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Orchid resources of Poba Reserve Forest in Dhemaji district of Assam (India)

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Abstract
India is one of the quintessential repositories of genetic resources of orchids having great potentiality in the field of floriculture, pharmacy and tourism. In India, North Eastern States including Assam plays an important role for orchid diversity. In Assam, Poba Reserve Forest (Dhemaji district) is rich in flora and fauna due to substantial rainfall, hilly location and various rivers such as Siang, Dibang and Lohit. There are 33 orchid species belonging to 24 genera enlisted in Poba reserve forest. But the orchid resources are lessening rapidly due to destruction, degradation and shrinkage of natural habitats and commercial exploitation. As part of the national plant conservation efforts, the present study proposes an attempt to explore the orchid resources of Poba Reserve Forest.

Keywords: orchid resources, dhemaji, orchidaceae, poba reserve

Introduction
Orchids are very popular for their medicinal values since Vedic period, but in recent years orchids are in great demand in national and international market due to their aesthetic value. Orchids show diversity in habit and habitat at global level by occupying almost all the environments under epiphytic and terrestrial conditions. Orchids are the well-known highly evolved angiospermic plant representing 9% of the Indian flora. A total of 32,000 orchids have been recorded in the world. In India, about 1430 species distributed into 192 genera have been reported (Kumar & Kumar, 2005; Misra, 2019) [12, 14] mainly from Himalayas and the mountain regions of Eastern and Western Ghats (Gogoi *et al*., 2012; Linthoingambi *et al*., 2015; Swain *et al*., 2019) [6, 13, 16]. Among them 150 species are endemic to North East India (De & Singh, 2015) [3]. In India, Arunachal Pradesh shows rich orchid flora and Assam encompasses 398 species in 102 genera (Gogoi, 2019) [8]. The fox tail orchid *Rhynchostylis retusa* (Linnaeus, 1753; 953) Blume (1825: 286) commonly known as *Kopo phool* in Assam has great cultural (*Bihu* festival) significance. Similarly Buddhists are using golden inflorescence of *Dendrobium hookerianum* to worship the Lord Buddha.
The climatic conditions of Assam are favouring the growth of orchid. Several studies carried out in reserve forests of Assam and adjoining areas (Gogoi, 2012 & Gogoi, 2019) [5, 8] have led to the documentation of 398 orchid species and 107 species were found in Joypur Reserve forest of Dibrugarh district. A case study in two districts of Assam reported 95 species in Tinsukia (Gogoi, 2012) [6, 7] and 140 species in Lakhimpur (Gogoi *et al*., 2021) [9]. Manas National Park located at Chirang and Baksa District houses 45 species (Daimalu Baro *et al*.) [4]. The present work aims to document orchid species in Poba Reserve Forest (PRF) of Dhemaji district, Assam.

Study area
The Poba Reserve Forest is located in eastern part of Assam and foot hills of Himalaya and the altitude of the forest is in between 27°50'11"N and 95°17'45"E (Figure 1). Northern side of the forest is bounded by NH 15, Arunachal Pradesh and Daying Ering Wildlife Sanctuary. Dibru Saikhuwa National Park and Laly River in east, Laly River is in south and Leku, Leku Jelom, Bahir Sille etc. on western side of the forest. The total area of the forest is about 10,221 hectares and it belonging to Jonai sub-division of Dhemaji district in Assam. In the year of 1924(26th May) government of Assam affirmed this area as a reserve forest with the aim to conserve diverse flora and fauna. However, for complete study and documentation of orchids, present study divided into the following three sectors.
Sector 1: Leku area located in Northern side of the forest and are closer to the NH 15 and the area is fully covered with evergreen plants along with few of deciduous species. So the dense, evergreen, characteristics of this forest made the environment to fit for the origin of various orchid habitats. But identification, documentation of orchids from this area could be achieved in the month of March to April by blooming of amazing flowers (Figure 2 & 4).
Sector 2: The southern side of the forest is surrounded by Tinimali beat and the beauty of this region is because of almighty of Laly River (known as Brahmaputra in downstream).

Sector 3: The forest department of Assam established a camp office in Sirung to protect this forest area from the encroachment nearby villagers and other anthropogenic factors. Sirung area comprises grassland, wetland and woodland. The climatic conditions of this forest are more or less similar to the rain forest of Western India and it favours for rich biodiversity.

The PRF is a good habitat since it provides favourable environmental conditions for orchid growth (Table 1). Though, the numbers of orchid species of this region is gradually disappearing due to habitat destruction, soil erosion, over exploitation. The adverse affect of climate change has also encouraging the loss of orchid species from this region.

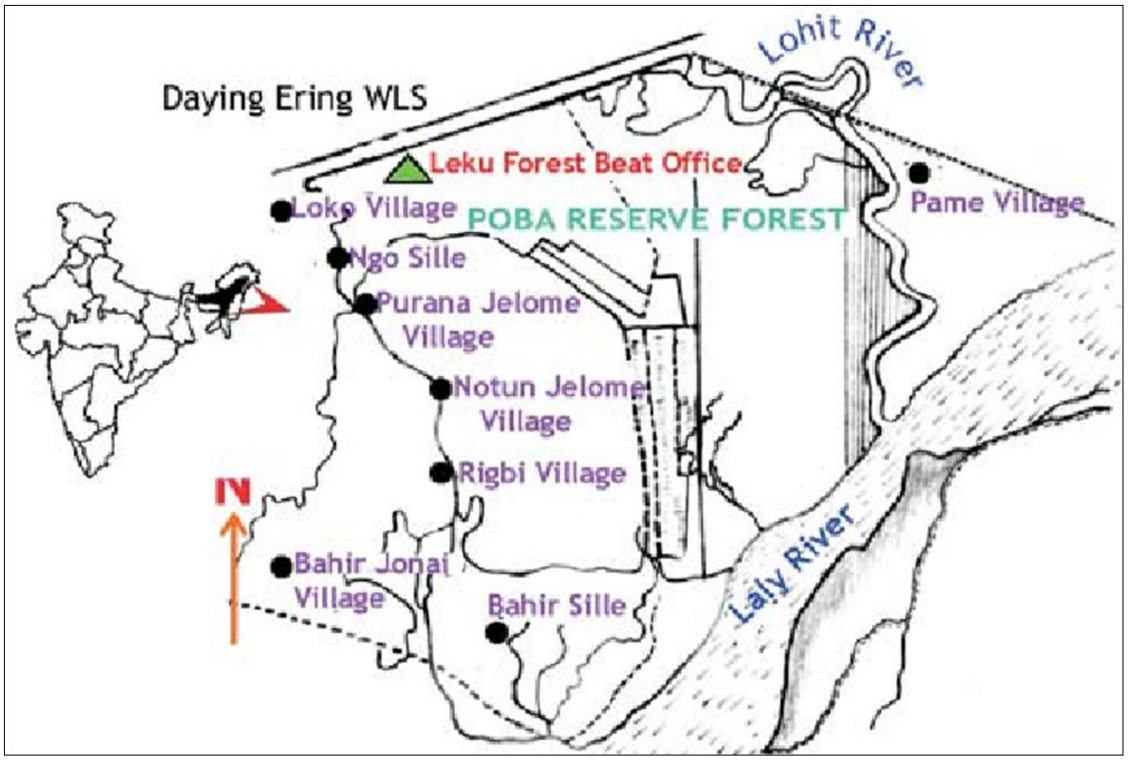

Fig 1: Map showing location of Poba Reserve Forest

Table 1: Physical parameters of Poba Reserve Forest in three sectors

Sl. No.	Parameters	Characteristics
1	Temperature	4° C-35°C
2	Humidity	38-72%
3	Rainfall	3,700mm - 3,900mm
4	Soil type	Sandy/Semi sandy/alluvial soil
5	Forest type	Semi evergreen
6	% of forest cover	65% dense forest, 20% grass land and 15% wetland

Fig 2: Photos: Summer views of PRF

Materials and Methods

Documentation of orchid from the PRF was carried out during the period of 2018 to 2022. During this study period, the orchids were brought to Silapathar Science College, Silapathar for identification and natural conservation. Identification was done as per the methodology of Jain & Rao (1977) [11] and the data found in the literature (Hooker, 1890; Deva & Nathani, 1968; Seidenfaden, 1973, Chowdhery, 1998) [10, 2, 15, 1]. The identified specimens of were preserved in Orchidorium of Silapathar Science College, Silapathar (27° 36' 14" N and 94° 43'41" E) (Fig-3).

Habitats, host trees, flowering time and locality of species and other important physical parameters of the forest have been recorded for future use.

Fig 3: Ariel view of Orchidarium, Silapathar Science College

Results

In this study, a total no of 33 species including 24 genera were identified and documented (Table 2). Of which 26 species were identified as epiphytes and 07 as terrestrial. Epiphytic species were mostly observed on the host trees such as *Lagerstroemia speciosa* (Linnaeus) Persoon, *Bombax ceiba* Linnaeus, *Bischofia javanica* Blume, *Premna bengalensis* C. B. Clarke, *Dillenia indica* Linnaeus , *Dipterocarpus retusus* Bl. , *Terminalia chebula* Retz. and *Vatica lanceifolia* (Roxburgh) Blume. However, maximum numbers of epiphytes were found on the host tree *Lagerstroemia speciosa.* Terrestrial orchids have been found in forest floors, grassland and in river bank of the forest. The numbers of orchid species availability in three sectors (Leku Beat, Tinimail beat and Sirung Forest camp) are 29, 19 and16 respectively.

Table 2: List of orchids enlisted in Poba Reserve Forest

Sl. No.	Names of orchid species	H	FT	O	Study sectors/localities
1	*Acampe carinata*(Griffith) Panigrahi	E	November-February	R	TB, LB
2	*Acampe praemorsa* var. *longepedunculata* (Trimen) Govaerts	E	May-August	R	TB, LB, SFC
3	*Acanthephippium sylhetense* Lindley	T	April-July	C	LB
4	*Aerides multiflora* Roxburgh	E	March-August	R	LB, SFC
5	*Aerides odorata* Loureiro	E	May-June	C	LB,TB
6	*Aerides rosea* Loddiges exLindley and Paxton	E	April-May	C	LB,TB
7	*Bulbophyllum careyanum*(Hooker f.) Sprengel	E	October-December	C	LB, TB,SFC
8	*Bulbophyllum roxburghii* (Lindley) Reichenbach f.	E	April-July	C	LB, TB
9	*Calanthe sylvatica* (Thouars) Lindley	T	August-September	C	LB
10	*Corymborkis veratrifolia* (Reinwardt) Blume	T	March-August	R	LB
11	*Cymbidium aloifolium* (Linnaeus) Swartz	E	April-May	C	LB,SFC
12	*Dendrobium aphyllum* (Roxburgh) C.E.C. Fisch	E	April-May	C	LB,TB, SFC
13	*Dendrobium aduncum* Lindl.	E	June	R	LB
14	*Dendrobium lituiflorum* Lindley	E	April-May	C	LB,TB, SFC
15	*Dendrobium moschatum*(Bunks) Swartz	E	April-June	C	LB,TB, SFC
16	*Dendrobium transparens* Wallichs exLindley	E	April-May	C	LB
17	*Dendrolirium ferrugineum* (Lindley) A.N.Rao	E	May-September	R	LB,TB
18	*Dendrolirium lasiopetalum* (Willdenow) S.C.Chen	E	March-April	C	LB,TB,SFC

	& J.J.Wood				
19	*Dieniao phrydis* (J. Koenig) Seidenfaden	E	May-June	C	LB
20	*Goodyera procera* (Ker Gawler) Hooker	T	April-June	C	LB,TB,SFC
21	*Liparis viridiflora* (Blume) Lindley	E	April-May	C	TB,SFC
22	*Luisia trichorrhiza*(Hooker) Blume	E	March-June	C	LB,TB,SFC
23	*Nervilia sp.*	E	February-March	R	LB
24	*Oberonia mucronata* (D. Don) Ormerod & Seidenfaden	E	September-October	C	LB,TB
25	*Papilionanthe teres* (Roxburgh) Schlechter	E	April-May	C	LB,TB,SFC
26	*Pelatantheria insectifera* Rchb,f.	E	November	R	LB
27	*Pholidota articulate* Lindley	E	July-October	C	LB,TB,SFC
28	*Pholidota imbricate* Hooker	E	June-August	C	LB
29	*Pinalia bractescens* (Lindley) Kuntze	E	April-May	R	LB
30	*Rhynchostylis retusa* (Linnaeus) Blume	E	May-June	C	LB,TB,SFC
31	*Spiranthes sinensis* (Persoon) Ames	T	January-February	C	SFC
32	*Sarcoglyphis arunachalensis* A.N. Rao	E	April - May	R	TB
33	*Zeuxine nervosa* (Wallice ex Lindley) Bentham ex Trimen	T	February-April	C	SFC,TB

*H-Habit (E- Epiphytic and T- Terrestrial), O- Occurrence (C- Common and R-Rare) and FT- Flowering Time. Study sectors (LB- Leku Beat, TB- Tinimail Beat & SFC- Sirung Forest camp)

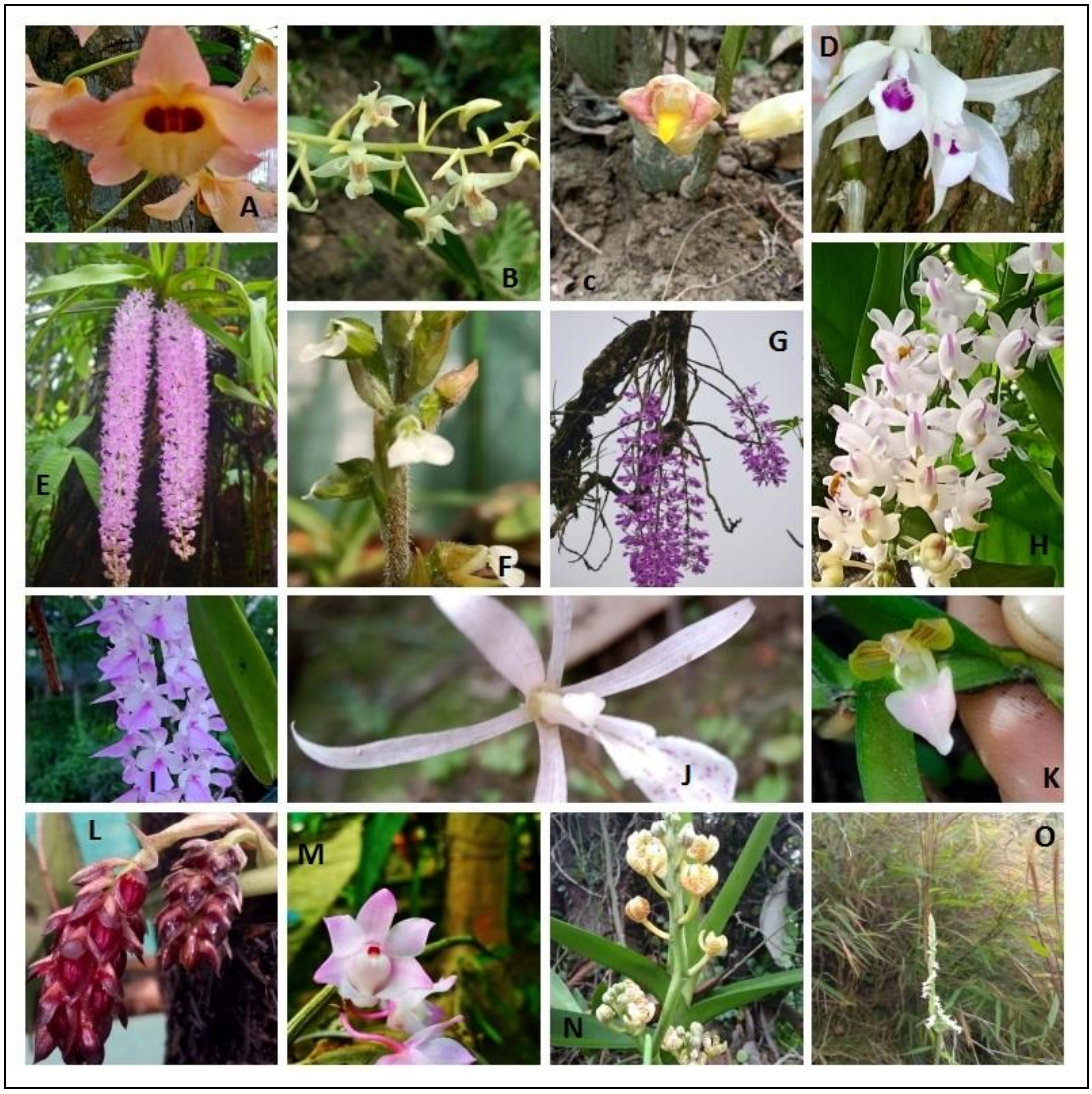

Fig 4: A- *Dendrobium moschatum*(Bunks) Swartz, B- *Pinalia bractescens* (Lindley) Kuntze, C- *Acanthephippium sylhetense* Lindley, D- *Dendrobium transparens* Wallichs exLindley, E- - *Rhynchostylis retusa* (Linnaeus) Blume, F- *Zeuxine nervosa* (Wallice ex Lindley) Bentham ex Trimen, G- *Dendrobium lituiflorum* Lindley, H- *Aerides odorata* Loureiro, I- *Aerides rosea* Loddiges ex Lindley and Paxton, J- *Nervilia sp*., K- *Pelatantheria insectifera* Rchb,f., L- *Bulbophyllum carneuan.* M- *Dendrobium aduncum* Lindl. N- *Acampe praemorsa* var. *longepedunculata* (Trimen) Govaerts, O- *Spiranthes sinensis* (Persoon) Ames.

Fig 5: Photos: Blooming *Dendrobium lituiflorum* Lindley in PRF (April, 2022)

Fig 6: *Dendrobium aphyllum* flowering on *Lagersotomia speciosa*

Fig 7: Four-layered vegetation in PFR.

Discussion

Orchids are cynosure of all eyes around the globe because of its fascinating and eccentric natures of their reproductive parts. Apparently, the elegance of orchids (flower) is double edged sword. It entices people to conserve them, but it also leads to the depletion of many species in India and other countries as some of the orchid lovers are involving in over exploitation of wild orchids in unscientific way in the name of conservation. Besides this, the native species face threats in the form of adverse climatic conditions and habitat destruction.

In India, north east regions such as Arunachal Pradesh, Sikkim, Assam favors the orchid growth due to its environmental suitability. The Dhemaji district of Assam is blessed with a total of 9 Reserve Forests but Poba Reserve Forest (PRF) is the only one thriving forest in this district whereas other eight forests are already degraded which were once good habitats of myriad of orchids. Hence, this paper is focusing on Poba Reserve Forest for orchid documentation. PRF is rich in flora and fauna and ideal habitat for various types of orchid. The work reveals highest numbers of species (29) in Leku beat and 19 and 16 species in Tinimail and Sirung areas respectively. Leku site is very close to the river with good numbers of host plants without disturbance may support the maximum orchids. Heavy soil erosion by Lali River, depletion of forest area and host trees is reducing the number of orchid species. However, Sirung sector comprises lesser number of orchids than other sector due to availability of more percentage of grassland and wetland as compared to woodland.

In this studied area, *Dendrobium luitifolium* , *Dendrobium aphyllum*, *Rhynchostylis retusa*, *Papilonthae tetres* are dominating orchid species on host tree *Lagersotomia speciosa* which are more conspicuous in flowering session(Fig 2 & 6). *Corymborkis veratrifolia* (Reinwardt) Blume is very rare where only one plant is noticed in core area of the forest.

Finally this study concludes that urgent conservation of natural forest by creating awareness to the public. It is also recommended for in-vitro conservation of rare orchids by adopting techniques of biotechnology.

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