

A REPORT ON
DR H.K BARUAH REGIONAL BOTANICAL RESOURCE CENTRE,
DEPARTMENT OF BOTANY, GAUHATI UNIVERSITY



Submitted to
IQAC, Gauhati University

Submitted by
Dr Rubul Buragohain
Superintendent, Dr H.K Baruah Regional Botanical Resource Centre,
Department of Botany, Gauhati University

DR HITENDRA KUMAR BARUAH REGIONAL BOTANICAL RESOURCE CENTRE, GAUHATI UNIVERSITY



The Gauhati University Botanical Garden is one of the largest and oldest Botanical Gardens of the North East in particular and the country in general. Pandit Jawaharlal Nehru (the then Prime Minister of India), who inaugurated the main building of the Botany Department on 29th August, 1955, also dedicated this garden for service to the nation. The garden with an expansion of area beyond the chemistry building was recognized by the UGC in 1965-1966. In 1969-70 some important arrangements have been made to organize a well equipped herbarium, museum, glass house and Botanical Garden for which funds have been allotted by the UGC. A new post designated as Superintendent of Botanical Garden to organize and manage the

Botanical garden. In 1995-1996, the department of Botany planted number of rare, endangered, medicinal and ornamental plants.

Like other botanical gardens across the world, it maintains different plants of botanical interests including ornamental, cultivated, wild, medicinal, or of any economic value or special interest, etc. that are collected from different localities of north east India. Some plants are of value not only to the botanists, horticulturists and foresters but also to the millions of tourists. Generally, botanical gardens devote their resources to the study and conservation of plants, as well as making the world's plant species diversity known to the public. These gardens also play a central role in meeting human needs and providing well-being. Botanical gardens are established specially for scientific research, in/ex situ conservation, plant resource utilization, recreation, mental satisfactions to the people.

In the year 1997, when the Botany department celebrated its Golden Jubilee on 18th December, the Executive Council of Gauhati University renamed the Botanical Garden as Dr.H. K. Baruah Regional Botanical Resource Centre in memory of the founder Professor and Head of the Department, Late Professor H. K. Baruah, a legendary botanist of the country. In 1998-2001, the Assam Government gave a financial assistance to develop Dr. H. K. Baruah Regional Botanical Resource Centre through which construction of a suitable permanent road for the use of visitors in the garden and renovation cactus house, green house, orchid house of the garden. A small office also constructed for the superintendent to maintain the official works.

The Garden was developed with an objective to study the rich and diverse flora of N.E. India and to conserve the rare, endangered and threaten plant species of the region and at present, it is spread over an area of ca 62 acres situated in the hills and valleys of Jalukbari hills within the University campus at an altitude ranging from 213 to 247 ft msl. There are two natural ponds within the garden covering an area more than 1 acre which are replenished by a perennial water stream originating from the peak of the Jalukbari hills. The garden was funded in 1994 by the MoEF (Govt. of India) which was a turning point for its development and converting into an experimental garden. In the year 1998, Dr Zoiinath Sarma, donated a beautiful gate with rocky patches dedicated to his father-in-law Professor H.K. Baruah.

Vision: Conservation and propagation of Plant Biodiversity of Northeast India.

Mission: To bring awareness to students about Environment and Biodiversity conservation

Aims and objectives:

1. To maintain documented collections of living plants for the purposes of scientific research, conservation, display, and education.
2. Ex-situ conservation of RET plants.
3. Survey, documentation and conservation of medicinal and ethno-medicinal plant of N.E India.

Future prospects:

- Develop a data base of all the flora and fauna conserved in the Centre.
- Develop an audio-visual herbarium and museum of plants and animals in the centre

In addition to the naturally growing plants, a good number of economically important plants have been cultivated in the garden from time to time. Some plants such as *Cycas pectinata*, *Pinus insularis*, *Litsea monopetala*, *Persea bombycina*, *Zingiber zerumbet*, *Tinospora cordifolia*, *Santalum album*, *Artocarpus lakoocha*, *Litsea salicifolia*, *Aquilaria malaccensis* etc. were planted in the year 1997. The plantation and maintenance of valuable plant resources inside the garden is a remarkable achievement of the garden.

At present, there are about 600 species of phanerogamic and cryptogamic plants that are growing in this Botanical Resource centre. Some interesting species are *Nepenthes khasiana*, *Vanilla borneensis*, *Zamia furfuracea*, *Brainea insignis*, *Angiopteris helferiana*, *Dipteris wallichii*, *Blechnum orientale*, *Cycas pectinata*, *Taxus baccata*, *Agathis robusta*, *Rauvolfia densiflora*, *Rauvolfia serpentina*, *Rauvolfia tetraphylla*, *Flacourtia jangomas*, *Baccaurea ramiflora*, *Magnolia spp.*, *Garcinia cowa*, *Garcinia lanceifolia*, *Garcinia pedunculata*, *Persea bombycina*, *Aquilaria malaccensis*, *Mesua assamica*, *Oroxylum indicum*, *Sapindus mukorossi*, *Dillenia indica*, *Elaeocarpus floribundus*, *Elaeocarpus ganitrus*, *Prunus jenkinsii*, *Elaeagnus latifolia*, *Phoebe goalparensis*, *Beilschmiedia assamica*, *Croton tiglium*, *Zingiber zerumbet*, *Curcuma caesia*, *Aristolochia ringens*, *Zeuxine strateumatica* and many more. Some of the commonly found birds and animals in the Garden are monkey, cobra, python, lizards, butterflies, wood pecker, king fisher, robin, cattle egret, etc. Leopard i.e. *Panthera pardus* species is also often spotted in the Garden. The Garden is regularly visited by students, teachers and researchers from different institutions of N.E. and other parts of the country. Foreign tourists visiting

Guwahati city also make a point to visit this Gauhati University Botanical garden. The visitors, who wish to visit the garden, need to take permission from the Head, Dept. of Botany, Gauhati University. Collection of any bio-resource material from the Garden is strictly prohibited and punishable.

The University Botanical garden provides valuable information on various plants of local flora, rare, endangered and threatened plants collected time to time by researcher, professors and students. The garden acts as “outdoor laboratories” for students and researchers of Botany as well as other departments also. Besides plant conservation the department is working on other important aspect like establishment of vermicompost unit, Bio-compost unit, mushroom cultivation unit, sapling house which are well maintained. Number of research project has been completed and still a few projects are going on specially conservation of RET species. Now a day’s every students from primary to PhD scholars regularly visited our botanical garden. The department like chemistry, Zoology, Political science, Women studies and Anthropology are also visited our botanical garden for their environmental studies. The Ministry of Environment, Forest and Climate Change (MoEFCC) Govt. of India has sanctioned a project for the conservation of *Garcinia* sp. which will be implanted in Dr. H. K. Baruah Regional Botanical Resource Centre.



Bifurcated road inside the garden



Low land area inside the Garden



Low land area inside the Garden



World Environment Day
Celebration and Plantation



Zoology Students and Teachers
in the Garden



Harvesting and Distribution of
Vermicompost inside the
Garden



Office Staff searching for practical
specimens inside the Garden



Visitors inside the Garden



World Environment Day Celebration and Plantation inside the Garden



Students from Lumding College, Hojai



Students from Kalgachia College, Barpeta



Students from Jalukbari High School



Distributing sapling to the students



Students from Royal Global School,



Students from Gauhati University

Tourists and Resource person from Foreign



Resource person from Australia



Tourists from France



Prof S. Ferber, University of Wallongong,
Australia



Tourist from USA



Tourist from New Zeland

Facilities in the Botanical Resource Centre

MUSHROOM CULTIVATION UNIT

Demand of edible mushrooms is increasing day-by-day in food markets due to its richness in protein, minerals and vitamins. In order to keep up with the current population growth, provide future food security, and promote social empowerment of the society's marginalised people, the mushroom farming facility was established in the year 2021 at the Department of Botany, Gauhati University, Guwahati, Assam. The cultivation unit spans an area of ca. 200 sq. ft. and is situated in the Dr. H. K. Baruah Regional Botanical Resource Centre of the Department of Botany. It has been developed to conduct both research and training purposes.

The main objectives of the cultivation unit are as follows:

- a) To hold trainings to promote the production of mushrooms in various agro-ecosystems and the social empowerment of the society's marginalised peoples.
- b) To identify the edible and medicinal wild mushroom species those are found naturally.
- c) Investigating the use of locally accessible materials as substrates.
- d) Standardisation of methods used to grow various mushrooms.
- e) To assess the strains' potential and high yields for regional applicability.
- f) Supply of high-quality spawns to mushroom farmers.

To date, the unit has standardised the cultivation technique of *Pleurotus ostratus* by utilising various locally available and unused lignocellulosic wastes like rice straw, sugarcane bagasse, wood chips, wood flakes, citronella bagasse (*Cymbopogon nardus*), leaf litter of *Monoon longifolium* and determined the yield and biological efficiency of the selected substrates and their combination on its productivity.



Fig. Mushroom Cultivation Unit. *Pleurotus ostreatus* in different substrates: (a) Mixtures of rice straw, wood flakes, and saw dust;(b) Citronella bagasse (*Cymbopogon nardus*)

VERMICOMPOSTING UNIT

The vermicomposting unit of the department was set up in the year 2019 at Dr. H.K. Baruah Regional Botanical Resource Centre to manage the leaf litters. Two earthworm species namely *Eisenia fetida* and *Eudrilus eugeniae* are being used for vermicomposting of leaf litters. The vermicomposting output (i.e. Vermicompost) generated time to time is used in the departmental garden and also available for selling at nominal cost. Besides, a significant amount after each harvest is usually given to the GU Estate Office at free of cost for growing plants inside the University campus.

In N.E. India including Assam, several farms and self help groups (SHGs), research and academic institutions are presently involved in production of vermicompost to manage the organic garbage. However, the quality of vermicompost in terms of nutrient composition is still a major challenge. This has already hampered the wider adoption of vermitechnology amongst the farmers and entrepreneurs in the state. Considering the situation, the quality improvement as well as value addition of the final vermicompost is one of the main research focuses of this vermicomposting unit.

With available raw material the department is planning to establish more vermicomposting setups to enhance the vermicompost production as well as to strengthen the research in this track. This will definitely be relevant in the present day context of high demand of organic cultivation globally. It will of course be possible as far as the raw material availability or other necessary components are concerned.



BIOCOMPOSTING UNIT

The biocomposting unit of Department of Botany, Gauhati University was established in the mid of 2023 with an objective to develop a microbial consortia-based biocomposting technology which could be useful to manage the abundant leaf litters that are generated every year within the University campus. At present, there are four chambers (each measuring 3 ft x 5 ft x 5 ft) in the biocomposting unit.

In general, the natural process of leaf litter composting takes about 8–9 months. But the addition of cowdung, kitchen wastes, earthworms etc. can reduce the composting time upto 3–4 months. However, the composting of huge leaf litters and agrowastes is often challenging with such conventional methods. Limitations to these conventional methods arise due to insufficient cowdung, kitchen wastes, and earth worms supply in the field. Besides, in case of vermicomposting, sensitivity of earth worms to temperature changes, oxygen conditions and leaf litter types are the major concerns. Alternatively, biocomposting where microorganisms play important roles in degrading the leaf litters or any agro-wastes can be done in two different ways: (1) Biostimulation, where the naturally occurring microorganisms are stimulated to grow by adding certain growth promoting factors such as cowdung, urine, kitchen wastes, degraded fruits etc. (2) Bioaugmentation, where active microorganisms (single species or in consortia) are applied on the substrates for composting.

Directly and indirectly, microorganisms are involved in composting of organic matters. Microorganisms are very much diverse physiologically, and their composting capacity also differs from strain to strain or species to species. Organic matters with simple carbohydrates are often easily degraded and utilized by several microorganisms. But, the lignocellulolytic materials are highly recalcitrant and can only be degraded by certain lignocellulolytic microbes. Therefore, isolation and identification of such potent lignocellulolytic microbes is important so as to use them for effective and efficient biocomposting of lignocellulosic materials.

The Department of Botany, GU being involved in microbial research including the lignocellulolytic ones, has identified several potent microbial strains that are capable of degrading lignocellulosic materials. The strains have already been characterized scientifically – based on which the current biocomposting experiments are going on. At present, four lignocellulolytic fungal strains (KP/05, RS/2, TMT/14/6 and T. heimii) recovered from the fungal garden of termites are in use for composting of the leaf litters that are collected from the Botanical Garden as well as from the premises of the Botany Department.



Collection of leaf litters in the Garden Collection of leaf litters in the Garden

Successful achievements of the Biocomposting Unit: The microbial consortium used in this biocomposting have been found useful for composting of leaf litters without adding agents like cowdung, kitchen waste, earthworms, etc. Interestingly, *Polyalthia* leaf which is recalcitrant to

vermicomposting has been successfully composted through this strain-based biocomposting within a time span of less than 3 months. In a pot experiment, the plants treated with our strain-based biocompost performed better than the plants treated with vermicompost and the control plants (without compost treatment).



Dry leaf filling in the composting unit



Mass culture of microbial strains



Microbial treatment for composting



Compost formation after 2.5months



Compost harvesting after 3months



Compost application in pot experiment.
A–Treated with biocompost,B–Treated with vermicompost,
C – without any compost

FERNARIUM

Assam is rich in fern diversity. Chapman (2009) estimated that there are about 12,000 species of ferns and fern-allies across the world. There are about 13,600 species of ferns and lycophytes in the world (Moran, 2015). The pteridophytic flora of India comprises around 1,000 species belonging to 191 genera and 67 families including 47 endemic Indian ferns (Dixit, 1984) and in another report, more than 1,100 species of pteridophytes belonging to 144 genera and 34 families with about 235 endemic species (Chandra, 2000).

Our centre has about 40 species of ferns which are growing luxuriantly because the humidity and light intensity very suitable for growth of ferns. Some common ferns of our centre is *Adiantum capillus-veneris* L., *Adiantum caudatum* L., *Adiantum philippense* L., *Angiopteris evecta* (G.Forst.) Hoffm. *Blechnum insigne* (Hook.) C.M.Kuo, *Blechnum orientale* L., *Diplazium esculentum* (Retz.) Sw, *Dipteris wallichii* (R.Br.) T.Moore, *Drynaria quercifolia* (L.) J.Sm., *Dryopteris sparsa* (D.Don) Kuntze, *Equisetum ramosissimum* Desf., *Lygodium flexuosum* (L.) Sw., *Odontosoria chinensis* (L.) J.Sm., *Pteris ensiformis* Burm., *Pteris vittata* L., *Pyrrosia heterophylla* (L.) M.G.Price, *Selaginella decipiens* Warb., *Thelypteris interrupta* (Willd.) K.Iwats. *Thelypteris parasitica* (L.) Tardieu etc. Some remarkable fern like *Blechnum insigne*, *Dipteris wallichii* and *Angiopteris evecta* are very uncommon and supposed to be threatened category as the population of this species are reducing very fast.



ORCHIDARIUM

‘Orchid’ the name itself refers to delightful world with over 25000 species having unique colours and shape. In India about 1331 species under 184 genera (Misra, 2007). Northeast India is a hotspots of orchid with 70 percent of the total orchids found in India can be found in the region (Baruah, 2001). Our centre has about 50 species of orchids which are mostly indigenous. Some common species are *Dendrobium anceps* Sw., *Dendrobium farmeri* Paxton, *Phalaenopsis manni* Rchb.f., *Pinalia bractescens* (Lindl.) Kuntze, *Luisia zollingeri* Rchb.f., *Aerides odorata* Lour., *Micropera pallida* (Roxb.) Lindl., *Phaius tankervilleae* (Banks) Blume, *Aerides multiflora* Roxb., *Micropera pallida* (Roxb.) Lindl., *Phaius tankervilleae* (Banks) Blume, *Aerides multiflora* Roxb., *Nervilia concolor* (Blume) Schltr., *Eulophia picta* (R.Br.) Ormerod, *Peristylus constrictus* (Lindl.) Lindl., *Zeuxine nervosa* (Wall. Ex Lindl.) Benth. Ex. Trimen, *Dendrobium aphyllum* (Roxb.) Fischer., *Didymoplexis pallens* Griff., *Papilionanthe teres* (Roxb.) Schltr., *Rhynchostylis retusa* (L.) Blume, *Cymbidium aloifolium* (L.) Sw. etc.



TEA GERmplasm UNIT

Assam is world famous for Tea. Tea is one of the most popular beverages in the world. Tea in India is so popular that liking for it has reached the point of admiration. The best quality tea in India pours chiefly from Assam. It was way back in 1823 that Robert Bruce a merchant and soldier, first spotted tea plant in Assam and this eventually led to East-India Company developing a trade in it. Assam Tea is a matter of pride for the entire country. Of late, however, concerns have been raised about the declining quality. Different factors have been attributed by different circles for this deterioration in quality. Conserving the important clones or variety is very essential. We have a tea germplasm unit where a good number of clones (7 nos) are preserved from both Darjeeling and Assam. In future we are planning to conserve all the important clone of Assam tea.



MEDICINAL AND AROMATIC PLANTS ZONE

We have about 50 medicinal and aromatic plant species which are growing in natural condition. Medicinal plants like *Rauvolfia serpentina*, *Asparagus racemosus*, *Saraca asoca*, *Terminalia arjuna* etc are growing naturally and scattered throughout the garden as the regeneration of this species are very remarkable.

FOREST ZONE

The forest zone of the garden is the area which is totally undisturbed and plants are grown naturally. This zone is a good habitat for wild animals. This zone is only allowed to researchers and visitors with a special permission from GU authority.

EXPERIMENT HOUSE

This house is made for experiment of plant species which are botanically important. Especially this house is used for students and other important plant related works. This house protects the experimented plants form wild animals like monkey and other.



Experimenting *Coptis teeta* (A rare plant)