary (Varusanad) on the east and the Periyar Tiger Reserve on the south.

The hill ranges of Megamalai Wildlife Sanctuary have been explored by several botanists namely E. Blatter, F. Hallberg, K.C. Jacob and M.R. Almeida since 1900s, and new taxa such as *Odontochilus rotundifolius* Blatt., *Eria pseudoclavicaulis* Blatt. and *Chrysoglossum hallbergi* Blatt. were described by them. The well-known Indian cyperologist, Prof. E. Govindarajalu (Presidency College, Chennai) visited the mountain range and described 14 new taxa of Cyperaceae from 1940 to 1986; 6 new woody taxa were described from the Megamalai hills by Ravikumar & Lakshmanan (1999), and Karuppusamy & Ravichandran (2014) also described a new species of *Hedyotis rajasekaranii* Karupp. & V. Ravich. from this hill range. The Wildlife Sanctuary serves the type locality for many narrow endemic plant species, including *Ardisia blatteri* Gamble, *Ixora ravikumarii* Kottaim., *Hedyotis rajasekaranii* Karupp. & V. Ravich. and *Macrosolen pseudopsilantha* (Rajasek.) Kottaim.

Area and Locality: The Megamalai (9°31'–9°51' N and 77°10'–77°30' E), popularly known as High Wavy Mountains, a part of the Western Ghats biodiversity hotspot, is located along the borders of Tamil Nadu and Kerala States. The Megamalai landscape is bounded by the Periyar Plateau (Periyar Tiger Reserve) on the south, Srivilliputhur Grizzled Squirrel Sanctuary on the south and southeast, Cumbam floodplains on the north and northeast and alluvial plains of Theni–Periyakulam on the northeast.

Objectives:

1. To collect the following five endemic orchid species, namely (i) *Aenhenrya rotundifolia* (Blatt.) Sath.Kumar & F.N. Rasm., (ii) *Brachycorythis wightii* Summerh., (iii) *Cylindrolobus pauciflorus* (Wight) Schuit., Y.P. Ng & H.A. Pedersen, (iv) *Dendrobium panduratum* Lindl. and (v) *Luisia megamalaiana* Karupp. & V. Ravich., for introduction and multiplication.
2. Also, the following tree and shrub species, namely (i) *Ardisia blatteri* Gamble (Primulaceae), (ii) *Cryptocarya stocksii* Meisn. (Lauraceae), (iii) *Elaeocarpus gausseii* Weibel (Elaeocarpaceae), (iv) *Hedyotis rajasekaranii* Karupp. & V. Ravich. (Rubiaceae), (v) *Ixora ravikumarii* Kottaim. (Rubiaceae), (vi) *Litsea megamalayana* Karupp., V. Ravich. & Bharath (Lauraceae), (vii) *Nothopegia vajravelui* K. Ravik. & V. Lakshm. (Anacardiaceae), (viii) *Symplocos monantha* Wight (Symplocaceae), (ix) *Syzygium myhendrae* (Bedd. ex Brandis) Gamble (Myrtaceae), and (x) *Syzygium parameswaranii* M. Mohanan & A.N. Henry (Myrtaceae) are proposed to collect for introduction and multiplication.

Achievements:

- Two field visits were proposed in Quarter 2 and 3, however, due to delay in obtaining permission from the PCCF, Tamil Nadu Forest Department, tours are not conducted so far.
- Local tour conducted to Manjakuttai, and *Drosera burmanni* Vahl and *D. peltata* Thunb. were collected and introduced.

Two field visits were proposed in Quarter II and III.

Plant Exploration Tour: Annual Action Plan Tour: As a part of Annual Research Plan (2024–25) (Quarters II and III) Dr. S. Kaliamoorthy, Scientist ‘E’ & Dr. T.S. Saravanan, Botanist and Mr. Arjun, S.K. Botanical Assistant undertaken a field visit to Megamalai Wildlife Sanctuary [part of Srivilliputhur Megamalai Tiger Reserve Forests (SMTR)], Tamil Nadu from 13.05.2025 to 17.05.2025 (Five days). The following plant species were collected, identified and introduced into NOEG, Yercaud for germplasm conservation. The field visit proposed in Quarter II and III was delayed due to delay in getting permission from PCCF (Wildlife).

S. No	Name of the Plant	Family Name	Habit	IUCN Status	No of plants introduced
1.	<i>Acampe praemorsa</i> var. <i>longepedunculata</i> (Trimen) Govaerts	Orchidaceae	Epiphyte	Not Evaluated	05
2.	<i>Aenhenrya rotundifolia</i> (Blatt.) C.S. Kumar & F.N. Rasm.	Orchidaceae	Terrestrial	Critically Endangered	15
3.	<i>Bulbophyllum fuscopurpureum</i> Wight	Orchidaceae	Epiphyte	Not Evaluated	10
4.	<i>Cylindrolobus pauciflorus</i> (Wight) Schuit., Y.P. Ng & H.A. Pedersen	Orchidaceae	Epiphyte	Least Concern	05
5.	<i>Diplozentrum recurvum</i> Lindl.	Orchidaceae	Epiphyte	Not Evaluated	10
6.	<i>Disperis neilgherrensis</i> Wight	Orchidaceae	Terrestrial	Data Deficient	01
7.	<i>Gastrochilus acaulis</i> (Lindl.) Kuntze	Orchidaceae	Epiphyte	Not Evaluated	02
8.	<i>Luisia megamalaiana</i> Karupp. & V. Ravich.	Orchidaceae	Epiphyte	Steno Endemic to Megamalai	05
9.	<i>Oberonia bicornis</i> Lindl.	Orchidaceae	Epiphyte	Not Evaluated	02

10.	<i>Oberonia brunoniana</i> Wight	Orchidaceae	Epiphyte	Not Evaluated	01
11.	<i>Papilionanthe subulata</i> (Willd.) Garay	Orchidaceae	Epiphyte	Not Evaluated	02
12.	<i>Polystachya concreta</i> (Jacq.) Garay & H.R. Sweet	Orchidaceae	Epiphyte	Not Evaluated	01
13.	<i>Sirhookera lanceolata</i> (Wight) Kuntze	Orchidaceae	Epiphyte	Not Evaluated	02
14.	<i>Vanda testacea</i> (Lindl.) Rchb.f.	Orchidaceae	Epiphyte	Not Evaluated	05
15.	<i>Cryptocarya stocksii</i> Meisn.	Lauraceae	Tree	Endemic to Western Ghats – Vulnerable VU (B1+2c ver. 2.3) 1998	11 cuttings
16.	<i>Elaeocarpus gaussenii</i> Weibel	Elaeocarpaceae	Tree	Endemic to Southern Western Ghats- Critically Endangered; CR (B1+2c ver 2.3) 1998	09 cuttings
17.	<i>Hedyotis rajasekaranii</i> Karupp. & V. Ravich.	Rubiaceae	Shrub	Endemic to Southern Western Ghats	15 cuttings
18.	<i>Henckelia incana</i> (Vahl) Spreng.	Gesneriaceae	Herb	Endemic to South India	05
19.	<i>Impatiens maculata</i> Wight	Balsaminaceae	Herb	Endemic to southern Western Ghats – Not Evaluated	02
20.	<i>Impatiens goughii</i> Wight	Balsaminaceae	Herb	Endemic to southern Western Ghats – Vulnerable	02
21.	<i>Memecylon flavescens</i> Gamble	Melastomataceae	Large Shrub/ Small Tree	Endemic to southern Western Ghats – Endangered; EN (B1+2c) 1998	04 cuttings
22.	<i>Nothopegia vajravelui</i> K. Ravik. & V. Lakshm.	Anacardiaceae	Trees	Endemic to Southern Western Ghats – Data Deficient	10 cuttings
23.	<i>Rauvolfia verticillata</i> (Lour.) Baill.	Apocynaceae	Shrubs	Least Concern in IUCN	11 cuttings
24.	<i>Sonerila pulneyensis</i> Gamble	Melastomataceae	Herbs	Endemic to southern Western Ghats	10
25.	<i>Symplocos monantha</i> Wight	Symplocaceae	Shrub	Endemic to southern Western Ghats	15
26.	<i>Syzygium myhendrae</i> (Bedd. ex Brandis) Gamble	Myrtaceae	Medium-sized Tree	Endemic to southern Western Ghats – EN (B1+2c ver. 2.3) 1998	15
27.	<i>Syzygium parameswaranii</i> M. Mohanan & A.N. Henry	Myrtaceae	Tree	Endemic to southern Western Ghats – EN (B1+2c ver. 2.3) 1998	02 cuttings
28.	<i>Uniyala multibracteata</i> (Gamble) H. Rob. & Skvarla	Asteraceae	Tree	Endemic to southern Western Ghats	02 cuttings
29.	<i>Vincetoxicum subramanii</i> (A.N. Henry) Meve & Liede	Apocynaceae	Climbing Subshrub	Endemic to Western Ghats	11 cuttings

Objective II: Number of genera/species for which phenological data recorded:

In total, flowering and fruiting phenophases were recorded for 479 species belonging to 311 genera.

Orchids: Flowering and fruiting phenophases were recorded respectively for 100 and 32 species of the family Orchidaceae.

Other Angiosperms: Flowering and fruiting phenophases were recorded respectively for 379 and 163 species of other Angiosperms.

Title of the Project: Lichens of Tamil Nadu

Executing Officials: Dr. Jagadeesh Ram, T.A.M., Scientist 'F'

Duration of the Project: April 2023–March 2026

Background: Lichenologically, the state of Tamil Nadu is known to have 892 species of lichens (Singh & Sinha, 2010; Sinha & al., 2018; Sinha, 2022). Singh & Sinha (2010), Sinha & al. (2018) and Joseph & al. (2018) enumerated all the species and the respective publications. Most of these reports are based on the explorations of Nilgiri and Palni hills (Awasthi & Singh, 1973; Singh, 1984) and their environs (Nayaka & al., 2001; Balaji & Hariharan, 2013) of the Western Ghats and Shevaroy hills (Hariharan & al., 2003) and Kolli hills (Shyam Kumar & al., 2011) of the Eastern Ghats, Chennai city (Balaji & Hariharan, 2004, 2005) and some sporadic collections from other areas by various workers. However, the hill ranges of Anamalais, Cardamom, Varsanadu, Andipatti and Agasthiyamalai and the associated protected areas of the Western Ghats (Agasthiyamalai Biosphere Reserve; Anamalai National Park, Mudumalai National Park, Mukurthi National Park; Grizzled Squirrel Wildlife Sanctuary, Vallanadu Wildlife Sanctuary, Point Calimere Wildlife Sanctuary, Gangaikondan Spotted Deer Wildlife Sanctuary, Cauvery North Wildlife Sanctuary, Nellai Wildlife Sanctuary, Vallanadu Black Buck Wildlife Sanctuary, Kanyakumari Wildlife Sanctuary; Srivilliputhur Elephant Reserve; Anamalai Tiger Reserve, Kalakkad-Mundanthurai Tiger Reserve, Sathyamangalam Tiger Reserve, Srivilliputhur-Megamalai Tiger Reserve), other reserve forests and plantations; Javadi, Kalrayans, Pachamalai, Kanjamalai and Azhagamalai of Eastern Ghats; hills in the plateau, coastal plains and mangroves are remain unexplored.

Further, over 50% of the reports are seemingly dubious, and most of those reports are by lichenologically untrained workers. Because of less expertise on lichens, Botanical Survey of India didn't initiate lichenological studies in the state of Tamil Nadu. In view of the above merits of the state it is necessary to document and assess the lichen diversity and suggest effective conservation measures and management for their future sustainable utilization.

Area and Locality: Tamil Nadu is situated at the southeastern extremity of the Indian Peninsula. It is the tenth largest state in India, and covers an area of 1,30,058 km² and lies between 8°5'–13° 35' N and 76°15'–80° 20' E. It has a coastline of 990 km and a land boundary of 1200 km. The state is bounded on the north by Karnataka and Andhra Pradesh, on the south by the Indian Ocean, on the east by the Bay of Bengal and the west by the Arabian Sea and the states of Kerala and Karnataka. The Union Territory of Puducherry including Karaikal is within the geographical region of the state. A chain of twenty coral islands collectively termed as Rameswaram and Krusadai groups of islands and several reefs extend along the northern shore of Gulf of Mannar. Kanyakumari is the southernmost tip of the Indian Peninsula which is the meeting point of the Arabian Sea, the Bay of Bengal, and the Indian Ocean (Chithra & Nair, 1999; Kabeer & Nair, 2009). Administratively, 38 districts have been demarcated.

Along the whole length of the western part of Tamil Nadu, Western Ghats runs southward and terminate at Kanyakumari, the southernmost extremity of peninsular India. The mountain ranges include Nilgiris,

Anamalais, Palni hills, Cardamom hills, Varsanadu and Andipatti hill ranges and Agasthiyamalai. Western Ghats supports tropical evergreen, semi-evergreen, and deciduous forests, as well as savannahs intermixed with cultivated lands and settlements. Slopes of Western Ghats are the source of many rivers, which flow eastwards towards the Bay of Bengal. The eastern parts are fertile coastal plains and the northern parts are a mix of hills and plains (Chithra & Nair, 1999; Kabeer & Nair, 2009). The state has 21% (FSI Report 2019) forest cover and has 3 Biosphere Reserves, 5 National Parks, 14 Wildlife Sanctuaries, 4 Elephant Reserves, 5 Tiger Reserves and 16 Bird Sanctuaries.

Objectives:

1. Documenting the lichens of the districts of the state Tamil Nadu.
2. Mapping the lichen species with GPS data.
3. Preparing identification manual/ flora with key to the families, genera and species with images.
4. Establishing Lichen Herbarium at BSI, SRC, Coimbatore.
5. Application of modern tools and techniques (molecular) to solve the taxonomic problems of complex taxa.

Achievements:

- Three Field tours were undertaken.
- First field tour was undertaken to Srivilliputhur Meghamalai Tiger Reserve, Virudhnagar District and Madurai Territorial forests, Madurai District *w.e.f.* 29.07.2024 to 11.08.2024 and collected 415 field packets of crustose, foliose and fruticose lichens.
- Second field tour was undertaken to Theni Territorial forests, Theni District and Madurai Territorial forests, Madurai District *w.e.f.* 25.08.2024 to 01.09.2024 and collected 115 field packets of crustose, foliose and fruticose lichens.
- Third Field tour has been undertaken from 26th February 2025 to 10th March 2025 to Kanyakumari, Tirunelveli, Toothukudi and Ramanathapuram districts and collected 190 Field Packets of corticolous, foliicolous and saxicolous lichen specimens. The samples are being air-dried for preservation. Morphological, Anatomical and Chemical characterization and identifications have been made. Captured Photomicrographs samples using stereomicroscope with attached camera and compound microscope with attached camera. Over 200 specimens have been identified into 92 species.

Project: A taxonomic revision of the tribe Semecarpeae (Anacardiaceae) in India

Executing Official: Dr. M. Murugesan, Scientist 'D' [Transferred to BSI, SRC from CNH, BSI, Howrah on 02.12.2024]

Duration of the Project: 2024–2026

Background: Anacardiaceae R. Br. are an ecologically and economically valuable plant family. The family comprises ca. 800 species belonging to 79 genera in the world, and distributed in the tropical Africa, Asia, Australia, Europe and temperate regions of the America (POWO, 2023). It is greatly diversified in tropical regions of the world, especially in Southeast Asia, the possible centre of origin (Mitchell & al., 2022). The family was established by Robert Brown (1818) as “Anacardeae”. Marchand (1869) recognized nine tribes, namely Astronieae, Buchananieae, Rhoideae, Mangifereae, Pistacieae, Spondieae, Tapirieae, Thyrsodieae and Semecarpeae based on the analogous characters. This

classification at tribe level was subsequently modified by Engler (1892) who divided the family into five tribes, namely Anacardiaceae (as Mangifereae), Dobineae (as Dobineae), Rhoeeae (as Rhoideae), Semecarpeae and Spondiadeae (as Spondiadeae) based on the phyllotaxy, leaf morphology and other floral characters, such as presence of a perianth in the female flower, number of staminal whorls, stylar insertion, number of carpels, ovary locules, placentation type and embryo morphology.

Globally, many taxonomic studies on the family Anacardiaceae have been carried out. However, no exclusive taxonomic revision on Indian Anacardiaceae has been done yet. Hooker (1876) in his Flora of British India reported 107 species belonging to 23 genera, based on collections from South and Southeast Asia. Gamble (1918) enumerated 26 species in 11 genera from southern India, especially from the Western Ghats. Mukherjee & Chandra (1983) outlined the taxonomy of this family with 59 species in 20 genera. The first detailed study on the Indian Anacardiaceae was done by Chandra & Mukherjee (2000), they enumerated 68 species under 20 genera with a key for identification. Recently, Pramanick & al. (2020) published the checklist of Indian Anacardiaceae. Studies on the family Anacardiaceae in India are many decades old.

Based on the generic affinities, Mitchel & al. (2022) divided the family Anacardiaceae into five tribes, namely Anacardiaceae, Dobineae, Rhoeeae, Semecarpeae and Spondiadeae. The tribe Semecarpeae comprising of five genera, namely *Drimycarpus*, *Holigarna*, *Melanochyla*, *Nothopegia* and *Semecarpus*, of which the genus *Melanochyla* not reported in India so far and its distribution restricted to Thailand to western Malesia. All other four genera are reported in India especially in the Western Ghats, northeastern region and Andaman and Nicobar Islands with a native range of distribution in Indian subcontinent and maximum diversity of endemics. In India, the genus *Nothopegia* is represented by 13 taxa (11 species and 2 varieties), *Semecarpus* by 7 species, *Holigarna* with 7 species and *Drimycarpus* with only one species.

The tropical Asia is the possible centre of origin for many Anacardiaceae members especially for the genera such as *Nothopegia*, *Holigarna* and *Semecarpus* with native range of distribution in Indian subcontinent, predominantly in the Western Ghats of India and Northeast India. However, no exclusive comprehensive taxonomic revision on these genera have been conducted so far. Therefore, the present work is aimed to study the taxonomy and morphology of the tribe Semecarpeae (include four genera viz., *Drimycarpus*, *Holigarna*, *Nothopegia*, *Semecarpus* and 28 taxa) with the following primary objectives.

Area and Locality: India, a South Asian country, and the seventh largest by geographic area, consists of 28 states and 8 union territories. It covers a total geographical area of 3,287,263 km², and bounded by the Indian Ocean on the south, the Arabian Sea on the southwest, and the Bay of Bengal on the southeast, Pakistan to the west, China, Nepal, and Bhutan to the north, and Bangladesh and Myanmar to the east, and the Andaman and Nicobar Islands, one of the union territories share a maritime border with Thailand, Myanmar, and Indonesia.

Objectives:

1. To carry out the comprehensive revisionary study on the tribe Semecarpeae in India, represented by four genera, namely *Drimycarpus*, *Holigarna*, *Nothopegia* and *Semecarpus* in India.
2. To record the distribution (with maps) and flowering and fruiting period for every species through field explorations and consultation of herbaria.
3. To assess the threat status of every species by following the current IUCN Red List Categories and Criteria based on field tours and available herbarium specimens housed at various herbaria.
4. To suggest suitable conservation strategies for endemic and threatened species.

Achievements:

- **Checklist Preparation:** A checklist of species belonging to four genera (*Drimycarpus*, *Holigarna*, *Semecarpus* and *Nothopegia*) has been prepared refereeing to literature and consultation of different herbaria to get an overview of species distribution. Also gathered protologues and images of type specimens of 18 taxa so far.
- **Herbarium Consultation and Metadata Preparation:** Consulted Central National Herbarium, Howrah (CAL); Madras Herbarium, Southern Regional Centre, Coimbatore (MH); Herbarium, Kerala Forest Research Institute, Thrissur, Kerala (KFRI) on 09.07.2024 and C.E.C. Fischer's Herbarium, Southern Forest Research Centre, Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore (FRC) on 12.07.2024 and 15.07.2024. Studied the herbarium specimens of members of *Drimycarpus*, *Holigarna*, *Semecarpus* and *Nothopegia* belonging to the tribe Semecarpeae (Anacardiaceae). About 1150 voucher specimens of the family housed in different herbaria, collected from various parts of India were referred, indexed and photographed. Also recorded the field details provided on the labels of herbarium specimens and affixed determinavit slips (on 27 herbarium specimens) for the wrongly identified specimens. Also consulted different virtual herbaria and recorded all the relevant information provided on the labels/herbarium sheets. Completed the preparation of detailed herbarium metadata in the prescribed format for about 570 herbarium specimens so far. For rest of the herbarium sheets preparation of metadata is under progress.
- **Preparation of description and relevant information:** Prepared bibliographic citation and detailed description for 11 species (*Holigarna* 4 species, *Nothopgia* 5 species, *Semecarpus* 2 species) along with all the relevant information such as details of habit, flowering and fruiting period and specimens examined.
- **Field tour conducted and Specimens collected:** Collected 18 field numbers belonging to the following six species (*Semecarpus travancoricus* Bedd., *Holigarna beddomei* Hook.f., *H. nigra* Bourd., *H. ferruginea* Marchand, *Nothopegia vajravelui* K. Ravik. & V. Lakshm. and *Nothopegia* sp. during the field trip conducted in the 3rd Quarter from 16.12.2024 to 22.12.2024 to various parts of Anamalai hill ranges of Kerala, covering different Forest Ranges (Periyar Tiger Reserve, Vallakkadavu and Gavi Forest Range, Painavu and Kulamavu Forest Ranges, Pambadam Shola National Park, Mangulam and Anakulam Forest Ranges, Eravikulam National Park, Rajamalai and Nemakkad) of Idukki and Kottayam districts. During the field tour, important field information such as population status, distribution, variations in the population, associated species, geocoordinates, existing threats to the species, if any, etc. have been noted for the assessment of IUCN status and for preparing distributional maps.

WESTERN REGIONAL CENTRE, PUNE

Project 1: DNA Barcoding of Endemic Plants from the Northern Western Ghats of Maharashtra

Executing Officials: Dr. Nithaniyal Stalin A (Botanist), Dr. A. Benniamin A (Scientist-F) and Shri. Kaushik Sarkar (Bot. Asst.), BSI, WRC, Pune

Duration of the Project: Nov, 2023–2027

Background: Endemic plants are living treasures that act as an irreplaceable national heritage of a country. India's rich biodiversity gained the spotlight in the world's taxonomic research by holding 4036 endemics out of 21,849 angiosperms which are crucial in supporting the monophyly of the existing phylogenetic classification. The Western Ghats of India alone support the habitat for more than 1273 endemic species. The Northern Western Ghats (NWG) of Maharashtra requires special attention since it represents 39% (71/181) of total endemic taxa restricted to a single location, and 53% (38/71) of them from type location require immediate conservation measures. DNA barcode identification is adopted worldwide in taxonomic research to resolve issues of ambiguous identification, and such studies are very much limited in India. Therefore, the proposed study is sharply focused on the DNA barcode assessment of endemics at Northern Western Ghats (NGW). Developing a reference DNA barcode library of NWG endemics is crucial because these taxa are not found elsewhere. The current DNA barcoding study will be beneficial to assess and characterize endemic plants, discover of new cryptic species, resolve the species complex in congeners, and understand phylogenetic relationships.

Area & Locality: The Northern Western Ghats (NWG) of Maharashtra comprises the tropical moist broadleaf forests at higher elevations (1000 MSL) and is surrounded by moist deciduous forests at lower elevations at the Indian peninsula. This region covers about 30,900 sq. km, lies between 14.8° to 21° N, and provides a microhabitat for many specialized stenoendemics (Fig. 1.). The NWG encompasses the most significant protected forested areas as wildlife sanctuaries like Koyna, Radhanagari, Bhadra, & Tansa, and national parks include Mollem, Anshi, and Chandoli. The UNISECO world-heritage site like Kaas plateau hold large number of endemic species and the fort including Torna and Sinhagad housed several unique ephemeral and threatened species. Forest areas such as comprise moist Tropical Forests, Southern Tropical Wet Evergreen Forest, Southern Tropical Semi-evergreen Forest, and West Coast Semi-Evergreen Forests (Puri 1960). The mixed escarpment forests and valleys, grasslands, rocky outcrops, dense network of east-flowing rivers, and interspersed laterite plateaus are ecologically significant. This region also provides shelter for endangered species, thus reinforcing implementation of conservation policies and gene pool preservation. However, anthropogenic pressures impact the NWG vegetation due to several developmental activities in cities like Mumbai, Pune, Kolhapur, Nashik, and Surat. Climate change, on the other side, leads to habitat loss and extinction of species. The unique geography of biodiversity and the implications of conservation action makes it imperative to study the area in better detail.

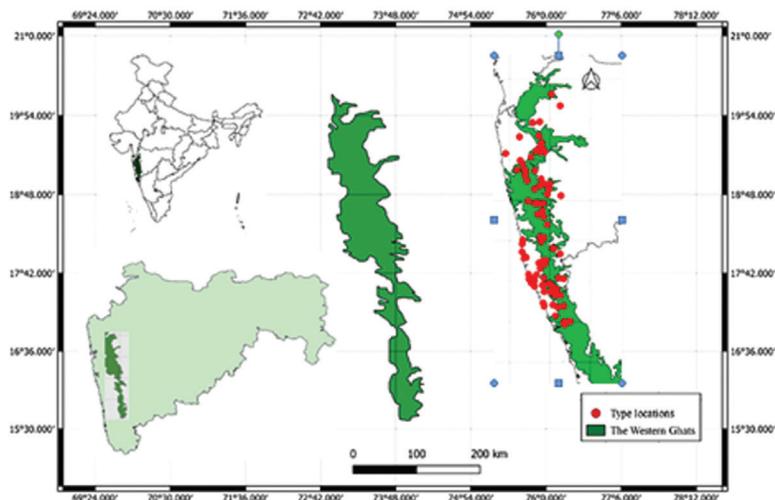


Fig. 1. Map showing type localities of local endemic species of Northern Western Ghats

Objectives:

1. To collect and document the endemic plants of Northern Western Ghats for DNA barcoding
2. To standardize simple and cost-effective laboratory protocols for DNA Extraction, PCR amplification, and DNA sequencing
3. To assemble authentic reference DNA barcode library for endemic plants of Northern Western Ghats
4. To develop a novel *in-silico* bioinformatics pipeline for the evolutionary study of endemics by phylogenetic analysis

Achievements:

Two field tours undertaken to Pushpagiri WLS and BRT Tiger Reserve, and BRT Tiger Reserve, Karnataka to collect the spores and studied the status of IUCN Studies of Threatened species of Pteridophytes. During the field tour to Pushpagiri WLS from 18th to 21st September 2024, a total of 17 plants collected were introduced in the experimental garden of BSI, WRC for ex-situ conservation: *Adiantum latifolium* Lam., *Leptochilus lanceolatus* Fée, *Tectaria paradoxa* (Fée) Sledge, *Elaphoglossum beddomei* Sledge, *Hymenophyllum gardeneri* Bosch, *Oreogrammitis pilifera* (Ravi & J. Joseph) Parris, *Angiopteris helferiana* C. Presl, *Trichomanes bimarginatum* (Bosch) Bosch, *Osmunda hilsenbergii* Grev. & Hook, *Tectaria polymorpha* (Wall. ex Hook.) Copel., *Selaginella delicatula* (Desv.) Alston, *Pteris cretica* L., *Pellaea boivinii* Hook, *Hemionitis arifolia* (Burm.f.) T. Moore, *Bosmania membranacea* (D. Don) Testo, *Leptochilus axillaris* (Cav.) Kaulf., *Selliguea oxyloba* (Wall. ex Kunze) Fraser-Jenk. During the second field tour to unexplored areas of Karnataka from 07–19th October 2024, 25 threatened species of Pteridophytes *Elaphoglossum beddomei*, *Dryopteris austro indica*, *Lycopodium wightianum*, *Bolbitis beddomei*, *Alsophilla gigantea*, *Alsophilla nilgiriensis*, *Hymenophyllum* sps, *Diplazium polypodioides*, *Asplenium* sps, *Pyrosia costata*, *Lepisorus nidus*, *Lepisorus amarolepidus*, *Huperzia phyllantha*, *Loxogramme involute*, *Asplenium zenkerianum*, *Cyrtomium micropterum*, *Adiantum capillus veneris*, *Arachniodes aristata*, *Botrychium daucifolium*, *Bolbitis asplenifolia*, *Polystichum harpophyllum*, *Leptochillus decurrens*, *Antrophyum plantagineum*, *Asplenium decrescens* and *Equisetum romossum* were collected and introduced in Botanical Garden of BSI WRC, Pune. Collected for In vitro Spore Culture and 6 specimens for Cytological studies. *Bolbitis aspleniifolia* (Bory) K. Iwats., *Arachniodes*

sledgei Fraser-Jenk., *Adiantum latifolium* Lam., *Asplenium yoshinagae* subsp. *indicum* (Sledge) Fraser-Jenk., *Thelypteris dentata* (Forssk.) E.P.St.John, *Pteris biaurita* L., *Leptochilus lanceolatus* Fée, *Diplazium travancoricum* Bedd., *Cyathea nilgirensis* Holttum, *Tectaria paradoxa* (Fée) Sledge, *Microlepia speluncae* (L.) T.Moore, *Elaphoglossum beddomei* Sledge, *Hymenophyllum gardeneri* Bosch, *Adiantum concinnum* Humb. & Bonpl. ex Willd., *Oreogrammitis pilifera* (Ravi & J. Joseph) Parris, *Angiopteris helferiana* C.Presl, *Trichomanes bimarginatum* (Bosch) Bosch, *Pyrrosia porosa* (C.Presl) Hovenk, *Athyrium* sp., *Osmunda hilsenbergii* Grev. & Hook., *Tectaria polymorpha* (Wall. ex Hook.) Copel., *Microsorium punctatum* (L.) Copel., *Selaginella delicatula* (Desv.) Alston, *Pteris cretica* L., *Pellaea boivinii* Hook, *Hemionitis arifolia* (Burm.f.) T.Moore, *Bosmania membranacea* (D. Don) Testo, *Leptochilus axillaris* (Cav.) Kaulf., *Selliguea oxyloba* (Wall. ex Kunze) Fraser-Jenk. Inoculated the spores of *Pellaea boivinii* Hook., *Bolbitis beddomei* Fraser-Jenk. & Gandhi, *Elaphoglossum beddomei* Sledge, *Selliguea oxyloba* (Wall. ex Kunze) Fraser-Jenk. and *Oreogrammitis pilifera* (Ravi & J. Joseph) Parris in KC media and ½ MS Media. Subculture of *Pyrrosia lanceolata* (L.) Farw. and *Lepisorus nudus* (Hook.) in KC media media supplemented with BAP and IBA.

Project 2: Pteridophytic flora of India Vol II

Executing Scientist (s): A. Benniamin, V.K. Rawat Brijesh kumar and D. Jesubalan

Duration of the Project: 2020-2025

Achievements: Prepared detailed description of 387 species under 6 families including Key to Genera and species for all the species. In addition, to Distribution map for all the species (387 spp) through QGIS software. Photographs of More than 100 spp has also been included. The complete report of Pteridophytic flora Vol II has submitted on 27th January 2025.

The complete list was completed for AAP Project Report of Pteridophytic flora of India Vol. II and the family Thelypteridaceae is in progress of preparation of details i.e. description, distribution, fertile information, threatened status and coordinates. The Volume-II will be submitted in the month of January 2024 to the Director, BSI. The report consists of description, distribution, Ecology, fertile information, threatened status, photo plates and distribution map for all Pteridophytes belonging Six families, 37 genera and 387 species. The Volume – II consist of Six families such as Pteridaceae, Aspleniaceae, Onocleanaceae, Woodsiaceae, Blechnaceae and Athyriaceae.

Pteridaceae

Acrostichum aureum L., *Acrostichum speciosum* Willd., *Actiniopteris radiata* (Sw.) Link, *Adiantum capillus-veneris* L., *Adiantum caudatum* L., *Adiantum concinnum* Humb. & Bonpl. ex Willd., *Adiantum edgeworthii* Hook., *Adiantum flabellulatum* L., *Adiantum formosum* R.Br., *Adiantum hispidulum* Sw., *Adiantum incisum* Forssk. subsp. *incisum*., *Adiantum incisum* Forssk. subsp. *indicum* (J. Ghatak) Fraser-Jenk., *Adiantum latifolium* Lam., *Adiantum myriosorum* Baker., *Adiantum pedatum* L. subsp. *pedatum*., *Adiantum peruvianum* Klotzsch., *Adiantum philippense* L. subsp. *Philippense*, *Adiantum philippense* L. subsp. *intermedium* S.C. Verma & Fraser-Jenk., *Adiantum philippense* L. subsp. *teestae* S.C. Verma & Fraser-Jenk., *Adiantum poiretii* Wikstr., *Adiantum raddianum* C.Presl., *Adiantum soboliferum* Wall. ex Hook., *Adiantum stenochlamys* Baker, *Adiantum tenerum* Sw., *Adiantum tibeticum* Ching., *Adiantum trapeziforme* L., *Adiantum venustum* D. Don., *Adiantum wattii* Baker, *Adiantum zollingeri* Mett. ex Kuhn., *Aleuritopteris albomarginata* (C.B. Clarke) Ching., *Aleuritopteris anceps* (Blanf.) Panigrahi., *Aleuritopteris argentea* (S.G. Gmel.) Fée. *Aleuritopteris bicolor* (Roxb.) Fraser-Jenk., *Aleuritopteris bullosa* (Kunze) Ching., *Aleuritopteris chrysophylla* (Hook.) Ching., *Aleuritopteris dealbata* (C.Presl) Fée., *Aleuritopteris dubia* (C. Hope) Ching., *Aleuritopteris duclouxii* (Christ) Ching., *Aleuritopteris duthiei* (Baker) Ching., *Aleuritopteris formosana* (Hayata) Tagawa., *Aleuritopteris*

grisea (Blanf.) Panigrahi. *Aleuritopteris leptolepis* (Fraser-Jenk.) Fraser-Jenk., *Aleuritopteris rufa* (D. Don) Ching., *Aleuritopteris scioana* (Chiov.) Fraser-Jenk. & Dulawat., *Aleuritopteris stenochlamys* Ching., *Aleuritopteris subdimorpha* (C.B. Clarke & Baker) Fraser-Jenk., *Aleuritopteris tamburii* (Hook.) Ching., *Aleuritopteris wollenweberi* Fraser-Jenk., *Anogramma leptophylla* (L.) Link., *Anogramma reichsteinii* Fraser-Jenk., *Ceratopteris cornuta* (P. Beauv.) Lepr., *Ceratopteris pteridoides* (Hook.) Hieron., *Ceratopteris thalictroides* (L.) Brongn. subsp. *Thalictroides*., *Ceratopteris thalictroides* (L.) Brongn. subsp. *gaudichaudii* (Brongn.) Fraser-Jenk. & Pariyar., *Cerosora* (Baker) Domin., *Coniogramme affinis* Hieron., *Coniogramme denticuloserrata* (Hieron.) R.D. Dixit & A. Das., *Coniogramme fraxinea* (D. Don) Fée ex Diels., *Coniogramme intermedia* Hieron., *Coniogramme procera* Fée., *Coniogramme pubescens* Hieron., *Coniogramme serrulata* (Blume) Fée., *Cryptogramma brunoniana* Wall. ex Hook. & Grev. subsp. *brunoniana*., *Cryptogramma brunoniana* Wall. ex Hook. & Grev. subsp. *raddeana* (Fomin) Fraser-Jenk., *Cryptogramma stelleri* (S.G. Gmel.) Prantl., *Doryopteris concolor* (Langsd. & Fisch.) Kuhn., *Doryopteris ludens* (Wall. ex Hook.) J. Sm., *Mickelopteris cordata* (Roxb. ex Hook. & Grev.) Fraser-Jenk., *Notholaena borealisinensis* (Kitag.) Fraser-Jenk., *Notholaena delavayi* (Baker) C. Chr., *Notholaena dipinnula* Fraser-Jenk., *Notholaena himalaica* Fraser-Jenk., *Notholaena lanuginosa* (Desf.) Desv. ex Poir. subsp. *Lanuginosa*., *Notholaena lanuginosa* (Desf.) Desv. ex Poir. subsp. *bivalens* Reichst., *Notholaena marantae* (L.) R. Br., *Oeosporangium belangeri* (Bory) Fraser-Jenk., *Oeosporangium elegans* (Poir.) Fraser-Jenk. & Pariyar., *Oeosporangium hancockii* (Baker) Fraser-Jenk., *Oeosporangium nitidulum* (Hook.) Fraser-Jenk., *Oeosporangium persicum* (Bory) Vis., *Oeosporangium pteridioides* (Reichard) Fraser-Jenk. & Pariyar. subsp. *pteridioides*., *Oeosporangium pteridioides* (Reichard) Fraser-Jenk. & Pariyar. subsp. *acrosticum* (Balb.) Fraser-Jenk. & Pariyar., *Oeosporangium stramineum* (Ching) Fraser-Jenk., *Oeosporangium subvillosum* (Hook.) Fraser-Jenk. & Pariyar., *Oeosporangium tenuifolium* (Burm. f.) Fraser-Jenk. & Pariyar., *Oeosporangium thwaitesii* (Mett. ex Kuhn) Fraser-Jenk., *Oeosporangium trichophyllum* (Baker) Fraser-Jenk., *Oeosporangium viride* (Forrsk.) Fraser-Jenk. & Pariyar., *Oeosporangium yunnanense* (Ching) Fraser-Jenk. & Pariyar., *Onychium cryptogrammoides* Christ subsp. *Cryptogrammoides*., *Onychium cryptogrammoides* Christ subsp. *fragile* (S.C. Verma & Khullar) Fraser-Jenk. & S. Matsumoto., *Onychium kholianum* Fraser-Jenk. & S. Matsumoto., *Onychium lucidum* (D. Don) Spreng., *Onychium moupinense* Ching., *Onychium siliculosum* (Desv.) C. Chr., *Onychium tenuifrons* Ching., *Onychium vermae* Fraser-Jenk. & Khullar., *Pellaea boivinii* Hook., *Pellaea calomelanos* (Sw.) Link., *Pellaea falcata* (R. Br.) Fée., *Pellaea longipilosa* Bonap., *Pityrogramma austroamericana* Domin., *Pityrogramma calomelanos* (L.) Link., *Pteris actinopteroides* Christ., *Pteris alata* Lam., *Pteris amoena* Blume, *Pteris andamanica* Fraser-Jenk., *Pteris argyrea* T. Moore., *Pteris arisanensis* Tagawa., *Pteris aspericaulis* Wall. ex J. Agardh., *Pteris assamica* Fraser-Jenk. & T.G. Walker., *Pteris barbiger* Ching., *Pteris biaurita* L. subsp. *Biaurita*., *Pteris biaurita* L. subsp. *fornicata* Fraser-Jenk., *Pteris biaurita* L. subsp. *walkeriana* Fraser-Jenk. & Dom. Rajkumar., *Pteris blumeana* J. Agardh., *Pteris cadieri* Christ subsp. *Cadieri*., *Pteris cadieri* Christ subsp. *dimorpha* (Copel.) Fraser-Jenk., *Pteris cadieri* Christ subsp. *walkeri* Fraser-Jenk., *Pteris cretica* L. subsp. *Cretica*., *Pteris cretica* L. subsp. *laeta* (Wall. ex Ettingsh.) Fraser-Jenk., *Pteris dactylina* Hook., *Pteris dixitii* Fraser-Jenk. & Pariyar., *Pteris ensiformis* Burm. f., *Pteris geminata* Wall. ex J. Agardh., *Pteris gongalensis* T.G. Walker., *Pteris grevilleana* Wall. ex J. Agardh. subsp. *grevilleana*., *Pteris griffithii* Hook., *Pteris heteromorpha* Fée., *Pteris hirtula* (C. Chr.) C.V. Morton., *Pteris hookeriana* J. Agardh., *Pteris inaequalis* Baker., *Pteris kathmanduensis* Fraser-Jenk. & T.G. Walker., *Pteris khasiana* (C.B. Clarke) Hieron. subsp. *Khasiana*., *Pteris longipinnula* Wall. ex J. Agardh., *Pteris mawsmiensis* Fraser-Jenk. & Benniamin., *Pteris medogensis* Ching & S.K. Wu., *Pteris mertensioides* Willd., *Pteris multiaurita* J. Agardh., **Pteris multifida* Poir., *Pteris normalis* D. Don., *Pteris otaria* Bedd., *Pteris parkeri* hort. ex J.J. Parker., *Pteris pellucens* J. Agardh., *Pteris perrottetii* Hieron., *Pteris praetermissa* T.G. Walker., *Pteris pseudopellucida* Ching., *Pteris puberula* Ching., *Pteris quadriaurita* Retz., *Pteris reptans* T.G. Walker., *Pteris roseolilacina* Hieron., *Pteris scabripes* Wall. ex J. Agardh., *Pteris*

scabririgens Fraser-Jenk., *Pteris spinescens* C.Presl., *Pteris stenophylla* Wall. ex Hook. & Grev., *Pteris subindivisa* C.B.Clarke., *Pteris subquinata* Wall. ex J.Agardh., *Pteris taiwanensis* Ching., *Pteris terminalis* Wall. ex J.Agardh., *Pteris tibetica* Ching., *Pteris tremula* R.Br., *Pteris tricolor* Linden., *Pteris tripartita* Sw., *Pteris venulosa* Blume, *Pteris venusta* Kunze subsp. *Venusta*, *Pteris venusta* Kunze subsp. *matsudae* (Masam.) Fraser-Jenk. & Kandel, *Pteris vittata* L. subsp. *Vittata*, *Pteris vittata* L. subsp. *emodi* Fraser-Jenk., *Pteris vittata* L. subsp. *vermae* Fraser-Jenk., *Pteris wallichiana* J.Agardh., *Syngamma alismifolia* (C.Presl) J.Sm., *Taenitis blechnoides* (Willd.) Sw., *Taenitis interrupta* Hook. & Grev., *Antrophyum callifolium* Blume, *Antrophyum obovatum* Baker, *Antrophyum parvulum* Blume, *Antrophyum plantagineum* Kaulf., *Antrophyum reticulatum* (G.Forst.) Kaulf., *Vittaria amboinensis* Fée, *Vittaria doniana* Mett. ex Hieron., *Vittaria elongata* Sw., *Vittaria ensiformis* Sw., *Vittaria flexuosa* Fée. *Vittaria fudzinoi* Makino, *Vittaria mediosora* Hayata, *Vittaria microlepis* Hieron., *Vittaria sikkimensis* Kuhn., *Vittaria taeniophylla* Copel., *Vittaria zosterifolia* Willd.

Aspleniaceae

Asplenium adiantum-nigrum L. Subsp. *adiantum-nigrum*., *Asplenium aethiopicum* (Burm.f.) Bech. Subsp. *aethiopicum*., *Asplenium affine* Sw., *Asplenium amoenum* C.Presl ex Mett., *Asplenium andreisii* Fraser-Jenk., *Asplenium anguineum* Christ., *Asplenium apogamum* N.Murak. & Hatan., *Asplenium batuense* Alderw., *Asplenium bullatum* Wall. ex Mett., *Asplenium capillipes* Makino, *Asplenium ceterach* L., *Asplenium cheilosorum* Kunze ex Mett., *Asplenium crinicaule* Hance., *Asplenium daghestanicum* Christ., *Asplenium daghestanicum* Christ., *Asplenium dalhousieae* Hook., *Asplenium decrescens* Kunze., *Asplenium delavayi* (Franch.) Copel., *Asplenium emarginatodentatum* Zenker ex Kunze., *Asplenium ensiforme* Wall. ex Hook. & Grev., *Asplenium erectum* Bory ex Willd., *Asplenium excisum* C.Presl., *Asplenium exiguum* Bedd. Subsp. *exiguum*., *Asplenium exiguum* Bedd. Subsp. *lushanense* (C.Chr.) Fraser-Jenk., *Asplenium exiguum* Bedd. Subsp. *yunnanense* (Franch.) Fraser-Jenk., *Asplenium eylesii* Sim. *Asplenium falcatum* Lam., *Asplenium finlaysonianum* Hook. *Asplenium formosum* Willd. *Asplenium grevillei* Wall. ex Hook. & Grev. *Asplenium griffithianum* Hook. *Asplenium holosorum* Christ., *Asplenium hondoense* N. Murak. & Hatan., *Asplenium inaequilaterale* Bory ex Willd., *Asplenium khullarii* Reichst. & Rasbach ex Fraser-Jenk., *Asplenium laciniatum* D.Don, subsp. *laciniatum*., *Asplenium laciniatum* D.Don, Subsp. *fraser-jenkinsii* Reichst. ex Pangtey & Khullar., *Asplenium laciniatum* D.Don, Subsp. *kukkonenii* (Viane & Reichst.) Fraser-Jenk., *Asplenium laciniatum* D.Don, Subsp. *tenuicaule* (Hayata) Fraser-Jenk., *Asplenium lacinioides* Fraser-Jenk., *Asplenium longissimum* Blume., *Asplenium musifolium* Mett., *Asplenium mysorensis* Roth. *Asplenium nesii* Christ., *Asplenium nidoides* Fraser-Jenk., *Asplenium nidus* L., *Asplenium nitidum* Sw., *Asplenium normale* D.Don, *Asplenium obscurum* Blume., *Asplenium obliquissimum* (Hayata) Sugim. & Sa.Kurata., *Asplenium paucivenosum* (Ching) Bir., *Asplenium paucivenosum* (Ching) Bir., *Asplenium pellucidum* Lam., *Asplenium phyllitidis* D.Don, *Asplenium prolongatum* Hook., *Asplenium punjabense* Bir, Fraser-Jenk. & Lovis., *Asplenium rockii* C.Chr., *Asplenium ruta-muraria* L., *Asplenium sarelii* Hook. subsp. *pekinense* (Hance) Fraser-Jenkins., *Asplenium scalare* Rosenst., *Asplenium septentrionale* (L.) Hoffm. Subsp. *septentrionale*., *Asplenium septentrionale* (L.) Hoffm., *Asplenium caucasicum* Fraser-Jenkins & Lovis., *Asplenium serricula* Fée, *Mém. Fam. Asplenium shimurae* (H.Itô) Nakaike., *Asplenium sikkimbirii* Fraser-Jenk. *Asplenium simile* Blume., *Asplenium simonsianum* Hook., *Asplenium sublaserpitiifolium* Ching., *Asplenium tenerum* G.Forst., *Asplenium tenuifolium* D.Don, *Asplenium thunbergii* Kunze., *Asplenium trapeziforme* Roxb., *Asplenium trapezoideum* Ching. *Asplenium trichomanes* L. Subsp. *trichomanes*., *Asplenium trichomanes* L. Subsp. *humistratum* (Ching) Fraser-Jenk., *Asplenium trichomanes* L. Subsp. *quadrivalens* D.E.Mey., *Asplenium viride* Huds., *Asplenium yoshinagae* Makino, Subsp. *yoshinagae*., *Asplenium yoshinagae* Makino, Subsp. *austroindicum* Fraser-Jenk., *Asplenium yoshinagae* Makino, Phan. *Pterid. Jap. Icon. 1: t. 64. 1900.* Subsp. *indicum* (Sledge) Fraser-Jenk., *Asplenium zenkerianum* Kunze.

Onocleanaceae

Onoclea intermedia (C.Chr.) M.Kato, *Onoclea orientalis* (Hook.) Hook., *Blechnum appendiculatum* Willd.

Woodsiaceae

Woodsia alpina (Bolton) Gray., *Woodsia andersonii* (Bedd.) Christ., *Woodsia cycloloba* Hand.-Mazz., *Woodsia elongata* Hook., *Woodsia glabella* R.Br. ex Richardson., *Woodsia hancockii* Baker., *Woodsia lanosa* Hook., *Woodsia rosthorniana* Diels.

Blechnaceae

Blechnum appendiculatum Willd., *Blechnum finlaysonianum* Wall. ex Hook. & Grev., *Blechnum melanocaulon* (Brack.) T.C. Chambers & P.A. Farrant subsp. *Melanocaulon*., *Blechnum melanocaulon* (Brack.) T.C. Chambers & P.A. Farrant subsp. *pallens* T.C.Chambers & P.A. Farrant., *Blechnum melanopus* Hook. *Blechnum occidentale* L., *Brainea insignis* (Hook.) J.Sm., **Doodia caudata* (Cav.) R.Br., *Doodia dives* Kunze., *Stenochlaena palustris* (Burm.f.) Bedd., *Woodwardia unigemmata* (Makino) Nakai.

Project 3: Conservation through Micropropagation of Endemic and Threatened Pteridophytes from Central Western Ghats of Karnataka

Executing Officials: A. Benniamin, Scientist-F, Mr. Kaushik Sarkar, Botanical Assistant, Mr. Rajeshwar Dayal, Botanical Assistant

Background: The Pteridophytes being an important part of the flora of a region form the next important part after the angiosperms. There are a large number of indigenous species of Pteridophytes which a considerable percentage is rare and threatened. Due to over-exploitation of natural resources and large-scale land transformations, the pressure on the threatened and endangered species has increased manifolds and hence, they may face the brunt of extinction in the coming times. This group of plants faces serious threats to its survival due to climate change, increased demand for natural resources, invasive species, land for agriculture and so on. Plant tissue culture has emerged as a powerful tool with the potential not only for rapid multiplication of plant species but also for conservation of rare and endangered ones. In the cases of ferns also, the best method of conserving the species is by *in vitro* tissue culture or spore culture method. Application of tissue culture methods not only can increase the sporophyte production but also can provide useful insights into fern biology. It should be done properly by studying the reproductive biology of the risky species in detail. Otherwise, all the conservation efforts may fail. Thus, for the threatened plants with intrinsic risky factors, *in situ* conservation may not be of successful one and they may need careful *ex situ* conservation by adopting suitable biotechnological methods. Based on the above reasons with several other reasons like medicinal importance and other intrinsic factors such as erect rhizome, dimorphic fronds and less viable yellowish green spores etc., the above endangered Central Western Ghats ferns have been selected for the present study, particularly for *ex situ* conservation. Therefore, a conservative biotechnological programme on Threatened species as proposed in practically and will hopefully provide new information in the rehabilitation of endangered taxa of the Western Ghats. In the present study both *in vitro* spore and tissue culture will be attempted to conserve Endemic, Threatened and economic value ferns species. Reintroduction of the plants so multiplied through both spore and tissue culture in selected forest habitats, hitherto untested in our cent will also be attempted.

Area & Locality: Central Western Ghats of Karnataka

Objectives:

1. Collection of spores, croziers (young coiled fronds) and establishment of cultures *in vitro*.
2. Multiplication through fragmentation of gametophytes and regeneration of plants from fragments of homogenous tissue or prothalli.
3. Comparative study of the influence of growth regulators on gametophyte sporophyte development and multiplication of vegetative buds.
4. Assessment of the relative rates of sporophyte multiplication in different methods, media and procedural alterations.
5. Weaning of the *in vitro* raised sporelings / plantlets and transplanting them with high percent establishment in pots.
6. Restoration of the *in vitro* multiplied plants through re-introduction and re-establishment in selected forest habitats.
7. Distribution of the micro propagated plants to various Botanic gardens as part of *ex situ* conservation.

Achievements:

Two field tour was undertaken to the Central Western Ghats of Karnataka:

- **Tour 1: Pushpagiri Wildlife Sanctuary from 17th September to 21st September 2024, during the survey collected 22 species viz.** *Selaginella delicatula* (Desv.) Alston, *Hymenophyllum gardeneri* Bosch, *Pellaea boivinii* Hook., *Cyathea nilgirensis* Holttum, *Hemionitis arifolia* (Burm.f.) T.Moore, *Microsorium membranaceum* (D.Don) Ching, *Selliguea oxyloba* (Wall. ex Kunze) Fraser-Jenk., *Elaphoglossum beddomei* Sledge, *Leptochilus axillaris* (Cav.) Kaulf., *Trichomanes* sp., *Trichomanes* sp., *Hymenophyllum gardeneri* Bosch, *Selaginella indica* Tryon, *Bolbitis aspleniifolia* (Bory) K.Iwats., *Oreogrammitis pilifera* (Ravi & J. Joseph) Parris, *Asplenium yoshinagae* subsp. *indicum* (Sledge) Fraser-Jenk., *Adiantum latifolium* Lam., *Bolbitis semicordata* (Baker) Ching, *Trichomanes bimarginatum* (Bosch) Bosch, *Tectaria coadunata* (J.Sm.) C.Chr., *Leptochilus decurrens* Blume, *Pteris cretica* L.
- **Tour 2: Biligiri Rangaswamy Temple (BRT) Tiger Reserve, Talakaveri Wildlife Sanctuary from 7th October to 19th October 2024, during the survey collected 84 species viz.** *Microsorium punctatum* (L.) Copel., *Thelypteris parasitica* (L.) Tardieu, *Selaginella delicatula* (Desv.) Alston, *Drynaria quercifolia* (L.) J.Sm., *Adiantum concinnum* Humb. & Bonpl. ex Willd., *Pyrrosia porosa* (C.Presl) Hovenkamp, *Lepisorus nudus* (Hook.) Ching, *Adiantum philippense* L., *Hemionitis bicolor* (Roxb.) Christenh., *Dryopteris cochleata* (D.Don) C.Chr., *Bolbitis aspleniifolia* (Bory) K.Iwats., *Leucostegia immersa* C.Presl, *Hymenophyllum* sp., *Athyrium* sp., *Davallodes pulchra* (D.Don) M.Kato & Tsutsumi, *Pteris blumeana* J.Agardh, *Bolbitis semicordata* (Baker) Ching, *Tectaria coadunata* (J.Sm.) C.Chr., *Bosmania membranacea* (D.Don) Testo, *Pteris argyraea* T. Moore, *Angiopteris helferiana* Presl., *Gymnosphaera gigantea* (Wall. ex Hook.) S.Y.Dong, *Alsophila nilgirensis* (Holttum) R.M.Tryon, *Osmunda regalis* L., *Lycopodiella cernua* (L.) Pic.Serm., *Diplazium* sp., *Nephrolepis* sp., *Dicranopteris linearis* (Burm.f.) Underw., *Selaginella* sp., *Odontosoria chinensis* (L.) J.Sm., *Dryopteris cochleata* (D.Don) C.Chr., *Selaginella* sp., *Thelypteris* sp., *Loxogramme parallela* Copel., *Leptochilus axillaris* (Cav.) Kaulf., *Hemionitis concolor* (Langsd. & Fisch.) Christenh., *Asplenium* sp., *Pyrrosia porosa* (C.Presl) Hovenkamp, *Lepisorus nudus* (Hook.) Ching, *Bosmania membranacea* (D.Don) Testo, *Adiantum concinnum* Humb. & Bonpl. ex

Willd., *Microlepia speluncae* (L.) T.Moore, *Asplenium yoshinagae* Makino, *Arachniodes sledgei* Fraser-Jenk., *Asplenium polyodon* G.Forst., *Pteris arisanensis* Tagawa, *Bolbitis semicordata* (Baker) Ching, *Bolbitis* sp., *Leptochilus decurrens* Blume, *Dryopteris hirtipes* (Blume) Kuntze, *Angiopteris helferiana* C.Presl, *Diplazium* sp., *Huperzia phyllantha* (Hook. & Arn.) Holub, *Lepisorus contortus* (Christ) Ching, *Adiantum* sp., *Haplopteris elongata* (Sw.) E.H.Crane, *Diplazium brachylobum* (Sledge) Manickam & Irudayaraj, *Leptochilus decurrens* Blume, *Diplazium esculentum* (Retz.) Sw., *Asplenium zenkerianum* Kunze, *Antrophyum plantagineum* Kaulf., *Bolbitis aspleniifolia* (Bory) K.Iwats., *Cyrtomium micropterum* (Kunze) Ching, *Botrychium daucifolium* Wall. ex Hook. & Grev., *Polystichum harpophyllum* (Zenker ex Kunze) Sledge, *Bolbitis semicordata* (Baker) Ching, *Asplenium inaequilaterale* Willd., *Nephrolepis brownii* (Desv.) Hovenkamp & Miyam., *Leptochilus lanceolatus* Fée, *Asplenium yoshinagae* subsp. *indicum* (Sledge) Fraser-Jenk., *Pteris venusta* Kunze, *Hymenophyllum* sp., *Trichomanes* sp., *Selaginella* sp., *Hemionitis arifolia* (Burm.f.) T.Moore.

- During the present study, spores of the following fern species were successfully collected: *Pellaea boivinii* Hook., *Cyrtomium micropterum* (Kunze), *Elaphoglossum beddomei* Sledge, *Cyathea nilgirensis* Holttum, *Lepisorus nudus* (Hook.) Ching, *Pyrrosia lanceolata* (L.) Farw., *Microsorium punctatum* (L.) Copel., and *Osmunda hilsenbergii* Grev. & Hook. The collected spores were inoculated on various culture media enriched with plant growth regulators (PGRs) to evaluate their germination potential under in vitro conditions. Among the eight species, the following five species viz. ***Elaphoglossum beddomei* Sledge, *Cyathea nilgirensis* Holttum, *Lepisorus nudus* (Hook.) Ching, *Pyrrosia lanceolata* (L.) Farw., *Microsorium punctatum* (L.) Copel.** exhibited successful germination.

Project 4: Bambusicolous Fungi of Goa

Executing Scientist (s): Dr. Rashmi Dubey, Scientist - F

Duration of the Project: April, 2020- extended upto September, 2024

Background: India is the second richest country in bamboo genetic resources after China and is likely to support an equally diverse mycota. But India's knowledge of bamboo fungi is still at the cataloguing stage. Bambusicolous fungi records are indexed, but the bamboo species hosting bambusicolous fungi are often not reported, secondly most bamboo species are in the wild and not domesticated for phytopathological scrutiny, and the complex lifestyle of bamboo species which encompasses fast growth, giant height, often growing in difficult terrain limits surveillance and impedes insights on bamboo pathology. Goa, with its varied geography from the Western Ghats to coastal plains, provides an ideal habitat for diverse Bambusicolous fungi. Therefore, this work was undertaken for a comprehensive understanding of complex of Bambusicolous Fungi of Goa.

Area & Locality: Goa is located on the Western coast of India, along the Arabian Sea and has an area of 3,702 sq km, occupying 0.11% of the geographical area of the country. The State lies between 14°53'N to 15°40' N latitude and 73°40' E to 74°21' E longitudes and is bordered by Maharashtra in the North & East and Karnataka in the South. Extensive surveys were conducted over a period of four-year from 2020 to 2024, in Goa. The study area is shown in figure along with collection points plotted using QGIS 3.14 'Pi' version. The studies covered all major geographical regions, including both core and buffer zones of Mollem National Park & Bhagwan Mahaveer Wildlife Sanctuary, Bondla Wildlife Sanctuary, Bhagwan Mahavir Wildlife Sanctuary, Cotigao Wildlife Sanctuary, Mhadei Wildlife Sanctuary, Netravali Wildlife Sanctuary and Dr. Salim Ali Bird Sanctuary. Additionally, other bamboo-growing areas, cultivation field and nurseries were also thoroughly explored and investigated during field tours.

Objectives:

1. To explore the diversity of bambusicolous fungi growing in Wild forests as well as in Cultivated fields of Goa state.
2. Morphological identification of the bambusicolous fungal species.
3. Isolation and molecular characterization of bambusicolous fungal species associated with different parts of Bamboo.
4. To evaluate the validity of bambusicolous fungal taxa and clarify their phylogenetic relationships by multigene sequencing.
5. To calculate the diversity of bambusicolous fungi in different bamboo growing areas of Goa
6. Cataloguing, preservation and maintenance of fungal germplasm.

Achievements: Final report of ARP project entitled “Bambusicolous Fungi of Goa” has been submitted to Director, Botanical Survey of India on 25.10.2024.

The study on “**Bambusicolous fungi of Goa**” during the period from 2020-24 provided a valuable insights into the taxonomy, diversity, and distribution of bambusicolous fungi and have yielded remarkable findings, uncovering a diverse and previously unexplored fungal community. The research highlighted the discovery of numerous new species and extended the known range of several existing ones, showcasing the rich and unique fungal biodiversity associated with bamboo in this tropical habitat like Goa. Extensive surveys were conducted over a four-year period from 2020 to 2024, with collection points mapped using QGIS 3.14 ‘Pi’ version. The study covered all major geographical regions of Goa, including both core and buffer zones of Mollem National Park & Bhagwan Mahaveer Wildlife Sanctuary, Bondla Wildlife Sanctuary, Cotigao Wildlife Sanctuary, Mhadei Wildlife Sanctuary, Netravali Wildlife Sanctuary, and Dr. Salim Ali Bird Sanctuary. Additionally, other bamboo-growing areas, cultivation fields, and nurseries were thoroughly explored and investigated during field tours. In the laboratory, fungal isolates were identified based on their morphological characteristics, and molecular phylogeny was performed for some selected species.

The comprehensive survey collected over 500 infected samples, resulting in the identification of 487 fungal isolates belonging to 209 species under 124 genera, which were further classified under 67 taxonomic ranks. Among the 209 total fungal species, 11 species were particularly prevalent, accounting for approximately 5% of all identified species.

The study highlighted the dominance of Pezizomycotina, with 33 species, and *Apiospora* as the most prevalent genus, followed by *Distoseptispora*. Among the species, *Apiospora pusillisperma* was the most dominant, with 26 isolates, followed by *Stanjehughesia jiangxiensis* (21) and *Distoseptispora dehongensis* (17).

Above and beyond, **Goa has been identified as the type locality for the discovery of 15 new fungal species** In addition to the discovery of new species, **the study also contributed 56 new records of fungi, which** were recovered from 153 isolates. Approximately 8% of the isolates represented new species, while around 31% were identified as new records. Combined, this means that about 40% of the isolates were either newly discovered species or documented as new records, which is indicating a substantial contribution to the regional and global fungal inventory.

Bambusaria bambusae, *Endomelanconiopsis endophytic*, *Xenomyrothecium tongaense* emerged as new record to Goa. Around 150 fungal cultures were preserved on Potato Dextrose Agar, in mycolab at BSI, WRC, Pune.

The study on fungal diversity across different regions in Goa highlights significant variation in species richness and diversity indices. A total of 491 fungal isolates were collected from Goa, with Bhagwan Mahaveer (Mollem) showing the highest number of isolates (160), while Salim Ali had the lowest, with 17 isolates. Mhadei had the highest species richness, with 79 species, compared to Salim Ali, which had the lowest species richness with 16 species. Among different eco-regions of Goa, North Western Ghats Montane Rain Forests (NWG-MRF) displayed the highest number of isolates (301), whereas the Malabar Coast Moist Forests (MCMF) had the lowest number of isolates with 46. NWG-MRF recorded the highest species richness with 144 species, while the MCMF showed the least with 36 species.

It was concluded that this extensive research has significantly enriched the understanding of fungal diversity in the region and underscored the Western Ghats as a biodiversity hotspot. This study not only fills a gap in the existing literature on Goa's fungal diversity but also sets a foundation for future research to explore and conserve the unique fungi associated with bamboo. The findings underscore the importance of targeted ecological studies in revealing hidden biodiversity and contribute to a broader understanding of fungal communities within tropical ecosystems.

Project 5: Morpho-Molecular Systematics and Bio-potency of Terrestrial Microfungi of Bhagwan Mahavir (Mollem) National Park, Goa.

Executing Officials: Dr. Rashmi Dubey, Scientist -F & Mr. Amit D. Pandey, Botanical Asst.

Duration of the Project: October 2024–2027

Background: The current estimated number of fungal species is between 2.2. to 3.8 million (Hawksworth & Lücking, 2017), of which around 1,55,000 fungal species are known (less than 5–7.5% known) thus, as a result, between 92.5% and 95% of all fungal species remain unknown. As a part of its Vision 2047, the primary objective of BSI to fully document plant, algal and fungal wealth of the India by extensive exploration of protected areas of the country. Protected areas of country, particularly those lying with the biodiversity hotspots, provide favorable conditions for proliferation of myriad fungi. There are several biodiversity rich places in Western Ghats of India. Bhagwan Mahavir (Mollem) National Park is one of these protected areas in Goa and offers an ideal niche for the occurrence of diversified mycoflora and fauna. No work has been undertaken in Indian subcontinent on molecular analysis, phylogenetic affinities and ecology between different morphs of microfungi fungi of Western Ghats. Thus, this is the high time to survey, collect, conserve, identifies and explore the microfungi of a protected areas of Western Ghats. There is also necessity to conserve the fungal germplasm ex-situ for future basic and applied research having potential industrial applications. All this parameters attracted the attention of the scientist to undertake a novel work on morpho molecular syytematics of Bhagwan Mahavir (Molem) National Park with a view to bring out a holistic account of microfungi of the national park along with applied research having potential industrial applications which will be a first comprehensive study of this group of fungi in a Western Ghats of India.

Area & Locality: Bhagwan Mahavir (Mollem) National Park lies on the western escarpment of Western Ghats in the Sanguem Taluka of Goa between 15°14'09.82"–15°24' 34.3" N latitude and 74°13'20.6"–74°20'02.92" E longitude. It is the only National Park in Goa, which forms the core area of larger Bhagwan Mahavir Wildlife Sanctuary and is spreading over a total area of 107 sq km. Broadly, the vegetation of the national park can be classified into moist deciduous forests confined to areas at lower elevations on the plains of Goa and semi-evergreen to evergreen forests along upper elevations of the Ghats. The evergreen forests are mainly seen at higher altitudes and along the river banks. The forest canopy is almost closed and the availability of grass is very limited.

Objectives:

1. Survey and documentation of microfungi from different terrestrial ecological niche of the Bhagwan Mahavir (Molem) National Park, Goa.
2. Morphological examination of terrestrial micro fungal specimens supported by multigene phylogenies to better infer their phylogenetic relationships, resolve species complexity and to evaluate the validity of fungal taxa.
3. Analyzing the ecological aspects of microfungal diversity of the National Park using appropriate statistical modeling.
4. Biopotency test of some selected microfungi and their application in agricultural waste management.
5. Cataloging, preservation and strengthening of fungal germplasm to serve as repository of fungal wealth of the country with potential for interesting industrial applications.
6. To prepare an inventory of microfungi, virtual herbarium for ready references.

Achievements:

A field tour was conducted to Goa from January 26 to February 1, 2025, covering various areas within the Bhagwan Mahavir National Park, including Nandaran Beat, Collem Beat 1, Collem Beat 2, Mollem village, and the Dudhsagar area. The total area surveyed was approximately 90 sq. km. During the tour, over 300 samples were collected, each georeferenced using GPS. Around 350 photographs were taken to document the field conditions and specimens. The collection comprised various plant parts such as dead stems, fallen leaves, fresh leaves, and leaf sheaths. 18 selected fungi were cultured on PDA media to facilitate accurate identification and DNA sequencing was carried out for 06 samples. Processing of 17 black mildew samples was conducted by nail polish techniques. A total of 89 fungal isolates were identified, which includes litter and Follicolous Fungi.

Project: Flora of Goa

Executing Official: Dr. Prashant K. Pusalkar, Scientist-F

Duration of the Project: 2024–2027

Background: A detailed descriptive flora of Goa state is presently not available, and the available floristic data of the state urgently needs to be compiled for early completion of flora of the state as a part of state flora series.

Area & Locality: Goa state

Objectives:

The documentation of floristic diversity (descriptive account) of Goa state to prepare consolidated 'Flora of Goa'.

Achievements:

- Species descriptions completed: 516;
- Genus descriptions completed: 129;
- Herbarium study & Data Record: Completed herbarium specimen study, identity confirmation and data record for 516 species;
- Undertaken one floristic survey tour [Q3] to North Goa and collected 213 collection numbers;
- Completed data documentation of threatened and endemic trees (of India) in Goa state; Attended to literature study and collected 213 references on flora of Goa.



Impatiens pulcherrima Dalzell



Terminalia paniculata B.Heyne ex Roth

Project: Flora of India, Volume 6 [Fabaceae Part-I] and Volume 7 [Fabaceae Part-II]

Executing Officials: Dr. Prashant K. Pusalkar, Scientist-F (in association with Dr. M. Sanjappa)

Duration of the Project: 2021–2025

Background: The documentation and publication of National Flora of India.

Objectives:

Compilation, updation, completion and editing of Flora of India Volume 6 and Volume 7.

Achievements:

- **Flora of India, Volume 6** [Fabaceae Part-I: Subfamily Cercidoideae, Subfamily Detarioideae, Subfamily Dialioideae, Subfamily Caesalpinioideae (Caesalpinioids & Mimosoids) and Subfamily Papilionoideae (Genistoids)]: Completed. **Volume 6 is published by BSI in 2024;** (2). Discovered one genus (*Kanjilalia* Sanjappa & Pusalkar), resurrected one genus (*Cinclidocarpus* Zoll. & Moritzi) with new combinations and redelimited two genera redefining endemism.
- **Flora of India, Volume 7:** (1) Attended to updation and completion (including nomenclature; description writing or updation; literature reference additions; phenology, habitats and distribution updation) of taxonomic treatment for 380 species under 10 tribes; (ii) Prepared keys to the genera for 7 tribes and keys to the species for 82 genera; (iii). Prepared illustrations and/or photo-plates for 137 species; (iii). Updated genus descriptions for 56 genera; (iv). The manuscript is under checking and editing.



Astragalus munroi Benth. ex Bunge



Eleiotis rottleri Wight & Arn.

FLORA OF INDIA PROJECT

As approved by the RAMC during the last meeting, the editorial committee for completion of Flora of India volumes has been set up with following members.

1. Dr. A. A. Mao
2. Dr. S. S. Dash
3. Dr. J. Jayanthi
4. Dr. J.S. Jalal
5. Dr. D. K. Agrawala
6. Dr. U.L. Tiwari
7. Dr. C. P. Vivek
8. Dr. Gopal Krishna

The Flora of India Programme is almost completed with the following 15 volumes being published during this time.

Flora of India, Volume 06 [Fabaceae (Leguminosae) Part-I]

Flora of India, Volume 08 [Rosaceae–Neuradaceae]

Flora of India, Volume 11 [Cactaceae–Apiaceae]

Flora of India, Volume 14 [Rubiaceae–Morinaceae]

Flora of India, Volume 15 [Stylidiaceae-Primulaceae]

Flora of India, Volume 16 [Myrsinaceae–Apocynaceae]

Flora of India, Volume 19 [Scrophulariaceae–Lentibulariaceae]

Flora of India, Volume 20 [Gesneriaceae-Acanthaceae]

Flora of India, Volume 21 [Phrymaceae–Plantaginaceae]

Flora of India, Volume 22 [Nyctaginaceae–Elaeagnaceae]

Flora of India, Volume 27 [Zingiberaceae–Smilacaceae]

Flora of India, Volume 28 [Typhaceae–Eriocaulaceae]

Flora of India, Volume 30 [Poaceae (Gramineae) Subfamily Bambusoideae]

Flora of India, Volume 31 [Poaceae]

Flora of India, Volume 32 [Poaceae]

However, Flora of India Volumes 7, 10, 18, 25, 26, 29 is at the final stage of editing.

NEW DISCOVERIES

NEW TO SCIENCE**ANGIOSPERM****New Genus**

1. *Kanjilalia* Sanjappa & Pusalkar

New Species

1. *Aeschynanthus chayangtajoensis* Chowlu, A. Shenoy & A. Ray
2. *Aeschynanthus maoi* Debta & A. Shenoy
3. *Boesenbergia ashiohi* Suparna, Sameer Patil & V. Deepu
4. *Boesenbergia kalakadensis* Sarav. & Kalam.
5. *Crinum andhricum* Rasingam, Susmitha, Ranjana, Ranjithkumar & Parthiban
6. *Crotalaria andamanica* F. Saleem, L.J. Singh & A. K. Pandey
7. *Crotalaria nicobarica* F. Saleem, L.J. Singh, S. Subramaniam & A. K. Pandey
8. *Cyrtandromoea sudhansui* Chowlu, A. Shenoy & Nuraliev
9. *Dicliptera srisailamica* Rasingam, Nethaji & Susmitha
10. *Gastrodia lohitisensis* Chowlu, Tsering, A. Ray, A. N. Rao, S. S. Dash & Abing
11. *Gomphostemma andamanensis* L.J. Singh, M.C. Naik & G.A. Ekka
12. *Petrocosmea arunachalensis* Chowlu & A. Shenoy
13. *Phlogacanthus sudhansusekharii* R. Maity & S. Goswami
14. *Strobilanthes gigantea* Chowlu, R. Maity & S. S. Dash

New Sub-species

1. *Jasminum adenophyllum* subsp. *saparlaense* Rasingam, Ranjana & Susmitha

FUNGI**New Species**

1. *Amanita indovaginata* A. Ghosh, A. Kumar, D. Chakr. et Hembrom,
2. *Anthracoportus indohimalayanus* D. Chakr., Su. Datta & K. Das
3. *Boletus dhakuricus* K. Das, A. Ghosh & Su. Datta
4. *Harrya olivaceobrunnea* K. Das
5. *Leccinellum bothii* K. Das, A. Ghosh, Su. Datta, U. Singh & Vizzini
6. *Penzigomyces indicus* Rashmi Dubey & S. Jash
7. *Phylloporus himalayanus* K. Das, Su. Datta & A. Ghosh
8. *Phylloporus smithii* K. Das, Su. Datta, U. Singh & A. Ghosh
9. *Porphyrellus uttarakhandae* K. Das, Su. Datta & A. Ghosh
10. *Retiboletus pseudoater* K. Das, A. Ghosh, Su. Datta & Vizzini
11. *Russula deodarae* D. Chakr. & A. Ghosh

12. *Russula Rajmahalensis* A. Ghosh, Hembrom & D. Chakr.
13. *Singerocybe alboinfundibuliformis* (Seok, Yang S.Kim, K.M. Park, W.G. Kim, K.H. Yoo & I.C. Park) Zhu L. Yang, J. Qin & Har. Takah.)
14. *Sutorius apleurocystidiatus* K. Das, Su. Datta, A. Ghosh & Vizzini
15. *Thaxterogaster thindii* A. Bose & D. Chakr
16. *Xiuguo Zhangia macrospora* Rashmi Dubey & Jash

PTERIDOPHYTES

New Species

1. *Dryopteris dibangensis* (Dryopteridaceae)

NEW DISTRIBUTIONAL RECORDS TO INDIA

ANGIOSPERM

1. *Erythranthe szechuanensis* (Y.Y.Pai) G.L.Nesom
2. *Globba rahmanii* Yusuf
3. *Hodgsonia tsaii* J.Y.Shen, X.D.Ma, W.G.Wang & B.Pan bis
4. *Loxostigma puhoatense* N.D. Do & al.
5. *Mazus motuoensis* W.B.Ju, Bo Xu bis & X.F.Gao

FUNGI

1. *Aureoboletus miniatoaurantiacus* (C.S. Bi & Loh) Ming Zhang, N.K. Zeng & T.H. Li
2. *Butyriboletus pseudospeciosus* Kuan Zhao & Zhu L. Yang
3. *Lactarius hatsudake* Nabuj. Tanaka
4. *Leccinellum sinoaurantiacum* (M. Zang & R.H. Petersen) Yan C. Li & Zhu L. Yang
5. *Memnoniella longistipitata* D.W. Li, Chin S. Yang, Vesper & Haugland
6. *Phlegmacium balteatocumatile* (Rob. Henry ex P.D. Orton) Niskanen & Liimat.
7. *Pulveroboletus reticulopileus* M. Zang & R.H. Petersen
8. *Scleroderma yunnanense* Y. Wang
9. *Singerocybe alboinfundibuliformis* (S.J. Seok, Yang S. Kim, K.M. Park, W.G. Kim, K.H. Yoo & I.C. Park) Zhu L. Yang, J. Qin & Har. Takah.
10. *Tricholoma olivaceum* Reschke, Popa, Zhu L. Yang & G. Kost
11. *Xerocomus rugosellus* (W.F. Chiu) F.L. Tai

EX-SITU CONSERVATION

Botanical Survey of India, being a premier organization under Ministry of Environment, Forest and Climate Change maintains the custodianship of 11 botanic gardens spread over the different geographical regions of India. Through these gardens BSI promotes and nurtures the practice of *ex-situ* conservation of different Endemic, Threatened and Economically important plants which require conservation. All the gardens under BSI have been precisely designed for collection, introduction, multiplication and maintenance of germplasms of orchids, bamboos, medicinal plants, palms, ferns, legumes, wild edible plants, insectivorous plants, gymnosperms and EET plants. Since their inception, all these gardens are engaged in delivering meticulous analysis and experimentation in the field of ex-situ conservation, biodiversity conservation, education and awareness with the broader objective to safeguard the plant wealth of the country.

The Botanic Gardens under the control of Botanical Survey of India are as follows:

Sl. No.	Name of Garden	Regional Centre jurisdiction
1	AJC Bose Indian Botanic Garden, Howrah	Howrah
2	Andaman & Nicobar Regional Centre, BSI, Experimental Garden, Dhanikhari	Port Blair
3	Arid Zone Regional Centre, Jodhpur: Experimental Garden, Jodhpur	Jodhpur
4	Arunachal Pradesh Regional Centre, Itanagar: Experimental Garden, Sankie View	Itanagar
5	Botanic Garden of Indian Republic, Experimental Garden, Noida	Noida
6	Central Regional Centre, Experimental Garden, Allahabad	Allahabad
7	Eastern Regional Centre, Shillong: Experimental Garden, Barapani	Shillong
8	National Orchidarium and Experimental Garden, Yercaud	Coimbatore
9	National Gymnosperm collection cum Botanic Garden, Pauri	Dehradun
10	Sikkim Himalaya Regional Centre, Experimental Garden, Gangtok	Gangtok
11	Western Regional Centre, Pune, Experimental Garden, Mundhwa	Pune

AJC BOSE INDIAN BOTANIC GARDEN, BSI, HOWRAH

- a. Name of the garden (Regional Centre): **AJC Bose Indian Botanic Garden (AJCBIBG), BSI, Howrah.**
- b. Brief note on the conservation work done during the reference period:
 - Plants collected during field tours: **750 species in 10 tours, out of which 102 species are IUCN red listed and 110 species are endemic.**
 - Plant multiplication in Nursery-I & II: **more than 60 species were multiplied including 15 EET species.**
 - Mass Plantation: **more than 3200 saplings were planted in different occasions and also planted 3000 mangroves belonging to 7 different species in riverside.**
 - **Development of new sections:**
 - **Plant Taxonomic Section:** 143 beds for Dicots, 29 beds for Monocots, 3 beds for Gymnosperm, 5 beds for cryptogams have been prepared in division no. XXV.
 - **Plant Butterfly Section:** 50 butterfly attracting plant species at division no II were planted.

- **Tea Plant Section:** more than 1000 saplings of *Camellia sinensis* (L.) Kuntze were planted in division no. XXII.
 - **Expansion of Charaka Udyan:** Existing section has been extended with 300 beds of 150 species of medicinal plants.
 - **Conservation Hedge:** 120 species were conserved along the roadside in division I & II.
 - **Developme of plant avenues:** White Sanders (*Santalum album*), Branched palm (*Hyphaene thebaica*), Neem (*Azadirachta indica*), Agarwood (*Aquilaria malaccensis*), *Elaeocarpus serratus* avenues have been prepared.
 - **Floristic Survey and labelling of roadside plants from Division No. 1 To 25 has been done.**
- c. Details of the plants conserved
- Number of plant/ seeds/ saplings collected: **750 species**
 - Number of plant/ seeds/ saplings introduced: **750 species**
 - Name of the species that were newly introduced in the garden: **120 species**
 - Mortality Rate: **20%**

ANDAMAN AND NICOBAR REGIONAL CENTRE, PORT BLAIR

(Dhanikhari Experimental Garden cum Arboretum, Port Blair)

Brief note on the conservation work done during the reference period:

As part of *ex-situ* conservation of EET plants of Andaman and Nicobar Islands, several species are being collected and introduced in the Dhanikhari Experimental Garden cum Arboretum. Some of the plant species are: *Adenia heterophylla* (Blume) Koord., *Bouea oppositifolia* (Roxb.) Meisn, *Calotropis gigantea* (L.) W.T.Aiton, *Canthium glabrum* Blume, *Cascabela thevetia* (L.) Lippold., *Cleistanthus andamanicus* N. Balach. & al., *Cyathea albosetacea* (Bedd.) Copel., *Dipterocarpus alatus* Roxb. ex G. Don, *Dichapetalum gelonioides* (Roxb.) Engl. subsp. *andamanicum* (King) Leenh., *Guettarda andamanica* Goel & Mehrotra, *Hernandia nymphaeifolia* (C. Presl) Kubitzki, *Hybanthus enneaspermus* (L.) F. Muell., *Hygrophila ringens* (L.) R.Br. ex Steud., *Ipomoea mauritiana* Jacq., *Mangifera andamanica* King, *Memecylon balakrishnani* Lakshmin. & S.P.Mathew, *Musa indandamanensis* L.J. Singh, *Ophioglossum pendulum* L., *Psilotum complanatum* Sw., *Pterocymbium tinctorium* (Blanco) Merr., *Pyrostria laljii* M.C.Naik, Arriola & Bheem., *Rauvolfia sumatrana* Jack, *Rinorea bengalensis* (Wall.) Kuntze, *Solanum torvum* Sw., *Suregada multiflora* (A. Juss.) Baill., *Tacca leontopetaloides* (L.) Kuntze, *Victoria amazonica* (Poepp.) Klotzsch.

ARUNACHAL PRADESH REGIONAL CENTRE, ITANAGAR

- a. Name of the garden (Regional Centre) : APRC Botanic Garden, Itanagar
- b. Brief note on the conservation work done during the reference period.
- c. Details of the plants conserved
 - Number of plant/ seeds/ saplings collected - 25
 - Number of plant/ seeds/ saplings introduced - 25
 - Name of the species that were newly introduced in the garden -
 - Flowering/ Fruiting/ Mortality Rate

ARID ZONE REGIONAL CENTRE, JODHPUR

Brief note on the conservation work done during the reference period:

- During the period reported upon seeds of *Abrus precatorius*, *Abelmoschus spp.*, *Melhania spp.*, *Rivea spp.*, *Farsetia spp.*, *Blepharis spp.* and *Artiplex spp.* were collected during different tours. Several species like *Santalum album* L., *Guazuma ulmifolia* Lam., *Moringa concanensis* Nimmo ex Dalzell & A.Gibson, *Prosopis cineraria* (L.) Druce, *Gmelina arborea* Roxb. ex Sm., *Anogeissus sericea* var. *nummularia* King ex Duthie were multiplied in the garden through germination in polybags.
- **Introduction in garden:** Following species were introduced in the garden during the period reported upon: *Santalum album* L. (36), *Nyctanthes arbor-tristis* L. (06), *Syzygium cumini* (L.) Skeels (06), *Sapindus spp.* (01), *Cordia myxa* L. (07), *Butea monosperma* (Lam.) Kuntze (06), *Bombax ceiba* L. (01), *Punica granatum* L. (05), *Psidium guajava* L. (05), *Annona squamosa* L. (05), *Michelia champaca* L. (05), *Citrus limon* (L.) Osbeck (03), *Saraca asoca* (Roxb.) W.J.de Wilde (03).
- **Distribution of saplings:** Following species were distributed to various universities, colleges, govt. and non-govt. organisations, schools, etc. on request: *Albizia lebeck* (L.) Benth.(3), *Colophospermum mopane* (J.Kirk ex Benth.) J.Léonard (5), *Justicia adhatoda* L. (5), *Murraya koenigii* (L.) Spreng. (2), *Sapindus laurifolius* Vahl (5), *Azadirachta indica* A.Juss. (5), *Holoptelea integrifolia* (Roxb.) Planch. (2), *Moringa oleifera* Lam. (2) and *Senna alata* (L.) Roxb. (2). *Euphorbia jodhpurensis* Blatt. & Hallb. (08), *Lasiurus scindicus* Henrard (05), *Cymbopogon jwarancusa* (Jones) Schult. (05), *Cereus hexagonus* (L.) Mill. (03), *Caralluma edulis* (Edgew.) Benth. ex Hook.f. (04), *Caralluma fimbriata* Wall. (04), *Commiphora wightii* (05 cuttings), *Prosopis cineraria* (L.) Druce (03), *Opuntia ficus-indica* (L.) Mill. (05).

Details of the plants conserved

- Number of plant/ seeds/ saplings collected: Approx. 520 seeds of 13 species were collected.
- Number of plant/ seeds/ saplings introduced: 84 individuals of 13 species were introduced in garden.
- Name of the species that were newly introduced in the garden: *Sterculia foetida* L.
- Flowering/ Fruiting/ Mortality Rate:

Species	Flowering/Fruiting	Mortality Rate
1. <i>Santalum album</i> L.	March to April	24 %
2. <i>Nyctanthes arbor-tristis</i> L.	September to April.	40 %
3. <i>Syzygium cumini</i> (L.) Skeels	March to April.	65 %
4. <i>Sapindus spp.</i>	August-December	50 %
5. <i>Cordia myxa</i> L.	March and April	20 %
6. <i>Butea monosperma</i> (Lam.) Kuntze	February to April	30 %
7. <i>Bombax ceiba</i> L.	March and April	30 %
8. <i>Punica granatum</i> L.	Almost throughout the year	35 %
9. <i>Psidium guajava</i> L.	October - December	70 %
10. <i>Annona squamosa</i> L.	April - September	90 %
11. <i>Michelia champaca</i> L.	March - July	10 %
12. <i>Citrus limon</i> (L.) Osbeck	December - March	20 %
13. <i>Saraca asoca</i> (Roxb.) W.J.de Wilde	February to April	40 %

BOTANICAL GARDEN OF INDIAN REPUBLIC (BGIR), NOIDA

Brief note on the conservation work done during the reference period:

a. Name of the garden (Regional Centre): **Botanical Survey of India, Botanical Garden of Indian Republic (BGIR), Noida**

b. Brief note on the conservation work done during the reference period.

During the period of 2023-24, the Botanical Garden of Indian Republic (BGIR) in Noida has undertaken extensive ex-situ conservation initiatives focused on preserving rare, endangered, and threatened (RET) plant species, thereby contributing significantly to the preservation of India's rich botanical diversity. The garden's efforts began with the systematic collection of indigenous RET species from diverse ecological regions across India, including the Western Ghats, Eastern Ghats, North East India, and the Andaman & Nicobar Islands. These species were then cultivated in controlled environments designed to mimic their natural habitats, ensuring optimal growth conditions through careful soil preparation and ongoing monitoring. In addition to cultivation, BGIR has prioritized public engagement by organizing educational programs aimed at schools and local communities, which included guided tours, workshops, and distribution of informative materials to raise awareness about the importance of plant conservation. Collaborative efforts with other botanical institutions have further enriched these initiatives by facilitating knowledge exchange and enhancing genetic diversity among the conserved species. Notably, BGIR successfully propagated over 13690 plants of 43 species and ca 1 lac ornamental plants, reflecting not only a robust commitment to safeguarding India's botanical heritage but also a growing public interest in conservation efforts. These comprehensive strategies underscore BGIR's dedication to addressing ongoing environmental challenges while ensuring the sustainability of vital plant species for future generations.

c. Details of the plants conserved

- Number of plant/ seeds/ saplings collected - **764**
- Number of plant/ seeds/ saplings introduced - **764**
- Name of the species that were newly introduced in the garden – **Annexure IV**
- Flowering/ Fruiting/ Phenology- flowering-fruiting data of **150** taxa recorded

CENTRAL REGIONAL CENTRE, ALLAHABAD

Following species have been introduced in BSI, CRC, Allahabad Garden for MP.conservaion :

Dr. Sanjay Mishra, Scientist 'D' collected following plants for introduction in the garden from Madhav National Park.

Name of Plant	Family	Seedling/cutting/seed/rhizome	No.
<i>Curculigo orchioides</i> Gaertn. (Black Musli,	Hypoxidaceae	Rhizome	02
<i>Naringi crenulata</i> (Roxb.) D.H. Nicolson (Toothed-Leaf Limonia, Beli)	Rutaceae	Cutting	04
<i>Butea monosperma</i> (Lam.) Kuntze, (Palash)	Fabaceae	Seedling	04
<i>Balanitesaegyptiaca</i> (L.) Delile (Desert Date)	Zygophyllaceae	Fruit	05
<i>Gloriosa superba</i> L.	Colchicaceae	Tuber	02

Dr. O. N. Maurya, Scientist 'E' & Smt. Neelima A. M, Botanist collected and conserved following plants in the garden

Name of Plant	Family	Seedling/cutting/seed/rhizome	No.
<i>Commiphorawightii</i> (Arn.) Bhandari	Burseraceae	Sapling	01
<i>Dilleniaindica</i> L.	Dilleniaceae	Sapling	01
<i>Strychnospotatorum</i> L.f.	Loganiaceae	Sapling	02
<i>Bambusaventricosa</i> McClure	Poaceae	Sapling	01
<i>Pistia stratiotes</i> L.	Araceae	Sapling	10

Shri. B. Lakshmanudu, Senior Preservation Assistant multiplied following plants

1. *Commiphorawightii* (Arn.) Bhandari RET plant multiplied to 6 plants by grafting.
2. *Ficuskrishnae*C. DC.multiplied to 30 saplings by grafting and given to different institutions.

EASTERN REGIONAL CENTRE, SHILLONG

Brief note on the conservation work done during the reference period.

- a. Name of the garden (Regional Centre): Experimental Botanic Garden, BSI, ERC, Barapani.
- b. Brief note on the conservation work done during the reference period.

Conducted 1 field tour to Garo Hills, Meghalaya and 5 local field trips in Meghalaya for live plants collection during the period. 136 plant species including 24 EET species, 83 Medicinal/ Economically important species and 14 Ornamental species were collected and conserved in EBG, Barapani during the period. EET plant species viz. *Aerides multiflora* (4 nos.), *Aquilaria malaccensis* (5 nos.), *Begonia silletensis* (2 nos.), *Brainia insignis* (3 nos.), *Bulbophyllum careyanum* (14 nos.), *Cephalantheropsis obcordata* (4 nos.), *Coelogyne viscosa* (3 nos.), *Crepidium acuminatum* (2 nos.), *Dendrobium aphyllum* (3 nos.), *Dendrobium jenkinsii* (11 nos.), *Dendrobium transparens* (4 nos.), *Eria coronaria* (3 nos.), *Gymnosphaera gigantea* (3 nos.), *Ilex khasiana* (3 nos.), *Impatiens acuminata* (3 nos.), *Impatiens racemulosa* (3 nos.), *Mycaranthes floribunda* (4 nos.), *Nephelaphyllum cordifolium* (6 nos.), *Oberonia acaulis* (1 no.), *Pholidota articulata* (3 nos.), *Pholidota imbricata* (1 no.), *Pinalia acervata* (1 no.), *Rhynchostylis retusa* (8 nos.) and *Taxus wallichiana* (9 nos.).

- c. Details of the plants conserved

➤ Number of plant/ seeds/ saplings collected & introduced-

Sl. No.	Name of the species introduced	Number of plants introduced
1.	<i>Adenanthera pavonina</i>	2
2.	<i>Aerides multiflora</i>	4
3.	<i>Aesculus assamica</i>	3
4.	<i>Aeschynanthus sikkimensis</i>	8
5.	<i>Allamanda schottii</i>	3
6.	<i>Alpinia galanga</i>	4
7.	<i>Alpinia nigra</i>	4
8.	<i>Amomum dealbatum</i>	3
9.	<i>Anthurium</i> sp.	3
10.	<i>Amorphophallus bulbifer</i>	3
11.	<i>Aquilaria malaccensis</i>	5
12.	<i>Arachis pintoii</i>	5
13.	<i>Aralia armata</i>	1
14.	<i>Arisaema tortuosum</i>	3

15.	<i>Artocarpus chama</i>	4
16.	<i>Artocarpus lacucha</i>	4
17.	<i>Artocarpus heterophyllus</i>	2
18.	<i>Asplenium onopteris</i>	2
19.	<i>Azadirachta indica</i>	4
20.	<i>Baccaurea ramiflora</i>	3
21.	<i>Baccaurea</i> sp.	2
22.	<i>Bambusa tulda</i>	3
23.	<i>Bambusa pallida</i>	6
24.	<i>Bauhinia acuminata</i>	2
25.	<i>Bauhinia variegata</i>	3
26.	<i>Boesenbergia longiflora</i>	4
27.	<i>Begonia hatacoa</i>	3
28.	<i>Begonia roxburghii</i>	5
29.	<i>Begonia silletensis</i>	2
30.	<i>Begonia thomsonii</i>	4
31.	<i>Blechnum orientale</i>	3
32.	<i>Brainia insignis</i>	3
33.	<i>Bulbophyllum careyanum</i>	14
34.	<i>Carallia brachiata</i>	8
35.	<i>Caryota urens</i>	2
36.	<i>Cephalantheropsis obcordata</i>	3
37.	<i>Choerospondias axillaris</i>	2
38.	<i>Cinnamomum verum</i>	1
39.	<i>Cinnamomum zeylanicum</i>	2
40.	<i>Citrus maxima</i>	3
41.	<i>Clerodendrum colebrookeanum</i>	7
42.	<i>Clerodendrum indica</i>	3
43.	<i>Clitoria mariana</i>	1
44.	<i>Clematis</i> sp.	2
45.	<i>Codonantheropsis</i> sp.	2
46.	<i>Coelogyne viscosa</i>	3
47.	<i>Colocasia affinis</i>	5
48.	<i>Costus pictus</i>	2
49.	<i>Crepidium acuminatum</i>	2
50.	<i>Curculigo orchioides</i>	3
51.	<i>Curcuma angustifolia</i>	5
52.	<i>Curcuma caesia</i>	4
53.	<i>Curcuma longa</i>	8
54.	<i>Davallia trichomanoides</i>	3
55.	<i>Dendrobium aphyllum</i>	3
56.	<i>Dendrobium jenkinsii</i>	11
57.	<i>Dendrobium transparens</i>	4

58.	<i>Dillenia indica</i>	7
59.	<i>Dillenia pentagyna</i>	3
60.	<i>Dioscorea bulbifera</i>	3
61.	<i>Dioscorea pentaphylla</i>	3
62.	<i>Drynaria quercifolia</i>	2
63.	<i>Elaeocarpus floribundus</i>	2
64.	<i>Elettaria cardamomum</i>	4
65.	<i>Eria coronaria</i>	3
66.	<i>Etilingera linguiformis</i>	9
67.	<i>Euphorbia pulcherrima</i>	2
68.	<i>Ficus auriculata</i>	2
69.	<i>Ficus hirta</i>	3
70.	<i>Ficus hispida</i>	2
71.	<i>Garcinia morella</i>	2
72.	<i>Garcinia pedunculata</i>	1
73.	<i>Garcinia xanthochymus</i>	2
74.	<i>Gomphostemma mastersii</i>	1
75.	<i>Grevillea robusta</i>	2
76.	<i>Gymnosphaera gigantea</i>	3
77.	<i>Hedychium coronarium</i>	2
78.	<i>Hedychium ellipticum</i>	4
79.	<i>Hedychium stenopetalum</i>	2
80.	<i>Huperzia phlegmaria</i>	1
81.	<i>Ilex khasiana</i>	3
82.	<i>Impatiens acuminata</i>	3
83.	<i>Impatiens bracteata</i>	1
84.	<i>Impatiens laevigata</i>	1
85.	<i>Impatiens racemulosa</i>	3
86.	<i>Impatiens porrecta</i>	3
87.	<i>Ixora coccinea</i>	5
88.	<i>Kalanchoe pinnata</i>	3
89.	<i>Kaempferia rotunda</i>	4
90.	<i>Ligustrum robustum</i>	2
91.	<i>Litsea cubeba</i>	3
92.	<i>Lycopodium japonicum</i>	3
93.	<i>Lygodium flexuosum</i>	2
94.	<i>Microcos paniculata</i>	2
95.	<i>Musa sp.</i>	2
96.	<i>Musa sp.</i>	3
97.	<i>Mycaranthes floribunda</i>	4
98.	<i>Myrica esculenta</i>	3
99.	<i>Nephelaphyllum cordifolium</i>	6
100.	<i>Nymphaea nouchali</i>	3

101.	<i>Oberonia acaulis</i>	1
102.	<i>Oroxylum indicum</i>	3
103.	<i>Oxyspora paniculata</i>	2
104.	<i>Peliosanthes teta</i>	4
105.	<i>Peperomia polybotrya</i>	2
106.	<i>Phoebe lanceolata</i>	3
107.	<i>Phlogacanthus thyrsoiflorus</i>	3
108.	<i>Pholidota articulata</i>	3
109.	<i>Pholidota imbricata</i>	1
110.	<i>Phyllanthus emblica</i>	4
111.	<i>Pinalia acervata</i>	1
112.	<i>Piper longum</i>	3
113.	<i>Piper mullesua</i>	4
114.	<i>Podocarpus neriifolius</i>	4
115.	<i>Polyalthia longifolia</i>	2
116.	<i>Prunus cerasoides</i>	7
117.	<i>Pteris biaurita</i>	3
118.	<i>Pyrrosia lanceolata</i>	15
119.	<i>Pyrrosia nummularifolia</i>	1
120.	<i>Rauvolfia serpentina</i>	3
121.	<i>Rhaphidophora decursiva</i>	1
122.	<i>Rhynchostylis retusa</i>	8
123.	<i>Rhynchotechum ellipticum</i>	2
124.	<i>Rothea serrata</i>	6
125.	<i>Shorea robusta</i>	2
126.	<i>Strobilanthes auriculata</i>	2
127.	<i>Syzygium cumini</i>	2
128.	<i>Syzygium jambos</i>	5
129.	<i>Syzygium tetragonum</i>	3
130.	<i>Tadehagi triquetrum</i>	2
131.	<i>Tabernaemontana divaricata</i>	3
132.	<i>Thunbergia grandiflora</i>	2
133.	<i>Taxus wallichiana</i>	9
134.	<i>Tupistra</i> sp.	2
135.	<i>Zingiber rubens</i>	7
136.	<i>Zingiber zerumbet</i>	9

- Name of the species that were newly introduced in the garden-

The following 15 species viz. *Arachis pintoii*, *Amorphophallus bulbifer*, *Asplenium onopteris*, *Clitoria mariana*, *Davallia trichomanoides*, *Garcinia morella*, *Garcinia pedunculata*, *Gomphostemma mastersii*, *Huperzia phlegmaria*, *Microcos paniculata*, *Oxyspora paniculata*, *Peperomia polybotrya*, *Pyrrosia nummularifolia*, *Strobilanthes auriculata* and *Thunbergia grandiflora* were newly introduced in EBG, Barapani during the period.

- Flowering/Fruiting/ Mortality Rate-

Sl. No.	Name of the species introduced	No. of plants introduced	No. of plants survived	Survival rate	Mortality rate
1.	<i>Adenantha pavonina</i>	2	2	100%	0%
2.	<i>Aerides multiflora</i>	4	4	100%	0%
3.	<i>Aesculus assamica</i>	3	3	100%	0%
4.	<i>Aeschynanthus sikkimensis</i>	8	8	100%	0%
5.	<i>Allamanda schottii</i>	3	2	66.67%	33.33%
6.	<i>Alpinia galanga</i>	4	4	100%	0%
7.	<i>Alpinia nigra</i>	4	4	100%	0%
8.	<i>Amomum dealbatum</i>	3	3	100%	0%
9.	<i>Anthurium</i> sp.	3	3	100%	0%
10.	<i>Amorphophallus bulbifer</i>	3	3	100%	0%
11.	<i>Aquilaria malaccensis</i>	5	5	100%	0%
12.	<i>Arachis pintoii</i>	5	4	80%	20%
13.	<i>Aralia armata</i>	1	1	100%	0%
14.	<i>Arisaema tortuosum</i>	3	3	100%	0%
15.	<i>Artocarpus chama</i>	4	4	100%	0%
16.	<i>Artocarpus lacucha</i>	4	3	75%	25%
17.	<i>Artocarpus heterophyllus</i>	2	2	100%	0%
18.	<i>Asplenium onopteris</i>	2	2	100%	0%
19.	<i>Azadirachta indica</i>	4	3	75%	25%
20.	<i>Baccaurea ramiflora</i>	3	3	100%	0%
21.	<i>Baccaurea</i> sp.	2	2	100%	0%
22.	<i>Bambusa tulda</i>	3	3	100%	0%
23.	<i>Bambusa pallida</i>	6	5	83.33%	16.67%
24.	<i>Bauhinia acuminata</i>	2	2	100%	0%
25.	<i>Bauhinia variegata</i>	3	3	100%	0%
26.	<i>Boesenbergia longiflora</i>	4	4	100%	0%
27.	<i>Begonia hatacoa</i>	3	3	100%	0%
28.	<i>Begonia roxburghii</i>	5	5	100%	0%
29.	<i>Begonia silletensis</i>	2	2	100%	0%
30.	<i>Begonia thomsonii</i>	4	4	100%	0%
31.	<i>Blechnum orientale</i>	3	3	100%	0%
32.	<i>Brainia insignis</i>	3	3	100%	0%
33.	<i>Bulbophyllum careyanum</i>	14	14	100%	0%
34.	<i>Carallia brachiata</i>	8	7	87.50%	12.50%
35.	<i>Caryota urens</i>	2	2	100%	0%
36.	<i>Cephalantheropsis obcordata</i>	3	3	100%	0%
37.	<i>Choerospondias axillaris</i>	2	2	100%	0%
38.	<i>Cinnamomum verum</i>	1	1	100%	0%
39.	<i>Cinnamomum zeylanicum</i>	2	2	100%	0%
40.	<i>Citrus maxima</i>	3	3	100%	0%
41.	<i>Clerodendrum colebrookeanum</i>	7	6	85.71%	14.29%
42.	<i>Clerodendrum indica</i>	3	3	100%	0%
43.	<i>Clitoria mariana</i>	1	1	100%	0%

44.	<i>Clematis</i> sp.	2	2	100%	0%
45.	<i>Codonanthopsis</i> sp.	2	2	100%	0%
46.	<i>Coelogyne viscosa</i>	3	3	100%	0%
47.	<i>Colocasia affinis</i>	5	4	80%	20%
48.	<i>Costus pictus</i>	2	2	100%	0%
49.	<i>Crepidium acuminatum</i>	2	2	100%	0%
50.	<i>Curculigo orchiodes</i>	3	3	100%	0%
51.	<i>Curcuma angustifolia</i>	5	5	100%	0%
52.	<i>Curcuma caesia</i>	4	4	100%	0%
53.	<i>Curcuma longa</i>	8	7	87.50%	12.50%
54.	<i>Davallia trichomanoides</i>	3	3	100%	0%
55.	<i>Dendrobium aphyllum</i>	3	3	100%	0%
56.	<i>Dendrobium jenkinsii</i>	11	11	100%	0%
57.	<i>Dendrobium transparens</i>	4	4	100%	0%
58.	<i>Dillenia indica</i>	7	6	85.71%	14.29%
59.	<i>Dillenia pentagyna</i>	3	3	100%	0%
60.	<i>Dioscorea bulbifera</i>	3	3	100%	0%
61.	<i>Dioscorea pentaphylla</i>	3	3	100%	0%
62.	<i>Drynaria quercifolia</i>	2	2	100%	0%
63.	<i>Elaeocarpus floribundus</i>	2	2	100%	0%
64.	<i>Elettaria cardamomum</i>	4	4	100%	0%
65.	<i>Eria coronaria</i>	3	3	100%	0%
66.	<i>Etlingera linguiformis</i>	9	7	77.78%	22.22%
67.	<i>Euphorbia pulcherrima</i>	2	2	100%	0%
68.	<i>Ficus auriculata</i>	2	2	100%	0%
69.	<i>Ficus hirta</i>	3	3	100%	0%
70.	<i>Ficus hispida</i>	2	2	100%	0%
71.	<i>Garcinia morella</i>	2	2	100%	0%
72.	<i>Garcinia pedunculata</i>	1	1	100%	0%
73.	<i>Garcinia xanthochymus</i>	2	2	100%	0%
74.	<i>Gomphostemma mastersii</i>	1	1	100%	0%
75.	<i>Grevillea robusta</i>	2	2	100%	0%
76.	<i>Gymnosphaera gigantea</i>	3	3	100%	0%
77.	<i>Hedychium coronarium</i>	2	2	100%	0%
78.	<i>Hedychium ellipticum</i>	4	4	100%	0%
79.	<i>Hedychium stenopetalum</i>	2	2	100%	0%
80.	<i>Huperzia phlegmaria</i>	1	1	100%	0%
81.	<i>Ilex khasiana</i>	3	3	100%	0%
82.	<i>Impatiens acuminata</i>	3	2	66.67%	33.33%
83.	<i>Impatiens bracteata</i>	1	1	100%	0%
84.	<i>Impatiens laevigata</i>	1	1	100%	0%
85.	<i>Impatiens racemulosa</i>	3	3	100%	0%
86.	<i>Impatiens porrecta</i>	3	3	100%	0%
87.	<i>Ixora coccinea</i>	5	5	100%	0%
88.	<i>Kalanchoe pinnata</i>	3	3	100%	0%

89.	<i>Kaempferia rotunda</i>	4	4	100%	0%
90.	<i>Ligustrum robustum</i>	2	2	100%	0%
91.	<i>Litsea cubeba</i>	3	3	100%	0%
92.	<i>Lycopodium japonicum</i>	3	2	66.67%	33.33%
93.	<i>Lygodium flexuosum</i>	2	2	100%	0%
94.	<i>Microcos paniculata</i>	2	2	100%	0%
95.	<i>Musa</i> sp.	2	2	100%	0%
96.	<i>Musa</i> sp.	3	3	100%	0%
97.	<i>Mycaranthes floribunda</i>	4	4	100%	0%
98.	<i>Myrica esculenta</i>	3	3	100%	0%
99.	<i>Nephelaphyllum cordifolium</i>	6	6	100%	0%
100.	<i>Nymphaea nouchali</i>	3	3	100%	0%
101.	<i>Oberonia acaulis</i>	1	1	100%	0%
102.	<i>Oroxylum indicum</i>	3	3	100%	0%
103.	<i>Oxyspora paniculata</i>	2	2	100%	0%
104.	<i>Peliosanthes teta</i>	4	3	75%	25%
105.	<i>Peperomia polybotrya</i>	2	2	100%	0%
106.	<i>Phoebe lanceolata</i>	3	3	100%	0%
107.	<i>Phlogacanthus thyrsoiflorus</i>	3	3	100%	0%
108.	<i>Pholidota articulata</i>	3	3	100%	0%
109.	<i>Pholidota imbricata</i>	1	1	100%	0%
110.	<i>Phyllanthus emblica</i>	4	3	75%	25%
111.	<i>Pinalia acervata</i>	1	1	100%	0%
112.	<i>Piper longum</i>	3	3	100%	0%
113.	<i>Piper mullesua</i>	4	4	100%	0%
114.	<i>Podocarpus neriifolius</i>	4	4	100%	0%
115.	<i>Polyalthia longifolia</i>	2	2	100%	0%
116.	<i>Prunus cerasoides</i>	7	7	100%	0%
117.	<i>Pteris biaurita</i>	3	3	100%	0%
118.	<i>Pyrrosia lanceolata</i>	15	13	86.67%	13.33%
119.	<i>Pyrrosia nummularifolia</i>	1	1	100%	0%
120.	<i>Rauvolfia serpentina</i>	3	3	100%	0%
121.	<i>Rhaphidophora decursiva</i>	1	1	100%	0%
122.	<i>Rhynchosstylis retusa</i>	8	8	100%	0%
123.	<i>Rhynchotechum ellipticum</i>	2	2	100%	0%
124.	<i>Rothea serrata</i>	6	5	83.33%	16.67%
125.	<i>Shorea robusta</i>	2	2	100%	0%
126.	<i>Strobilanthes auriculata</i>	2	2	100%	0%
127.	<i>Syzygium cumini</i>	2	2	100%	0%
128.	<i>Syzygium jambos</i>	5	5	100%	0%
129.	<i>Syzygium tetragonum</i>	3	3	100%	0%
130.	<i>Tadehagi triquetrum</i>	2	2	100%	0%
131.	<i>Tabernaemontana divaricata</i>	3	2	66.67%	33.33%
132.	<i>Thunbergia grandiflora</i>	2	2	100%	0%
133.	<i>Taxus wallichiana</i>	9	9	100%	0%

134.	<i>Tupistra</i> sp.	2	2	100%	0%
135.	<i>Zingiber rubens</i>	7	7	100%	0%
136.	<i>Zingiber zerumbet</i>	9	8	88.89%	11.11%

NORTHERN REGIONAL CENTRE, DEHRADUN

Brief note on the conservation work done during the reference period:

The following project has been executed on the lines of *ex-situ* conservation

Title of the project: Maintenance and conservation of the selected endemic, threatened and economic plants of the garden of NRC, Dehradun.

Executing Officials: Dr. S.K. Singh, Scientist F; Dr. Puneet Kumar, Scientist-D; Dr. Harminder Singh, Bot. Asstt. & Shri. Subhasmit Bhattacharya, Bot. Asstt.

Duration of the Project: Ongoing

Background: Endangered and endemic plants are highly susceptible to environmental challenges and face a constant risk of extinction. To preserve these species, both in-situ (in their natural habitat) and ex-situ (outside their natural habitat) conservation methods are necessary. At the NRC garden, many threatened endemic and medicinal plant species are cultivated. The primary aim of this project is to enhance the garden with a variety of species and focus on the ex-situ conservation of threatened plants from the Himalayan region.

Area & Locality: Botanic Garden of Botanical Survey of India, Northern Regional Centre.

Objectives: Regular maintenance and conservation of the endemic threatened and economic plant species in the garden of NRC. Documentation of monthly data on flowering and fruiting.

Achievements: During the reporting period, developed the Palm and Cycas section where 24 species were introduced. In other sections, 135 additional species were introduced or kept for acclimatization. Among these were twelve threatened plants namely, *Aquilaria malaccensis* Lam., *Commiphora wightii* (Arn.) Bhandari, *Cycas orixensis* (Haines) Rita Singh & Khuraijam, *Cycas nayagarhensis* Rita Singh, P.Radha & Khuraijam, *Aloe trinervis* C.S.Purohit, Kulloli & Suresh Kumar, *Pterocarpus indicus* Willd, *Heritiera fomes* Banks, *Zamia furfuracea* L.f. ex Aiton, *Gustavia gracillima* Miers, *Aporosa cardiosperma* (Gaertn.) Merr., *Cycas pectinata* Buch.-Ham. *Bentinckia condapanna* Berry ex Roxb., *Chrysalidocarpus lutescens* H.Wendl. Additionally, 20 varieties of Hibiscus were brought in from the AJC Bose Indian Botanical Garden, Howrah. Under the initiative “Ek Ped Maa Ke Naam,” 50 tree species were planted near the Palm and Cycas section. Furthermore, 250 saplings of various tree species were raised from seeds. Seven species were provided to the AJC Bose Indian Botanical Garden, Howrah, and around 150 saplings were distributed to villagers and during events in schools. Additionally, monthly documentation recorded the flowering in 179 plant species and the fruiting in 152 plant species in the garden. While a few of the introduced or acclimatized species faced challenges in establishment, a commendable survival rate of 76.44% was achieved under prevailing conditions.

SIKKIM HIMALAYAN REGIONAL CENTRE, GANGTOK

Brief note on the conservation work done during the reference period:

201 saplings/propagules of 45 species including 18 taxa of Zingiberaceae, 04 species of *Impatiens* spp., 05 species of *Rhododendron* spp., 02 species of *Musa* spp., 1 species of *Ensete* spp. and other 15 species



Newly Developed Palm & Cycas Section and Matri Van



Aquilaria malaccensis Lam



Zamia furfuracea L.f. ex Aiton

under 14 genera were introduced in the EBG, BIS-SHRC in 2024-25 (Q1–Q3). The plants under ex-situ conservation includes endangered *Rhododendron niveum* Hook.f. [Ericaceae] & *Taxus wallichiana* Zucc. [Taxaceae] and endemic *Caulokaempferia sikkimensis* (King ex Baker) K.Larsen [Zingiberaceae] and *Impatiens bakthangensis* Chhetri, Sherpa & Gogoi [Balsaminaceae].

Details of the plants conserved

- Number of plant/ seeds/ saplings collected: 201 saplings/propagules
- Number of plant/ seeds/ saplings introduced: 201 saplings/propagules
- Name of the species that were newly introduced in the garden:

1.	<i>Alpinia</i> sp. [Zingiberaceae]
2.	<i>Begonia panchtharensis</i> S.Rajbh. [Begoniaceae]
3.	<i>Boesenbergia hamiltonii</i> Mood, S.Dey & L.M.Prince [Zingiberaceae]
4.	<i>Buddleja colvilei</i> Hook.f. [Buddlejaceae]
5.	<i>Caulokaempferia sikkimensis</i> (King ex Baker) K.Larsen [Zingiberaceae]
6.	<i>Decaisnea insignis</i> (Griff.) Hook.f. & Thomson [Lardizabalaceae]
7.	<i>Hypericum</i> sp. [Hypericaceae]
8.	<i>Impatiens scitula</i> Hook.f. [Balsaminaceae]
9.	<i>Musa rubra</i> Wall. ex Kurz [Musaceae]
10.	<i>Rhododendron baileyi</i> Balf.f. [Ericaceae]

- Flowering/ Fruiting/ Mortality Rate

Sl. No.	Species	Fl/Fr	No. of propagules	Surviving	Mortality Rate (%)
1.	<i>Alpinia</i> sp. [Zingiberaceae]		2	1	50
2.	<i>Amomum dealbatum</i> Roxb. [Zingiberaceae]		3	3	0
3.	<i>Boesenbergia hamiltonii</i> Mood, S.Dey & L.M.Prince [Zingiberaceae]		5	2	60
4.	<i>Caulokaempferia sikkimensis</i> (King ex Baker) K.Larsen [Zingiberaceae]		2	2	0
5.	<i>Cautleya gracilis</i> (Sm.) Dandy [Zingiberaceae]		11	10	9
6.	<i>Cautleya spicata</i> (Sm.) Baker [Zingiberaceae]		11	9	18
7.	<i>Curcuma aromatica</i> Salisb. [Zingiberaceae]		12	10	17
8.	<i>Globba clarkei</i> Baker [Zingiberaceae]		5	4	20
9.	<i>Globba racemosa</i> Sm. [Zingiberaceae]		3	1	67
10.	<i>Globba</i> sp. [Zingiberaceae]		2	2	0
11.	<i>Globba</i> sp. [Zingiberaceae]		2	2	0
12.	<i>Hedychium coccineum</i> Buch.-Ham. ex Sm. [Zingiberaceae]		2	2	0
13.	<i>Hedychium coronarium</i> J.Koenig [Zingiberaceae]		1	1	0
14.	<i>Hedychium ellipticum</i> Buch.-Ham. ex Sm. [Zingiberaceae]		18	17	5
15.	<i>Hedychium gracile</i> Roxb. [Zingiberaceae]		4	1	75
16.	<i>Hedychium spicatum</i> Sm. [Zingiberaceae]		5	5	0

17.	<i>Roscoea auriculata</i> K.Schum. [Zingiberaceae]	Fl.	6	6	0
18.	<i>Zingiber</i> sp. [Zingiberaceae]		2	2	0
19.	<i>Impatiens bakthangensis</i> Chhetri, Sherpa & Gogoi [Balsaminaceae]	Fl.	2	2	0
20.	<i>Impatiens pradhanii</i> H.Hara [Balsaminaceae]	Fl.	2	2	0
21.	<i>Impatiens scitula</i> Hook.f. [Balsaminaceae]	Fl.	6	5	17
22.	<i>Impatiens stenantha</i> Hook.f. [Balsaminaceae]	Fl.	4	4	0
23.	<i>Musa balbisiana</i> Colla [Musaceae]		2	2	0
24.	<i>Musa rubra</i> Wall. ex Kurz [Musaceae]		3	2	33
25.	<i>Ensete</i> sp. [Musaceae]		1	1	0
26.	<i>Rhododendron arboreum</i> Sm. [Ericaceae]		35	35	0
27.	<i>Rhododendron baileyi</i> Balf.f. [Ericaceae]		2	1	50
28.	<i>Rhododendron falconeri</i> Hook.f. [Ericaceae]		8	8	0
29.	<i>Rhododendron lepidotum</i> Wall. ex G.Don [Ericaceae]		2	1	50
30.	<i>Rhododendron niveum</i> Hook.f. [Ericaceae]		7	7	0
31.	<i>Arisaema griffithii</i> Schott [Araceae]		1	1	0
32.	<i>Begonia palmata</i> D.Don [Begoniaceae]		2	2	0
33.	<i>Begonia panchtharensis</i> S.Rajbh. [Begoniaceae]		1	1	0
34.	<i>Buddleja colvilei</i> Hook.f. [Buddlejaceae]		4	2	50
35.	<i>Cynoglossum zeylanicum</i> (Sw. ex Lehm.) Thunb. ex Brand [Boraginaceae]		5	5	0
36.	<i>Decaisnea insignis</i> (Griff.) Hook.f. & Thomson [Lardizabalaceae]		1	1	0
37.	<i>Dendrobium longicornu</i> Lindl. [Orchidaceae]		2	2	0
38.	<i>Didymocarpus aromaticus</i> D.Don [Gesneriaceae]		3	1	67
39.	<i>Cinnamomum cecidodaphne</i> Meisn. [Lauraceae]		3	3	0
40.	<i>Clerodendrum japonicum</i> (Thunb.) Sweet [Verbenaceae]		2	1	50
41.	<i>Hypericum</i> sp. [Hypericaceae]		1	1	0
42.	<i>Magnolia campbellii</i> Hook.f. & Thomson [Magnoliaceae]		1	1	0
43.	<i>Swertia bimaculata</i> (Siebold & Zucc.) Hook.f. & Thomson ex C.B.Clarke [Gentianaceae]		2	2	0
44.	<i>Taxus wallichiana</i> Zucc. [Taxaceae]		1	1	0
45.	<i>Viola hamiltoniana</i> D.Don [Violaceae]		2	2	0

SOUTHERN REGIONAL CENTRE, COIMBATORE

- a. Name of the Garden (Regional Centre): National Orchidarium and Experimental Garden, Yercaud (Southern Regional Centre, Coimbatore)
- b. Brief note on the conservation work done during the reference period.
 - Rare, Endangered and Economic important plants collected and details of conservation initiations

- Multiplication of endemic and threatened plant species, viz., *Vernonia vivekanathanii* Uniyal and *Solanum vagum* Nees were collected and introduced in the garden. Multiplications of these species were initiated using conventional vegetative propagation method.
- c. Details of the plants conserved:
- Number of plant/ seeds/saplings collected: Nil
 - Number of plant/ seeds/saplings introduced: Not applicable
 - Name of the species that were newly introduced in the garden: Not applicable
 - Flowering/ Fruiting/ Mortality Rate: Not applicable

WESTERN REGIONAL CENTRE, PUNE

Name of the garden: Western Regional Centre, Pune

Brief note on the conservation work done during the reference period

Details of the plants conserved

- Number of plant/ seeds/ saplings collected: **55**
- Number of plant/ seeds/ saplings introduced: **36**
- Name of the species that were newly introduced in the garden

1. *Cyrtomium micropterum* (Kunze), 2. *Osmunda hilsenbergii* Grev. & Hook., 3. *Angiopteris helferiana* Presl., 4. *Microlepia speluncae* (L.) T.Moore, 5. *Leptochilus axillaris* (Cav.) Kaulf., 6. *Huperzia phyllantha* (Hook. & Arn.) Holub, 7. *Lepisorus nudus* (Hook.) Ching, 8. *Bolbitis semicordata* (Baker) Ching, 9. *Botrychium daucifolium* Wall. ex Hook., 10. *Adiantum philippense* L., 11. *Dryopteris cochleata* (D.Don) C.Chr., 12. *Leptochilus decurrens* Blume, 13. *Alsophila nilgirensis* (Holttum) R.M.Tryon, 14. *Sphaeropteris crinita* (Hook.) R.M.Tryon, 15. *Drynaria quercifolia* (L.) J.Sm., 16. *Adiantum concinnum* Humb. & Bonpl. Ex Willd., 17. *Leucostegia immersa* C.Presl, 18. *Hemionitis bicolor* (Roxb.) Christenh., 19. *Davallodes pulchra* (D.Don) M.Kato & Tsutsumi, 20. *Asplenium zenkerianum* Kunze 21. *Bolbitis aspleniifolia* (Bory) K.Iwats., 22. *Hymenophyllum gardeneri*, 23. *Trichomanes obscurum* Blume, 24. *Elaphoglossum beddomei* Sledge, 25. *Trichomanes bimarginatum* (Bosch) Bosch, 26. *Odontosoria chinensis* (L.) J.Sm., 27. *Adiantum latifolium* Lam., 28. *Tectaria polymorpha* (Wall. ex Hook.) Copel., 29. *Blechnum orientale* L., 30. *Bolbitis feeiana* (Copel.) Fraser-Jenk. & Gandhi, 31. *Lygodium flexuosum* (L.) Sw., 32. *Pteris longipes* D. Don, 33. *Diplazium travancoricum* Bedd., 34. *Diplazium esculentum* (Retz.) Sw., 35. *Thelypteris triphylla* (Sw.) K.Iwats., 36. *Lycopodiella cernua* (L.) Pic.Serm.

- **Flowering/ Fruiting/ Mortality Rate:**

- Around 150 fungal cultures were preserved on Potato Dextrose Agar, in mycolab at BSI, WRC, Pune.

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BOOK CHAPTERS PUBLISHED

Over the past year, the Botanical Survey of India (BSI) has brought out several publications, with its scientists and scientific staff contributing chapters across different volumes. Among these, the notable publication “Compendium on Phytodiversity of Ramsar Sites in India, Volumes I & II” was released last year. The compendium comprises 75 chapters, each highlighting one of the

Ramsar Sites in the country, authored by different scientists and staff members of the institute. Apart from that some other book chapters written by scientific fraternity of Botanical Survey of India are as follows.

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HINDI ARTICLE

- पंकज अरविंद ढोले, प्रकाश होरो, गौतम अनुज एक्का, अनिल कुमार मिडिगेसी, महादेवकुमार एस., लाल जी सिंह 2024. जरायुजता: प्रजनन कौशल की एक क्षमता, *वनस्पति वाणी* अंक 33: 1–2.
- एल.आर. मैती, बी.बी.टी. थाम. सौरभ सचान, विजय, हेमन्त कुमार दास, डेविड एल. बियते एवं एन. ऑडियो 2024. प्रायोगिक वनस्पति उद्यान, बड़ापानी की बहुरंगी बांस विविधता, *वनस्पति वाणी* अंक 33: 3–4.
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बी.बी.टी. थाम., एल. आर. मैती, छाया देओरी, विजय, डेविड एल. बियते एवं एन. ऑडियो भारतीय वनस्पति सर्वक्षण, पूर्वी क्षेत्रीय केंद्र, बारापानी (उमियाम), मेघालय के प्रायोगिक वनस्पति उद्यान में औषधीय पौधों का संरक्षण, *वनस्पति वाणी* अंक 33:53–58.

हरेकृष्ण स्वैन, वाई. महेश, आर. कोट्टईमुथु एवं विजय 2024. पूर्वोत्तर भारत में जैविक खेती: दृष्टिकोण और अवसर, *वनस्पति वाणी* अंक 33:59–60.

नंदिता शर्मा, हेमन्त कुमार दास, बी.बी.टी. थाम, लैशिराम रिकी मैती, सौरभ सचान एवं विजय 2024 भारत के प्रमुख निर्यातकीय एवं राजकीय फल, राजकीय फल, *वनस्पति वाणी* अंक 33:61–62.

आरती गर्ग 2024 जलवायु परिवर्तन परिपेक्ष में ऊपरी गंगा रामसर साइट के अतुलनीय जैविक संसाधन, *वनस्पति वाणी* अंक 33:63–66.

एम.यू. शारीफ़, एस.पी.पांडा एवं रजत पाल 2024. कृत्रिम बीज, *वनस्पति वाणी* अंक 33:67–68.

एम.यू. शारीफ़, एस.पी.पांडा एवं रजत पाल 2024. टेस्ट ट्यूब वन, *वनस्पति वाणी* अंक 33:69–71.

देवस्मिता दत्ता प्रामाणिक एवं डिम्पल जैन 2024. ई कचरा: एक गंभीर समस्या, *वनस्पति वाणी* अंक 33:72–76.

मानस भौमिक एवं डिम्पल जैन 2024. कलम एवं पेंसिल, *वनस्पति वाणी* अंक 33:77–78.

सिंचिता बिस्वास एवं डॉ. उमेशकुमार ल. तिवारी 2024. भारत में आर्द्रभूमियाँ, *वनस्पति वाणी* अंक 33:79–83.

आरती गर्ग एवं एस.के. सिंह 2024. फ्लोमोइडस सुपर्बा की जनसांख्यिकी पर संभावित खतरे एवं वर्तमान स्थिति, *वनस्पति वाणी* अंक 33:84–86.

प्रकाश होरो 2024. वन एवं वन महोत्सव, *वनस्पति वाणी* अंक 33:87–88.

थान सिंह निरंजन 2024. राजभाषा की आत्मकथा, *वनस्पति वाणी* अंक 33:89.

थान सिंह निरंजन 2024. प्रकृति की सुंदरता, *वनस्पति वाणी* अंक 33:90.

कैलाश प्रसाद कुशवाहा 2024. पर्यावरण की हत्या और जहरीला कचरा, *वनस्पति वाणी* अंक 33:91.

**TRAINING/WORKSHOP/
SEMINAR/SYMPOSIUM/
CONFERENCE
ORGANIZED BY BSI**

Training/Workshop/Seminar/Symposium/Conference organized by BSI

Three-day training workshop on 'Plant Identification and Nomenclature' for the Indian Forest Service (IFoS) officers nominated by the MoEF&CC, Govt. of India, New Delhi, was organized at Central National Herbarium from 03.01.2024 to 05.01.2024.

The 13th meeting of the Research Advisory & Monitoring Committee (RAMC) of BSI was held from 29.12.2024 to 01.03.2024 at BSI-ANRC, Port Blair.

Workshop on 'Plant identification and Herbarium methodology' was organized in collaboration with EIACP, BSI at BSI-CNH, Howrah from 09.03.2024 to 10.03.2024.

An International Conference Cum Workshop (Hybrid Mode) on 'Resource Development of Medicinal and Floricultural Orchids- Lab Techniques to Entrepreneurial Ventures & Orchid Show' was organized by BSI-WRC, Pune in collaboration with The orchid society of India (TOSI), Botanical Survey of India, Kolkata and National Chemical Laboratory (NCL), Pune from 15.03.2024 to 17.03.2024.

Three-day Workshop-cum Hands-on Training on Molecular Taxonomy of Plants for the postgraduate students/Ph.D. scholars and faculties at colleges/universities and scientific staff of BSI units outside Howrah/ Kolkata was organized at BSI-CNH, Howrah from 02.04.2024 to 04.04.2024.

Training on Herbarium Techniques/methodology & Maintenance to three faculty and 23 B.Sc. Botany Honours students of Sualkuchi Budram Madhab Stradhikar College, Assam was organised by BSI-ERC, Shillong at BSI-EBG, Barapani on 10.05.2024.

One-day Hands-on training in Plant Molecular Taxonomy was organized for 16 M.Sc. students of William Carey, University, Shillong by BSI-ERC, Shillong under SSR Program of the DST-SERB sponsored project on 19.06.2024.

Induction training on Importance of Botanic Garden in 21st Century keeping AJC Bose Indian Botanic Garden in Centre for newly recruited 30 research scholars of ZSI under the National Mission on Himalayan Studies (NMHS) was organised at BSI-AJCBIBG, Howrah on 19.07.2024.

BSI in collaboration with the Chhattisgarh State Biodiversity Board, Raipur organized two batches of Para-taxonomy course. The 1st phase was organized at New Raipur, Chhattisgarh from 22.07.2024 to 18.08.2024. The 2nd phase of the skill development training in para-taxonomy & biodiversity conservation was organized at Jagdalpur, Chhattisgarh from 13.11.2024 to 27.11.2024.

Five-day Hand's of training course on 'Basic of Plant taxonomy & Identification' was arranged by BSI-NRC, Dehradun & USERC at BSI-NRC, Dehradun from 05.08.2024 to 10.08.2024.

Identification of Garden Plants Training for Technical Personals from Forest Survey of India on the topics Identification of Plants/Trees and Identification of special group of plants: Bamboo was organised at BSI-AJCBIBG, Howrah on 06.08.2024 and 09.08.2024.

A collaborative international exhibition on 'Travelling Plants' in collaboration with Gothe Institute & Max Muller Bhavan, Kolkata, Indian Museum was organized at BSI-ISIM, Kolkata from 06.09.2024 to 05.10.2024.

One day herbarium technique training program for 33 students of St. Joseph College, Tolichowhi, Hyderabad was organized by BSI-DRC, Hyderabad on 03.10.2024.

Seven days training/workshop programme on Plant Taxonomy (Identification, Nomenclature and Herbarium Technique) for M.Sc. (Botany) students was organised at BSI-ANRC, Port Blair from 15.10.2024 to 21.10.2024.

‘Two weeks in-service training programme for the Botanical Assistants in BSI’ was organized at BSI-CNH, Howrah from 02.12.2024–16.12.2024. The training included a 4 days field tour to the Buxa Tiger Reserve, New Alipurduar, West Bengal.

Workshop on ‘Botanical colour extraction and application’ was organized at BSI-ISIM, Kolkata in collaboration with Kolkata Centre for Creativity (KCC), Kolkata on 18.12.2024.

Two-Day Workshop on ‘Chromosome Botany in The Hotspot of Biodiversity: Implications for Plant Taxonomy’ was organized by BSI-WRC, Pune in association with Shivaji University, Kolhapur from 23.12.2024 to 24.12.2024.

Two days training program on ‘Capacity Building Training on Biodiversity Conservation and its impact on Climate Change’ was organised at BSI-AJCBIBG, Howrah on on 20.01.2025 to 21.01.2025.

Three days Pilot Capacity Building Programme of BMCs for the state of Maharashtra was organized by BSI-WRC, Pune from 21.01.2025 to 23.01.2025 at Gadchiroli, Maharashtra.

International exhibition cum conference in collaboration with Weaver’s Studio, Bangladesh Museums at Kolkata Centre for Creativity, Kolkata was organized at BSI-ISIM, Kolkata from 30.01.2025 to 24.02.2025.

Botanical Nomenclature Course under the esteemed mentorship of Dr. K.N. Gandhi from Harvard University, USA was organized by BSI-SHRC, Gangtok from 03.02.2025 to 07.02.2025 at BSI-SHRC, Gangtok.

Botanical Survey of India celebrated its 136th Foundation Day on 13.02.2025 at the Dhano Dhanyo Auditorium, Alipore, Kolkata. On this occasion, BSI organized the ‘3rd International Symposium on Plant Taxonomy, Ethnobotany, Botanic Gardens and Biodiversity Conservation (ISPTEBG&BC 2025)’ from 13.02.2025–15.02.2025.

‘Three Days Pilot capacity Building Program of BMCs for Uttarakhand’ was organized by BSI-NRC, Dehradun from from 05.03.2025 to 07.03.2025.

One day workshop on ‘The Art & Science of Herbarium making: A hands on workshop’ in collaboration with Government Degree College, Begumpet, Hyderabad was organised by BSI-DRC, Hyderabad on 13.03.2025.

The IUCN Red List Assessor Training Workshop jointly organised by IUCN, BSI and ZSI at BSI-CNH, Howrah from 26.08.2024 to 30.08.2024 and 12.12.2024 to 15.12.2024.

Workshop on ‘Natural dye extraction and application’ was organized by BSI-ISIM, Kolkata at Bali Islands, South 24 parganas, West Bengal in February 2025, in collaboration with University of Sussex, UK and Local NGO.

One day workshop titled ‘Arunachal Taxonomy Summit: Unveiling Flora and Fauna in Connection with Current Environmental and Climate Change’ was organized by BSI-APRC, Itanagar in collaboration with the National Bank for Agriculture and Rural Development (NABARD), Itanagar Regional Branch.

Two day workshop titled ‘Taxonomy and Ecology of Floral Elements of the Eastern Himalayan Region and Hands-on Training on Systematics of Different Plant Groups’ was organized by BSI-AZRC, Jodhpur on 2024.

A special lecture on ‘The Changing Paradigm of our Environment’ in association with Scientist Unique Researchers Yare Association (SURYA), India as a part of ‘Mission Life’ was organised at BSI-ANRC, Port Blair.

**PARTICIPATION OF
BSI OFFICIALS IN
SEMINAR / SYMPOSIUM /
CONFERENCE TRAINING**

- Online MycoAsia Lecture Series by Laurent Dufosse on ‘Filamentous Fungi one of many players in Microbial Pigment Industrial Production’ on 29.03.2024; by Marc Stadler on ‘Discovery of Biologically active secondary metabolites from Basidiomycota’ on 30.03.2024; by Dr. Avneet Pal Singh on ‘Morphological Identification of Corticoid and Poroid Fungi’ on 06.04.2024; by Prof Hesham on ‘fungal morphology in biotechnology industry’ on 07.04.2024; by Prof. K.R. Sridhar on ‘Ecology of Macrofungi from Western Ghats’ on 11.05.2024.
- One-day online workshop on ‘Introduction to Next Generation Sequencing Data Analysis’ organized by Rajiv Gandhi Centre for Biotechnology (RGCB), Bioinformatics facility (Training and services) on 30.04.2024.
- Two days National conference conducted by Asufii Christan Institute, Punanamei, Mao in collaboration with Botanical Survey of India, Kolkata from 01.05.2024–02.05.2024.
- Round Table Discussion on “Climate Resilient Agriculture Technologies for Islands” organized by TIFAC, New Delhi and CIARI, Port Blair on 15.05.2024.
- ‘South-East Asia on Nutrition and Climate Change’ organized by WHO held at Kathmandu, Nepal from 14.05.2024–16.05.2024.
- Online association of Fungal Biologists – MycoIndia MycoTalk #5 by Dr. Belle Damodara Shenoy on ‘Phylogenetic Analysis using MEGA software – For Beginners’ on 19.05.2024.
- National seminar entitled “Impact of Climate Change and Ecotourism on Biodiversity” at Andhra University on 23.05.2024.
- Online Modern Mycology Lecture Series by MycoIndia and CBEC by Dr. Arun Kumar Gupta (New Zealand) on the topic “*Commercialization of research: Lab to Market Strategy*” on 08.06.2024.
- Webinar on ‘Seaweeds: The Ocean’s Gift to the Mankind’ on 08.06.2024 organized by Seaweed Research and Utilization Association, India.
- Online MycoAsia Fungi-ID Lecture Series by MycoAsia by Mr. Vyom Bhatt (Nuvedo Lab, India) on the topic “*Understanding mushroom morphology for identification of wild mushrooms*” on 09.06.2024.
- First quarter Rajbhasha Meeting & Workshop which was held on 27.06.2024 at D G office, Assam Rifles Laitkor.
- MycoAsia Masterclass lecture series by Dr. Sanjeeva Nayaka, Chief Scientist, NBRI, Lucknow on *Lichen Research in India: Progress and Prospects* on 30.06.2024.
- Online Modern Mycology Lecture Series by MycoIndia and CBEC by Dr. Aradhana Mishra, NBRI, Lucknow on the topic “*Modern Plant Pathology – Biotransformation of Phytopathogens*” on 07.07.2024.
- 27th meeting of the CITES Plants Committee held in Geneva from 08.01.2024–13.07.2024.
- Conference on Promoting Entrepreneurship among Indigenous Women of NER based on Non-Timber Forest Produce (NTFP), organised by National commission for Women Govt. of India in collaboration with Meghalaya Biodiversity Board on 09.07.2024 at Meghalaya State Convention Centre, Shillong.
- Online AFB-MYCOINDIA Mycotalk by Dr. Fung Shin Yee Universiti Malaya (Malaysia) on the topic “*Breathing new life into Malaysia’s Medicinal Gem: XLR® from TMO2® for Health and Well Being*” on 14.07.2024.

International Water Lilies and Water Garden Society, Symposium conducted at RBG, KEW through online on 17.07.2024.

MycoAsia Masterclass lecture series by Dr. Steven L. Stephenson, Professor, Department of Biological Sciences, University of Arkansas, USA on Research on Myxomycetes on 21.07.2024.

Training for Skill Development in Para-Taxonomy and Biodiversity Conservation Programme conducted jointly by the Chhattisgarh State Biodiversity Board, Raipur and the Botanical Survey of India from 22/07/2024 to 18/08/2024 held at State Forest Research and Training Institute, Raipur, Chhattisgarh.

Regional Research Conference organised by Institute of Forest Biodiversity, Hyderabad on 02.08.2024

Online Modern Mycology Lecture Series by Dr. Belle Damodara Shenoy, Principal Scientist, SCIR-National Institute of Oceanography, Visakhapatnam, India on “*Marine Fungi: What’s next for India?*” on 04.08.2024.

Market Secretaries Training programme at the Directorate of Marketing and Inspection MoAFW, Hyderabad, on 07.08.2024.

Two Days Regional Workshop on Conservation and Wise Use of Wetlands under Sahbhagita Mission for Southern Region States during 13.08.2024–14.08.2024 at Hotel Taj, Hyderabad, jointly organised by MoEF & CC & EPTRI.

Two day workshop on ‘Hands on training on Collection, Preservation and Identification of Orchids, Algae, Fungi & Bryophytes’ at the Dept. of Bioscience (Botany), Midnapore City College, Paschim Medinipur, West Bengal on 16.08.2024.

‘Conservation and Wise Use of Wetlands’ at Taj TAAL Kutir, Kolkata held on 29.08.2024–30.08.2024 organised by ZSI, Kolkata.

Fourth Official Language conference from 14.09.2024 to 15.09.2024 which was held at Bharat Mandapam, Pargati Maidan, New Delhi

National workshop titled Basics, Advances in Plant Taxonomy & Herbarium Techniques organized by Govt. City College, Nayapul, Hyderabad on 20.09.2024.

National Workshop on Basics & Advances in Plant Taxonomy & Herbarium Preparation Techniques on 20.09.2024–21.09.2024 organised by Department of Botany, Government City College (A), Nayapul, Hyderabad in association with Botanical Survey of India, Hyderabad.

National Seminar entitled “Biodiversity for sustainable future with special focus on plant taxonomy” organized by Dept. of Botany, Guwahati University, Assam in collaboration with BSI, Kolkata, Botanical Society of Assam and EHSST society from 27.09.2024–28.09.2024 at Guwahati, Assam.

18 days Seed Conservation Training in Millennium Seed Bank, Royal Botanic Garden, Kew, United Kingdom 11.10.2024–28.10.2024

Workshop on Technological Innovations to Improve Forest Management at Vijayawada, Andhra Pradesh on 15.10.2024 organised by the Forest Plus 3.0.

Workshop cum-consultative meeting of “National Museum of Natural History” at Guwahati, Assam on 18.10.2024.

Seaweed cultivation demonstration project at Chiritapu, South Andaman organised by Dept. of Fisheries, Andaman & Nicobar Administration and NIOT, MoES, Govt. of India on 23.10.2024.

- Inter College Science Exhibition organized by Synod College, Shillong on 25.10.2024.
- International Seminar of Current Advancement in Modern Biology organized by University of Gour Banga, Malda, West Bengal on 25.10.2024.
- 9th Ayurveda Day with theme of “*Ayurveda Innovation for Global Health*” at Windermere Banquet Hall, Umpling, Shillong on 29.10.2024.
- Assam Botanical Congress cum International Conference on Biodiversity and Climate Change: Challenges and Opportunities for Nature Based Solutions on 11.11.2024–13.11.2024 Attended a webinar on Sexual Harassment organized by the Zoological Survey of India, Kolkata on 13.11.2024.
- Online training on the “to upskill and familiarize the members of the ICCs” under POSH Act on 13.11.2024
- One week compulsory training course for the Indian Forest Services (IFS) officer’s on Coastal and marine biodiversity of Island Ecosystem supported by MoEF & CC, Govt. of India and organised by Zoological Survey of India, ANRC on 11.11.2024 and 15.11.2024.
- 2nd phase of training for skill development in Para taxonomy and Biodiversity conservation at Jagadalpur, Chhattisgarh from 13.11.2024 to 27.11.2024.
- 3-days training workshop on Coastal and Marine Diversity of Island Ecosystem under the training of Personal of others Stateholders by ZSI, ANRC on 21.11.2024.
- IAAT Annual Conference held at Silchar during 23.11.2024–25.11.2024.
- Workshop entitled “Gender and Climate Change in the Thar Desert” on 26.11.2024 organized by GRAVIS (NGO), Jodhpur.
- One day awareness workshop on “Space-based data, Products & Geospatial Technology based Services for Disaster Management Support with Special Emphasis on Detection and Monitoring of Dust Storm in North Western States of India” organized by Regional Remote Sensing Centre-West, NRSC/ISRO, Jodhpur on 29.11.2024.
- National Level online internship on ‘Molecular Phylogeny & Biogeography’- Hands on training of Phyloinformatic tools in Systematics for 15 days from 02.12.2024–18.12.2024 conducted by Department of Botany, Madras Christian College (Autonomous), Tambaram, Chennai
- Agricultural Education Day organized by ICAR-CIARI, Port Blair on 03.12.2024.
- ‘CME program for Dravyaguna Teachers’ at NEIAH, Mawdiangdiang, Shillong on 05.12.2024.
- National Conference on “Resilient Coasts: Addressing the Interplay of Climate Change, Biodiversity and Sustainable Development” at ORC, ITPI, Bhubaneswar held on 08.12.2025–09.12.2025.
- ‘National Conference on Advances and Perspectives in Cryptogam Research’ at the CSIR-National Botanical Research Institute, Lucknow, Uttar Pradesh, from 09.12.2024 to 11.12.2024.
- 3 days training at ICFRE-ERC, Prayagraj on ‘Sustainable Land Management Technology and Approaches to Achieve Land Degeneration Neutrality’ from 10.12.2024 – 12.12.2024.
- NFCCI-ARI Pune and Association of Fungal Biologist (AFB) online seminar by Dr. John F. Leslie, Director of Fungal Genetics Stock Centre, Kansas State University, Kansas, USA on 17.12.2024.
- Webinar on “Scouting and Documentation of grassroots innovations & outstanding traditional knowledge practices Changlang District of Arunachal Pradesh” in National Innovation Foundation of India.

Joined in National Workshop on Good Governance Practices organized by the Ministry of Environment Forest & Climate Change, Govt. of India, New Delhi, on 23.12.2024.

“National Workshop on Good Governance Practices” organized by the Ministry of Environment Forest & Climate Change, Govt. Of India, on 23.12.2024.

Two-day workshop on ‘Chromosome Botany in the hotspot of biodiversity: implications for plant taxonomy’ organised by Department of Botany, Shivaji University, Kolhapur, Maharashtra on 23.12.2024–24.12.2024.

3rd Acharya Prafulla Chandra Roy Smarak Vigyan Mela O Pradarshani-2024 on 26.12.2024–29.12.2024 organized by 18th All India People’s Science Congress Organising Committee at West Bengal University of Animal and Fishery Sciences.

47th Annual Conference of Orissa Botanical Society and National Conference on Research approaches for sustainable growth of plants and microbes in present climatic conditions from 28.12.2024–29.12.2024

6th International Conference on Genome Biology Cell-Organism-Environment & 56TH Aqua-Terr Annual Day on 28.12.2024–01.03.2024 organised by Madurai Kamaraj University, through Online mode.

One day National seminar on “Exploration of Phytodiversity of Medicinal values of Eastern Himalaya: Focus on Mapping and Scientific Validation” on 11.01.2025 organized by CCRAS- Regional Ayurveda Research Institute, Itanagar.

National Seminar on “The Dreams of Swami Vivekananda: Viksit Bharat @ 2047” at Birla Industrial and Technological Museum (BITM), Kolkata on 12.01.2025 organised by International Benevolent Foundation (IBRF), West Bengal in association with Confederation of Indian Universities (CIU), New Delhi.

7th International Conference on Agri Vision-2025 at Odisha University of Agriculture and Technology, Bhubaneswar from 17.01.2025–19.01.2025.

Pilot training programme for BMC members of Andhra Pradesh and Telangana states organised by the EIACP Unit, ZSI, Kolkata and FBRC, ZSI, Hyderabad on 20.02.2025 at Acharya Nagarjuna University, Guntur.

Pilot Capacity Building Training Programme for Biodiversity Management Committee (BMC) held at Krish Villa Jhargram, West Bengal from 20.02.2025–24.02.2025.

Attended an Inaugural Function of Science Academics Lecture Workshop on Recent Advances in Biodiversity of Andaman and Nicobar Islands at Zoological Survey of India, ANRC, Port Blair on 27.02.2025.

Passing out ceremony of 52nd Batch of Forest Guard (2024-2025) at the Forest Training Institute, Wimberlygunj, South Andaman on 28.02.2025.

Valedictory function of Science Academics Lecture Workshop on Recent Advances in Biodiversity of Andaman and Nicobar Islands at Zoological Survey of India, ANRC, Port Blair on 28.02.2025.

Joint Regional Official Language Conference for East and North East Regions which was held on 05.03.2025 at Mayfair Spring Valley Resort, Tapesia Garden Road, Sonapur, Guwhati.

Biodiversity (Fauna) Kolkata & APRC, Zoological Survey of India in collaboration with Arunachal Pradesh Biodiversity Board on 05.03.2025–08.03.2025 held at ZSI, APRC, Itanagar.

- National Conference on Agriculture, environment and Sustainable Development (NCAESD 2025) organized by the Department of Horticulture, Rajiv Gandhi University, Doimukh on 10.03.2025.
- Inaugural Function of Dweep Agro-Eco Walk & Kisan Mela-2025 organized by ICAR-CIARI, Sri Vijaya Puram on 18.03.2025.
- 3 days' workshop on 'Pilot Capacity Building Programme for Biodiversity Management Committee of Arunachal Pradesh' organized by EIACP Centre on A Training programme on "Ecological Niche Modelling- Training and Applications for Biodiversity Conservation" from 19.03.2025 to 21.03.2025 held at GBPNIHE-NERC, Itanagar.
- National Conference on New Perspectives in Forestry for Sustainable Development and Climate Change on 19.03.2025 organised by the Acharya Nagarjuna University, Guntur.
- Brainstorming session on "Identifying the key issues and challenges on environmental aspects for the north-eastern region of India" collectively organized by GBPNIHE-NERC, BSI and ZSI
- Jeju International Island Symposium organized by Research Institute for Basic Sciences, Jeju National University, Korea
- National Seminar on "Ethnobotany and Biodiversity Conservation- A Global Prospective" at Modern Degree College, Nuapada, Khariar, Odisha.
- International Conference on Plant Taxonomy-Tracking Changes Overtime for Biodiversity Conservation and Human Welfare.
- Two day National Seminar on "Biodiversity for sustainable future with special focus on Plant taxonomy" conducted by Guwahati University in collaboration with EHSST, BSI, BCA and AST & EC.
- Additionally BSI Officials have participated in different meetings, a number of trainings related to introduction of e-Office system, Rajbhasha related meetings, IUCN-related meetings and 'Swachhta Hi Seva' implementation related meetings.

**ACTIVITIES OF THE
RESEARCH
SCHOLARS/RESEARCH
ASSOCIATES OF BSI**

Project 1: Taxonomic studies and documentation of the Bryophyte of Nagaland (Liverwort, Hornwort and Mosses)

Name of the JRFs: Mr. Sk Nasim Ali and Ms. Meghna Paul

Name of the Supervisor: Dr. Devendra Singh, Scientist-E

Duration of the project: 2023–2028

Achievements:

- During the period two field tours were undertaken in the surrounding areas of Dzukou valley and Saramati hills of Nagaland and collected 395 specimen and more than 593 photographs were taken. Identified 98 specimen belonging to 82 species, and illustrated 74 species. Studied oil-bodies of 85 species from freshly collected specimens during the field. A total 7 research papers were written, out of which 6 were published and 2 communicated. Also communicated two abstracts for oral presentation in BSI International Symposium.

Project 2: Assessment of Endemic species of Andaman and Nicobar Islands

Name of the JRF: Ms. Sagarika Kumari

Name of the Supervisor: Dr. Lal Ji Singh, Scientist-F

Duration of the project: 2023–2028

Achievements:

- **Field trips:** Conducted 04 field trips to Little Andaman (25.07.2024 to 09.08.2024), South Andaman (21.11.2024 to 30.11.2024), Swaraj Dweep (01.10.2024 to 07.10.2024) & North and Middle Andaman (04.01.2025 to 18.01.2025) and collected and preserved 154 samples.
- **Identification:** Identified 10 nos. of endemic species.
- **Herbarium Preparation:** Prepared 150 herbariums from previous collections.

Project 3: Quantifying the significance of economic importance and Bio-prospecting of selected Marine Macro Algae.

Name of the JRF: Ms. Reetika Srivastava

Name of the supervisor: Dr. Sudipta Kumar Das, Scientist-E

Duration of the project: 2023–2028

Achievements:

- **Field trips:** Conducted 02 field tours to coastal areas of Kerala, Tamil Nadu, and Andaman and Nicobar Islands.
- **Collection:** Collected a total of 215 seaweed samples from different coast of Kerala, Tamil Nadu, and Andaman and Nicobar Islands.
- **Identification:** 70 taxa belonging to Rhodophyceae, Phaeophyceae and Chlorophyceae.
- **Bio-prospection studies:** Biomass of 10 seaweed specimens from Kerala and Tamil Nadu are under progress for Biochemical profiling.

Project 4: Revisionary studies on tribe Aveneae (Pooideae, Poaceae) of India.

Name of the JRF: Veeresh H Ari

Name of the Supervisor: Dr. K.A.A. Kabeer, Scientist-E

Duration of the Project: 2023–2028

Achievements:

- For the year 2024, 3 major field tours were conducted to the states of Jammu & Kashmir, Himachal Pradesh, Uttarakhand and Sikkim, which included collection of 190 specimens of tribe Aveneae (Poaceae) and consultation of DD (1722 herbarium specimens), BSD (542 Herbarium specimens) & KASH (147 Herbarium Specimens). CAL was consulted for a total of 1025 herbarium specimens of tribe Aveneae.
- All the 190 specimens that were collected from field tours were studied for their primary identifications. Conducted local field collection trip to Changlang and Tirap districts of Arunachal Pradesh from 23rd to 31st January, 2025 (38 field collections were made). Conducted 2 days field collection at East Sikkim district of Sikkim on 8th and 9th of February, 2025. 13 field collections were made, Consulted Central National Herbarium (CAL) for the Specimens of tribe Aveneae from 17th to 20th February, 2025. (96 Herbarium Specimens were consulted). Furthermore, Photoplate for 12 species were prepared accompanied by their taxonomic descriptions. An article titled “New generic record to northeast India and notes on nomenclature and typification of its basionym” was communicated to Nelumbo and revised. Meanwhile attended the 34th Annual conference of the IAAT at Assam University, Silchar and presented a paper on the topic “Wallich Catalogue no. 3769”. In addition, attended 2 workshops on Cytology and Biodiversity conservation & its impact on climate change. Attended a five-day workshop on Plant nomenclature conducted by Botanical Survey of India, Sikkim Himalayan Regional Centre, Gangtok from 3rd to 7th February, 2025. Attended 3rd International Symposium of Botanical Survey of India at Kolkata from 13th to 15th February 2025. Submitted an article to Kew Bulletin.

Project 5: Poaceae of Andaman and Nicobar Islands.

Name of the JRF: Ms Reshma Lakra

Name of the Supervisor: Dr Pushpa Kumari, Scientist-E

Duration of the Project: 2017–2022

Achievements:

- Taxonomic account of 212 infraspecific taxa, under 89 Genera, 3 subfamilies and 14 tribes completed. This account includes key to the genera, species as well as varieties; protologue with citation; detailed description; flowering and fruiting periods and information on habit and habitat.
- It includes one new species *Dimeria fasciculata*, One new record to India (*Apocopsis collinus*) and 3 new records to Andaman and Nicobar Islands (*E.pilosa*, *Ottochloa nodosa* and *A. setosa*).
- Photoplates will be completed soon and final report will be submitted before March 2025.

Project 6: Phylogeny of the Subfamily Lamioideae Harley (Lamiaceae) in India

Name of the JRF: Appu Siga

Name of the Supervisor: Dr. David L. Biate, Scientist-D

Duration of the Project: 2023-2028.

Achievements:

Study Area: INDIA

Area Covered: Meghalaya, Arunachal Pradesh, Assam, West Bengal, Kerala, Tamil Nadu; Maharashtra

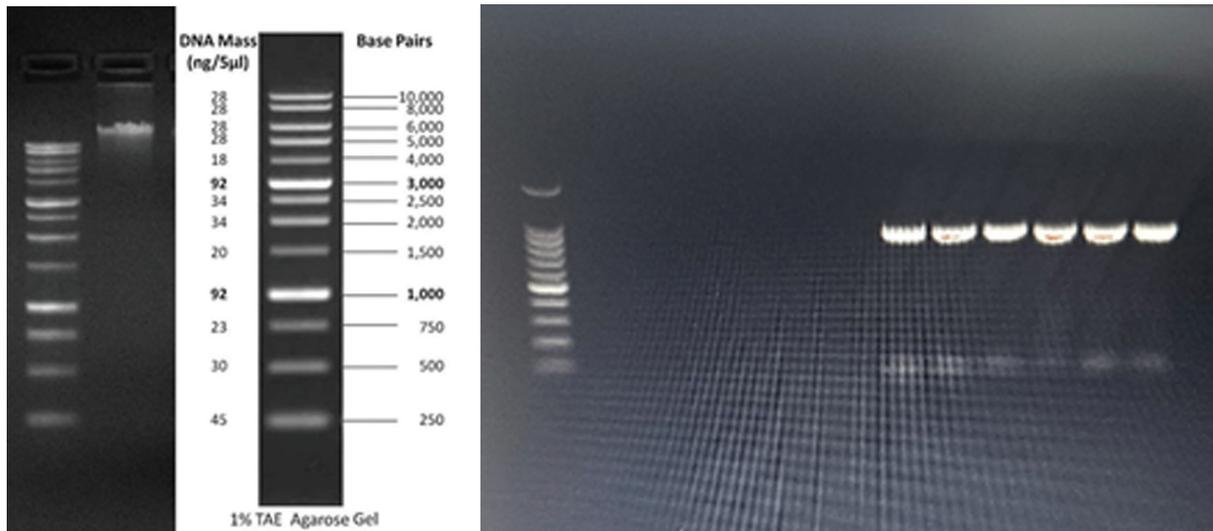
- **Literature Survey:** Comprehensive Literature review of the Subfamily Lamioideae (Lamiaceae) done for India and the world
- **Field Survey:** 15 botanical Field tours undertaken to Meghalaya; Arunachal Pradesh; Assam; West Bengal; Tamil Nadu; Kerala.
- **Metadata Collection:**
 1. Metadata collected for 15 species under 9 genera from 446 Herbarium specimens housed at BSI, WRC, Pune.
 2. Metadata collected for 18 species under 4 genera from 140 Herbarium specimens housed at Shivaji University Herbarium, Kolhapur.
- **Plant identification: 25 Plant species collected.**



Leucas longifolia Benth.

- Pogostemon auricularius* (L.) Hassk.; *Pogostemon quadrifolius* (Benth.) F.Muell.; *Pogostemon elsholtzioides* Benth.; *Pogostemon hispidus* (Benth.) Prain; *Pogostemon benghalensis* (Burm.f.) Kuntze; *Leucoseptrum canum* Sm.; *Achyrospermum densiflorum* Blume; *Anisomeles indica* (L.) Kuntze; *Leucas lavandulifolia* Sm.; *Leucas ciliata* Benth.; *Leucas manipurensis* N.P.Singh; *Leucas longifolia* Benth.; *Pogostemon cablin* (Blanco) Benth.; *Pogostemon paniculatus* (Willd.) Benth.; *Leucas zeylanica* (L.) W.T.Aiton; *Pogostemon amaranthoides* Benth.; *Pogostemon deccanensis* (Panigrahi) Press; *Pogostemon jaitapurensis* Chandore & S.R.Yadav; *Pogostemon menthoides* Blume; *Pogostemon purpurascens* Dalzell; *Pogostemon stellatus* (Lour.) Kuntze; *Pogostemon tuberculosus* Benth.; *Gomphostemma niveum* Hook.f.; *Paralamium griffithii* (Hook.f.) Suddee & A.J.Paton; *Pogostemon dasianus* A.B.De & Mukerjee.
- **PCR standardization done using trnH-psbA marker** for *Pogostemon* sp., *Pogostemon elsholtzoides*, and two species of *Gomphostemma*. *Pogostemon cablin*, *Pogostemon elsholtzoides*, *Pogostemon quadrifolius*, *Colquhounia coccinea*, *Pogostemon brachystachyus*, *Leucas lavandulifolia*, *Leucas ciliata*. *Gomphostemma parviflorum*, *Achyrospermum densiflorum*.
 - Referred to the protologues and digital images and original herbarium as well as live specimens to solve taxonomic issues of *Achyrospermum densiflorum*, genus *Gomphostemma* represented in India.
 - A comprehensive review of literature done on genus *Gomphostemma* pertaining to its ecology, phytochemistry as well as ethnobotany.
 - **PCR amplification done using matk marker** for *Pogostemon cablin*, *Leucas longifolia*, *Gomphostemma parviflorum*, *Pogostemon elsholtzoides*?, *Pogostemon* sp., *Pogostemon benghalensis*.
 - **Description and Photoplate preparation:** Photoplates description of the identified species prepared with their flowers dissected.
 - **Genomic DNA extraction:** Genomic DNA extracted for 25 species from live specimens including 2 species from herbarium specimens.

- **PCR standardization:** PCR conditions standardized for the isolated DNA using nuclear ITS marker for 25 species; using chloroplast matK and trnH-psbA marker for 16 species and 3 species respectively.
- **PCR amplification:** PCR amplification done for the isolated DNA of 24 species using ITS marker and 16 species using matK marker.
- **DNA sequencing:** Amplified DNA using ITS and matK markers for 17 species sequenced with good results:

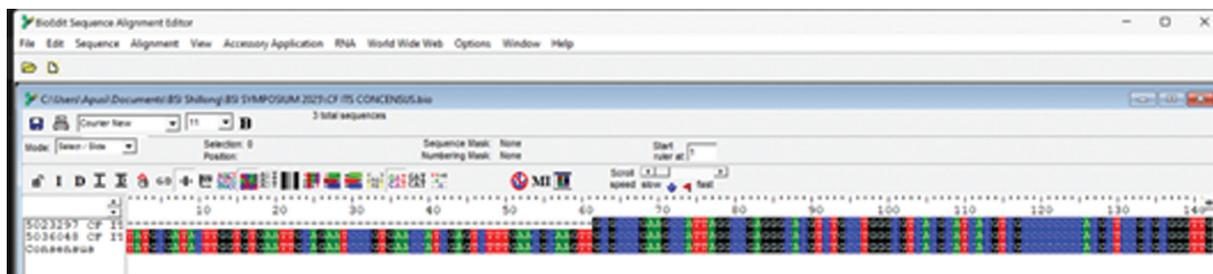


Genomic DNA of *Pogostemon menthoides* Blume

matK Marker region amplification of *Craniotome furcata* (Link) Kuntze



Chromatogram of Chloroplast matK marker of *Craniotome furcata* (Link) Kuntze



Consensus Sequence of *Craniotome furcata* (Link) Kuntze using nuclear ITS marker

Project 7: Flora of India (Taxonomic Study of Family Caryophyllaceae in India)

Name of the JRF: Seemarjit Kaur

Name of the Supervisor: Dr.Chaya Deori, Scientist-E

Duration of the Project: 2023–2028

Achievements:

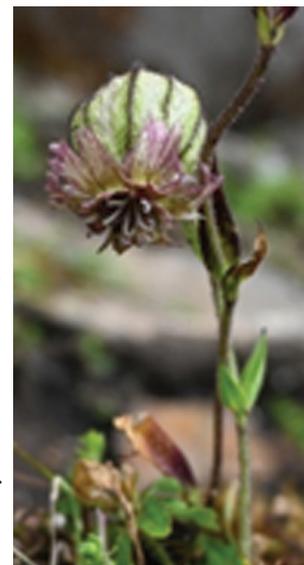
Study Area: INDIA (Target states: Jammu & Kashmir, Uttarakhand, Himachal Pradesh, Sikkim, Arunachal Pradesh, Meghalaya, Assam & Tamil Nadu)

Area covered till date: Area Covered: Assam, Meghalaya, Arunachal Pradesh, Maharashtra & Nagaland

➤ **Field tours:** During the period, total **6 (for 12 days) field tours** conducted to different regions of MEGHALAYA & ARUNACHAL PRADESH.

➤ **Herbarium tours : 1 (one) 3 (Three)**

Northern Regional Centre (BSD) Dehradun, Uttarakhand: Consultation was done for 48(forty eight) species under 11 genera (*Acanthophyllum*, *Cerastium*, *Dianthus*, *Dichodon*, *Drymaria*, *Eremogone*, *Gypsophila*, *Holosteum*, *Sabulina*, *Silene* and *Stellaria*) of Caryophyllaceae. A total of approximately 750 (seven hundred fifty) photographs taken for metadata preparation and reference. Forest Research Institute (DD) Herbarium, Dehradun: Consultation was done for 20(twenty) species under 8 genera (*Acanthophyllum*, *Atocion*, *Dianthus*, *Drymaria*, *Gypsophila*, *Polycarpon*, *Silene* and *Thylacospermum*) of Caryophyllaceae. A total of approximately 200 (two hundred) photographs of herbarium specimen as well as other literature taken for reference. Sikkim Himalayan Regional Centre (BSHC) Herbarium, Gangtok, Sikkim: Consultation was done for 49(forty nine) species under 11 genera (*Arenaria*, *Cerastium*, *Drymaria*, *Gypsophila*, *Lepyrodiclis*, *Minuartia*, *Odontostemma*, *Sagina*, *Shivparvatia*, *Silene* and *Stellaria*) of Caryophyllaceae. A total of 544 (five hundred forty four) photographs taken for metadata preparation and reference.



➤ **Plant identification: 11 (eleven) Live plants identified.**

Spergula rosea Blatt., *Stellaria wallichiana* Haines, *S. aquatica* (L.) Scop., *S. alsine* Grimm and *S. vestita* Kurz; *S. cuonaensis* L.H.Zhou, *S. semivestita* Edgew., *S. lanata* Hook. f., *S. sikkimensis* Hook. f., *S. patens* var. *ovatifolia* H.Hara. Species level identification of **4(four)** specimens in progress for *Odontostemma* sp., *Silene* sp., *Arenaria* sp. and *Cerastium* sp. Genus level identification in progress for **1(one)** Caryophyllaceae plant.

➤ **Herbarium preparation: Total 53 (Fifty three) specimens collected for Herbarium preparation** (field no. 143201-143284, 143287-143300, 145103-145109 and 145111-145121). Poisoning and mounting of 45(forty five) specimens (field no. 143201 to 143246) completed and rest in progress. Changing and cleaning of blotting sheets at regular intervals. Caryophyllaceae specimens collected from Dehradun, Uttarakhand: (*Drymaria diandra* Blume, *Cerastium glomeratum* Thuill., *Stellaria media* (L.) Vill. and *S. wallichiana* Haines) pressed for voucher specimen preparation with field no. 145122-145125. Collected 4 (four) Caryophyllaceae live specimens from Gangtok, Sikkim with field no. 145126-145129. Changing and cleaning of blotting sheets in regular intervals to ensure proper drying of collected herbarium specimens.

➤ **Herbarium consultation: 7(seven)**

Herbarium tour in progress: **1(one)** to **BSD & DD** herbarium, Dehradun.

Meta data entry of **704**(Seven hundred four) sheets from **CAL** herbarium, Howrah and **158** sheets from **ARUN** herbarium, Arunachal Pradesh completed. Online Herbaria consulted (Linnaean Herbarium, **LINN**; General Herbarium, **NHM** and Sloane Herbarium, **BM** of National History Museum). Online Herbaria consulted (Linnaean Herbarium; General Herbarium and Sloane Herbarium of National History Museum, London; Swedish Museum of Natural History, Stockholm Herbarium & Leiden Herbarium). Working on metadata preparation of Caryophyllaceae collected from a) Sikkim Himalayan Regional Centre (BSHC) Herbarium, Gangtok, Sikkim; b) Northern Regional Centre (BSD) Herbarium and c) Forest Research Institute (DD) Herbarium, Dehradun, Uttarakhand. A total of 300 (three hundred) sheets entered.

- **Type specimen consultation:** Type specimens downloaded and examined for *Drymaria cordata* (L.) Roem. & Schult. (Lectotype: [icon] “*Alsine americana nummulariae folio*” in Hermann, Parad. Bat.: t. 11. 1698; Herb. Linn. No. 109). Evaluated **14 (fourteen)** type specimens deposited in BSD herbarium (*Minuartia ebracteolata* Majumdar & G.S. Giri; *Silene gangotriana* Pusalkar, D.K. Singh & Lakshmin and *Stellaria devendrae* Pusalkar & S.K. Srivast.) and **10(ten)** Type specimens deposited in DD herbarium (*Acanthophyllum* (Boiss.) Barkoudah; *A. montanum* Akhtar; *Arenaria curvifolia* Majumdar; *A. ferruginea* Duthie; *Dianthus angulatus* Royle and *Silene laxantha* Majumdar). Type specimens evaluated for *Drymaria cordata* (L.) Roem. & Schult. (Lectotype: [icon] “*Alsine americana nummulariae folio*” in Hermann, Parad. Bat.: t. 11. 1698; Herb. Linn. No. 109); **L0036873**, Java, inpaludo sismontanis, October, Blume1549(L99-143-199); **LECB0000548**, Chamisso, L.C.A. von, 505; in aquosis prope Jalapam; **BM000946422**, Blume, Isotype; *Holosteum cordatum*, S-LINN; **L0038674**, Blume1549(899 -143-201); *Alsine americana nummulariae folio*, **000589765 BM**

➤ **Literature studied:**

1. Kumar, A., G. Krishna and P. Venu. 2004. Caryophyllaceae in *The Flora of Buxa Tiger Reserve, West Bengal India*. Botanical Survey of India.
2. Gogoi, R., N. Sherpa, J.H.F. Benjamin, D.K. Agrawala, S.K. Rai and S.S. Dash. 2021. Caryophyllaceae in *Flora of Sikkim: A pictorial guide*. Botanical Survey of India.
3. Cafferty, S., & Jarvis, C. E. (2004). Typification of Linnaean plant names in *Caryophyllaceae*. *Taxon*, 53(4), 1049-1054. Duke, J. A. (1961). Preliminary revision of the genus *Drymaria*. *Annals of the Missouri Botanical Garden*, 48(3), 173-268.
4. Hermann, P. (1698). *Paradisus Batavus* (W. Sherard, Ed.). Pieter van der Aa.
5. Majumdar, N. C. (1968a). The genus *Drymaria* in India. *Bulletin of the Botanical Survey of India*, 10(1), 293-295.
6. Majumdar, N. C. (1968b). *Drymaria villosa* Cham. & Schlecht.: A new record for South India. *The Indian Forester*, 94, 210-212.
7. Malick, K. C., & Majumdar, N. C. (1974). Observations and critical notes on Indian *Drymaria* Willd. *Bulletin of the Botanical Survey of India*, 16(1-4), 151-153.
8. Schultes, J. A. (1819). *Systema vegetabilium* (5th ed.). Sumtibus G.J. Cottae.

- **Descriptions Written:** Taxonomic descriptions written for 5 (five) species (*Stellaria alsine* Grimm; *S. vestita* Kurz; *S. sikkimensis* Hook. f., *S. cuonaensis* L.H.Zhou & *Silene* sp.)

- **Photographs taken:** Near about **120 (one hundred twenty)** photographs taken of habitat, habit, characters and dissected parts of the collected Caryophyllaceae species (*Stellaria wallichiana* Haines, *S. aquatica* (L.) Scop., *S. alsine* Grimm and *S. vestita* Kurz; *S. cuonaensis* L.H.Zhou, *S. semivestita* Edgew., *S. lanata* Hook. f., *S. sikkimensis* Hook. f., *S. patens* var. *ovatifolia* H.Hara; *Odontostemma* sp., *Silene* sp., *Arenaria* sp. and *Cerastium* sp.).
- **Illustrations:** Photographic illustrations and Line drawings prepared for **5 (five)** collected species (*Stellaria alsine* Grimm; *S. vestita* Kurz; *Spergula arvensis* L.); *Sagina japonica* (Sw.) Ohwi. & *Silene* sp.).
- **Other scientific work done:**
- **Kaur, S., Deori, C., & Shankar, U.** (2024). Taxonomic notes on the genus *Drymaria* Willd. ex Schult. (Caryophyllaceae) in India. . Abstract submitted at International Conference on Biodiversity and Climate Change: Challenges and Opportunities for Nature Based Solutions. Department of Life Sciences, Dibrugarh University & Botanical Society of Assam.
- **Kaur, S., Deori, C., & Shankar, U.** (2024). Taxonomy and distribution of the family Caryophyllaceae in India: A preliminary analysis. Abstract submitted at 3rd International Symposium on Plant Taxonomy, Ethnobotany and Botanic gardens, Kolkata, West Bengal. Botanical Survey of India.
- **Additional:** (i) Study of Phenology of Caryophyllaceae species to plan future field tours. (ii) Hindi article written on Caryophyllaceae for Vanaspati Vaani. (iii) Seed collection done for collected Caryophyllaceae species. (iv) Dissection and photography done for Caryophyllaceae species, *Cymbidium* sp., collected during field tour. (v) Country-wise distribution list of Caryophyllaceae genera in the Indian Subcontinent prepared using different literatures and online databases. (vi) Generic diversity list of Caryophyllaceae species prepared using different literatures and online databases. (vii) Caryophyllaceae species distribution in Indian eastern & western Himalayas listed in detail according to the genera found in the country. (viii) Participated in clean drive program organized in the office and residential area on 10/8/24. (ix) Participated in Independence Day program. (x) Identified **14(fourteen)** plant specimens of other families (*Anaphalis nepalensis* (Spreng.) Hand.-Mazz.; *Primula wattii* King ex G.Watt; *Aconitum* spp.; *Impatiens scabrifolia* DC.; *Bistorta vacciniifolia* (Meisn.) Greene; *Cyananthus* sp.; *Cyananthus inflatus* Hook.f. & Thomson; *Pedicularis siphonantha* subsp. *siphonantha*; *Impatiens chungtienensis* Y.L.Chen; *Elsholtzia strobilifera* (Benth.) Benth.; *Geranium polyanthes* Edgew.; *Sedum* sp.; *Hemiphragma heterophyllum* Wall. & *Epilobium* sp.) collected during tour. (xi) Participated in cleanliness drive to clean Herbarium hall on 14/10/24. (xii) Participated in the annual cleanliness drive of the nearby Dobar Dong Demnseinion locality on 16/12/24.

Project 8: Ecological status of dominant invasive alien plant species, patterns of plant invasions and their impact on the native plant diversity in the North-western Himalaya (Himachal Pradesh, Ladakh and Jammu region)” Under Flora of India.

Name of the JRF: Mr Ritesh Kumar Singh

Name of the Supervisor: Dr. Kuldip S. Dogra, Scientist-E

Duration of the Project: 2023–2028

Achievements:

- Field tours conducted and area surveyed for ecological study (quantitative and qualitative) on dominant invasive alien plant species:

- Himachal Pradesh (3 Tours)- 65%
- Jammu Region (2 Tours)- 30%
- Ladakh- (1 Tour)- 50%
- Prepared inventories (checklists) with ecological status of Alien Plant Species through field survey and literatures
 - Himachal Pradesh (754 Species)
 - Jammu region (168 species) and Ladakh (134 species) [in progress]

Collected a total of 387 plant species (including both native and alien species).

Project 9: Taxonomic revision of Zingiberaceae Martinov (Excluding genera Amomum, Boesenbergia, Cautleya, Curcuma, Hedychium, Meistera, Wurfbainia)

Name of the JRF: Mrs. Aishwaryya Mitra

Name of the Supervisor: Dr Manas Ranjan Debta, Scientist-D

Duration of the Project: 2023–2028

Achievements:

- During the year 2024, two field tours were conducted to diverse regions including Sikkim, Neora Valley National Park, and Maharashtra to collect plant specimens for botanical research and conservation.
- A total of 63 plant species were collected, among these, 7 rhizomes were specifically collected for ex situ conservation. The specimens were identified, photographed, and documented.
- Photoplates were prepared and all collected specimens were subsequently processed to create herbarium records. A total of 7 herbarium consultations were conducted at various institutes, including BSD, DD, SUK, MH, FRC, CALI, and BSHC. During these consultations, 497 herbarium specimens were examined.
- The consultation at CAL is ongoing, and further studies are anticipated to refine species identification and classification.
- Conducted 2 field tour Parts of Sikkim and Neora valley national park and Mahashtra.
- Total collected plants (Field no): 63
- Total collected Zingiberaceae specimen: 15
- Identified plants: 12
- Prepared photoplates: 8
- Prepared distributional map: 23
- Brought rhizome for ex situ conservation: 7
- Herbarium Consultation tour: 7
- Consulted Herbaria: BSD, DD, CALI, MH, FRC, BSHC, SUK.
- Total consulted herbarium specimen: 497
- Consulted herbarium specimen from CAL: 200
- Participated in Seminar/conference:

Project 10: Freshwater Red Algae of India**Name of the RA:** Dr. U. Elaya Perumal, RA**Name of the Supervisor:** Dr. M Palanisamy, Scientist-E**Duration of the Project:** 2023–2026**Achievements:**

- As per the research proposal three field tours were conducted to various Northern States of India (Arunachal Pradesh (Namsai, East Siang and Papum Pare district), Assam (Cachar, Kamrup Metropolitan, Morigaon, Hojai, West Karbi Anglong, Nagaon, Dimapur, Tinsukia, Sivsagar, and Dibrugarh District); Meghalaya (East Khasi Hills, West Jaintia Hills); Nagaland (Dimapur District), Tripura (Dima Hasao, Gomati, West Tripura, Sipahijala, Khowai, Dhalai & Unakoti District); Jharkhand (Ranchi, Lohardaga, East Singhbhum, Seraikela Kharsawan Districts), Himachal Pradesh (Kangra District), Bihar (Patna, Muzaffarpur, Gaya Districts), Haryana (Ambala, Yamuna Nagar, Kurukshetra Districts), Jammu Kashmir (Kathua, Jammu, Ramban, Srinagar, Bandipore, and Baramulla Districts), Punjab (Amritsar, Pathankot and Patiala District) Rajasthan (Bharatpur, Jodhpur, Jaipur, Jalandhar District), Uttar Pradesh (Agra, Bareilly, Lucknow, Rae Bareilly, Prayagraj, Varanasi Districts), Uttarakhand (Dehradun, Haridwar, and Tehri Garhwal Districts), West Bengal (Alipurdwar, Cooch Behar, Jalpaiguri, Darjeeling, Dakshin Dinajpur, Uttar Dinajpur and Malda districts) Chandigarh-UT and New Delhi-UT.)
- Totally 317 samples were collected and preserved properly for further studies. All the samples were observed under microscope which revealed the presence of red algae in 72 samples. Detailed studies resulted 9 species under 6 genera belongs 5 orders under 2 classes.
- Liquid preservations of all samples were done using standard methods and herbarium sheets were made for 65 specimens of red algae. Using GIS coordinates collection location maps were prepared (Arc GIS). Habit and Habitat photographs were taken during the field tours (more than 200 photographs taken).
- All the Three field tour reports were prepared and submitted to the BSI Headquarter, Kolkata through the proper channel.
- Published an article on “Nomenclature changes in the *Kumanoa* (Batrachospermales, Rhodophyta) of India”.
- Prepared an updated checklist consisting of 115 species of freshwater red algae from India with their synonyms, correct citation and distributional records based on literatures. Final manuscript preparation is in progress.
- Submitted abstract on “Generic Addition to Algal Flora of India” to BSI symposium.

Project 11: Studies on the family Cortinariaceae (Basidiomycota) in India: Molecular and morpho-taxonomy**Name of the JRF:** Ms. Arunima Bose**Name of the Supervisor:** Dr. Kanad Das, Scientist-F**Duration of the Project:** 2023–2028**Achievements:**

- **Macrofungal surveys:**

- The first macrofungal survey tour to the Almora district of Uttarakhand (Binsar Wildlife Sanctuary) was undertaken w.e.f. 19.07.2024 to 28.07.2024, 2024. Adjoining forested areas of this Wildlife Sanctuary were also surveyed. About 25 field numbers belonging to 10 species from Cortinariaceae were collected. All the collections are well preserved and under study.
- A second field tour to the Shimla district, Himachal Pradesh w.e.f. 23.08.2024 to 01.09.2024 was also undertaken. The following areas were covered during this survey: Glen, Taradevi forest, Charabara, Narkanda, Hattoo Peak Forest, Baghi, Khardala, Chopal forest and Churdhar base. About 19 field numbers belonging to 10 species from Cortinariaceae were collected. All the collections are well preserved and under study.
- A third field tour to Wayanad, Kerala w.e.f. 14.10.2024 to 18.10.2024 was also undertaken. The following areas were covered during this survey: Kuruva Island, Narugami and Aralam Wildlife Sanctuary. About 06 field numbers belonging to 03 species of the family Cortinariaceae were collected. All the collections are well preserved and under study.
- **Macro-morphological characterization** of all 50 samples were undertaken in the field or respective basecamps.
- **Micro-morphological characterization and drawings of the collected samples:** A total of 24 samples have been morpho taxonomically and phylogenetically characterized under compound microscope. Micro-morphological (camera lucida) drawings were also prepared for these samples.
- **Identification:** Based on both morphological features and nrITS-based molecular phylogenetic analysis 18 species belonging to 34 samples were identified.
- **SEM study:** Undertaken the SEM studies for 8 samples namely, ABKDUK24-005, ABKDHP24-005, ABKDUK24-012, ABKDHP24-001, ABKDHP24-006, ABKDHP24-017, ABKDHP24-010 and ABKDUK24-006 at S.N. Bose National Centre for Basic Sciences (Kolkata, WB).

Project 12: Taxonomic revision of the tribes Coreopsidae (Asteraceae) and Gnaphalieae (Asteraceae) in India

Name of the JRF: Ms. Priya Singh Kushwaha

Name of the Supervisor: Dr. Avishek Bhattacharjee, Scientist-E

Duration of the Project: 2023–2028

Achievements:

➤ **Area Surveyed**

Conducted two consecutive field tours covering several regions of Uttarakhand from 03.8.2024 to 01.09.2024 and North-East India from 13.09.2024 to 26.09.2024. Also conducted one Herbarium consultation tour in Maharashtra from 14.12.2024 to 26.12.2024

➤ **Herbaria consulted (other than CAL)**

DD (consulted 28 herbarium specimens), BSD (consulted 33 herbarium specimens), WII (consulted 19 herbarium specimens), BSI (consulted 73 herbarium specimens), AMH (consulted 15 herbarium specimens), SUK (consulted 25 herbarium specimens).

List of collected species during the field tours in 2024: *Anaphalis adnata* DC., *Anaphalis busua* (Buch.-Ham. ex D. Don) DC., *Anaphalis contorta* (D. Don) Hook. f., *Anaphalis hookeri*

C.B. Clarke ex DC., *Anaphalis margaritacea* (L.) Benth. & Hook. f., *Anaphalis nepalensis* var. *monocephala* (DC.) Hand.-Mazz., *Anaphalis nepalensis* var. *nepalensis* (Spreng.) Hand.-Mazz. (Spreng.) Hand.-Mazz., *Anaphalis royleana* DC., *Anaphalis subumbellata* C.B. Clarke, *Anaphalis triplinervis* (Sims) C.B. Clarke, *Anaphalis xylorhiza* Sch. Bip. ex Hook.f, *Bidens pilosa* L., *Pseudognaphalium affine* (D. Don) Anderb., *Pseudognaphalium luteo-album* (L.) Hilliard & B.L. Burtt. *Leontopodium nivale* subsp. *alpinum* (Cass.) Greuter, *Leontopodium himalayanum* DC., *Leontopodium stracheyi* C.B. Clarke ex Hemsl. Morpho-taxonomic studies (both macro and micromorphology) including dissection, photoplate preparation and description of *Anaphalis* spp. (*A. adnata*, *A. subumbellata*, *A. xylorhiza*, *A. nepalensis* var. *monocephala*) were done. SEM of cypselas of *A. adnata*, *A. busua*, *A. contorta*, *A. hookeri*, *A. margaritacea*, *A. nepalensis* var. *monocephala*, *A. royleana*, *A. subumbellata*, *Anaphalis triplinervis*, *A. xylorhiza* was done. Protologue and Types were searched for the above mentioned species.

DNA extraction protocol standardization and isolation of 15 plant samples was done. PCR amplification and protocol standardization, Gel-screening and Scaling of 30 samples (for ITS, ETS and *trnL-F* markers) were carried out and sent for Sanger sequencing. Sequence authentication and curation were being done using Clustal W, BLAST (NCBI) and BioEdit of the received sequences for Phylogenetic analysis and tree construction.

Project 13: Taxonomic study of the family Lythraceae J.St.-Hil. in India

Name of the JRF: A. Parthiban

Name of the Supervisor: Dr. L. Rasingam, Scientist-E

Duration of the Project: 2023–2028

Achievements:

- Field collection trips were conducted in the northern parts of Kerala (August, September, and December 2024), selected locations in Karnataka (November 2024), and various reported locations in Maharashtra (September, October, and December 2024), resulting in the collection of 142 specimens. Among these, 120 specimens were identified as 25 distinct Lythraceae species with the aid of microscopic studies. Additionally, 30 specimens of associated species were also collected.
- Local collection trips to Amrabad Tiger Reserve and Kawal Tiger Reserve (December 2024), Paderu in Andhra Pradesh, and Pakhal Wildlife Sanctuary (April and May 2024) yielded 45 Lythraceae specimens, identified as 10 distinct species. Detailed morphological descriptions and photo plates were prepared for 8 species. Protologues and type specimens of names relevant to Indian Lythraceae were studied either directly or through images available from online herbarium databases. Lythraceae specimens housed in various herbaria, including BSI (Type Herbarium), CALI, KFRI, MH, SUK, and TBGT, were consulted between February and April 2024, comprising a total of 34 type specimens and 2200 general collections. Seed micro-morphological studies of 7 species were conducted using a Scanning Electron Microscope. Nucleotide sequences of various markers for Indian Lythraceae species were gathered from NCBI databases, and fresh specimens collected during fieldwork were stored with silica gel.

Project 14: Assessing impact of climate change on floristic and migration of vascular plants in alpine-subalpine landscape of western Arunachal Pradesh.

Name of the RA Dr. Subhajit Lahiri

Name of the Supervisor: Dr. Sudhansu Sekhar Dash, Scientist-F

Duration of the Project: 3 years (2023–2026)

Achievements:

- Four research sites have been selected in the alpine and subalpine regions (> 3000 m) of western Arunachal Pradesh, covering the parts of Tawang and West Kameng districts. During the monsoon and post-monsoon seasons, a thorough survey was conducted in various locations of the study site, and two hundred thirty-six voucher plant specimens were collected and further processed in accordance with standard procedures.
- All the collected specimens will be pressed, dried, poisoned, and mounted to prepare herbarium specimens. The voucher specimens will be deposited in Herbarium CAL.
- We have identified all collected samples based on field characteristics and conducted a study on previous collections kept at ARUN, ASSAM, BSHC, and CAL.
- If possible, we dissected the flowers in the field. All the collected species will be enumerated with accepted names followed by a brief description, geocoordinates, ethnomedicinal uses, phenology, and possible current threat status. Photographs of uncommon species were taken in the field with a Sony HX 400V camera.
- All samples are dissected in the field as far as possible for easy identification. Conservation evaluation of the alpine species viz. *Platanthera cumminsiana* (King & Pantl.) Renz; *Primula soldanelloides* G. Watt.; *Cirsium eriophoroides* (Hook.f.) Petr., *Eriophyton wallichii* Benth., *Androsace croftii* G. Watt.; *Primula flagellaris* W.W.Sm.; *Primula gambeliana* G. Watt.; *Primula concinna* G. Watt.; *Primula muscoides* Hook.f. ex G. Watt.; *Codonopsis bhutanica* Ludlow; *Cyananthus sherriffii* Cowan; *Codonopsis foetens* Hook.f. & Thomson; *Rhodiola cretinii* (Raym.-Hamet) H. Ohba; *Rhodiola fastigiata* (Hook.f. & Thomson) S.H. Fu and *Cyananthus spathulifolius* Nannf. have been carried out.
- The study was carried out in the eastern Himalayas by integrating historical and empirical data to reveal significant changes in the flowering phenology of *Rhododendron* species. During this tenure, two field tours were undertaken at subalpine and alpine areas of Tawang and West Kameng districts and four herbarium tours. Seven names of alpine species were lectotypified. During this period, 4 papers have been communicated, 2 were published, and 3 book chapters were also published.

Project 15: Taxonomic revision of the family Solanaceae in India

Name of the JRF: Phani Bhusan Sahoo

Name of the Supervisor: Dr. Sudhansu Sekhar Dash, Scientist-F

Duration of the Project: 2023–2028

Achievement:

- Studied micro-morphological features of 50 no. of Pollen and seed samples of *Solanum* spp. under Scanning Electron Microscopy (SEM) for understanding their taxonomical significance in identification of species.
- Prepared palynological description to 17 no. of *Solanum* spp. and prepared a key based on the observed palynological characters. Studied protologues and type specimens of 30 names under

genus *Solanum* L. and 10 names under *Cestrum* L. Visited different herbaria like BSI, SUK, NGCPR, MH, IFGTB, KFRI, JNTBGRI, TBGT and CALI and consulted about 7022 no. of herbarium specimen of family Solanaceae.

- Conducted field tour to different parts of Tamil Nadu and Maharashtra and collected 150 accessions of total 38 species of Solanaceae. The collected plant specimens are poisoned and pressed for preparation of Herbarium.
- Dissected 60 no. of flowering and fruiting samples of 35 species of Solanaceae and determined their correct identity. Prepared photo-plates of total 25 *Solanum* spp. for easy identification of taxa. Studied the morphological variations in the *Solanum nigrum* complex by study of available herbarium specimens and collecting plant specimens from different geographical parts of the country.



Physalis peruviana L.



Cestrum elegans (Brongn. ex Neumann) Schltdl.



Solanum laxum Spreng.



Solanum viarum Dunal

Project 16: Taxonomic Revision of the Subtribe *Justiciinae* (Acanthaceae) in India.

Name of the JRF: Samrat Goswami

Name of the Supervisor: Dr. S.S. Dash, Scientist-F

Duration of the Project: 2023–2028

Achievements:

- Databasing and documentation of Herbarium specimens in CAL (846 sheets), BSI (1,636), SUK (212) and NGCPR (105).
- Herbarium specimens had problems regarding their identity or misidentified, which includes 58 herbarium sheets which were determined correctly in accordance with the protologue and type materials.
- Study of Herbarium specimens and consulted floras for understanding the range of variation in the species collected. Dissection of flowers from general herbarium collections.
- Conducted a one-day tour to Deulti, Howrah on 17.03.2024. Collected 4 field numbers.
- Conducted a tour to Hazaribagh, Jharkhand on 23.03.2024. Collected 2 field numbers and tour to Jhargram, West Bengal on 30.03.2024. Collected 2 field numbers.
- Conducted 25 days (17th October to 11th November, 2024) tour to different regions of Maharashtra and Badami in Karnataka. Collected 42 field numbers in this tour.
- Conducted 6 days (21st to 27th February, 2025) days tour in different regions of Odisha. Collected 8 field numbers in this tour.
- Identified 18 species collected from the field tours by consulting protologues, types and took assistance from floras to measure the range of variations and also consulted various checklists.
- Performed DNA extraction from freshly collected leaf samples at Western Regional Centre, Pune (W.R.C.) in 4 different species of *Justicia*.
- Working on *Justicia* section *Rostellaria* and *J.* section *Harnieria* to resolve ambiguity within the members.
- Morphometric analysis to aid species delimitation in members of *J.* section *Rostellaria*.
- Nodal anatomical studies in different species of *Justicia* L., *Rungia* Nees and *Hypoestes*.
- Corolla vasculature and Petal micromorphological studies were conducted in 6 species belonging to *Justicia* L., *Rungia* Nees and *Rhinacanthus* Nees.
- Prepared Photoplate /Illustration preparation of 10 species of *Justicia* Awards
 - Awarded the best poster of the Theme VII ‘Taxonomy and biosystematics of Algae, Fungi and Plants’ in ‘International Conference on Plant Science: Today and Tomorrow 2024’.

Project 17: Taxonomic Revision of the genus *Bupleurum* L. (Apiaceae) in India

Name of the RA: Dr. Jayanta Ghosh (RA)

Name of the Supervisor: Dr. Manas Bhaumik, Scientist-F

Duration of Project: 3 Years (01.09.2023–31.08.2026)

Achievements:

To know the actual diversity and distribution of the species of the genus *Bupleurum* L. in India, an extensive effort has been made. A field identification key to the species of the genus has been prepared

based on the characters observed from the herbarium sheets of the species. Thorough literature survey and field collection trips have been conducted. In this year, three major field exploration and collection trips and one minor trip has been conducted. The field trips have been undertaken in different areas of Uttarakhand in the month of July [08.07.24-31.07.24], Darjeeling and Sikkim in August [09.08.24-23.08.24] and in different regions of Kameng and Tawang districts of Arunachal Pradesh in September [08.09.24- 27.09.24] and Netarhat of Jharkhand regions in the month of November. All these, field trips resulted in the collection of about 30 field numbers of the genus *Bupleurum*. All the collected specimens have been preserved properly, processed and poisoned, herbarium sheet preparation is continuing. During this tenure, nine different species of the genus have been dissected, illustrated, described, and identified with the help of relevant literatures. Out of this, *Bupleurum longicaule* var. *amplexicaule* R.H.Shan & Yin Li collected from Sikkim; *B. microcephalum* Diels, *B. rockii* H. Wolff and *B. yunnanense* Franch. from Arunachal Pradesh; and *B. petiolulatum* Franch. from Uttarakhand have been collected and identified preliminary as the new members to the flora of India. Molecular studies will be performed for further confirmation regarding their identity. Another, species *Bupleurum gracillimum* Klotzsch. has been collected and identified as its first report in Arunachal Pradesh. Besides, a comparative account of the morpho-anatomical features of the fruits of the genus *Bupleurum* has been prepared based on the collected materials as well from the available literature. Till date, the SEM studies of pollen grains have been done for three species of the genus based on the collected materials from the field trips. The AOO and EOO have been calculated through the GeoCAT website, for seven species, viz., *Bupleurum candollei* Wall. ex DC., *B. clarkeanum* (H.Wolff) Nasir, *B. gracillimum* Klotzsch, *B. khasianum* (C.B.Clarke) P.K.Mukh. *B. longicaule* Wall. ex DC., *B. maddenii* C.B.Clarke and *B. thomsonii* C.B.Clarke, based on the herbarium data as well as recently collected information regarding the occurrence of the species.

Project 18: Taxonomic Study of Some Selected Genera of Apiaceae (*Heracleum* L., *Pimpinella* L., *Pleurospermum* Hoffm., *Physospermopsis* H.Wolff, *Pternopetalum* Franch., *Sinocarum* H.Wolff ex R.H.Shan & F.T.Pu)

Name of the JRF: Priyanka Bhandari

Name of the Supervisor: Dr. Manas Bhaumik, Scientist-F

Duration of the project: 5 years

Achievements:

- Conducted a field tour at different places of Uttarakhand such as George Everest Peak, Chakrata, Deoban at Dehradun dist, Govind Wildlife Sanctuary, Gangotri National Park, at Uttarkashi District, and Hemkund, Valley Of Flowers at Chamoli dist, w.e.f. 8.07.2024 to 31.07.2024, for 23 days .
- During survey near about five Genera and twelve Species of Apiaceae have been collected. Among them Three genera such as *Heracleum* (three species), *Pimpinella* (two species), *Pleurospermum* (two species) , seven species which are included in my study area, have been collected, along with their GPS location, abundance data, soil type, associated plants type, economic importance etc.
- Conducted a field cum herbarium tour at Darjeeling, Singalilia National Park West Bengal and Sikkim, w.e.f. 9.08.2024 to 23.08.2024, for 14 days .
- During survey near about five Genera and twelve Species of Apiaceae have been collected. Among them Three genera such as *Heracleum* (two species), *Pimpinella* (two species), *Pleurospermum* (two species) , *Sinocarum* three species which are included in my study area, have been collected.

- During herbarium consultation five identity correction of wrongly identified herbarium sheets, viz. *Pimpinella sikkimensis* C.B.Clarke, East Sikkim, 42186, 12.02.2022, N.Sherpa & S.Mangar, BSHC00048746; *Acronema bellum* (C.B.Clarke) P.K.Mukh., North Sikkim, 22438, 30.08.1999, G.P.Sinha & A.Maity, BSHC00016603; *Sinocarum clarkeanum* P.K.Mukh & Constance; East Sikkim, 2880, 4.08.1985, DCS Raju & S.Singh, BSHC00016769; *Acronema bellum* (C.B.Clarke) P.K.Mukh., North Sikkim, 37541, 18.08.2012, Mohan Gangopadhyay, BSHC00016572; *Chaerophyllum villosum* Wall., North Sikkim, 36394, 2.08.2011, Mohan Gangopadhyay, BSHC00016561.
- Conducted a field tour at West Kameng, Tawang dist. Of Arunachal Pradesh., w.e.f. 8.09.2024 to 27.09.2024, for 20 days .
- During survey near about fifteen Genera (*Heracleum* , *Oenanthe* , *Torilis* , *Sanicula* , *Selinum*, *Sinocarum* , *Pimpinella* , *Acronema* , *Hymenidium* , *Trachydium* , *Physospermopsis* , *Cheerophyllum* , *Cortiella* , *Cnidium* and sixteen Species of Apiaceae have been collected. Among them Five genera such as *Heracleum* (two species), *Pimpinella*(two species), *Hymenidium* (three species) , *Sinocarum* (two species) which are included in my study area, have been collected. During this tour most of the Apiaceae plants are found in mature stage. Maximum plants are found in mature fruiting condition because of early monsoon in North-Eastern Himalaya, heavy rain in July-August is possibly the accurate time for Flowering of Apiaceae in Eastern Himalaya.
- Herbarium consultation at Guwahati University.About two hundred sheets have been studied, examined and photographed.
- Extraction of genomic DNA from eleven samples were done, collected from Arunachal Pradesh and Sikkim. Trial PCR amplification of eleven samples were done and results noted. Agarose Gel was prepared, checked the PCR product and documented the result. PCR amplifications and scaling of six samples were done . Samples were packed and sent for Sequencing. Sequencing order forms were prepared and sent. Phlogenetic analysis is under process for The Genus *Sinocarum* H.Wolff ex R.H.Shan & F.T.Pu.

Project 19: Threat assessment, distribution mapping and development of conservation protocol for Endemic, Threatened and lesser-known plants of Indian Himalayan Region

Name of the RA: Dr. Amber Srivastava

Name of the Supervisor: Dr. Sushil Kumar Singh, Scientist-F

Duration of the Project: 3 Years

Background: The Himalayan plant diversity is facing severe threats due to anthropogenic and climate induced changes. Some of the plant species have even reached to stage of extinction from the region. Considering the need and importance on endemic and threatened plant diversity, the proposal initiates to develop field-based database on some lesser-known threatened plant species viz., *Brachystelma attenuatum*, *Butea peltita*, *Catamixis baccharoides*, *Gymnocladus assamicus*, *Itea nutans*, *Lagerstroemia minuticarpa*, *Magnolia kisopa*, *Tricholepis roylei*, and *Ulmus wallichiana* will be carried out. To develop a database of endemic, threatened and lesser-known plants of Indian Himalayan Region. To study the taxonomy, population ecology, regeneration potential and species association of the selected threatened species. To develop a conventional propagation protocol for mass scale propagation of selected endemic, threatened and medicinal plants, and successful ex-situ conservation in the botanical garden. To develop distribution and habitat suitability maps of each species for identifying the potential areas for reintroduction and in-situ conservation.

Area & Locality: Indian Himalayan Region

Achievements: Resolved taxonomic and nomenclature problems in *Brachystelma attenuatum*. Threat assessment of 3 species viz., *Tricholepis roylei*, *Catamixis baccharoides* and *Brachystelma attenuatum* has been done. Propagated *Butea pellita*, *Itea nutans*, *Tricholepis roylei*, *Catamixis baccharoides* and *Brachystelma attenuatum* through seeds and stem cuttings. Habitat modelling of *Catamixis baccharoides* and *Butea pellita* has been done using MAXENT software. Introduced *Calotropis acia*, *Boucerosia umbellata*, *Eulophia dabia*, *Eulophia bicallosa*, *Cynanchum viminalis*, *Caralluma stalagmifera*, *Tinospora crispa* & Thomson and *Boucerosia crenulata* in the botanical garden. Developed a Carnivorous Plant Section and introduced *Drosera burmanni*, *D. binata*, *D. spatulata*, *D. filiformis*, *D. adalae*, *Sarracenia purpurea*, *Nepenthes khasiana*, *Nepenthes krabiensis*, *Nepenthes rafflesiana* and *Nepenthes* × ‘Gaya Buddha’ [*N. khasiana* × (*ventricosa* × *maxima*)]. Developed an Aquatic Plant Section in the botanical garden of BSI, Dehradun. Collected saplings of *Trachycarpus takil* Becc. from Munsyari and Thalkedar region. Collected seeds of *Butea pellita*, *Itea nutans* and *Magnolia kisopa* from Kumaon region and sowed in different media for germination.



Trachycarpus takil



Itea nutans



Magnolia kisopa

Project 20: Bryofloristic studies of Garhwal Region of Uttarakhand

Name of the JRFs: Darshan Shukla and Manchi Jandial

Name of the Supervisor: Dr. S.K. Singh, Scientist-F

Duration of the Project: 2023–2028

Achievements:

Field exploration tours undertaken: **6** [**1st tour** was undertaken to Yamunotri (Uttarakhand) from 02/04/2024 to 06/04/2024 and collected 135 specimens of bryophytes; **2nd tour** was undertaken to Valley of Flowers, Chamoli from 23/08/2024 to 26/08/2024 and collected 155 specimens of bryophytes, **3rd tour** was undertaken to Jhilmil Jheel Conservation Reserve, Haridwar on 7th September, 2024 and collected approximately 20 specimens of bryophytes; **4th tour** was undertaken to Dhanolti on 15th September, 2024 and collected 49 specimens of bryophytes; **5th tour** was undertaken to Chakrata on 14th November, 2024 and collected 34 specimens of bryophytes; **6th tour** was undertaken to Chopta, Rudraprayag (Uttarakhand) from 26/12/2024 to 01/01/2025 and collected 255 specimens of bryophytes

Total specimens collected: 648

Total specimens identified: 230

Taxonomic description and illustration completed: 75 species [*Fissidens geminiflorus* Dozy & Molk., *Pohlia minor* Schleich. ex Schwägr., *Distichium inclinatum* (Hedw.) Bruch & Schimp., *Orthotrichum griffithii* Mitt. ex Dixon, *Ochiobryum handelii* (Broth.) J.R. Spence & H.P. Ramsay, *Reimersia inconspicua* (Griff.) P.C. Chen, *Timmia anomala* (Bruch & Schimp.) Limpr., *Campylopus gracilis* (Mitt.) A. Jaeger, *Mielichhoferia himalayana* Mitt., *Ptychomitrium tortula* (Harv.) A. Jaeger, *Bryum dichotomum* Hedw., *Leptobryum pyriforme* (Hedw.) Wilson, *Anisothecium molliculum* (Mitt.) Broth., *Entodontopsis nitens* (Mitt.) W.R. Buck & Ireland, *Didymodon maschalogena* (Renauld & Cardot) Broth., *Anomodon viticulosus* (Hedw.) Hook. & Taylor, *Barbula confertifolia* Mitt., *Didymodon constrictus* (Mitt.) K. Saito., *Ditrichum pusillum* (Hedw.) Hampe., *Zygodon obtusifolius* Hook., *Grimmia longirostris* Hook., *Blindia acuta* (Hedw.) Bruch & Schimp., *Bryum pseudotriquetrum* (Hedw.) G. Gaertn., B. Mey. & Scherb., *Trematodon longicollis* Michx., *Tayloria jacquemontii* (Bruch & Schimp.) Mitt., *Brachymenium bryoides* Hook. ex Schwägr., *Imbribryum alpinum* (Huds. ex With.) N. Pedersen, *Barbula indica* (Hook.) Spreng., *Encalypta raptocarpa* Schwägr., *Fissidens curvatoinvolutus* Dixon, *Pohlia flexuosa* Harv., *Fleischerobryum longicolle* (Hampe) Loeske, *Pohlia gedeana* (Bosch & Sande Lac.) Gangulee, *Philonotis fontana* (Hedw.) Brid., *Brachymenium capitulatum* (Mitt.) Kindb., *Anomobryum nitidum* (Mitt.) A. Jaeger, *Brachymenium leptophyllum* (Bruch & Schimp. ex Müll. Hal.) Bruch & Schimp., *Bryum apiculatum* Schwägr., *Diobelonella rotundata* (Broth.) Schäff.-Verw., Gerh. Winter & K.Y. Yao, *Bryum lanatum* (P. Beauv.) Brid., *Brachymenium ptychothecium* (Besch.) Ochi; *Fissidens anomalus* Mont., *Fissidens ceylonensis* Dozy & Molk., *Pogonatum perichaetiale* (Mont.) A. Jaeger, *Fissidens flaccidus* Mitt., *Seligeria donniana* (Sm.) Müll. Hal., *Hookeria acutifolia* Hook. & Grev., *Pogonatum perichaetiale* subsp. *thomsonii* (Mitt.) Hyvönen, *Pogonatum urnigerum* (Hedw.) P. Beauv., *Atrichum subserratum* (Harv. & Hook. f.) Mitt., *Fissidens grandifrons* Brid., *Blindiadelphus campylopodus* (Kindb.) Fedosov & Ignatov, *Campylopus introflexus* (Hedw.) Brid., *Bryum argenteum* Hedw., *Pogonatum contortum* (Menzies ex Brid.) Lesq., *Fissidens enervis* Sim., *Fissidens flabellulus* Thwaites & Mitt., *Fissidens brevinervis* Broth., *Fissidens curvatus* Hornsch., *Syrrhopodon gardneri* (Hook.) Schwägr., *Lewinskya speciosa* (Nees.) F.Lara, Garilleti & Goffinet, *Neckera pennata* Hedw., *Fissidens virens* Thwaites & Mitt., *Splachnobryum obtusum* (Brid.) Müll. Hal., *Entosthodon wichurae* M. Fleisch., *Lepidozia brevifolia* Mitt., *Symblepharis vaginata* (Hook. ex Harv.) Wijk & Margad., *Rhachithecium perpusillum* (Thwaites & Mitt.) Broth., *Fabronia secunda* Mont., *Fissidens ganguleei* Nork., *Oligotrichum falcifolium* (Griff.) G.L.Sm.; *Rhodobryum giganteum* (Schwägr.) Paris; *Bryoerythrophyllum yunnanense* Chen Pan-chieh; *Fissidens diversifolius* Mitt.; *Entosthodon wallichii* Mitt.



Bryum cellular



Neckera pinnata

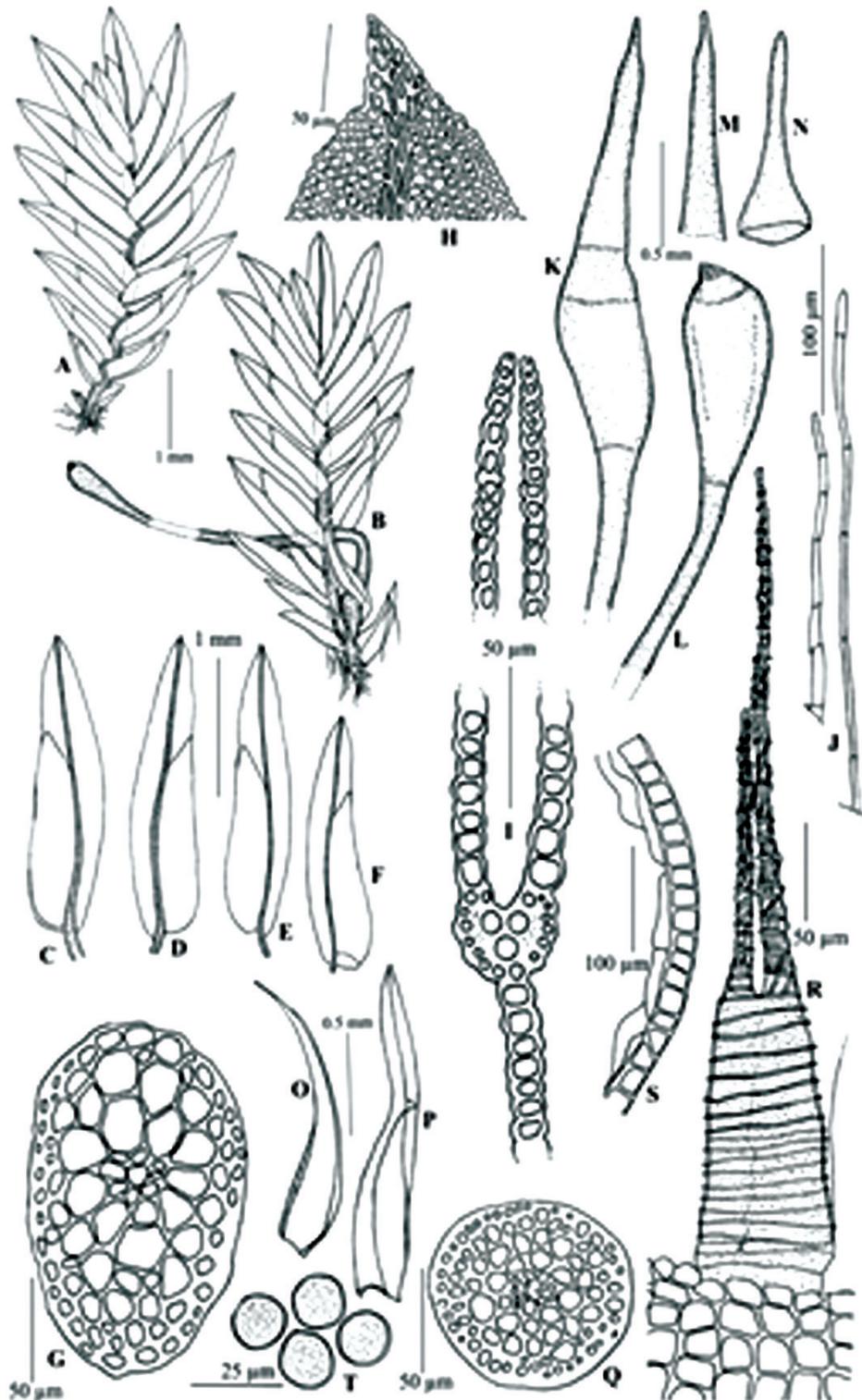


Plate 2 *Fissidens taxifolius* A: Vegetative plant, B: Plant with sporophyte, C-F: Leaves, G: T.S. stem, H: Cells towards leaf apex, I: T.S. leaf, J: Axillary hairs, K-L: Capsules, M: Calyptra, N: Operculum, O-P: Perichaetial leaves, Q: T.S. seta, R: Peristome teeth, S: A portion of cross section of capsule wall, T: Spores

Project 21: Revisionary Study of Wild Balsams (*Impatiens* Riv. ex L. Balsaminaceae) of Indian Himalayas (excluding Arunachal Pradesh & Sikkim)

Name of the JRFs: Shri Brahmarshi Mondal

Name of the Supervisor: Dr Rajib Gogoi, Scientist-F

Duration of the Project: 2023–2028

Achievements:

- Reviewed various taxonomic literature related to the genus *Impatiens* L., including *Balsams of Darjeeling & Sikkim Himalaya*, *Balsams of Eastern Himalaya*, *Balsaminaceae of Myanmar*, *Flora of India*, and consulted major online databases such as POWO, IPNI, WFO, and eFlora of India.
- Conducted a field survey in Uttarakhand from 28th July to 4th September, collecting 20 field numbers representing 11 species of *Impatiens* (family Balsaminaceae).
- Examined over 300 herbarium specimens at BSD and more than 500 specimens at DD during the Uttarakhand field tour.
- Conducted a herbarium consultation tour at the Central National Herbarium (CAL, Type Section) from 17th to 21st February 2025, examining over 250 sheets representing more than 110 species of *Impatiens*.
- Worked on the identification and documentation of 20 *Impatiens* species, including preparing photographic plates and capturing high-resolution images.
- Studied a total of 40 protologues related to the genus *Impatiens*.
- Prepared taxon Data sheet for 8 species of *Impatiens*.

Project 22: Taxonomic Studies on the Tribe Miliuseae (Subfamily Malmeoideae: Annonaceae) in India

Name of the JRFs: Mr. Sukdeb Bera

Name of the Supervisor: Dr. K. Karthigeyan, Scientist-F

Duration of the Project: 2023–2028

Achievements:

- Carried out field exploration at Velliangiri, Nilgiris Biosphere Reserve, Coimbatore, Tamil Nadu on 03.03.2024 and collected one species of *Miliusa*. Field survey in Kalakkad Mundanthurai Tiger Reserve in Tirunelveli, Tamil Nadu from 11.03.2024 to 16.03.2024 and twelve specimens of Annonaceae have been collected viz. *Miliusa indica*, *M. tirunelvelica*, *Orophea uniflora*, *O. thomsonii*, *Alphonsea sclerocarpa*, *Goniothalamus wightii*, *G. sericeus*, *G. rhynchantherus*, *Popowia beddomeana*, *Mitrephora heyneana*, *Meiogyne pannosa* and *M. ramarowii*. Field exploration in Anaimalai Hills of Western Ghats, Tamil Nadu from 28.03.2024 to 29.03.2024 and five species have been collected, namely *Meiogyne pannosa*, *M. ramarowii*, *Polyalthia suberosa*, *Goniothalamus wightii*, *Miliusa* sp. Field exploration tour to Periya Peak, Wayanad, Kerala from 17.04.2024 to 26.04.2024 and Chandanathodu, Wayanad, Kerala from 05.05.2024 to 11.05.2024 and collected 5 species of Annonaceae viz. *Meiogyne ramarowii*, *Orophea sivarajanii*, *Goniothalamus wynaadensis*, *Desmos lawii* and *Artabotrys zeylanicus*. Field tour to North Wayanad, Kerala from 19.05.2024 to 24.05.2024 and collected 2 species of Annonaceae viz. *Meiogyne ramarowii* and *Artabotrys zeylanicus*. Field survey at Cheruchakkichola and

Nelliampathi, Kerala from 28.08.2024 to 30.08.2024 and collected 6 species of Annonaceae viz. *Monoon coffeoides*, *Orophea uniflora*, *O. thomsonii*, *Meiogyne pannosa*, *Miliusa* sp., and *Desmos* sp. Field survey at Raja Mala and Pettimudi of Eravikulam National Park, Kerala from 24.09.2024 to 27.09.2024 and photographed and wrote description of one *Miliusa* species in field (collection not allowed). Field exploration tour in different parts of Khasia and Jaintia Hills of Meghalaya from 24.10.2024 to 27.10.2024 and collected 6 specimens of Annonaceae, viz. *Miliusa dioeca*, *Goniothalamus sesquipedalis*, *Polyalthia suberosa*, *Trivalvaria* sp., *Fissistigma* sp. and *Friesodielsia* sp. Field exploration tour to Andaman & Nicobar Islands and herbarium consultation at PBL from 23.11.2024 to 06.12.2024 and collected 11 species of Annonaceae viz. *Miliusa caudata*, *Miliusa jainii*, *Goniothalamus macranthus*, *Huberantha jenkinsii*, *Artabotrys speciosus*, *Uvaria micrantha*, *Anaxagorea luzuensis*, *Dasymaschalon dasymaschalum*, *Friesodielsia fornicate*, *Marsypopetalum modestum* and *Orophea monosperma*. Field survey at Kannur, Kerala from 19.01.2025 to 25.01.2025 and collected 8 species of Annonaceae, namely, *Orophea malabarica*, *Miliusa gokhalaei*, *Goniothalamus cardiopetalus*, *Meiogyne ramarowii*, *Polyalthia malabarica*, *Monoon fragrans*, *M. coffeoides* and *Sageraea* sp. Carried out field tour to Darjeeling from 15th to 20th February 2025. Carried out field survey at Kannur, Wayanad, Kozhikode and Palakkad districts of Kerala from 25.02.2025 to 06.03.2025 and collected 13 species of Annonaceae, namely, *Orophea malabarica*, *O. thomsonii*, *O. sivarajanii*, *Miliusa gokhalaei*, *M. paithalmalayana*, *M. nilagirica*, *M. wayanadica*, *M. tomentosa*, *Meiogyne pannosa*, *Polyalthia malabarica*, *Monoon fragrans*, *M. coffeoides* and *Cyathocalyx zeylanicus*. Field exploration tour to Nellai Wildlife Sanctuary, Tenkasi, Tamil Nadu from 17.03.2025 to 28.03.2025 and collected 10 species of Annonaceae, namely *Miliusa indica*, *M. sahyadrica*, *Alphonsea lutea*, *Meiogyne ramarowii*, *Orophea uniflora*, *Mitrephora heyneana*, *Polyalthia suberosa*, *Polyalthia longipedicellata*, *Huberantha korinti* and *H. cerasoides*.

- Studied pollen samples of 25 species of Annonaceae, viz. *Mitrephora heyneana*, *Monoon fragrans*, *M. coffeoides*, *M. longifolia*, *Meiogyne pannosa*, *M. ramarowii*, *Huberantha korinti*, *Miliusa tirunelvelica*, *M. indica*, *M. nilagirica*, *M. montana*, *Miliusa* sp. *Orophea sivarajanii*, *O. thomsonii*, *O. uniflora*, *Polyalthia suberosa*, *P. rufescens*, *Goniothalamus keralensis*, *G. wynadensis*, *G. seecious*, *Desmos lawii*, *Artabotrys zeylanicus*, *A. hexapetalus*, *Popowia beddomeana* and *Alphonsea sclerocarpa* under SEM. Colour photo plates are prepared for 10 species and illustration of 2 species have been drawn. All herbarium sheets at MH (more than 1500 herbarium sheets), ASSAM (370 general specimens and 2 type specimens), PBL (more than 300 herbarium sheets) and GUBH (54 specimens) were examined, photographed and all the data were noted down on prescribed Excel sheet. Identified 13 unidentified specimens of Annonaceae at CAL general collections. Verified more than 300 herbarium sheets and determined the correct identity of 67 specimens and corrected identity of 8 specimens at MH. Thirteen regional Flora books were referred at BSI, ERC Library. Photographed all the species in field and noted down the GPS data, habitat, distribution of all the species for further use. All the collected samples prepared for herbarium by following the standard Herbarium methodology. All collected flowers are dissected under light microscope and wrote the description of all species. All species are identified by comparing with protologue, type materials and authentic voucher specimens.

Project 23: A morphological and molecular approach to infer systematic relationships and species delineation in *Sonerila* Roxb. (Melastomataceae) in India, with special emphasis on inflorescence development and floral ontogeny

Name of the RA: Dr. Resmi, S.

Name of the Supervisor: Dr. K. Karthigeyan, Scientist-F

Duration of the Project: 2023–2026

Achievements:

- A total of 12 field trips were conducted to different parts of Kerala, Tamil Nadu, Meghalaya, and Andaman and Nicobar Islands, and 25 species were collected, identified and described.
- The samples collected were preserved for molecular and developmental studies. Studied the inflorescence and floral morphology of five species and colour photo plates were prepared.
- Completed the molecular analysis of 10 species. Studied the seed micromorphology of 13 species and prepared corresponding colour plates.
- Published one article in the Proceedings of the International Seminar on Plant Systematics: Present Status and Future Prospects. Indian Association for Plant Taxonomy, and two articles are accepted for publication in International Journals. One new species is awaiting publication.
- Furthermore, attended and presented a paper on Indian *Sonerila* in the International Botanical Congress held at Madrid, Spain.
- Another paper presented on the genus *Sonerila* Roxb. and was selected for **Dr. C. Chandrasekharan Memorial Award 2024** (Outstanding Contribution in Forest Conservation and Management in Kerala) by the Kerala Forest Research Institute (KFRI), Peechi.

Project 24: Floristic Studies on the Lichens of three southern districts (Madurai, Theni and Virudhunagar) of Tamil Nadu.

Name of the JRFs: Miss Hrudya, A.

Name of the Supervisor: Dr. T.A.M. Jagadeesh Ram, Scientist-F

Duration of the Project: 2023–2028

Achievements:

- From April 2024 to March 2025, botanical explorations were undertaken to document the lichen diversity of Madurai, Theni and Virudhunagar districts of Tamil Nadu. Field tours were conducted to Srivilliputhur Megamalai Tiger Reserve of Theni and Virudhunagar districts and to territorial forests of Madurai and Theni districts. During this period, a total of 735 packets were collected across various field expeditions and 120 specimens were identified (including those from previous fields).
- All the collected specimens are air dried for preservation and made into herbarium, totalling up to 2600, which are deposited in the Madras Herbarium (MH). Specimens are being identified based on their morphological, anatomical and chemical characters analysed in the laboratory. The specimens belonged to diverse families, including Parmeliaceae, Graphidaceae, Physciaceae, Letrouitiaceae, Pyrenulaceae, Caliciaceae, Peltigeraceae, Lobariaceae and Strigulaceae.
- Additionally, an oral presentation was delivered at the 3rd International Symposium on Plant Taxonomy, Ethnobotany, Botanic Gardens and Biodiversity Conservation conducted by Botanical Survey of India, Kolkata from 13th-15th Feb, 2025 on the topic “A preliminary exploration of diversity within the lichen family Parmeliaceae in Srivilliputhur-Meghamalai Tiger Reserve, Theni, Tamil Nadu”.

Project 25: Shola Forests: Floristic Composition, Structure and Dynamics in the Context of Climate Change.

Name of the JRFs: Miss Navya, S.

Name of the Supervisor: Dr. Sujana, K.A., Scientist-E

Duration of the Project: 2023–2028**Achievements:**

- A comprehensive botanical study was undertaken to explore and document the floristic diversity of the Shola forests ecosystems. Field surveys were conducted across key biodiversity hotspots, including the Agasthyamalai Biosphere Reserve, Kerala parts and Eravikulam National Park, Idukki, Kerala.
- During this period, a total of 130 plant specimens were identified (including those from previous fields) with 158 collected across various field expeditions. These collections were processed and preserved meticulously, enabling detailed taxonomic identification and the preparation of descriptions. The specimens belonged to diverse families, including Lauraceae, Orchidaceae, Asteraceae, and Balsaminaceae. Complementary to fieldwork, secondary data collection involved the compilation of a comprehensive checklist covering 100 plant families reported from the Shola forests of Kerala and Tamil Nadu. Herbarium records and historical literature were integrated to enhance the robustness of this checklist.
- Furthermore, two new plant records for Kerala published and documented extended distributions of tree species. The findings were actively disseminated through academic platforms, including the 47th All India Botanical Conference of the Indian Botanical Society and 31st Swadeshi Science Congress.
- Presentations highlighted pivotal topics such as the horizontal zonation of Shola forests and the threat status of endemic angiosperms. Additionally, an abstract titled “Treasure Islands of the Sky: Ecosystem Services of Tropical Sholas” was prepared for submission to the BSI International Symposium. Participated in a refresher course. Also worked on conservation assessments, with IUCN Red List evaluations initiated for five endemic species of the Western Ghats.

Project 26: Shola Forests: A Taxonomic Revision of the Family Oleaceae in India.

Name of the JRF: Miss E. Angelin Felicia

Name of the Supervisor: Dr. W. Arisdason, Scientist-E

Duration of the Project: 2023–2028

Achievements:

- Type Specimens Studied: Digital images of type specimens pertinent to 140 names in Oleaceae, housed in BM, E, G, K, K-W, LINN, NY and P.
- A total of 34 type specimens of names in genera such as *Chionanthus* Royen (02), *Fraxinus* L. (02), *Jasminum* L. (26), *Olea* L. (02), *Osmanthus* Lour. (02) housed at CAL and *Ligustrum* L. (02) housed at ASSAM were studied.
- Herbarium Consultation-cum-Field Tours: Conducted Herbarium Consultation-cum-Field Tour to different districts in Maharashtra and Kerala in August 2024. Subsequently, in February 2025, Herbarium Consultation-cum-Field Tour to 03 Regional Centers/Unit of Botanical Survey of India (SHRC, Gangtok, ERC, Shillong, and CAL, Howrah) and adjacent areas was conducted. The details of examination of voucher specimens of the family Oleaceae housed in the 05 herbaria (including 02 other herbaria, SUK, Kolhapur and FRC, Coimbatore) are listed below.
 - Department of Botany, Shivaji University, Kolhapur (SUK): 128 specimens
 - Botanical Survey of India, Sikkim Himalayan Regional Centre, Gangtok (BSHC): 106 specimens

- Central National Herbarium, Botanical Survey of India, Howrah (CAL): 3,181 specimens
 - Eastern Regional Centre, Botanical Survey of India, Shillong (ASSAM): 1579 specimens
 - Fischer Herbarium, Institute of Forest Genetics and Tree Breeding, Coimbatore (FRC): 390 specimens
- **Microscopic Studies:** Dissected the specimens and observed the macro- and micro-morphological features of the following taxa under microscope: (i) *Chionanthus courtallensis* Bedd., (ii) *C. mala-elengi* (Dennst.) P.S. Green subsp. *mala-elengi*, (iii) *C. mala-elengi* (Dennst.) P.S. Green subsp. *linocieroides* (Wight) P.S. Green, (iv) *C. ramiflorus* Roxb., (v) *C. zeylanicus* L., (vi) *Chrysojasminum bignoniaceum* (Wall. ex G. Don) Banfi, (vii) *Fraxinus excelsior* L., (viii) *Jasminum brevilibum* DC., (ix) *J. coarctatum* Roxb., (x) *J. cordifolium* Wall. ex G. Don, (xi) *J. elongatum* (P.J. Bergius) Willd., (xii) *J. malabaricum* Wight, (xiii) *J. mesnyi* Hance, (xiv) *J. multiflorum* (Burm.f.) Andrews, (xv) *J. officinale* L., (xvi) *J. ritchei* C.B. Clarke, (xvii) *J. sambac* (L.) Aiton, (xviii) *J. trichotomum* B. Heyne ex Roth (xix) *Ligustrum robustum* (Roxb.) Blume subsp. *robustum*, (xx) *L. robustum* (Roxb.) Blume subsp. *perrottetii* (A. DC.) de Juana, (xxi) *Nyctanthes arbor-tristis* L. and (xxii) *Schrebera swietenoides* Roxb.

Project 27: Taxonomic studies of the family Asparagaceae Juss. in India

Name of the JRFs: Ms. Athira, P.P.

Name of the Supervisor: Dr. R. Manikandan, Scientist-E

Duration of the Project: 2023–2028

Achievements:

- Conducted field trip to different parts of Maharashtra and collected 08 plant species of the family Asparagaceae.
- Conducted field trips to different parts of Kerala and collected 07 plant species.
- Conducted field trip to different parts of Arunachal Pradesh, Meghalaya and Sikkim and collected 16 plant species of the family Asparagaceae.
- Dissected, identified and described *Asparagus aethiopicus* L., *Chlorophytum capense* (L.) Voss., *Chlorophytum comosum* (Thunb.) Jacq., *Chlorophytum glaucum* Dalzell, *Chlorophytum laxum* R. Br., *Chlorophytum malabaricum* Baker, *Chlorophytum nimmonii* Dalzell, *Cordyline fruticosa* (L.) A. Chev., *Dipcadi concanense* (Dalzell) Baker, *Dipcadi montanum* (Dalzell) Baker, *Dipcadi ursulae* Blatt., *Ledebouria revoluta* (L.f.) Jessop, *Ophiopogon intermedius* D. Don and *Peliosanthes macrophylla* Wall. ex Baker.
- Consulted the herbaria SUK, ASSAM, ARUN, BSHC, CAL and indexed 4625 specimens.
- Completed Modules 1–7 of the IUCN Red List Assessment indicates that an individual has finished the foundational training on the IUCN Red List process.

Project 28: Morpho-Molecular Characterization of Micro-Fungi of Pushpagiri Wildlife Sanctuary, Karnataka

Name of the JRF: Mr. Sayantan Jash

Name of the Supervisor: Dr. Rashmi Dubey, Scientist-F

Duration of the Project: 2023–2028

Achievements:

- During 2024-25, one field tour has been undertaken to different forest areas of Beedhali APC & adjoining forest areas, Kumardhara river adjoining forest areas, Pushpagiri trekking trails & adjoining forest areas, Pushpagiri peak & adjoining areas, Marigundi APC & adjoining forest areas and Marigundi river adjoining forest areas of Somavarapete Taluka, and Mandalpatti Peak and nearby forest areas of Madikeri Taluka of Pushpagiri Wildlife Sanctuary, Karnataka from 04th to 15th March 2025. During this tour, a total of 368 isolates of possible microfungi have been collected.
- During this year, 107 isolates of microfungi were processed to prepare about 310 temporary slides. A detailed account of the micro-morphological description of 28 species along with the micro-photographs, has been prepared. A total of 52 microfungi have been identified up to the genus and species level. Few of them are PWL-1004: *Corynespora* sp., PWL-1023: *Vaginatispora bharatensis* Jash & Rashmi Dubey sp. nov., PWL-1025: *Vaginatispora bharatensis* Jash & Rashmi Dubey sp. nov., PWL-1054: *Pithomyces pulvinatus* (Cooke & Masee) M.B. Ellis, PWL-1056: *Melanographium citri* (Gonz. Frag. & Cif.) M.B. Ellis, PWL-1063: *Rhytidhysterion indicum* (Anahosur) M.P. Sharma & K.S. Thind, PWL-1068: *Pseudotorula* sp., PWL-1069.3: *Rhytidhysterion indicum* (Anahosur) M.P. Sharma & K.S. Thind, PWL-1071: *Diatrype lijiangensis* Thiagaraja & Wanas., PWL-1073: *Stanjehughesia jiangxiensis* Jian Ma, PWL-1074.2: *Distoseptispora* sp., PWL-1092.2: *Heteroconium indicum* Varghese & V.G. Rao, PWL-1095: *Heteroconium indicum* Varghese & V.G. Rao, PWL-1116.2: *Xenosporium africanum* Piroz., PWL-1118: *Diatrype* sp., PWL-1138: *Phragmospathula* sp., PWL-1141: *Paradictyoarthrinium diffractum* Matsush., PWL-1144.1: *Zygosporium verruciferum* L. Lucena, PWL-1147: *Apiospora neobambusae* Pintos & P. Alvarado, PWL-1151: *Paradictyoarthrinium diffractum* Matsush., PWL-1156: *Torula* sp., PWL-2003: *Neosporidesmium* sp., PWL-2012: *Corynesporina* sp., PWL-2248: *Neosporidesmium* sp., PWL-2266: *Neosporidesmium* sp. & PWL-2299: *Corynesporina* sp. During this period, single spore isolation of 16 interesting isolates of microfungi has been conducted, and a total of 42 fungal isolates have been cultured in synthetic media to preserve *in vitro*. DNA extraction, PCR amplification, and Gel documentation have been completed for two isolates, and a two-gene and a six-gene phylogenetic tree have been constructed. During this year, *Memnoniella longistipitata* D.W. Li, Chin S. Yang, Vesper & Haugland has been identified as a new addition to Fungi of India, and the manuscript has been communicated in the National Academy Science Letters. One new species of *Vaginatispora* has been identified based on morphology and six-gene phylogeny.
- Alongside, to showcase the outcome, a poster entitled “In Search of Hidden Treasure: A Mélange of Interesting Microfungi from preliminary studies in Pushpagiri Wildlife Sanctuary, Karnataka” has been presented in National Conference on “Fungal Frontiers: Biodiversity, Biomolecules and Bioengineering applications for Sustainable Perspectives” organized by Department of Botany (Centre for Advanced Study), Jai Narain Vyas University, Jodhpur, Rajasthan and Mycological Society of India from November 27 to 29, 2024.

Project 29: Studies on the endemic tree diversity of Maharashtra and its ex-situ conservation.

Name of the JRF: Miss. Pooja Shivaji Bhagure

Name of the Supervisor: Dr. Mayur Yashwant Kamble, Scientist-E

Duration: 2023–2028

Achievements:

- **Herbarium consultation and field tours:** Consulted herbarium specimens of endemic and threatened trees of Maharashtra at SUK! (Shivaji University Kolhapur), BLAT (Blatter Herbarium, Mumbai), BAMU (Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajnagar), and indexed data in Excel sheets. Five field exploration and seed collection tours to the Sahyadri Tiger Reserve, Koyna. Helwak range of Chandoli National Park, Amba ghat, Rajapur, Hiranyakeshi devrai, Mahabaleshwar, Ambeneli ghat, Khandala, Masai plateau.
- **Collection & Analysis:** Collected 22 species of endemic and threatened trees of the project and processed for herbarium preparation, photo plate making, and description writing. Captured high-resolution photographs documenting the morphological features of trees and the various stages of seed germination in endemic species, and systematically compiled them into well-organized photo plates.
- **Ex-situ conservation:** Through systematic germination studies and nursery trials, 15 endemic species have been successfully multiplied in the BSI garden, using various pre-sowing treatments like KNO₃, GA₃, H₂SO₄, and water soaking, along with 8 native trees. An arboretum has been initiated at the Mundhawa Experimental Garden to support long-term ex-situ conservation. The endemic and threatened tree species raised and conserved includes: *Beilschmiedia dalzellii* (Meisn.) Kosterm.; *Erinocarpus nimmonii* Nimmo ex J.Grah.; *Garcinia indica* (Thouars) Choisy; *Garcinia talboltii* Raizada ex Santapau; *Nothopegia castanaefolia* (Roth) Ding Hou; *Syzygium stocksii* (Duthie) Gamble; *Hymenodictyon obovatum* Wall.; *Prunus ceylanica* (Wight) Miq.; *Piliostigma foveolatum* (Dalzell) Thoth.;; *Sageraea laurina* Dalzell; *Ixora brachiata* Roxb.; *Flacourtia montana* J.Graham; *Alstonia venenata* R.Br.; *Actinodaphne lanceolata* Dalzell & A.Gibson., *Ixora brachiata* Roxb.

Project 30: Documentation and Assessment of Threatened and Endemic Pteridophytes of Central Western Ghats of Karnataka by Using IUCN Criteria.

Name of the JRFs: Mrs. Sakshi Pandey and Mr. Rajat Mondal

Name of the Supervisor: Dr. A. Benniamin, Scientist-F

Duration of the Project: 2023–2028

Achievements:

Field Exploration & Specimen Collection:

- Two major field tours were conducted: October 2024: Surveyed Talakaveri Wildlife Sanctuary and BRT Tiger Reserve, Karnataka.
March 2025: Covered Kudremukh National Park and surrounding districts (Chamarajanagar, Chikkamagaluru, Kodagu, Mysuru, and Udupi).
- A total of 150 plant specimens were collected and identified (Field Nos. BSI212069 to BSI212619).

Conservation Assessment

- **Three endemic and threatened ferns** of the Western Ghats—*Elaphoglossum beddomei*, *Elaphoglossum nilgircum*, and *Alsophila nilgirensis*—were officially assessed and published in the **IUCN Red List**.
- **Conservation assessments for eight additional species** include *Elaphoglossum stigmatolepis* (Fée) T.Moore, *Dryopteris austroindica* Fraser-Jenk., *Anemia wightiana* Gardner, *Isoetes udupiensis* P.K.Shukla, G.K.Srivast., S.K.Shukla & P.K.Rajagopal, *Trichomanes exiguum* (Bedd.) Baker, *Grammitis pilifera* Ravi & J.Joseph, *Grammitis austroindica* Parris, *Bolbitis semicordata*

(Baker) Ching, and *Polystichum manickamianum* Benniamin, Fraser-Jenk. & Irudayaraj were completed and submitted to the **SIS portal** of IUCN Red List.

3. Herbarium Work

All **150 collected specimens** were processed and mounted for herbarium accessioning at **BSI WRC, Pune**, contributing to botanical documentation and preservation.

Project 31: Red List Assessment of Endemic species of some selected families (Apocynaceae, Asclepiadaceae, Loganiaceae, Gentianaceae and Menyanthaceae) of India

Name of the JRF: Madhumita Pal

Name of the Supervisor: Dr. J. Jayanthi, Scientist-F

Duration of the Project: 2023–2028

Achievement:

- During the period from April 2024 to March 2025, two Herbarium Consultation Tours (HCT) were undertaken. The first tour was conducted to the Gauhati University Herbarium (GUBH) in Guwahati, ASSAM herbarium, and also included a field survey in the neighbouring regions of Meghalaya from 20th October to 29th October, 2024. During this tour, a total of 375 herbarium specimens from the designated families were examined, comprising 240 specimens from Assam and 135 from GUBH. All specimens were photographed, and the relevant data was recorded in the specified Excel format. Additionally, three specimens from the Asclepiadaceae family, one from the Gentianaceae family, and two from the Apocynaceae family were collected in Meghalaya.
- The second HCT was conducted from 16th February to 3rd March, 2025, to the RHT in Tiruchi, the HIFP Herbarium in Pondicherry, and XCH in Palayamkottai in Tamil Nadu state, along with field visits to the surrounding areas of the Kodaikanal hills. A total of 1,075 herbarium specimens were studied, including 200 from HIFP, 175 from XCH, and 700 from RHT. These specimens were also photographed, and all pertinent data was documented in the prescribed Excel sheets. During this field survey, four live specimens of *Boucerosia* sp. were collected in a vegetative state, along with one specimen of *Vincetoxicum hirsutum* (Wall.) Kuntze from the Kodaikanal area.
- During this year, draft taxon sheets for IUCN assessment were prepared for a total of 39 species within the Asclepiadaceae and Gentianaceae family, such as *Ceropegia santapau*, *C. schumanniana*, *C. shivrayana*, *C. noorjahaniae*, *C. rollae*, *C. fantastica*, *C. jainii*, *Brachystelma annamacharyae*, *B. ariyittaparensis*, *B. bilobatum*, *B. brevitubulatum*, *B. densiflorum*, *B. gondwanense*, *B. kadapense*, *B. kumaonense*, *B. mahajanii*, *B. matthewianum*, *B. nigidianum*, *B. penchalakonense*, *B. pullaiahii*, *B. ramaswamii*, *B. rapinatianum*, *B. reflexicorollinum*, *B. tumakurense*, *Caralluma geniculata*, *Caralluma sarkariae*, *Caralluma stalagmifera*, *Caralluma adscendens* var. *carinata*, *Caralluma adscendens* var. *gracilis*, *Decalepis arayalpathra*, *Canscora shrirangiana*, *Crawfordia arunachalensis*, *Heterostemma dalzellii*, *Heterostemma vasudevani*, *Hoya kanyakumariana*, *Hoya wightii* subsp. *palniensis*, *Toxocarpus concanensis*, *Toxocarpus kurzii* and *Vincetoxicum balakrishnanii*.

Project 32: Molecular systematics and historical biogeography of the genus *Justicia* L. (Acanthaceae) in India

Name of the RA: Dr. Soumya P.

Name of Supervisor: Dr. S.S. Dash, Scientist-F

Duration of the Project: 2023–2028

Achievements:

- Conducted extensive field trips to various locations in Tamil Nadu and Andhra Pradesh (Avalanche, Akkamalai, Kalakad Mundanthurai Tiger Reserve (KMTR), Manjolai Hills, Ambasamudram, Manimuthar dam side, Agasthiyar Falls (Papanasam falls), Gingee Fort (Senji hills), Talakona waterfalls, Sri Venkateswara National Park and Srikalahasti).
- Collected plant specimens were processed for herbarium preparation. Young leaves were preserved in silica gel for molecular studies, while mature seeds were stored in airtight vials for seed micromorphological analysis.
- Downloaded authentic sequences of five plastid markers (*ndhA*, *trnL-F*, *trnT-L*, *trnS-G* & *rps16*) for *Justicia* from NCBI. Initial phylogenetic analyses were conducted individually for each marker to identify the top three markers providing the best resolution in the phylogenetic tree. The analyses were repeated using all available sequences of *Justicia* and *Rungia* from NCBI.
- Initiated wet lab experiments at the Molecular Laboratory of the Central National Herbarium. Several DNA extraction trials were performed using both fresh and silica-dried tissues employing the CTAB method and the DNeasy Kit for comparison. PCR amplification was successfully conducted on 15 samples using three plastid markers (*ndhA* intron, *trnT-L* spacer and *rps16* intron) and the products were submitted for sequencing.
- Chromatograms were edited using Sequencher software and aligned using MEGA. Concatenated sequences of the three markers were prepared using Mesquite, and both individual and combined phylogenetic trees were constructed using Maximum Likelihood (IQ-TREE) and Bayesian (MrBayes) approaches. Trees were visualized and interpreted using Figtree. A manuscript focusing on the molecular identification of a *Justicia* species is currently under preparation.
- Conducted a tour to the Southern Regional Centre- BSI, Coimbatore to perform Scanning Electron Microscopy (SEM) analysis on 27 seed samples from the genera *Justicia* and *Rungia*. Seed morphological traits were documented and a manuscript on the seed micromorphology of *Justicia* is in progress.
- Participated in the 2nd Botanical Congress 2024 and presented a paper titled “Towards an integrative revision of the genus *Justicia* L. (Acanthaceae) in Peninsular India based on morphological, micromorphological, and molecular approaches”.
- Presented a poster at the International Botanical Congress (IBC) 2024 titled “Phylogenetic investigation of *Justicia* (Acanthaceae) using Molecular, Morphological, and Micromorphological Data”.
- Completed the final draft of the manuscript on the phylogenetic placement of an endemic *Justicia* species based on combined nuclear and plastid sequence data.
- Continued an extensive literature survey related to the genus *Justicia*, collecting and reviewing relevant publications from online databases and libraries.



Rungia anamalayana (Chandrab. & V.Chandras.) Nazarudeen & G.Rajkumar



Justicia prostrata (Roxb. ex C.B.Clarke) Gamble



Justicia glauca Rottler

Project 33: Systematics of the genus *Coelogyne* Lindl. in India (Orchidaceae: Epidendroideae) in India and assessment of threat status as per IUCN criteria

Name of the RA: Dr. Rijupalika Roy

Name of the Supervisor: Dr. Dinesh Kumar Agrawala, Scientist-E

Duration of the Project: 2023–2026

Achievements:

- A list of *Coelogyne* species occurring in India has been prepared based on available literatures, checklists and herbarium specimens. There are 41 species of *Coelogyne* known from India of which 9 species were reported to be endemic.
- Distribution and phenology of each taxon has been recorded from both herbarium records and relevant literatures.
- Morphological parameters recorded for 38 species dealing with nearly 1500 herbarium specimens. 14 species were collected in live condition from field. They are dissected to note down morphological characters and their variations.
- 3 field tours have been conducted to three different regions of India:
 - In peninsular India, field tour was conducted in selected regions of Tamil Nadu (Muttupalayam, Coonor, Glenmorgan, Naduvattum, Kotagiri, Pykara, Iduhatty, Ooty, Viksal, Ebbanad, Solur, Yercaud) and Kerala (Rosemala, Palarvi, Ambanad, Mullumala, Avanippara).
 - In the Himalayas field tour was conducted in Sikkim Himalayan region; South Sikkim (Maenam Wild life sanctuary, Damthang, Deythang, Roling, Ravangla, Kewzig) and East Sikkim (Pangthang, Pakchey, Rumtek, Ranka, Burtuk, Bulbuley, Upper Sichey).
 - In eastern India field tour was conducted in Meghalaya (Rhi Bhoi district, Kalong Reserve forest, Laitkor, Upper Shillong).
- Herbarium tours were conducted in Eastern Himalayan Regional Centre (ASSAM), Sikkim Himalayan Regional Centre (BSHC), Calicut University Herbarium (CALI), Fischer Herbarium

(FRC), Kerala State Forest Research Institute (KFRI), Botanical Survey of India; Southern Regional Centre (MH), Jawaharlal Nehru Tropical Botanic Garden and Research Institute (TBGT) and National Orchidarium and Botanic Garden, Yercaud.

- Thorough morphological description completed for 16 species.
- Molecular characterization was done to address complexes in the section Flaccidae and 3 species were merged.
- Geo referencing was done for 41 species of *Coelogyne* (approximately 1473 herbarium sheets have been geo tagged).
- 8 endemic species of *Coelogyne* were mapped after geo-referencing.
- Threat assessment was done based on IUCN guidelines for all the endemic species of the genus.

Project 34: Red List Assessment of Endemic Angiosperms in India as Per IUCN guidelines (Dilleniaceae- Ixonanthaceae)

Name of the JRF: Mr. Kundan Bhattacharji,

Name of the Supervisor: Dr. Dr. Dinesh Kumar Agrawala, Scientist-E

Duration of the Project: 2023–2028

Achievements:

Objective: 1

- Preparation of Taxon Data sheet for the Red List assessment and compilation of the Secondary data.
- Methodologies:
- Available data on the IUCN Red List Assessment based on the Indian plants were noted.
- Gathered relevant data for each species of allotted families and checked their endemic status from different available literature and articles.
- Enlisted endemic plants of each of the allotted families.
- The endemic status of each of the endemic species of India was recorded from allotted families based on available data that were tabulated (according to Flora of India books, Vascular Endemic Plants, Flowering Plants of India: An annotated checklist (1 & 2) & Plant of World Online).
- Available herbarium sheets of those endemic species from CAL were photographed, and the identity of each sheet based on their special characters are being checked.
- Herbarium label data are retrieved and indexed in an Excel sheet for further study.
- Relevant available herbarium sheets were studied from different Indian herbaria.
- **Achievements:**
- Completed an Excel sheet about endemic plants of India under the targeted family.
- Making a Taxon data sheet of the endemic plants of Dilleniaceae, Magoniaceae, Lardizabalaceae (based on the secondary data gathered till now).
- Prepared Taxon data Sheets of 4 endemic species of Dilleniaceae, 3 Lardizabalaceae, 4 Magnoliaceae.

- BSHC 356 and ASSAM 956 sheets were photographed to confirm their identity.
- **Objective: 2**
- Georeferencing based on the location data available in herbaria for preparation of Range map.
- **Methodologies:**
- Tabulating the Location information in Excel Sheets with other secondary data.
- Each location is geo referenced.
- CSV files are browsed in the Geo-Cat (<https://geocat.iucnredlist.org/>) to produce a distribution map.
- **Achievements:**
- Range mapping is done for two endemic species of the family Dilleniaceae: *Acrotrema arnottianum* Wight and *Dillenia bracteata* Wight, *Dillenia andamanica* C.E.Parkinson,
- A nomenclatural problem was solved regarding the proper identification of *Hybanthus enneaspermus* (L.) F.Muell. and *Hybanthus puberulus* M.G.Gilbert
- **Quantifiable derivatives of each year:**
- Tours: Sikkim (BSHC), Shillong (ASSAM)
- Area Covered: Sikkim and Meghalaya
- Identification: *Acrotrema arnottianum*, *Dillenia bracteata*, *Dillenia andamanica*, *Magnolia andamanica*, *Magnolia insignis*, *Magnolia pealiana*, *Magnolia punduana*, *Magnolia doltsopa*, *Holboelia khashiana*, *Holboelia latifolia*.
- Description: *Acrotrema arnottianum*, *Dillenia bracteata*, *Dillenia andamanica*, *Magnolia andamanica*, *Magnolia insignis*, *Magnolia pealiana*, *Magnolia punduana*, *Magnolia doltsopa*, *Holboelia khashiana*, *Holboelia latifolia*.
- Digitization: -
- Status of specimen: Under the press
- Status of manuscript: Ready to communicate
- Work remaining: From Fumariaceae- Ixonanthaceae

Project 35: Red List Assessment of Endemic Orchids of India as per IUCN Criteria

Name of the JRF: Ms. Yasaswinee Rout

Name of the Supervisor: Dr. Jeewan Singh Jalal, Scientist-E

Duration: 2023–2028

Achievements:

- Two tours were undertaken during this period.
- The first field & herbarium consultation tour was undertaken from 03.08.2024 to 20.08.2024 in Maharashtra. During this tour, 350 herbarium specimens of SUK (Shivaji University, Kolhapur) were consulted. A total of 33 herbarium data of endemic orchids belonging to 7 genera were collected with photographs from the herbarium. An extensive field survey was conducted in different districts of Maharashtra, i.e., Pune, Kolhapur, Satara, Sindhudurg, and Ratnagiri,

which comprise the majority of the north side of the Western Ghat region. 7 endemic orchids i.e. *Dendrobium barbatulum* Lindl., *Habenaria ovalifolia* Dalzell, *Habenaria grandifloriformis* Blatt. & McCann, *Habenaria heyneana* Lindl., *Habenaria longicorniculata* Graham, *Habenaria rariflora* A. Rich., *Habenaria suaveolens* Dalzell have been collected. Along with this, the population data, habitat quality, and threats have also been noted down for assessment purposes. Live plant specimens were collected from the field and has been planted in the Orchidarium, Western Regional Centre, Pune for Conservation purpose.

- The second Herbarium consultation tour was conducted from 16.02.2025 to 03.03.2025, which included a herbarium and library consultation tour to French Research Institute (Pondicherry), XCH (Xavier Research Foundation, St. Xaviers College, Palayamkottai); Rapinat Herbarium (St. Joseph's College, Tiruchirapalli).
- During the herbarium consultation at French Research Institute, Pondicherry, a total of 149 sheets were consulted, and only 21 sheets belonging to 9 genera and 14 species were found to be endemic (Table 2). In case of XCH, only 4 herbarium sheets were found to be endemic, belonging to 1 genus and 4 species out of 42 sheets. A total of 1008 herbarium sheets were consulted at RHT. Out of which only 137 sheets belonging to 5 genera and 12 species were found to be endemic. In addition to this, library consultation and botanical garden visits were made simultaneously in all the institutes.
- Besides, a short field tour was conducted to Palni Hills, Kodaikanal for 3 days, and 2 field collections were made (Fig.1; Table 5). A total of 4 live plant specimens (1 endemic) were collected for plantation in Orchidarium, CNH, Howrah
- Furthermore, a poster presentation on the topic “*Habenaria grandifloriformis* Bltt. & McCann, an endemic threatened Orchid in Peninsular India: Analysis of potential Ecologically Suitable Habitat Using MaxEnt Modelling” at 3rd International Symposium on Plant Taxonomy, Ethnobotany, Botanical Gardens & Biodiversity Conservation organized by Botanical Survey of India held from 13th to 15th February, 2025 in Kolkata, West Bengal.
- Participated and presented PPT entitled “Red List Assessment of Endemic Orchid *Schoenorchis smeeana*, Western Ghats, India” at National Conference on Sustainable Food Security [SFS, 2025] organized by DDU Gorakhpur University, UP, on 11th March, 2025.
- Based on the data gathered from Herbarium specimens and the literature survey, Georeferencing of the respective species was done.
- With reference to the Georeferencing data of individual species, the species distribution map was prepared for each species with the help of GEOCAT.
- During this period, a total of 35 taxon sheets were prepared according to the mandate given by BSI.
- Global Red List Assessment of 2 endemics, i.e., *Diplocentrum recurvum* & *Diplocentrum congestum*) has been published in the IUCN.

FUNDED/ COLLABORATIVE PROJECTS

Project 1:

- a) **Title of the project:** *Ex-Situ* Conservation and Propagation of Endemic and Threatened Plants of India
- b) **Name of the Executing official:** Dr. Devendra Singh, Scientist 'E' & H.o.O. (PI) & Dr. J. Swamy, Scientist 'C' & Curator In-charge (Co-PI)
- c) **Name of the funding agency:** Ministry of Environment, Forest & Climate Change
- d) **Duration of the Project:** 2024 to 2027
- e) **Brief note on the work done and achievements:**
- Established naturally ventilated Poly house (500 sq. ft.) in the Nursery number I and fogger system and chain linked nursey beds stands has been installed in the poly house.
 - A field tour has been undertaken to Eastern Ghats (Andhra Pradesh & Telangana) and Western Ghats (Maharashtra) from 20.08.2024 to 30.08.2024 and collected germplasm/seedlings of *Garcinia indica* (Thouars) Choisy, *Aponogeton satarensis* Sundararagh., A.R.Kulk. & S.R.Yadav, *Syzygium stocksii* (Duthie) Gamble, and *Syzygium alternifolium* (Wight) Walp. were collected from Eastern and Western Ghats and raised in nursery.
 - Different media were used for the germination seeds and germplasm of endemic and threatened species and successfully developed 7151 seedlings of *Garcinia indica*, *Aponogeton satarensis*, *Pterocarpus santalinus*, *Syzygium stocksii*, *Aquilaria malaccensis* and *Hibiscus fragrans*.
 - Successfully developed grafted Hibiscus fragrans on the *Malvaviscus arboreus* Dill. ex Cav.

Project 2:

- a) **Title of the project:** Exploration and documentation with geo tagging of wild edible plants of Eastern Arunachal Pradesh for emergency use.
- b) **Name of the Executing official:** Dr. Krishna Chowlu, Scientist 'D'; Dr. Arvind Parihar, Scientist 'C'; Mr. Simanta Taid, Research Associate; Mr. Ajit Ray, Field Assistant
- c) **Name of the funding agency:** Defence Research & Development Organization (DRDO), Ministry of Defence, Tezpur-784001
- d) **Duration of the Project:** 2 (Two) Year (2023–2025).
- e) **Brief note on the work done and achievements:**
- The Field survey was carried out to documentation of Wild Edible Plants used by local people of the Eastern Arunachal Pradesh. A total twelve field tours were conducted in the Eastern parts of Arunachal Pradesh respectively.
 - During these field tours, 110 species were collected and 98 descriptions were prepared based on live plant and herbarium specimens. The Photo plates of 98 species have been prepared so far for the respective species which were clicked during field survey.

Project 3:

- a) **Title of the project:** “Scouting and Documentation of grassroots innovations & outstanding traditional knowledge practices Changlang District of Arunachal Pradesh”
- b) **Name of the Executing official:** Dr. Krishna Chowlu
- c) **Name of the funding agency:** National Innovations Foundations – Gujrat

- d) Duration of the Project:** 1 year (Likely to extend for next year depending upon performance)
- e) Brief note on the work done and achievements:**
- Scouted and document the grassroots innovation, idea, TK for bi-annual competition of National Innovation Foundation.
 - Verification and detail documentation of explored entries documented in previous competitions of NIF.
 - Documentation and digitization of TK and innovative practices of local community.
 - Dissemination of useful herbal practices and diffusion of innovations.
 - **Achievements**
 - In each month required number of herbal practices is given with proper survey.
 - Grassroots innovations were also reported to the institute.
 - Proper herbariums were processed for identification and documentations.

Project 4:

- a) Title of the project:** Molecular Systematics of *Dipcadi Medikus* (Asparagaceae) from Indian Subcontinent as an aid to its Conservation
- b) Name of the Executing official:** Dr. Priyanka Ashokrao Ingle (Co-PI)
- c) Name of the funding agency:** Council of Scientific and Industrial Research (CSIR)
- d) Duration of the Project:** 2024–2027 (36 months)
- e) Brief note on the work done and achievements:**
- (Work will be initiated after receiving funds which is still awaited)

Project 5:

- a) Title of the project:** Survey and documentation of less known Sacred Groves of Andhra Pradesh, India.
- b) Name of the Executing official:** Dr. Sankararao Mudadla, Scientist-D
- c) Name of the funding agency:** Andhra Pradesh State Biodiversity Board
- d) Duration of the Project:** 01 year
- e) Brief note on the work done and achievements:** Enumerated 51 less known Sacred Groves in 25 districts of Andhra Pradesh.

Project 6:

- a) Title of the project:** Bio-survey of Eastern Ghats of Andhra Pradesh (Flora)
- b) Name of the Executing officials:** Dr. L. Rasingam, Scientist-E & Research students
- c) Name of the funding agency:** Andhra Pradesh State Biodiversity Board
- d) Duration of the Project:** 02 years (2022–24)
- e) Brief note on the work done and achievements:**
- Conducted one field tour to Kadapa and Rajampeta Forest Divisions from 22nd to 29th July 2024 and collected 66 field numbers.

- All the collected specimens were identified.
- Around 1200 specimens were mounted on the herbarium sheets and stitched.
- Herbarium label were prepared and pasted on the herbarium sheets.
- All the sheets were incorporated in the general herbarium after digitization.
- Published 04 research articles including 02 new taxa.
- Preparation of the final report is under progress.

Project 7:

- a) Title of the project: Investigation on Indian *Aster* L. (Asteraceae: Astereae) with emphasis on morpho-anatomical studies of cypsela**
- b) Name of the Executing official: Dr. Avishek Bhattacharjee, Scientist-E**
- c) Name of the funding agency: Anusandhan National Research Foundation (formerly Science and Engineering Research Board) (Core Research Grant Project: CRG/2021/000790)**
- d) Duration of the Project: 30.12.2021–29.12.2024**
- e) Brief note on the work done and achievements:**
 - A systematic study of the genus *Aster* L. has been conducted in the Indian context. This study has been supplemented by macro- and micro-morphological (SEM) and anatomical studies of cypsela, as well as molecular studies. The macro- and micro-morphological characteristics of cypsela have proven to be highly effective in distinguishing various species of *Aster*. While the anatomical features of cypsela are suitable to distinguish a limited number of taxa, it is not very promising to discriminate majority of the species. Currently, the *Aster s.l.* concept is predominantly followed in Indian literature, which is primarily based on macro-morphological studies.
 - The finding of this study (as on date) supports that *Aster* is not monophyletic and therefore, it's generic split into different genera should be justified. Hence, all the members of Indian *Aster s.l.* have been delimited into different genera based on morphological (macro and micro) and molecular data generated during the present work. Further, there is a high morphological resemblance between several species of *Aster* and different species of *Erigeron*, leading to misidentification even at the generic level. During the present study the ongoing confusion between *Erigeron multiradiatus* (Lindl. ex DC.) Benth. & Hook.f. and *Tibetiodes himalaica* (C.B. Clarke) G.L. Nesom (= *Aster himalaicus* C.B. Clarke) has been resolved; additionally, a lectotype has been designated after consulting all the original material of *Erigeron multiradiatus* (= *Aster inuloides* D. Don, *Aster multiradiatus* Wall., nom. nud., *Aster roylei* Onno).
 - The findings have been published in a SCI indexed journal [Phytotaxa: 670 (2): 133–147. 2024]. A species of Astereae collected from Spiti Valley of Himachal Pradesh has been identified as *Erigeron jaeschkei* Vier. This discovery constitutes recollection of the species, which had not been recorded since its type-collection over 150 years ago.
 - Further, a lectotype has also been designated for the name. The findings have been published in a SCI indexed journal [Phytotaxa 674 (3): 275–280. 2024]. Taxonomic placement of an unplaced species of *Aster s.l.*, viz. *Aster ageratoides* Turcz. has been ascertained based on morpho-molecular studies (under publication). One new synonym and one new combination are proposed based on morpho-molecular characters (under publication). Some collections

from North Sikkim primarily identified as *Erigeron multiradiatus* have been turned out as a new taxon (under publication). Another interesting collection from a high altitude location in North-east India showing neoteny is morphologically very distinct from any species of *Aster* and *Erigeron*. This species shows some morphological characters of both *Aster* and *Erigeron*; additionally, in molecular study (based on ITS and trnL-F), both *Aster*-specific and *Erigeron*-specific regions have been found in this unique species. Presently, study with one more nuclear marker (ETS) is under process to get more resolution which may help in taking final taxonomical judgement on this species. Apart from these, one popular article has also been published. More papers/ findings are expected in due course.

Project 8:

- a) Title of the Project: Development of DUS testing Guidelines for Palmyra (*Borassus flabellifer* L.)– A collaborative project with College of Horticulture and Research, Tamil Nadu Agricultural University, Coimbatore.**
- b) Name of the Executing Officials:** Dr. P. Irene Vethamoni, Professor & Dean (PI) and her team, and Dr. S.S. Hameed, Scientist-F (CoPI)
- c) Name of the Funding Agency:** Protection of Plant Varieties and Farmers' Rights Authority, Govt. of India
- d) Duration of the Project:** 2024–2027 (Three years)
- e) Brief note on the work done and achievements:**
 - A preliminary survey has been conducted to understand the distribution and occurrence, and variability of *Borassus flabellifer* in the state of Tamil Nadu.

Project 9:

- a) Title of the Project: Taxonomic Assessment of the Lichen Biodiversity of Agasthiyamalai Biosphere Reserve, Southern Western Ghats**
- b) Name of the Executing official:** Dr. Jagadeesh Ram, T.A.M., Scientist-F(Principal Investigator) and Mr. George N. Mathew (SRF)
- c) Name of the Funding Agency:** ANRF (SERB), DST
- d) Duration of the Project:** 3 Years
- e) Brief Note on the Work done and Achievements:**
 - Conducted a field tour from 26th February 2025 to 10th March 2025. Collected lichen samples from the following Protective areas: Kanyakumari Wildlife Sanctuary, Kalakad-Mundanthurai Tiger Reserve, Neyyar Wildlife Sanctuary and Peppara Wildlife Sanctuary. Collections were made from tree trunks/ branches/ bark (corticolous), rock (saxicolous), living leaves (foliicolous) and soil (terricolous). About 350 field collection numbers were collected with GPS data.
 - The collected specimens were preserved using standard herbarium techniques.
 - The lichen samples collected were air dried by pressing them in the blotting sheet packets specially folded for drying lichen specimens.
 - The well dried samples were observed under the stereomicroscope and segregated. The segregated samples were assigned with field numbers and labelled with all collection details are

deposited in the cryptogamic section of Madras Herbarium. These entries were incorporated to the lichen register. The preserved samples are characterized based on morphological, anatomical and chemical characteristics.

- Morphological characters are being studied using ‘Olympus SZX7’ and anatomical characters using NIKON 50i microscopes. Secondary chemistry is studied by colour tests, Thin Layer Chromatography (TLC) and Micro-crystallography. A total of 106 species in 41 genera and 15 families have been identified.

Project 10:

- a) Title of the Project: Implementation of Integrated Management Plan– Agasthyamala Biosphere Reserve (Lead Institution: BSI)**
- b) Name of the Executing Officials:** Dr. Sujana, K.A., Scientist-E, Dr. S. Arumugam, Botanist and Dr. R.G. Vadhyar, Botanist
- c) Name of the Funding Agency:** MoEF&CC through Kerala and Tamil Nadu Forest Departments
- d) Duration of the Project:** 2022–2027
- e) Brief Note on the Work done and Achievements:**
 - Baseline surveys (two field tours) were conducted and documented 2581 (Angiosperms: 2270 taxa; Gymnosperms: 03; Pteridophytes: 175; Bryophytes: 131) plants from primary and secondary sources. Distribution, population and regeneration of *Memecylon subramanii* A.N. Henry, *Asystasia travancorica* Bedd., *Eugenia floccosa* Bedd., *Memecylon tirunelvelicum* Murugan, Manickam & Sundaresan, *Miliusa tirunelvelica* Murugan, Manickam, Sundaresan & Jothi, *Henckelia repens* (Bedd.) A. Weber & B.L. Burtt, *Uniyala ramaswamii* (Hutch.) H. Rob. & Skvarla, and *Goniothalamus sericeus* Sujana & Vadhyar were studied. *Mussaenda conferta* Sujana & Vadhyar discovered from ABR and described as new.
 - GPS datasets collected from ABR by BSI have been handed over to FSI. A total of 20 Permanent grid points of ABR were received from FSI for long-term monitoring of biodiversity. Locations selected to study the impact of climate changes and ecosystem services (1 ha each) are Kannikatti, Senkaltheri, Muthukuzhivayal, Kulathupuzha, Thenmala, Pongalapara and Konni.
 - A list of 83 invasive plant species was prepared. *Miconia crenata* (Vahl) Michelang. was observed as a novel invasive to the ABR. Initiated collaboration with BMCs, NGOs, VSSs, EDCs, and community-based organizations for the mechanical removal of invasive plants and revegetation of degraded lands. Experts from BSI initiated the orientation of plant identification among field-level forest officials of ABR of Kerala and Tamil Nadu. Dialogues began with experts from the Institute of Forest Genetics and Tree Breeding, Kerala Forest Research Institute, Kerala State Biodiversity Board, Tamil Nadu State Biodiversity Board and M.S. Swaminathan Research Foundation for expert and technical support on the skill development program. A list of 20 threatened plants has been prepared and their distribution (GPS positions) in ABR. Horizontal zonation of Shola forests and floristic composition in different altitudes at ABR were carried out. Ecosystem services of Shola forests of ABR documented.

**FUNDS RELEASED UNDER
THE ASSISTANCE TO
BOTANIC GARDEN SCHEME
IN THE FINANCIAL YEAR
2024-25**

Sl. No.	Name of the Organization	Amount
1.	A.S.C. College, Palghar, Maharashtra	₹ 7,12,800.00
2.	Ahalia International Foundation	₹ 9,60,000.00
3.	AJC Bose Indian Botanic Garden, Shibpur, Howrah	₹ 12,00,000.00
4.	Andhra University, Andhra Pradesh	₹ 10,66,000.00
5.	Berhampur University, Odisha	₹ 11,36,000.00
6.	D.D.U. Gorakhpur University, Uttar Pradesh	₹ 6,06,568.00
7.	G. B. Pant NIHE, Almora, Uttarakhand	₹ 11,83,840.00
8.	Gauhati University, Assam	₹ 10,91,200.00
9.	ICFRE- Institute of Forest Genetics and Tree Breeding, Tamil Nadu	₹ 11,64,000.00
10.	Maharaja Sriram Chandra Bhanja Deo University, Odisha	₹ 11,96,000.00
11.	Sardar Patel University, Gujarat	₹ 7,92,160.00
12.	Tamil Nadu Agricultural University, Tamil Nadu	₹ 12,00,000.00
13.	The Maharaja Sayajirao University of Baroda, Gujarat	₹ 11,71,600.00
14.	BSI Western Regional Centre, Pune	₹ 15,06,000.00
Grand Total		₹ 1,49,86,168.00

HERBARIUM INFORMATION

Information on Herbarium Maintenance														
Name of the Regional Centre/ Unit	ANRC	APRC	AZRC	CBL	CNH	CRC	DRC	ERC	HAWHRC	ISIM	NRC	SHRC	SRC	WRC
Present status of Herbarium holdings	40,000	42,667	53,834	12,124	2 Million	107718	25040	186453	7,000	70,000	1,37,537	55684	350000	7000

Herbarium maintenance	Numbers													
	Name of the Regional Centre / Unit	ANRC	APRC	AZRC	CBL	CNH	CRC	DRC	ERC	HAWHRC	ISIM	NRC	SHRC	SRC
No. of specimens mounted/re-mounted / labelled	265	2000 / 100 / 1500	Mounting: 3070; Label pasting: 2315	-	Nil / 126 / 303	1060+ 672 lichens / 00 / 1060	1595	1084 / 117 / 1685	1250 / 100 / 2000	Nil	1825 / 7579 / 1585	2167	1140	125 mounted and stiched 111 poisoning done
No. of Herbarium sheets stitched / re-stitched / poisoned / fumigated / dusted		Stitched: 1000 re-stitched: 0 dusted: 31025 ARUN herbaria fully fumigated one time.	2623	542	Nil / Nil / 3809 / Nil / 6104	930 / 80 / 1060 / 344 / 2246	1595	843 / 330 / 442 / 124291 / 18182	1000 / 50 / 2000 / 800	3381	4840 / 20178 / 115984	8448	325 / 290 / 1375 / Nil / 5490	
No. of Herbarium sheets accessioned		3318	228	-	15321	658	1824	918	775	Nil	84	217	107	
No. of Herbarium sheets incorporated / re-incorporated		6786	224	-	9323	734	1700	22 / 5	5500 / 300	4463	1,116		11 / 575	
No. of specimens sent on loan		01	-	-	3	0	Nil	01	0	Nil	-		274	
No. of loaned / type specimens received / returned / exchanged		07	-	-	21 / 08 / Nil	6 returned	Nil	0	0	Nil	-		Nil	
No. of specimens identified		2100	212	112	357	391		Backlog: 974 Visitors: 257 Ann RP: 86	850	Nil	2078	90		

No. of Genus /species covers changed	300 /600	-	227	542 /2723	24 /37 /22 envelopes and 293 new cardboard sheets added in Lichen section	Nil	1502 /228	350 /100	1557	35	44 /103	
No. of specimens segregated	3100	-	1025	11275	230	Nil	18168	5000 /1500	Nil	-	80	
Documentation of existing herbarium sheets at herbaria /entry in Excel sheet /Field data written	35000 entry in Excel sheet 5000 Field data written	Metadata entry: 628	2076	NA / /15321 /NIL	104269		314	500 /1200	4454	/1344 /721	135426	350

NO. OF HERBARIUM SHEETS DIGITIZED

Contents	Numbers												
	ANRC	APRC	AZRC	CBL	CNH	CRC	DRC	ERC	HAWHRC	ISIM	NRC	SHRC	WRC
No. of Herbarium Sheets Scanned	6259	3910	3335	2034	15321	10,104	1959	29623	NIL	5054	41,113	3533	10,274 specimens (600 dpi TIFF and JPEG images)
No. of Metadata prepared	6023	6000	628	2034	15321	12,296		6483	2500	5054	274	691	135426
Deficit of the Metadata and reasons thereof	-	-	-	-	NIL	-		Initiated entering the Metadata of	Lack of staff	Nil	-		Due to ongoing office renovations, a shortage of manpower, and the absence of a suitable scanner, we regretfully cannot scan the herbarium sheets. progress.

AWARDS AND HONOURS

- Dr. S.L. Meena, Scientist-E and H.o.O, BSI-AZRC received the Late Pramod Puro Goswami Smriti Puraskar for his extra-ordinary contribution towards plant and environment conservation in the arid and semi-arid region of the country on August 18, 2024.
- Dr. S.L. Meena, Scientist-E and H.o.O was honoured with an Appreciation Certificate received from Dr. M.R. Baloch, PCCF (W.B.) & Director AFRI, Jodhpur.
- Dr. Priyanaka Ingle, Scientist-D, BSI-BGIR, Noida was conferred the IUCN Species Survival Commission Membership of Fresh Water Plant Specialist Group, for the block year 2021–2025.
- Dr. Sandeep Chauhan, Scientist-F, BSI-BGIR, Noida conferred Executive Councillor Member: International Association of Botanic Garden
- Dr. Muthukumar, Botanist, BSI-CRC received the Dr. D.K. Upreti Best Thesis Award for his doctoral thesis “Novel tryptethelones and phenalenones from the mycobiont culture of *Trypethelium eluteriae* Spreng. and secondary metabolite diversity from the selected mycobiont cultures” from the Indian Lichenological Society on 09.12.2024.



Photo : Dr. Muthukumar, Botanist, receiving Dr. D.K. Upreti Best Thesis Award for his doctoral thesis from the Indian Lichenological Society on 09.12.2024.

- Dr. M. Sankara Rao, Scientist-D, BSI-DRC received Biodiversity Conserver Award-2024 from Andhra Pradesh State Biodiversity Board on 22nd May 2024.
- Dr. Harekrushna Swain, Senior Preservation Assistant, BSI-ERC received the “Shining Star Award” for presenting the topic “Diversity, distribution and indigenous uses of *Hypericum spp.* in Northeast India” at the International conference on Agriculture & Rural Development (AGRIVISION-2024) from 19th -21st January, 2024 at ICAR- NRRI, Cuttack.

- Dr Rajib Gogoi, Scientist-F, BSI-SHRC, honoured with “Fellow of The Linnean Society (FLS)” of London, UK on 17th Oct. 2024.
- Dr Rajib Gogoi, Scientist-F, BSI-SHRC, became the “Chairman, Research Council” of Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI), Thiruvananthapuram, Kerala for the 2024-2026 (Three years).
- Dr. Rashmi Dubey, Scientist F,WRC-Pune conferred with Fellow of Linnean Society of London (FLS), Linnean Society of London U.K. in 2024
- Dr. Rashmi Dubey, Scientist F,WRC-Pune, conferred with Fellow of Botanical Society of India, (FBS) by Indian Botanical Society, Merrut, (U.P.) in 2024.
- Dr. Rashmi Dubey, Scientist F received the Prof. J. Muthumary memorial for Middle-aged Women Scientist Award during the National Conference on Fungal Frontiers: Biodiversity, Biomolecules, and Bioengineering. Applications for Sustainable Perspectives at Jai Narain Vyas University in Jodhpur, Rajasthan on 27th Nov.2024.

SERVICE RENDERED

During 2024-25, the different regional centres and units of BSI has been occupied with the task of providing several identification, authentication, guidance and scientific assistance services to the general public as well as different Government or Non-Government institutes or organization.

IDENTIFICATION AND AUTHETICATION OF PLANT SAMPLES

- BSI-AZRC, Jodhpur Identified specimens brought by the scholars/students of different institutes: *Aegle marmelos* (L.) Corrêa, *Clitoria ternatea* L., *Capparis decidua* (Forssk.) Edgew., *Zygophyllum coccineum* L., *Tephrosia purpurea* (L.) Pers. *Capparis decidua* (Forssk.) Edgew., *Zygophyllum coccineum* L., *Aloe vera* (L.) Burm.f. *Tephrosia purpurea* (L.) Pers., *Colocasia esculenta* (L.) Schott, *Moringa oleifera* Lam., *Erigeron bonariensis* L., *Acalypha indica* L., *Aegle marmelos* (L.) Corrêa, *Alstonia scholaris* (L.) R.Br., *Bacopa monnieri* (L.) Wettst., *Celosia argentea* L., *Centella asiatica* (L.) Urb., *Coriandrum sativum* L., *Eclipta prostrata* (L.) L., *Salvadora persica* L., *Ocimum sanctum* L., *Annona squamosa* L., *Crotalaria medicaginea* Lam., *Achyranthes aspera* L., *Withania somnifera* (L.) Dunal, *Ficus benghalensis* L. *Cynodon dactylon* (L.) Pers., *Calotropis procera* (Aiton) W.T.Aiton, *Plumbago zeylanica* L., *Justicia adhatoda* L., *Carissa carandas* L., *Dalbergia sissoo* Roxb. ex DC., *Melia azadirachta* L., *Coccinia grandis* (L.) Voigt, *Pergularia daemia* (Forssk.) Chiov., *Withania somnifera* (L.) Dunal, *Adiantum philippense* L. and other specimens.
- BSI-BGIR, Noida provided Plant identification service for identification of 151 plant materials and provided the certificates of authentication to respective students/researchers.
- BSI-ERC, Shillong provided plant identification and authentication services for c. 247 and 100 specimens of angiosperms and pteridophytes respectively.
- BSI-APRC, Itanagar Identified and given authentication letters for 37 plant samples.

PLANT DISTRIBUTION

- BSI-ANRC, Port Blair supplied Seedlings of *Knema andamanica* (Warb.) W.J. de Wilde-25 nos., *Pinanga andamanensis* Becc.-25 nos., *Cycas zeylanica* (J. Schust.) A. Lindstr. & K.D. Hill -10 nos., *Pterocarpus dalbergioides* Roxb. ex DC. 02 nos., *Bentinckia nicobarica* (Kurz) Becc. 25m nos., *Horsfieldia irya* (Gaertn.) Warb. 30 nos., *Garcinia dhanikhariensis* S.K. Srivast. 30 nos. on demand to BSI-AJCBIBG, Howrah.

Further, on demand seedlings of *Cratoxylum formosum* (Jack) Dyer-(20), *Rinorea bengalensis* (Wall.) Kuntze - (10), *Tacca leontopetaloides* (L.) Kuntze (5), *Flacourtia* sp.,(05), were supplied to BSI-HQRS, Kolkata. The BSI-ANRC also supplied seeds of *Musa balbisiana* Colla on demand to Prof. K. Rama Rao, Dept. of Zoology, Andhra University, Vishakapatnam for *ex-situ* conservation on 20.11.2024.

- BSI-AZRC, Jodhpur provided germplasm of following species to Lachoo Memorial College of Science and Technology, Jodhpur on request: *Albizia lebbeck* (L.) Benth. (3), *Colophospermum mopane* (J.Kirk ex Benth.) J.Léonard (5), *Justicia adhatoda* L. (5), *Murraya koenigii* (L.) Spreng. (2), *Sapindus laurifolius* Vahl (5), *Azadirachta indica* A.Juss. (5), *Holoptelea integrifolia* (Roxb.) Planch. (2), *Moringa oleifera* Lam. (2) and *Senna alata* (L.) Roxb. (2).
- BSI-ERC, Shillong distributed 11,088 Saplings and seeds supplied to different Institutions.

ACADEMIC EXPERT SERVICES

➤ Review of Paper

As potential reviewers Scientists of Botanical Survey of India reviewed for national and international journals such as Indian Journal of Forestry, Nordic Journal of Botany, Journal of Andaman Science Association, Journal of the Indian Botanical Society, Plant Science Today,

Discover Life, South Asian Journal of Research in Microbiology, Journal of Threatened Taxa, Nelumbo, BMC Plant Biology, Discover Plants, Scientific Reports, Industrial Crops and Products, Forest Pathology, Molecular Biology Reports, Journal of Phytopathology.

➤ **Supervision of Ph.D. & M. Sc. Internship**

Semester-IV dissertation work of Seven M.Sc. Botany Students (07) from Telangana Mahila Viswavidyalayam were supervised by Scientists of Botanical Survey of India during the month of October 2024.

➤ **Evaluation of Ph.D. thesis/Viva voce**

- Ph.D. thesis titled “Floristic and Ecological Studies of Horsely Hills, Chittoor District, Andhra Pradesh, India,” of Sri Venkateswara University on 31.05.2024
- Ph.D. thesis entitled “Ethnomedico Botanical Studies on Wildplant Resources of Giddalur Division, Prakasam District, Andhra Pradesh, India” of Rayalaseema University, Kurnool on 16.08.2024.
- The BSI-AJCBIBG, Howrah has provided scientific guidance especially on the lines of plant identification. Scientific guidance were provided to a total of 2665 attendees during educational visits from about 65 different School/Colleges/Institutions/Dignitaries.
- Internship Project on Garden Management: Scientists and staff of BSI-AJCBIBG, Howrah supervised 7 students from Dr. Kanailal Bhattacharyya College, Howrah for their internship projects on several topics based on garden management, conservation technique, resource utilization etc.
- Scientists and staff of BSI-AJCBIBG, Howrah attended IFoS officers nominated by MoEF &CC for Workshop/Training on “Basics in Plant Identification and nomenclature:
- 25 research scholars officially visited ARUN (BSI-APRC, Itanagar) for the consultation.
- From different universities and research institutes a total of 200 herbarium sheets were deposited in ARUN (BSI-APRC, Itanagar).
- BSI-APRC, Itanagar provided scanned images of herbarium sheets to the scholars upon request.
- A number of undergraduate and postgraduate students and Ph. D, scholars along with faculty members from different institutions (Lovely Professional University, Phagwara, Punjab; Jai Narayan Vyas University, Jodhpur; Rayat Shikshan Sanstha’s ASC College, Mokhada, Maharashtra; RSM International School, Jodhpur; Shri Mahalakshmi Girls College, Pratap Nagar, Jodhpur; Bhakta Kavi Narsinh University, Junagarh, Gujarat, G.D. Memorial College, Jodhpur) visited BSI-AZRC, Jodhpur from time to time. They were briefed about the BSI’s Objective, mandate, conservation of EET species and herbarium methodology.
- 636 student from 13 different academic institutes (SDGI Global University Students, Ghaziabad; Amity University, Noida; Kendriya Vidyalaya, Meerut Cantt., Uttar Pradesh; Kendriya Vidyalaya, Baoli, Baghpat, Uttar Pradesh; Vidyan Child, Sector 38, Noida, Uttar Pradesh; Prakash Institute of Ayurveda; Prof. P.L. Uniyal, Delhi University; Amity Institute of Forestry and Wildlife, Amity University; Ramjas college, Delhi University; Chaudhari Charan Singh University, Meerut; S.R.M inter college, Gautam Budh Nagar; BHMS, Venkateswara Homeopathic College & Hospital Chennai) visited BSI-BGIR, Noida.
- BSI-CBL, Howrah provided HPLC training programme to the undergraduate students, Department of Biotechnology, St Xavier’s College, Kolkata, Postgraduate students, Department of Physiology, Sreerampore College.

- BSI-CNH, Howrah hosted 3 students of Dr. Kanailal Bhattacharya College, Howrah on 12.07.2024 as part of the 15 days internship programme.
- The BSI-DRC hosted students from different colleges and different scientific institutes. Lectures were delivered by the scientists and scientific staffs of the regional centre, Provided lectures on Botanical Survey of India - An Overview & its Role in Advancement of Taxonomic Research & Conservation in India at Government City College, Hyderabad on 20.09.2024.

Delivered lectures on the role & responsibility of BSI for the undergraduate students of Department of Botany, Government Degree College for Women, Begumpet, on 15th April 2024.

- BSI-ERC, Shillong attended *c.* 994 visitors including VIPs, dignitaries, foreign delegates, scientists, academicians, researchers and students.

Training on Herbarium Techniques/methodology & Maintenance and Institutional visits:

- Three faculty and 23 B.Sc. Botany Honours students of Sualkuchi Budram Madhab Stradhikar College, Assam visited EBG, BSI, Barapani on 10.05.2024. A lecture on identification, conservation, propagation of plants and ethnobotany was provided.
- One faculty and total 15 B.Sc. IV semester students from Dept. of Botany, Bhattadev University, Assam visited BSI, ERC, Shillong on 15.05.2024 as a part of an educational visit. They were informed about the survey, collection, identification, and herbarium preparation of plant specimens. They also visited the garden, the National Orchidarium. They were informed about the various activities of BSI.
- A one-day Hands-on training in Plant Molecular Taxonomy was organized under SSR Program of the DST-SERB sponsored project on 19.06.2024. 16 M.Sc. students of William Carey, University, Shillong attended the training. They were given training on the theoretical principle and laboratory working of Plant Molecular Taxonomy.
- Two MSc students from Dr. Babasaheb Ambedkar Marathwada University, aurangabad has carried out their internship at ERC, Shillong from 20.05.2024 to 03.05.2024. They were given training on plant collection, identification and Herbarium techniques.
- BSI, ERC provided training in herbarium methodology, including survey, collection, identification of plants and visit to the experimental garden, orchidarium and digitization of herbarium sheets to 8 Internship Trainees (Data entry operator (DEO) trainee) from GCIIT Society, South West Khasi Hills District-793114 from 21.10.24 to 13.12.24.
- Training on herbarium methodology, including survey, collection, identification of plants and visit to the experimental garden, orchidarium to 27 B.Sc. students from the Department of Botany, Pachhunga Univeristy College, Mizoram on 27.02.2025.

EXPERT SERVICES

- Assessment after Remal Cyclone: A detailed report was provided by scientific staff of BSI-AJCBIBH, Howrah on damage and loss of plants and any property in different divisions of AJCBIBG due to cyclonic storm 'Remal' on 26.05.2024.
- Scientists and scientific staffs of BSI served as resource Person for Skill Development Program: Delivered lectures and guided in field tours (plant collection and identification) for Parataxonomy, Biodiversity, and Conservation trainees at the Chhattisgarh Biodiversity Board's program in Jagdalpur from 14.11.2024–17.11.2024
- A presentation on 'Wild Edible Fruits (Bio-resources)' was delivered at the program organized by the EIACP Centre on Biodiversity (Fauna), Kolkata & Freshwater Biology Regional Centre,

Zoological Survey of India, in collaboration with the Andhra Pradesh State Biodiversity Board and Telangana Biodiversity Board on 20.12.2025, at the Prof. L. Venugopal Reddy Seminar Hall, Acharya Nagarjuna University, Guntur, Andhra Pradesh.

- On 13.09.2024 (World Ozone Day) a power point presentation was delivered by Dr. Swarnalatha, BSI-DRC, Hyderabad on the importance of the ozone layer, its depletion, and the theme “Montreal Protocol – Advancing Climate Actions” to the students of Government City College, Hyderabad.
- Scientists and scientific staff of BSI-DRC, Hyderabad delivered a number of talks on ‘Floristic diversity of India with special references to Endemic and Threatened taxa from Telangana and Andhra Pradesh’ and ‘Mission on Life’ during National workshop titled Basics, Advances in Plant Taxonomy & Herbarium Techniques organized by Govt. City College, Nayapul, Hyderabad on 20.09.2024.
- Dr. S.L. Meena and Dr. Pushpa Kumari BSI-AZRC, Jodhpur attended Prof. Daulat Singh Kothari Memorial Oration on “INDIA@2030: S&T Opportunities and Challenges” by Prof. Ajay Kumar Sood, Principal Scientific Advisor to the Govt. of India on 19.10.2024 at Defence Laboratory, Jodhpur.
- Dr. S.L. Meena, BSI-AZRC, Jodhpur also participated in State Level Van Mahotsav, organized by Rajasthan State Govt. on August 07, 2024.
- Dr. Tapan Seal, BSI-CBL, Howrah delivered a lecture entitled ‘Environmental Governance and Pollution Control: Strategies for Air, Water, Waste, and Forest Management’ at Regional Capacity Building and Knowledge Institute, Indian Audit and Accounts, Kolkata on 28.08.2024.
- Dr. Vinay Ranjan, BSI-CRC, Allahabad delivered a lecture on ‘Plant Taxonomy and Herbarium Techniques’ in the Dept. of Botany, Iswar Saran Degree College on 03.10.2024.
- Dr. O.N. Maurya, BSI-CRC, Allahabad delivered invited lecture on ‘Environmental Conciousness’ and ‘GEM (Govt. E market)’ on 18.04.2024 as part of Induction Training to 23 newly promoted AAO/DRAAO/Supervisors at Regional Capacity Building & Knowledge Institute, Prayagraj (Indian Audit & Accounts Department).

Scientists of BSI attended several high level meetings such as-

- Review meeting of High Level Technical Committee on Red Oil Palm Plantation in Little Andaman Island on 09.05.2024 & 15.09.2024 and on 18.07. 2024.
- Board of studies meeting for the academic year 2024–25 at Government Degree Collage for Women Begumpet on 03.07.2024.
- Local Advisory Committee meeting of Central Research Institute of Unani Medicine (CRIUM), Erragadda, Hyderabad on 12.11.2024.
- Meeting at Ministry of Environment, Forest & Climate Change, New Delhi on various aspects related to conservation, protection and promotion of Red sanders trees held under the Chairmanship of Inspector General of Forests (WL) on 04.12.2024.
- State Wildlife Board Meeting on 24.02.2025 at Telangana Secretariat, Hyderabad.
- Board of Studies at the Department of Botany, Andhra University, Visakhapatnam, on 03.05.2024, Department of Botany, Govt. Degree College, Tanuku, on 13.06.2024.
- VIP meeting entitled “Proposed to established a Cactus garden in Bikaner” as a subject expertise at Beechwal, Bikaner in collaboration with forest department on dated 17.12.2024.

EVENTS AND ACTIVITIES

International Biodiversity Day 2024:

- On the occasion of International Biodiversity Day, the staff of BSI-AJCBIBG, Howrah participated in various programs viz. awareness rally from Curator's Office to Central National Herbarium and Mass Plantation programme at Aquatic Plant Section, Taxonomic Garden and Charak Udyan. In Aquatic plant sections 5 aquatic plants (including *Nymphaea* and Giant water lily), in taxonomic garden (12 species viz. *Asplenium nidus* L., *Psilotum nudum* (L.) P. Beauv., *Thelypteris nudata* (Roxb.) C.V. Morton etc.) and in Charak Udyan (7 species viz. *Rauvolfia serpentina* (L.) Benth. ex Kurz., *Justicia adhatoda* L., and *Geranium Tourn.* ex L. etc.,) were planted.
- BSI-ANRC, Port Blair organised Virtual drawing competition on this day for school students.
- On this occasion, 22 research scholars/M.Sc. students from Jay Narayan Vyas University, Jodhpur participated in the lectures delivered by the scientists of BSI-AZRC, Jodhpur.
- BSI-HAWHRC, Solan celebrated the day in the campus of Bal Bharati Public School, Gladly Dhank, Rajgarh Road, Tehsil & District Solan (H.P.). An essay writing competition was organized to generate awareness among the students. A total of 35 students from class 7th to 10th standard participated in this competition.
- A programme was organised by BSI-NRC, Dehradun to save nature and natural
- Resources under Mission Life in collaboration with USERC and Uttarakhand Forest Department.

World Environment Day, 2024:

- On this occasion the officials and staff BSI-AJCBIBG, Howrah organized various environmental awareness programs viz. awareness rally from Curator's Office to Kyd Monument, Mass Plantation programme, Nursery Visit, Plant Distribution etc. focusing on the theme "Land Restoration, Desertification and Draught resilience" under the slogan "Our land Our future We are #GenerationRestoration". Students from different schools of Kolkata and Howrah namely Kendriya Vidyalaya, Fort William, Kolkata, Skylark English Medium School, Nazirganj and different NGOs namely Wild Life and Environmental Protection Group, Surya Toran Scout and Guide Group, Morning Walkers Association actively participated in all the above-mentioned awareness campaigns.
- More than 500 people including students, parents, staff, and morning walkers participated in the mass rally. Later, they proceeded towards the plantation site (Division 17 signifies the plants of Andhra Pradesh) where more than 300 plants belonging to 204 species (out of which more than 70 species are threatened and other IUCN Red List categories and more than 30 species are endemic to Eastern Ghats) were planted by them. After the plantation, the gathering went to nursery no. 1 where staff of AJCBIBG briefed them about the techniques of plantation and vegetative propagation of plants in different sections of nursery. A total 1460 plants were distributed to the participants, guests and visitors.
- BSI-AZRC, Jodhpur organized a painting event in which 29 children participated. Plantation programme was also held in which sapling of *Anogeissus sericea* var. *nummularia* King ex Duthie and *Anogeissus sericea* Brandis var. *sericea* were planted by the children in AZRC garden.

- The scientist and staff of the BSI-HAWHRC, Solan along with 28 local villagers conducted a tree plantation drive and an awareness program. A total of 20 tree saplings of *Cedrus deodara* (Roxb. ex D.Don) G.Don and *Podocarpus neriifolius* D.Don were planted.
- BSI-ANRC, Port Blair also celebrated the day while a program was organised by BSI-NRC, Dehradun to adopt sustainable food system in collaboration with DD college.

International Yoga Day 2024:

- On this occasion the officials and staff of Botanical Survey of India, Kolkata and Howrah region jointly celebrated Yoga Day at AJC Bose Indian Botanic Garden, Howrah in collaboration with the Axis Bank Limited (Howrah and Kolkata region). The interactive yoga session is held in front of Great Banyan Tree on 21st June, 2024 under the theme 'Yoga for Self and Society'. More than 400 enthusiasts including officials/staff of HQ, AJCBIBG, CNH, CBL, ISIM, Axis bank actively participated in yoga activities as demonstrated by yoga instructor, Ms. Jyoti Nahata.
- BSI-ANRC, Port Blair organised Mass Yoga demonstrations on this occasion at premises of Science Centre and BSI, Port Blair.
- On this day BSI-AZRC, Jodhpur and BSI-HAWHRC, Solan organized a yoga training programme in the office premise. Sh. Rakesh Garg from Sun to Human Foundation, Jodhpur and Sh. Jagdeep Singh Kanwar from Art of Living were invited respectively in the offices to demonstrate the yoga exercises.

Van Mahotsav celebration, 2024:

- The officials and staff of BSI-AJCBIBG, Howrah celebrated the day under the theme 'Ek Ped Ma Ke Naam' and organized a mass plantation programme at Division no 22 of the garden. More than 400 enthusiasts including scientists, officials, ministerial staff, research scholars and associates and internship trainees of BSI-HQ, AJCBIBG, CBL, CNH, ISIM and ENVIS-EIACP actively participated in this plantation programme for fulfilment this year's theme by planting a tree as a tribute to their mother for better biodiversity conservation through community participation.
- BSI-ANRC, Port Blair organised awareness rally, mass tree plantation programme at Government Primary School, Nayashahar and Dhanikhari Experimental Garden cum Arboretum, Nayasahar.
- It also organised mass tree plantation programme as a part of 'Ek ped maa ke naam' at Dhanikhari Experimental Garden cum Arboretum, Nayasahar on the occasion of celebration of Van Mahatsav-2024. On this occasion a sapling of Rudraksha (*Elaeocarpus ganitrus* Roxb. ex G.Don) were gifted to Dr. E.B. Chakurkar, Director, ICAR-Central Island Agricultural Research Institute (CIARI), Port Blair on 26.07.2024.
- BSI-AZRC, Jodhpur organized Van Mahotsav and carried out plantation programme in office garden on 05.07.2024. Eight saplings of *Moringa concanensis*, *Anogeissus sericea* var. *nummularia*, *Ficus religiosa*, *Dichrostachys cinerarea*, *Butea monosperma* were planted by officers and employees of this office.
- BSI-CRC, Allahabad organized plantation drive during Van Mahotsava in 17 BN, NCC, Allahabad on 04.07.2024.

Ozone Day Celebration:

- The officials and staff of BSI-AJCBIBG, Howrah celebrated Ozone Day at Curator's lawn, AJCBIBG. Teachers, students and officials from Scottish Church College, Kolkata have also participated in the event.
- BSI-ANRC, Port Blair and BSI-APRC, Itanagar organised celebration of World Ozone Day 2024.

Hindi Diwas and Hindi Pakhwada:

- Botanical Survey of India and its all regional centres organized various programmes to celebrate Hindi Diwas and Hindi Pakhwada.
- BSI-APRC, Itanagar organized two hindi workshops on 01.10.2024 and 06.03.2025 for the Officials.
- BSI-AZRC, Jodhpur organized a Hindi workshop on 28.06.2024 in which Dr. Dalpat Singh Rajpurohit, Assistant Professor, University of Texas, USA, delivered a lecture on 'Status and role of Hindi in foreign countries'.
- Hindi Pakhwada was observed at BSI-AZRC, Jodhpur from 14.09.2024. Several events like Ashu Bhasan, Nibandh Lekhan, Kavya Path, Vad-Vivad Pratiyogita and Prasnotari were organised.

Swachhata Mission 4.0

- The staff of BSI-AJCBIBG, Howrah participated in Swachhata Pledge taking ceremony at Curator Office. They also participated in the Swachhata Mission 4.0 cleaning drive organized at Ganga River bank of garden with garden staffs and cleaned the area on 26.09.2024.
- As a part of Swachhata Hi Seva 2024, BSI-ANRC, Port Blair organised a special cleaning drive in the islands from the campus of Science Centre and in the Residential area of Anarkali, Sri Vijaya Puram on 18.09.2024. It also organized Swachhata pledge at office on 19.09.2024 and Swachhata pledge and special cleaning drive campaign at village area of Gram Panchayat Beodnabad, South Andaman on 20.09.2024.
- BSI-AZRC, Jodhpur organised a Drawing competition under the Swachhata Campaign 4.0 on 17.09.2024 in the office in which students from B.R. Birla Public School, Jodhpur participated.
- It carried out several cleanliness events under Swachhata Hi Sewa campaign. A cleaning drive was organized at Kailana Lake, Jodhpur together by BSI and ZSI officials on 26.09.2024. Cleaning of ZSI office premises was done by the officials of both departments on 01.10.2024.
- A collaborative cleanliness drive by BSI and ZSI at the BSI-AZRC, Jodhpur office campus was carried out under the Swachhata Campaign 4.0 on 18.09.2024. On this occasion, 07 plant saplings of various plants species i.e. *Nyctanthes arbor-tristis* (01), *Syzygium cumini* (01), *Sapindus laurifolius* (01), *Cordia myxa* (02), *Butea monosperma* (01), *Bombax ceiba* (01) were planted in campus botanical garden.

- BSI-DRC, Hyderabad conducted an awareness programme on Swachha Seva (cleanliness drive) at Govt. High School, Koti, on 24.09.2024.
- BSI-HAWHRC, Solan organized a number of events such as cleanliness drive, plantation drive, Swachhata hi seva pledge taking etc. An awareness campaign was organized in the Government Middle School Kalaghat, Solan.
- A cleanliness drive and awareness camp was organised by Botanical BSI-SHRC, Gangtok under the theme Swachhata Me Jan Bhagidari under Swachhata Hi Seva 2024 mission in collaboration with the Great Club of Baluakhani, Gangtok on 29.09.2024. Local residents were also informed about 75 Mission LiFE action areas under seven categories to adapt in their daily life and also to disseminate in the society.
- BSI-SHRC, Gangtok undertook a Swachhata hi Seva (SHS) programme on 02.10.2024 at Gurung Gaon, Gangtok. Villagers were also informed about 75 Mission LiFE action areas under seven categories to adapt in their daily life and also to disseminate in the society.
- All officials of BSI-CRC, Allahabad participated in cleanliness drive under Swachhata campaign 4.0 held in October, 2024 with various activities like Health Check-up, Plantation etc.,

Ek Ped Maa Ke Naam' plantation program:

- All Scientific staff and officials attended 'Ek Ped Maa Ke Naam' plantation programme on 27.11.2024 at Division No. 5 in Palmatum and on 04.12.2024 at Division No. 21 in Garjan Math, BSI-AJCBIBG, Howrah. More than 400 plants were planted by the staff and dignitaries at both the division.
- BSI-ANRC, Port Blair organised tree plantation programme as a part of this campaign at garden on 14.11.2024. Chief Guest, Dr. Dhriti Banerjee, Director, Zoological Survey of India planted seedlings of coffee family plant species, *Pyrostria laljii* M.C. Naik et. al.. It also organized plantation programme at Satsang Vihar, Lambaline, South Andaman on 28.09.2024.
- Under Ek Ped Maa ka Naam scientists and staff of BSI-HAWHRC, Solan planted the saplings of *Pinus gerardiana*, *Salix* spp. and *Prunus armenica* while BSI-AZRC, Jodhpur also carried out plantation program in ZSI campus.

Mission Life

- BSI-AJCBIBG, Howrah created awareness to more than 5043 visitors during the year and weekly and monthly reports have been sent central nodal officer timely.
- BSI-SHRC, Gangtok organized a Health Camp at Doksing Luing Village, East Sikkim on 22.09.2024 under Safai Mitra Suraksha Shivirs. Villagers were also informed about 75 Mission LiFE action areas under seven categories to adapt in their daily life and also to disseminate in the society.

World Wetland Day

- Botanical Survey of India and all its regional centres observed World Wetland Day on 02.02.2025 by organizing different events and plantation programmes.

- On this occasion, BSI-CRC, Allahabad participated by putting up exhibition stalls at Parvati Arga Ramsar site, Gonda district Uttar Pradesh and displayed Posters, Publications, Herbarium specimens and live aquatic medicinal plants. BSI-CRC also participated in the 'Regional Workshop for Northern States for Conservation and wise use of Wetlands on 01.02.2025. The program was attended by the Hon'ble Chief Minister of UP and Hon'ble Union State Minister MoEF&CC, New Delhi along with JS, MoEF&CC; PCCF, UP and other officials of Central and State governments.
- BSI-NRC, Dehradun carried out a plantation programme at the Tapkeshwar Temples area in Dehradun.
- BSI-HAWHRC, Solan celebrated World Wetland Day 2024 in the campus of Bal Bharati Public School, Gladly Dhank, Rajgarh Road, Tehsil & District Solan (H.P.). Students and participants were briefed about the Wetlands, Ramsar convention and role of peoples/ stakeholders in the conservation of wetlands. Later a mass *Wetland Mitra Pledge* was taken.
- **Miscellaneous**
- BSI-AJCBIBG, Howrah and BSI-HAWHRC, Solan celebrated Vigilance Awareness Week.
- BSI-ANRC, Port Blair organised 53rd Foundation Day of ANRC, National Endangered Species Day-2024.
- BSI-ANRC, Port Blair and BSI-HAWHRC, Solan organized International Day of Forests.
- BSI-APRC, Itanagar BSI-HAWHRC, Solan celebrated the International Women's Day, International Mountain Day.
- BSI-AZRC, Jodhpur organized Plantation programme at office campus as well as in other academic institutions such as Govt. Senior Secondary School, Mata ka Than, Jodhpur. Saplings of *Moringa oleifera*, *Ficus religiosa*, *Murraya koenigii*, *Adhatodavasaca*, *Albizzialebeck*, *Punica granatum* (05), *Psidium guajava* (05), *Syzygium cumini* (05), *Annona squamosal* (05), *Cordia myxa* (05), *Nyctanthes arbor-tristis* (05), *Michelia champaca* (05), *Butea monosperma* (05), *Citrus limon* (03), *Nyctanthes arbor-tristis* (01), *Syzygium cumini* (01), *Sapindus spp.* (01), *Cordia myxa* (02), *Butea monosperma* (01), *Bombax ceiba* (01) *Saraca asoca* (03) were planted.
- BSI-BGIR, Noida celebrated Word Biodiversity day, Word forestry day, Wetland Day, World Environment day, Ozone day, Yoga day, Vigilance awareness week, Hindi Phkwara, Head of Office Meeting /RC meeting etc throughout the year. Various Mission Life and Swatch Bharat Abhiyan events were also conducted during the period.
- BSI-SHRC, Gangtok, observed International Mountain Day 2024 on 11.12.2024.
- BSI-CRC, Allahabad celebrated the Earth Day with R.K. College of Pharmacy, Naini, Prayagraj on 22.04.2024.
- BSI-ISIM, Kolkata observed International Day for Biological Diversity, Foundation of Botanical Gallery, ISIM, World Biofuel Day, World Coconut Day, Zero Emission Day, National Science Day with great passion and zeal.

BUDGET

BOTANICAL SURVEY OF INDIA		
OBJECT HEAD-WISE BREAK UP OF FINAL RE- 2024-2025		
		IN THOUSAND
OBJECT HEAD	CODE	FINAL RE 2024-2025
1	2	3
Salaries	1	355000
Wages	2	120
Rewards	5	3100
Medical Treatment	6	8000
Allowances	7	299500
Leave Travel Concession	8	4300
Training Expenses	9	700
Domestic Travel Expenses	11	18000
Foreign Travel Expenses	12	2220
Office Expenses	13	139130
Rent, Rates and Taxes	14	5700
Printing and Publication	16	6600
Rent for Others	18	2600
Digital Equipment	19	4067
Materials and Supplies	21	10513
Fuels and Lubricants	24	4800
Advertising and Publicity	26	150
Minor civil and electric Works	27	100000
Professional Services	28	700
Repair and Maintenance	29	6000
Grants-in-aid-General	31	15000
Scholarships	34	29000
Awards and Prizes	40	0
Other Revenue Expenditure	49	1000
TOTAL OF REVENUE		1016200
CAPITAL:		
Motor Vehicles	51	5100
Machinery and Equipment	52	6500
Information Computer, Telecommunication (ICT) Equipment	71	9900
Buildings & Structures	72	102353
Furniture & Fixtures	74	5000
Other Fixed Assets	77	3500
TOTAL OF CAPITAL		132353
	TOTAL	1148553

Ranajit Kr Roy 9/4/25
 RANAJIT KR. ROY
 SAO & HEAD OF OFFICE