

Present Status of Orchid Species Diversity Resources of Joypur Reserve Forest of Dibrugarh District (Assam) of North East India

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Abstract Present paper deals with the Orchid species diversity of Joypur reserve forest of Dibrugarh district of Assam of North East India. A total of 107 Orchid species with 47 genera have been recorded from the region. Of them, 82 are epiphytic, 23 are terrestrial and 2 species like *Didymoplexis pallens* and *Epipogium roseum* are saprophytic. This attempt is the first step to correct taxonomic identification to workout currently accepted botanical names, voucher specimen, habitat, phenology and locality of Orchid species occurring in the study regions.

Keywords Orchid Species Diversity, Joypur Reserve Forest, Dibrugarh District, Assam

1. Introduction

Orchids belong to the family Orchidaceae is considered to be the most highly evolved in the floral specialization and diversified form among the monocotyledons. In India, Orchids from 9% of our flora and are the largest and highly advanced botanical family of higher plants. It is estimated that at about 25,000-35,000 species with 800-1,000 genera are distributed throughout the world. About 1331 species with 140 genera of Orchid species are found in India with temperate Himalayas as their natural home[23].

Study area

Joypur is a Reserve forest endowed with rich Biodiversity especially in orchids besides other plant species, which is also a part of one of the biodiversity hot spot[11]. It is situated between 95°22' E. to 95°30' E. and 27°00' N. to 27°16' N. covering a geographical area of 10,876.68 hectares (Figure 1). It forms a part of the world heritage of tropical/sub-tropical wet evergreen forest, multistoried in structure and rich in biodiversity, more popularly known as 'Rain forest'. The forest is rich in biodiversity and one of the great reservoirs of Orchid germplasm due to its high rainfall, relative humidity etc. (Gogoi et al, 2009, 2010).

Present investigation reports the Orchid species diversity resources of Joypur Reserve Forest of Dibrugarh district of

Assam with voucher specimen, habitat, date of collection, phenology, local distribution with Joypur Reserve Forest and general distribution.

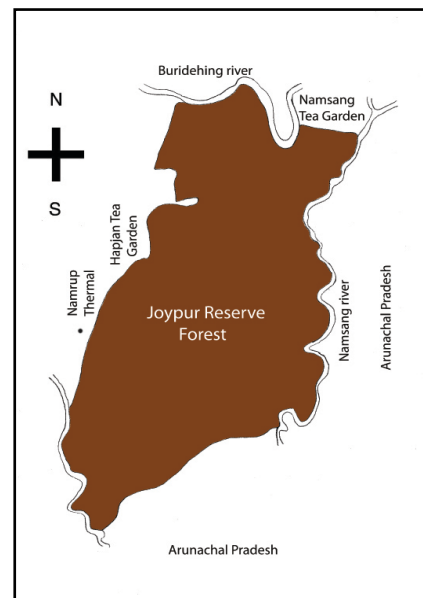


Figure 1. Location of study area (Joypur Reserve Forest of Dibrugarh district, Assam)

2. Materials and Methods

The intensive field survey works were carried out during 2009-2011 covering all the seasons of the year in all parts of Joypur reserve forest of Dibrugarh district of Assam.

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Collected specimens were made into standard mounted herbarium sheets following the procedure of Jain and Rao[15]. The authors have done photographs and sketches of all the available Orchid species of the region. The relevant data from the field notebooks were then transferred to the labels of the herbarium sheets and computer. Normally, 2–3 specimens of each species in flowering or fruiting stage were collected and life form photographs were prepared. The specimens were identified, authenticated and described with the help of The specimens were identified, described and nomenclature checked with the help of The genera and species of Orchidaceous plants[21]; *Folia Orchidacea*[20]; The orchids of the Sikkim Himalayas[16]; A Guide to the Orchid of Sikkim[4]; The Orchid Flora of North-West Himalaya[8]; Notes on *Cirrhopetalum*[30]; Indian Orchids Guide to Identification and Culture[27]; Indian Orchids Guide to Identification and Culture[28]; Orchids of Mussoorie[29]; Orchids of Arunachal Pradesh[13]; Flora of British India[14]; Orchids of Kumaun Himalaya[24]; A Catalogue of Indian Orchids[17]; Orchids of Nagaland[7]; Orchid Flora of Arunachal Pradesh[5]; 100 Sikkim Himalayan Orchids[26] etc. and by matching at the Herbarium of the Department of Botany, Guwahati University. Finally all the Voucher specimens are deposited in the Herbarium, Department of Botany, Guwahati University.

3. Enumeration

Acampe Lindley

About 10 species in India, China, S. E. Asia and tropical Africa; 6 species in India, 3 species in Assam, 2 in Joypur Reserve Forest.

Acampe papillosa (Lindl.) Lindl., *Fol. Orchid*, 2, 1853; Chowdhery, *Orch. Fl. Arunachal Prad.* 41, 1998.

Plant 8–23cm tall with many distichous leaves. Leaf 7–14.5×1.4–2.3cm, oblong. Inflorescence several, opposite to leaves or axillary, 1–4cm long. Flowers 1cm across, yellow, slightly fragrant; sepals and petals yellow with reddish brown transverse stripes; lip white, slightly spotted with purple-red.



Figure 2. *Acampe papillosa*

Habitat: Epiphyte on tree trunk. Voucher specimen: Gogoi *et al.* 0226. Flowering: November – December. Local distribution: Joypur R. F, Assam. General distribution: India, China, Nepal, Burma, Thailand, Vietnam, Bangladesh, Bhutan, Laos, Myanmar. (Figure 2)

Acampe rigida (Buch.-Ham. ex J.E. Smith) P.F. Hunt in *Kew Bull.* 24: 98. 1970; Chowdhery, *Orch. Fl. Arunachal Prad.* 41, 1998; Mishra, *Orch. India* 280. 2007.

Plants 61–86cm long. Stem 0.8–1cm thick, erect, unbranched or branched. Leaves 14–26×3.5–4.1cm, distichous, fleshy-coriaceous, conduplicate, curved, linear-oblong, apex unequally 2-lobed. Inflorescence axillary, subcapitate, paniculate, densely 7–11 flowered; peduncle 5–7cm long. Flowers yellow with purplish brown transverse stripes; lip white, with purplish brown longitudinal stripes above.

Habitat: Epiphyte on tree trunks or large branches. Voucher specimen: Gogoi *et al.* 0096. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: Southern and east Africa, Sri Lanka, India, Burma, China, Taiwan, Thailand, Cambodia, Vietnam, Peninsular Malaysia.

Acanthephippium Blume

About 15 species in tropical Asia, Malaysia and Fiji; 3 species in India, 2 in Assam and 1 species in Joypur Reserve Forest.

Acanthephippium sylhetense Lindl., *Gen. Sp. Orchid. Pl.* 177. 1833; Hook. f., *Fl. Brit. India* 5: 815. 1890; Chowdhery, *Orch. Fl. Arunachal Prad.* 43. 1998.

Plants to 50cm tall. Pseudobulb ovoid cylindrical, 7–15 × 1.5–4cm, 2–4-noded, 2–4 leaved. Leaves elliptic to oblong-elliptic, 30–40×8–11cm, apex acuminate. Inflorescence 15–20cm, fleshy, with several broadly ovate-lanceolate sheaths at base; rachis densely 3–5-flowered. Flowers white or yellow with purplish brown spots, 2.5–3cm across.

Habitat: Growing in shaded and humid places in dense forests, banks of streams. Voucher specimen: Gogoi *et al.* 0233. Flowering: June – July. Local distribution: Joypur R.F, Assam. General distribution: NE India, China, Indonesia, Malaysia, Nepal, Thailand, Vietnam. (Figure 3)

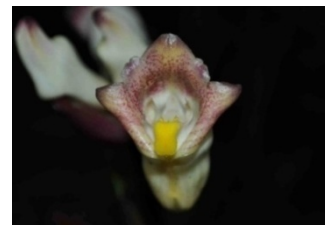


Figure 3. *Acanthephippium sylhetense*

Aerides Loureiro

About 20 species in the world, distributed from India to Vietnam, Malaysia and Japan, 10 species recorded in India, 5 species in North East India. (I. C. Barua:2001) and 2 species in Joypur Reserve Forest.

Aerides odorata Lour., *Fl. Cochinch.* 2: 525. 1790; Hook. f. *Fl. Brit. India*, 6:47, 1890; Chowdhery, *Orch. Fl. Arunachal Prad.* 49. 1998.

Plant 21–40cm long. Stem 9–18cm long, stout, pendent, branched, covered by persistent leaf sheaths. Leaves 10–19×2.8–4.2cm, oblong, round-lobed at apex, incurved, distichous, jointed, pale green. Inflorescences 1–3, pendent, racemose, densely many-flowered, 10–15cm long, stout, glabrous. Flowers white with purple blotches at the

extremities, 2.2–2.5 cm across, fragrant.

Habitat: Epiphyte in lowland forest. Voucher specimen: Gogoi et al. 0156. Flowering : May-June. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, Andaman Is., Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines. (Figure 4)



Figure 4. *Aerides odorata*

Aerides rosea Lodd. ex. Lindl. & Paxt. Fl. Gard. 2: 109. 1852; Chowdhery, Orch. Fl. Arunachal Prad. 49. 1998; Mishra, Orch. India. 280. 2007.

Plant 25–35cm. stem stout, covered with sheaths. Leaves 13–33×2.4–4cm, oblong, 2-lobed, deeply channeled above, keeled beneath, curved, jointed. Inflorescence arising from peduncle sheath, racemes or panicle, densely many-flowered, 20–40cm long, sheathed; sheaths 5–8mm long, tubular, broadly ovate; rachis 21–31cm long; floral bracts 3.5–5mm long. Flowers fragrant, purplish-pink suffused with white, dark pink spotted, opening widely, about 2 cm across.

Habitat: Epiphyte in mixed deciduous forest and humid evergreen forest. Voucher specimen: Gogoi et al. 0131. Flowering: May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, Burma, China (Yunnan), Thailand, Vietnam.

Agrostophyllum Blume

About 4 species in India, 1 in Assam and 1 in Joypur Reserve Forest.

Agrostophyllum planicaule (Wall. ex Lindl.) Reichb. f. in W.G. Walpers, Ann. Bot. Syst. 6: 909. 1864. *Agrostophyllum khasianum* Griffith in Calcutta Jour. Nat. Hist. 4: 378, t. 19. 1844; Hook. f., Fl. Brit. India 5: 824. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 53. 1998.

Plant 23–31cm tall. Stems 7–10cm long, fusiform, compressed, covered by overlapping sheaths. Leaves 7–14.5×1.6–2.2cm, 3 or 4, terminal, distichous, alternate, narrow to ovate-oblong, tapering to each end, shortly petiolate, erect. Inflorescence 2–2.3cm across, globose-capitate, densely many-flowered; peduncle short. Flowers white, 6–8 mm across.

Habitat: Epiphyte in mixed deciduous forest and humid evergreen forest. Voucher specimen: Gogoi et al. 0132. Flowering: August - October. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Myanmar, Thailand, Cambodia and Vietnam.

Anoectochilus Blume

About 40 species known from India, S.E. Asia to Australia; 16 species in India, 3 species in Assam, 2 in Joypur Reserve

Forest.

Anoectochilus brevilabris Lindl. Gen. Sp. Orchid. 499. 1840; Hook. f., Fl. Brit. India 5: 824. 1890. *Anoectochilus sikkimensis* King & Pantl., J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 65: 124 (1896).

Plant 13–24cm tall. Stem 3mm wide, decumbent, glabrous. Leaves 4–6, 3.4–6×2.3–4cm, clustered at base of stem, petiolate, elliptic-ovate, acute, purple-green with yellow reticulations. Inflorescence densely many flowered, 7–12cm long. Flowers up to 1.5–1.8cm across; sepals olive-green and white, lip white, mesochile teeth green.

Habitat: Terrestrial in dense humid evergreen forest. Voucher specimen: Gogoi et al. 0312. Flowering: April - June. Local distribution: Joypur R. F, Assam. General distribution: India (Assam), eastern Himalayas. (Figure 5)



Figure 5. *Anoectochilus brevilabris*

Anoectochilus roxburghii (Wall.) Lindl. in J.F. Royle, III. Bot. Himal. Mts.: 368. 1839.

Plants up to 27cm long. Leaves petiolate, 3–6×2–5cm wide, ovate to ovate-oblong, acute, in a basal rosette, velvety, purplish-red with golden reticulation. Inflorescence laxly many flowered, 13–17cm long, glandular-pubescent, with 3 to 5 oblong sheathing bracts. Flowers up to 2cm long, resupinate; sepals and petals pale pink-white, lip white.

Habitat: Terrestrial in dense humid evergreen forest. Voucher specimen: Gogoi et al. 0490. Flowering: July-August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Nepal, Bhutan, Burma, China, Thailand, Vietnam.

Bulbophyllum Du. Petit Thouars

About 1000 species in South East Asia, Africa, Australia and tropical America, about 100 species in India and 62 species are known from North Eastern region. Assam represents about 24 species among them 8 species grow in Joypur.

Bulbophyllum affine Lindl. Gen. Sp. Orchid. 48. 1830; Hook. f. Fl. Brit. India 5: 756. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 87. 1998.

Pseudobulbs 2.6–4×0.4–0.6cm, inserted at intervals of 3.7–7.5cm along rhizome, erect, cylindrical, rugose. Leaf 9–17×2.5–3.3cm, solitary, coriaceous, linear-oblong to narrowly oblong-elliptic, apex obtusely and inconspicuously 2-lobed. Inflorescence basal, very short. Flowers white with pink lined, about 3 cm long, solitary.

Habitat: Epiphyte in mixed deciduous forest and humid evergreen forest. Voucher specimen: Gogoi et al. 0098. Flowering: June- August. Local distribution: Joypur R. F,

Assam. General distribution: N.E. India, Bhutan, China, Thailand, Cambodia, Vietnam, Nepal. (Figure 6)

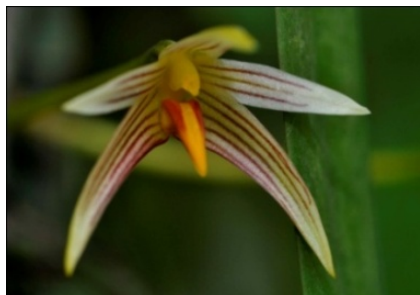


Figure 6. *Bulbophyllum affine*

Bulbophyllum andersonii (Hook. f.) J.J. Smith in Bull. Jard. Bot. Buitenz. Ser. 2, 8: 22. 1912; Seidenf., Nots. Cirrhoptalum Lindl. 67. 1987; Chowdhery, Orch. Fl. Arunachal Prad. 92. 1998.

Cirrhoptalum andersonii Hook. f., Fl. Brit. India 5: 777. 1890.

Pseudobulbs 2–3.4×0.4–0.6cm, ellipsoid to ovoid, smooth, fibrous at base. Leaf solitary, 8–14×2–3.6cm, oblong to linear-oblong, apex subacute to emarginated, narrowed at base; petiole 2cm long, channeled. Inflorescence basal from pseudobulb base, erect, umbellate, 4 to 9-flowered. Flowers 1.5 cm long, sepals and petals whitish, densely spotted with purplish red; lip purple.

Habitat: Epiphyte in mixed deciduous forest and humid evergreen forest. Voucher specimen: Gogoi *et al.* 0112. Flowering: October. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Myanmar, Vietnam.

Bulbophyllum careyanum (Hook. f.) Spreng., Syst. Veg. 3: 732. 1826; Hook. f., Fl. Brit. India 5: 760. 1890; Barua, Orch. Fl. Kamrup dist. 144. 2001.

Pseudobulbs 3–6×2.8–3.4cm, globose-ovoid to narrowly ovoid, lightly grooved, inserted at intervals of 3.3–8.9cm along rhizome. Leaf 11–23×3.6–4.9cm solitary, erect to suberect, oblong to linear-oblong, obtuse, sessile to shortly petiolate. Inflorescence lateral from pseudobulb base, decurved, racemose, cylindrical, densely many-flowered; peduncle 5–8cm long, stout, sheathed. Flowers purplish-brown, 0.5–0.8cm long.

Habitat: Epiphyte on tree trunks in dense humid evergreen forest. Voucher specimen: Borah *et al.* 0176. Flowering: October–December. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Nepal, Bhutan, Burma, Thailand, Vietnam.

Bulbophyllum delitescens Hance in Jour. Bot. 14: 44. 1867; Seidenf. Not. Cirrhoptalum Lindl. 215. 1987; Chowdhery, Orch. Fl. Arunachal Prad. 101. 1998.

Pseudobulb 1.5–3cm long, 3–11cm apart on rhizome, ovate or ovoid-conical, covered, with long persistent sheaths. Leaves 15–25×3–5 cm, oblong-obovate, leathery, obtuse at apex, petiolate, scapes from base of pseudobulb, erect, 10–22cm long, with 3 tubular sterile bracts at long intervals. Inflorescence 3–8 flowered, sub-umbellate. Flowers reddish-brown.

Habitat: Epiphyte in dense humid evergreen forest near a

waterfall. Voucher specimen: Gogoi *et al.* 0301. Flowering: June–July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Vietnam.

Bulbophyllum ebullum King & Pantl. in Jour. Asiat. Soc. Bengal 64: 334. 1895 *et in* Ann. Roy. Bot. Gard. Calcutta 8: 83, t. 115. 1898; Chowdhery, Orch. Fl. Arunachal Prad. 104. 1998; Pradhan, Indian Orchid- II: 428. 1979.

Pseudobulb absent; rhizome slender to stout, 4–5mm thick; roots arising from nodes. Leaf 14–22×2.8–4cm, solitary, oblong-lanceolate, obtuse to subacute, inserted at intervals of 4–6cm along rhizome; petiole 4.5–5.7cm long, channeled. Inflorescence basal, close to leaf, racemose, arcuate, laxly many-flowered, 3.5–4.5cm long, sheathed at base. Flowers pale-green, about 0.8 cm long.

Habitat: Epiphyte on tree trunks in dense humid evergreen forest. Voucher specimen: Gogoi *et al.* 0492. Flowering: May–June. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Thailand, Vietnam, Malaysia, Vietnam, Java, Sumatra, Borneo, Philippines.

Bulbophyllum odoratissimum (J.E. Smith) Lindl. Gen. Sp. Orchid. 55. 1830; Hook. f., Fl. Brit. India 5: 758. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 123. 1998.

Pseudobulbs 1.8–2.4×0.6–0.8cm, erect, cylindrical, smooth to ridged, inserted at intervals of 2.3–4.7cm along rhizome. Leaf 3.4–5×1.4–1.6cm, solitary, oblong-elliptic to oblong-lanceolate, apex emarginated, subsessile to shortly petiole; petiole 1–3mm long. Inflorescence 1, basal from pseudobulb, compact umbel, densely 7–14 flowered, 3.5–8cm long, sheathed. Flower 5–7mm long, white, fragrant.

Habitat: Epiphyte in dense humid evergreen forest near a waterfall. Voucher specimen: Gogoi *et al.* 0256. Flowering: May–September. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Nepal, Burma, China, Thailand, Vietnam.

Bulbophyllum protractum Hook. f. Fl. Brit. India, 5: 758. 1890; Pradhan, Indian Orchid- II: 409. 1979.

Pseudobulbs 1.5–2cm long, about 3cm apart on branched, obliquely narrowly cylindrical. Leaves 4–5×0.2–1.2cm, oblong, acute sessile; scape filiform, 2–3 flowered, slightly longer than pseudobulb, and arising from base of pseudobulb or from any point on the rhizome. Flowers 0.6cm long, pale yellow.

Habitat: Growing epiphyte in evergreen forest. Voucher specimen: Gogoi *et al.* 0491. Flowering: June–July. Local distribution: Joypur R. F, Assam. General distribution: India and Burma.

Bulbophyllum roxburghii (Lindley) Reichenbach *f.* in W.G. Walpers, Ann. Bot. Syst. 6: 263. 1861; *Cirrhoptalum roxburghii* Lindley, Gen. Sp. Orchid. Pl.: 58. 1830; *Bulbophyllum sikkimense* (King & Pantling) J.J. Smith, Bull. Jard. Bot. Buitenzorg, II, 8: 28. 1912.

Epiphyte. Pseudobulb, ovoid globose, 1–1.5 cm long. Leaves fleshy, oblanceolate, 7–8.8×1–2cm. Inflorescence 6–8cm long umbellate, arising from base of pseudobulb; flowers small, dirty brown or pale rosy, spotted with purple.

Habitat: Growing epiphyte in evergreen forest. Voucher specimen: Gogoi *et al.* 0721. Flowering: April–July. Local

distribution: Joypur R. F, Assam. General distribution: India (Assam) and Eastern Himalaya.

Bulbophyllum spathulatum (Rolfe ex. E. Cooper) Seidenf. In Bot. Tidsskr. 65: 347. 1970; Chowdhery, Orch. Fl. Arunachal Prad. 146. 1998.

Pseudobulbs 2–3×0.6–0.8cm, cylindrical-ovoid, narrow, suberect to oblique. Leaf 4.5–7.5×1.5–2cm, solitary, coriaceous, oblong-elliptic, obtuse to subacute. Inflorescence basal from pseudobulb, subumbellat, 5 to 9-flowered, 2–3cm long, sheathed. Flowers rose red, deeply spotted, 1.6 cm long.

Habitat: Epiphytic in riverine forest and in secondary evergreen forest. Voucher specimen: Gogoi et al, 0276. Flowering: April. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, Thailand, Vietnam.

Calanthe R. Brown

About 150 species throughout the tropics and sub tropical Asia; 23 species in India, 9 in Assam, 2 species in Joypur Reserve Forest.

Calanthe lyroglossa Rehb. f., Otia Bot. Hamburg. 1: 53. 1878; Seidenfaden, Opera Botanica 114: 99. 1992; Mishra, Orch. India 285. 2007.

Plant 30–50cm tall; rhizome short, stout. Pseudobulbs 2–3 cm long, clavate-cylindric. Leaves 3–5, 30–60×3–8.5cm, basal; blade oblanceolate, plicate, glabrous, apex acuminate. Inflorescence arising from base of pseudobulb, erect, 30–50cm, stout, lower part with 3 or 4 tubular sheaths. Flowers small, yellow, turning black when dried; ovary and pedicel 10mm long, glabrous.

Habitat: Terrestrial in damp places on riversides. Voucher specimen: Gogoi et al, 0486. Flowering: November–February. Local distribution: Joypur R. F, Assam. General distribution: India, China, Burma, Taiwan, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Philippines.

Calanthe sylvatica (Thou.) Lindl., Gen. Sp. Orchid. Pl.: 250. 1833. *Calanthe masuca* (D. Don) Lindl., Gen. Sp. Orchid. 249. 1830; Hook. f., Fl. Brit. India 5: 850. 1890.

Plant 25–57cm tall. Pseudobulbs 2–4cm, narrowly conical-cylindric, 4 or 5 noded. Leaves 4–6, 15–37×4–11cm, large, broadly elliptic, acute to acuminate, petiolate. Inflorescence terminal, laxly few to many-flowered, 21–35cm long, pubescent, sheathed. Flowers 2.5–4.2cm across, pale pinkish purple with purple lip sometimes flushed with orange.

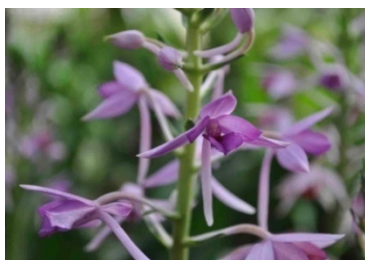


Figure 7. *Calanthe sylvatica*

Habitat: Terrestrial in damp places on riversides. Voucher specimen: Borah et al, 0161. Flowering: August – September. Local distribution: Joypur R. F, Assam. General distribution: India, China, Bhutan, Indonesia, Japan, Malaysia, Myanmar,

Nepal, Sri Lanka, Thailand, Vietnam, Africa, Madagascar. (Figure 7)

Ceratostylis Blume

About 60 species in India, S.E. Asia, Philippines and Pacific Islands. 1 species in India, Assam and Joypur Reserve Forest.

Ceratostylis sabulata Bl., Bijdr. 7: 206. 1825; Chowdhery, Orch. Fl. Arunachal Prad. 167. 1998; Mishra, Orch. India 286. 2007.

Plant 13–24cm tall, closely tufted, rush-like, sheathed at base, dark green. Leaf solitary, linear, subterete, grooved on one side, arising from stem apex, overtopping. Inflorescence, 1.5–2.7×0.2–0.4cm, terminal, capitate, sessile, dense, 0.3–0.5cm long. Flowers not opening widely, sparsely pubescent, sepals and petals yellow or dull red-purple, lip yellow.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0154. Flowering: May – August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, China, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, New Guinea, Philippines. (Figure 8)

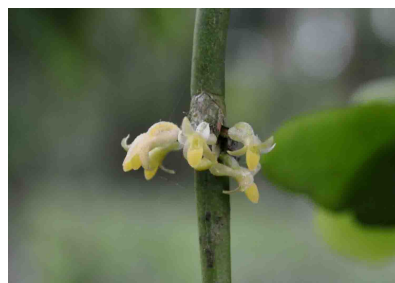


Figure 8. *Ceratostylis sabulata*

Chrysoglossum Blume

About 6 species in India, 3 in Assam, 2 species in Joypur Reserve Forest.

Chrysoglossum ornatum Bl., Bjd. 338. 1825. *Chrysoglossum erraticum* Hook. f. Fl. Brit. India 5: 784, 1890; Chowdhery, Orch. Fl. Arunachal Prad. 197. 1998.

Plant 26–41cm tall. Pseudobulbs 3–5.4×2–3cm, ovoid to tapering, terete. Leaf solitary, 15–30×5–8cm, lanceolate, acuminate. Inflorescence 10–15-flowered, 13–22cm long, sheathed. Flowers 1.8–2cm long; sepals and petals green to yellow, lip white or yellowish with yellow.

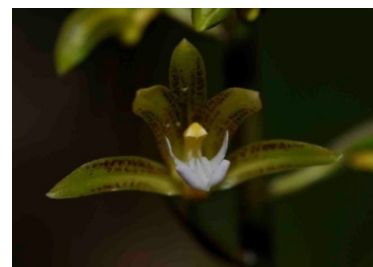


Figure 9. *Chrysoglossum ornatum*

Habitat: Shaded and humid places in forests. Voucher specimen: Borah et al, 0252. Flowering: August – October. Local distribution: Joypur R. F, Assam. General distribution:

N.E. India, China, Taiwan, Bhutan, Cambodia, Indonesia, Malaysia, Nepal, Philippines, Sri Lanka, Thailand, Vietnam. (Figure 9)

Chrysoglossum robinsonii Ridley in Jour. Fed. Mal. St. Mus. 5: 157. 1915; Chowdhery, Orch. Fl. Arunachal Prad. 197. 1998; Mishra, Orch. India 287. 2007.

Plant rhizomatous; pseudobulbs 4×0.2–0.4cm, cylindrical, usually petiolate base slightly dilated; Leaf 7–15×4–7cm, papery, base subrounded, acute. Inflorescence 14–18cm long, glabrous, with 2–4 membranous tubular sheaths, laxly 4–7-flowered. Flowers medium-sized, sepals and petals green, lip white, column yellow.

Habitat: Shaded and humid places in dense forests. Voucher specimen: Gogoi et al, 0237. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: India, China, Taiwan, Thailand, Vietnam.

Cleisocentron Bruhl

1 species in India, Assam and Joypur Reserve Forest.

Cleisocentron pallens (Cath. ex Lindl.) N. Pearce & P.J.Cribb, Edinburgh J. Bot. 58: 118. 2001. *Cleisocentron trichromum* (Reichb. f.) Bruhl, Guid. Orch. Sikkim 137. 1926; Chowdhery, Orch. Fl. Arunachal Prad. 199. 1998.

Plant 34–96cm long. Stem branched, covered with fibrous leaf sheaths. Leaves many, 9–17×1.4–2cm, narrowly oblong, tapering slightly, apex obliquely bifid, sessile. Inflorescence divergent, second, few-flowered, 3.7–6.9cm long, sheathed at base. Flowers 2.4–2.8cm across; sepals and petals pale straw-coloured, lined with pale pink, spur pink, column white.

Habitat: Epiphytic on tree trunks evergreen forests. Voucher specimen: Borah et al, 0230. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: India (Assam, Arunachal Pradesh), Eastern Himalayas and Sikkim. (Figure 10)

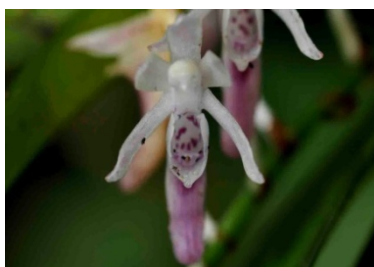


Figure 10. *Cleisocentron pallens*

***Cleisostoma* Blume**

About 100 species distributed in India, South East Asia, Indonesia, New Guinea, Philippines and Pacific Island to Australia. About 19 species in India among them 7 species grow in Joypur.

Cleisostoma appendiculatum (Lindl.) Benth. & Hook. f. ex Jackson in Index Kew. 1: 555. 1895; Chowdhery, Orch. Fl. Arunachal Prad. 200. 1998; Barua, Orch. Fl. Kamrup dist. 104. 2001.

Epiphyte; stem slender, erect, simple or branched, 20–40cm long, covered with leaf sheaths, rooting throughout the stem. Leaves fleshy, slightly curved, 7–10cm long,

spirally arranged, ascendant. Inflorescence few flowered, longer than leaves. Flowers 1.5 cm across, sepals and petals buff with purple longitudinal lines.

Habitat: Epiphytic on tree trunks in evergreen forests. Voucher specimen: Borah et al, 0230. Flowering: August–October. Local distribution: Joypur R. F, Assam. General distribution: India, Myanmar. (Figure 11)

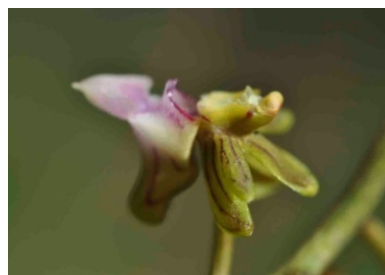


Figure 11. *Cleisostoma appendiculatum*

Cleisostoma filiforme (Lindl.) Garay in Bot. Mus. Leaf. Harvard Univ. 23(4): 171. 1972; Chowdhery, Orch. Fl. Arunachal Prad. 204. 1998; Pradhan, Indian Orchid-II: 509. 1979.

Plants epiphyte, pedulous, 40–100cm long. Stem 2–3.5m m wide, covered by leaf sheaths. Leaves 15–26×0.2–0.3cm, terete, rugose, apex subacute, sessile. Inflorescence lateral, axillary, leaf-opposed, racemose, laxly 9 to 22-flowered, 9–11cm long, glabrous, sheathed. Flowers about 1.3 cm across; sepals and petals yellowish green, with purplish brown stripes; lip white with purple-red midlobe, column yellow.

Habitat: Epiphytic on tree trunks in evergreen forests. Voucher specimen: Gogoi et al, 0494. Flowering: April–June. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Myanmar, Nepal, Thailand, Vietnam.

Cleisostoma linearilobatum (Seidenf. & Smitinand) Garay, Bot. Reg. 31, mise. 59. 1845; Hook. f., Fl. Brit. India, 6: 75. 1890; Mishra, Orch. India, 288, 2007.

Plant 13–20cm tall. Stem covered by leaf sheaths. Leaves 6–11.5×1.5–2cm, distichously, apex unequally 2-lobed, lobules rounded. Inflorescence 7–15cm long, lateral, paniculate, laxly many-flowered. Flowers 3.8–5.5mm across; Dorsal sepals and petals reddish-brown with intra-marginal bands of yellow, lip white with pink.

Habitat: Epiphytic on tree trunks in evergreen forests. Voucher specimen: Gogoi et al, 0493. Flowering: May–July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan.

Cleisostoma paniculatum (Ker.-Gawl.) Garay in Bot. Mus. Leaf. Harvard Univ. 23(4): 173. 1972; Chowdhery, Orch. Fl. Arunachal Prad. 204. 1998; Mishra, Orch. India 288. 2007.

Plant erect, compressed terete, elongate, 30–60cm long, sometimes branching, many leaved. Leaves 10–25×0.8–2cm, distichous, flat, narrowly oblong or linear, leathery, unequally bilobed. Inflorescence axillary, much longer than leaves, many branched, many flowered. Flowers opening

widely. Sepals and petals yellowish green abaxially, purplish brown adaxially, margins and midvein yellow. Lip yellow.

Habitat: Epiphytic on tree trunks in evergreen forests. Voucher specimen: Gogoi et al, 0707. Flowering: September-February. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China (Yunnan), Thailand, Vietnam.

Cleisostoma racemiferum (Lindl.) Garay in Bot. Mus. Leaf. Harvard Univ. 23(4): 173. 1972; Chowdhery, Orch. Fl. Arunachal Prad. 204. 1998; Pradhan, Indian Orchid-II: 515. 1979.

Plant 18–27cm tall. Stem covered by leaf sheaths, 0.8–1.2cm wide. Leaves 5–9, 15–30×2.5–3.4cm, oblong, spreading, coriaceous, keeled beneath, apex unequally 2-lobed, lobules broadly rounded, sessile, jointed. Inflorescence lateral, 14–18cm, leaf-opposite, paniculate, laxly many-flowered. Flowers 0.7–0.8cm across; sepals and petals brownish-black, edged with yellow, lip yellowish, column white.

Habitat: Epiphytic on tree trunks in evergreen forests. Voucher specimen: Gogoi et al, 0710. Flowering: July-September. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China (Yunnan), Thailand, Vietnam. Present ecological status: Endangered.

Cleisostoma simondii (Gagnep.) Scidenf. In Dansk Bot. Arkiv 29(3): 66. 1975; Chowdhery, Orch. Fl. Arunachal Prad. 208. 1998; Pradhan, Indian Orchid-II: 510. 1979.

Plant 20–38cm tall. Stem erect, covered by leaf sheaths, 3–4mm thick; sheaths overlapping. Leaves 5–8×0.1–0.2cm, terete, fleshy, linear, apex subacute to obtuse, sessile, jointed. Inflorescence extra-axillary, pendent, long, simple or paniculate, laxly many flowered; 6–15cm long, sheathed. Flowers 6.5–9mm across; sepals and petals yellow to buff-coloured with many longitudinal purple to brown-purple markings, lip mid-lobe mauve to pink.

Habitat: Epiphyte on thick-barked tree trunks in evergreen and deciduous forest. Voucher specimen: Gogoi et al, 0221. Flowering: August- October. Local distribution: Joypur R. F, Assam. General distribution: India (N.E.), China, Thailand, Vietnam.

Cleisostoma subulatum Bl., Bijdr. 363. 1825; Chowdhery, Orch. Fl. Arunachal Prad. 208. 1998; Pradhan, Indian Orchid-II: 514. 1979.

Plant pendulous. Stem 10–30cm long, slender. Leaves 8.5–16×0.8–1.1cm, distichous, fleshy, linear-oblong to oblong-lanceolate, acuminate, sheathed. Inflorescence lateral, leaf-opposed, pendent, racemose, laxly 7–18 flowered, 3–8cm long. Flowers 5–7mm across, scentless; sepals and petals pale yellow with intra-marginal bands of golden to red-brown, lip white with purple-pink apical lobe.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0097. Flowering: May-June. Local distribution: Joypur R. F, Assam. General distribution: Himalayas, India, Bangladesh, China, Taiwan, Yunnan, Cambodia, Philippines, Malaysia, Myanmar, Thailand, Vietnam, Java and Sumatra.

Coelogyne Lindley

43 species in India, 15 in Assam and 2 in Joypur.

Coelogyne fimbriata Lindl., Edwards's Bot. Reg. 11: t. 868. 1825; Hook. f., Fl. Brit. India 5: 836. 1890.

Plant 11–26cm tall; rhizome creeping, sheathed. Pseudobulbs 2.8–7×0.8–1.2cm, ovoid to ellipsoid, 3–4cm apart on rhizome. Leaves 2, 7.3–15×1.5–2.5cm, oblong-elliptic, acute. Inflorescence hysteroanthous, 1 to few-flowered, 3–8cm long, zigzag. Flowers 3–4 cm across, pale-yellow; sepals and petals yellowish. Lip yellowish, fimbriate at margins, keels 3 brownish; lip and column base brownish.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0709. Flowering: October- December. Local distribution: Joypur R. F, Assam. General distribution: NE India, Bhutan, Cambodia, Indonesia, Laos, NE Malaysia, Myanmar, Nepal, Thailand, Vietnam. (Figure 12)

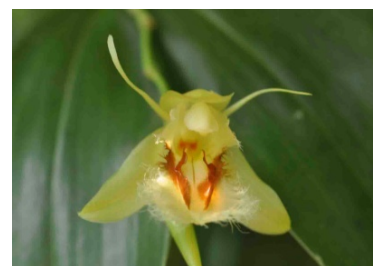


Figure 12. *Coelogyne fimbriata*

Coelogyne ovalis Lindl., Bot. Reg. 24: 91. Misc. 191. 1838; Hook. f. Fl. Brit. India 5: 836. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 234. 1998.

Plants 14–21cm tall, rhizome creeping, branching, sheathed. Pseudobulbs 4.8–8.3×1.5–1.9cm, ovoid-fusiform to fusiform, smooth, 4–6cm apart on rhizome, becoming ridged with age, sheathed at base. Leaves 2, 9–14×2.9–3.6cm, narrowly elliptic, acute to acuminate, petiolate. Inflorescence, 1 to few-flowered, 3–5cm long. Flowers 4.6–5.5cm across, pale yellowish, lip marked brown, keels darker brown, column yellowish-green.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0485. Flowering: August- December. Local distribution: Joypur R. F, Assam. **General distribution:** Epiphyte on tree trunk in dense humid evergreen forest.

Corymborkis Du. Petit Thouars

About 5 species in the world, 1 species in India, Assam and Joypur Reserve Forest.

Corymborkis veratrifolia (Reinw.) Bl., Coll. Orchid. Arch. Ind. 125, tt. 42 e & 43. 1859; Pradhan, Indian Orchid-I: 100. 1979; Chowdhery, Orch. Fl. Arunachal Prad. 246. 1998.

Plant 75–90cm tall. Stem terete, woody, leafy. Leaves 16–43×4–13cm, plicate, elliptic to oblong-elliptic, acute to acuminate, sheathing at base. Inflorescence branched, erect or spreading, pendent, many-flowered. 9–13cm long. Flowers fragrant, spreading, tubular, white, not widely spreading, 3.2–3.8 cm long.

Habitat: Terrestrial at shade and in dense humid evergreen forest with undergrowth of tall herbs. Voucher specimen: Gogoi et al, 0076. Flowering: March – May. Local

distribution: Joypur R. F, Assam. General distribution: India, Thailand, Vietnam, tropical east Asia, Australia, Malaysia, Singapore, Sumatra, Java, Borneo, Moluccas, New Guinea, Philippines. (Figure 13)



Figure 13. *Corymborkis veratrifolia*

Cymbidium Swartz

About 50 species distributed in S.E. Asia, China, Japan, Indonesia, India and Australia; 30 species in India, 12 in Assam and 3 species in Joypur Reserve Forest.

Cymbidium aloifolium (Lindl.) Sw. in Nova Acta Upsal. 2, 6: 73. 1799; Hook. f., Fl. Brit. India 6: 10. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 253. 1998.

Plant 40–65cm tall. Pseudobulbs 6–8×3–4cm, inflated, ovoid, bilaterally flattened, enclosed in persistent leaf bases and sheaths. Leaves 4–5, 34–65×2.7–3.8cm, oblong, obtuse to emarginated, unequally bylobed at apex, coriaceous, arching. Inflorescence many flowered, pendulous, 50–70cm long. Flowers 4–5cm across, slightly fragrant; sepals and petals pale yellow to cream-yellow, with a broad central maroon-brown stripe; lip cream-colored.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Borah et al, 0079. Flowering: April – May; Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, Nepal, Bangladesh, China, Burma, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Java. (Figure 14)

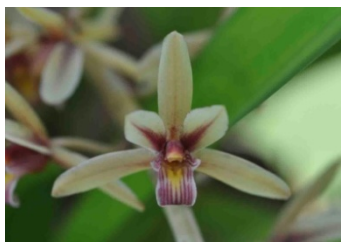


Figure 14. *Cymbidium aloifolium*

Cymbidium bicolor Lindl., Gen. Sp. Orchid. 164. 1833; Hook. f., Fl. Brit. India 6: 10. 1890.

Plant 24–58cm tall. Pseudobulbs narrowly ovoid, enclosed in persistent leaf bases; bladeless sheaths 4 or 5. Leaves 5–6, 34–75×2.5–3.4cm, narrowly oblong, obtuse, stiff, arching; leaf base 3–12cm long. Inflorescence pendulous, 11 to 20-flowered, 20–30cm long. Flowers 3–4 cm across; sepals and petals yellow with a central purplish red longitudinal stripe; lip cream-yellow.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0135. Flowering: May – June. Local distribution: Joypur R. F, Assam. General distribution: Thailand, Cambodia, Vietnam, Nepal, Bhutan,

N.E. India, Burma, China.

Cymbidium dayanum Reichb. f. in Gard. Chron. 710. 1869; Chowdhery, Orch. Fl. Arunachal Prad., 256, 1998; Mishra, Orch. India, 290, 2007.

Plant 27–83cm tall. Pseudobulbs 3.7–4.5cm long, fusiform, covered by scarious remains of leaf bases and bladeless sheaths. Leaves 5–8, 30–75×1–1.5cm, distichous, linear-elliptic, acute to acuminate, erect to arching, coriaceous. Inflorescence, pendulous, 8 to 13-flowered, 10–15cm long. Flowers 4–5 cm across; sepals and petals white, with a central maroon stripe; lip maroon, tinged white at its base.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi, 0116. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, China, Taiwan, Japan, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Borneo, Philippines.

Dendrobium Swartz

More than 1000 species and is widely distributed in Sri Lanka, India, China, Japan, Malaysia, Australia and Newzealand. In India it represents 102 species and nearly 20 species grow in Assam among them 13 species are grow in Joypur.

Dendrobium acinaciforme Roxb., Fl. Ind. 3: 487. 1832; Barua, Orch. Fl. Kamrup dist. 151. 2001; Chowdhery, Orch. Fl. Arunachal Prad. 283. 1998.

Plant 10–30cm long, compressed. Leaves 3.5–5×0.6–0.8 cm, lanceolate, distichous, fleshy, enciform, acute, sessile, laterally compressed. Inflorescence racemose. Flowers solitary from axils of bracts, yellowish-white, small, about 8mm across.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0117. Flowering: June - August. Local distribution: Joypur R. F, Assam. General distribution: India, China, Thailand, Cambodia, Vietnam and Malaysia.

Dendrobium aduncum Wall. In Bot. Reg. 1842, misc. 62, t. 15. 1846; Hook. f., Fl. Brit. India 5: 730. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 283. 1998.

Plants pendulous, 30–60cm long. Stems, branching, narrow, grooved; internodes sheathed, 1.8–4cm long. Leaves 5.5–8.9×0.8–1.6cm, oblong-lanceolate, acute to acuminate, minutely to obliquely emarginated, sessile. Inflorescence lateral, from leafless stem, 4–6 flowered, 3–8cm long, zigzag. Flowers 1.2–2 cm across, pale purple; sepals and petals pale pink; lip white; column white.

Habitat: Epiphyte on a small tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0078. Flowering: May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, Burma, China, Thailand, Vietnam.

Dendrobium aphyllum (Roxb.) Fischer in Gamble, Fl. Pres. Madras 1416. 1928; Hook. f., Fl. Brit. India 5: 738. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 287. 1998.

Plans with pseudobulbs, 60–120cm long, with a sub-orbicular bulbus base and tuft of basal roots, pendulous,

leafless when flowering; inter nodes 3cm, striate, sheathed. Leaves deciduous, sessile, sheathing. Flowers, pale rose, 4.5–5 cm across; lip yellow.

Habitat: Epiphyte in mixed deciduous forest or open forest. Voucher specimen: Gogoi et al, 0077. Flowering: April - May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia.

Dendrobium cathcartii Hook. f., Fl. Brit. India 5: 727. 1890, Chowdhery Orch. Fl. Arunachal Prad. 290. 1998.

Plant 40–66cm tall. Stems erect, 0.4–0.5cm thick, terete, uniform in size, many-leaved; internodes yellowish, sheathed, 2–2.4cm long. Leaves 8–12×0.9–1.3cm, linear-lanceolate, obliquely notched, sessile, distichous, jointed. Inflorescence fasciculate, lateral, arising from nodes, 2-flowered. Flowers greenish-yellow, 2cm. across, fragrant; lip yellow with purple.

Habitat: Epiphyte on tree trunk in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0148. Flowering: April - May. Local distribution: Joypur R. F, Assam. General distribution: India, Eastern Himalayas and Laos. Present ecological status: Endangered.

Dendrobium cumulatum Lindl. in Gard. Chron. 756. 1855; Hook. f., Fl. Brit. India 5: 731. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 295. 1998.

Plant 28–54cm tall. Stems erect, thickened upwards, internodes covered by leaf sheaths; internodes 2.5–3.6cm long. Leaves 5–10×1.5–3cm, oblong-lanceolate to elliptic, acute, distichous, sessile, sheathed. Inflorescence corymbiform, borne on a leafless stem, 5 to 10 flowered, 2–4cm long, glabrous, zigzag. Flowers white with purple; lip white suffused with yellow.

Habitat: Epiphyte on tree trunk in forest along a small stream. Voucher specimen: Gogoi, 0265. Flowering: March - May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, Thailand, Cambodia, Vietnam, Borneo.

Dendrobium fimbriaum Hook., Exot. Fl. t. 71. 1823; Hook. f., Fl. Brit. India 5: 745. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 301. 1998.

Plant 71–115cm long. Stems erect or pendulous, tapering at end, yellowing, jointed, swollen at base, many-leaved; internodes 1.8–3×0.7–2cm, sheathed. Leaves 9–14×1.5–2.7 cm, oblong-lanceolate to narrowly elliptic-lanceolate, acute to acuminate, many-veined, deciduous, sessile, jointed with internode sheath. Inflorescences lateral, arising from nodes, pendulous, 5–15-flowered, 5–15cm long, glabrous. Flowers 4–5 cm across, sepals and petals golden yellow; lip golden yellow, with or without maroon blotch.

Habitat: Epiphyte in mixed deciduous forest, also in humid evergreen forest. Voucher specimen: Gogoi et al, 0101. Flowering: March - May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China, Thailand, Vietnam.

Dendrobium lituiflorum Lindl. in Gard. Chron. 372. 1856; Hook. f., Fl. Brit. India 5: 740. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 308. 1998.

Plant pendulous, cylindrical, up to 60–80cm long, 7–10 mm in diam., slender, slightly fleshy, unbranched, with many nodes, internodes 3–3.5 cm. Leaves 7.5–10×1.6–2cm, narrowly oblong, linear-lanceolate, leathery, base sheathing, apex acuminate and slightly hooked on one side, deciduous, absent at the time of flowering. Inflorescences many, arising from old leafless stems, 2–5 flowered. Flowers 4–5 cm. across, pale purple inner surface of lip with a deep purple spot surrounded by a white circle.

Habitat: Epiphytic on tree trunks in open forests. Voucher specimen: Gogoi et al, 0057. Flowering: April - May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Thailand, Vietnam, Burma, China.

Dendrobium moschatum (Buch.-Hum.) Sw. in Schrad., Neu. Jour. Bot. 1: 94. 1805; Barua, Orch. Fl. Kamrup Dist. 159. 2001; Chowdhery, Orch. Fl. Arunachal Prad. 311. 1998.

Plant 70–131cm tall. Stems clustered, stout, terete, erect to pendulous, ridged, jointed; internodes sheathed. Leaves 8–17×2–4.5cm, lanceolate to elliptic-lanceolate, acute, subsessile, many veined, distichous, jointed. Inflorescences lateral, arising from nodes of leafy or leafless stem, laxly 7–14 flowered, 10–18cm long. Flower orange yellow, 5–7cm across, deep yellow disk with a pale purplish brown blotch on either side.

Habitat: Epiphytic on tree trunks in open forests. Voucher specimen: Gogoi et al, 0058. Flowering: April - June. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China, Thailand, Cambodia, Vietnam.

Dendrobium nobile Lindl., Gen. Sp. Orchid. 79. 1830; Hook. f. Fl. Brit. India 5: 740. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 314. 1998.

Plant forming large clumps. Stems 30–60cm long, clustered, compressed, swollen at base, covered with sheaths, beaded, yellowish; internodes 2.8–3.5×0.8–1.2cm. Leaves 6.5–12×2.5–3cm, oblong, emarginated, many-veined, sessile, coriaceous, distichous, persistent. Inflorescences lateral, arising from nodes, 2–4-flowered, 1–1.5cm long. Flowers 5–7cm. across, white merging with purple at apex; lip purple at tip, at middle followed by deep purple central blotch.

Habitat: Epiphyte in humid evergreen forest, also in the lowlands. Voucher specimen: Gogoi et al, 0346. Flowering: April - May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China, Taiwan, Thailand, Vietnam. (Figure 15)

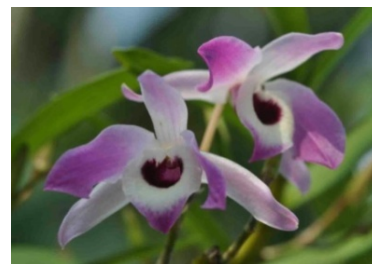


Figure 15. *Dendrobium nobile*

Dendrobium stuposum Lindl. in Bot. Reg. 52. 1838; Hook. f. Fl. Brit. India 6: 186. 1890; Chowdhery Orch. Fl.

Arunachal Prad. 322. 1998.

Plant 13–34cm tall. Stems caespitose, subclavate, grooved, sheathless; internodes 2.3–4.2cm long. Leaves 3–7×0.8–1.5 cm, oblong, obtuse-emarginate, distichous, sessile. Inflorescence lateral, arising from nodes, leaf-opposed or from leafless stem, 2 or 3-flowered. Flowers 1.6–2.1cm across, sepals and petals white with purple margins, lip with a blotch of dull yellow-orange at apex.

Habitat: Epiphytic on tree trunks in open and mountain forests. Voucher specimen: Gogoi *et al.*, 0504. Flowering: June– August. Local distribution: Joypur R. F, Assam. General distribution: India, Bhutan, Burma, China, Thailand.

Dendrobium sulcatum Lindl in Bot. Reg. n. 5. 24: t. 65. 1838; Hook. f. Fl. Brit. India 5: 749. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 322. 1998.

Plant 19–42cm tall. Stem pseudobulbs, clavate, compressed, grooved, narrowed towards base, nodes several. Leaves 3 to 4, 8–15×3–5cm, subterminal, distichous, broadly elliptic to elliptic ovate, acute, sessile. Inflorescence 6–10cm long, axillary, adjacent to leaf, subdensely 3 to 7-flowered. Flowers golden yellow, 2.5–3.5 cm across; lip with red-purple markings at base.

Habitat: Epiphytic on tree trunks in dense forests. Voucher specimen: Gogoi *et al.*, 0153. Flowering: April–May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, China, Thailand.

Dendrobium terminale Par. & Reichb. f. in Trans. Linn. Soc. 30: 149. 1859; Hook. f. Fl. Brit. India 5: 725. 1890; Chowdhry, Orch. Fl. Arunachal Prad. 193. 1998.

Plant 9–14cm tall. Stem subclavate, slender at base, covered with leaf sheaths; internodes 0.8–1.1cm long. Leaves 1.4–2×0.4–0.6cm, distichous, many, fleshy, oblong-elliptic, subacute to acute, equitant, jointed, base broad, sessile. Inflorescence terminal, 1 or 2-flowered. Flowers 1–1.2 cm long, white flushed pink.

Habitat: Epiphytic on tree trunks at forest. Voucher specimen: Borah *et al.*, 0203. Flowering: April–June. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Malaysia, Myanmar, Thailand, Vietnam.

Dendrobium transparens Lindl., Gen. Sp. Orchid. 79. 1830; Hook. f. Fl. Brit. India 5: 738. 1890; Chowdhry, Orch. Fl. Arunachal Prad. 327. 1998.

Plant 30–54cm tall, slender, erect, swollen at nodes, pseudobulbous at base; internodes covered by leaf sheaths, yellowing with age, 2.4–5.3cm. Leaves 7–11×1.1–1.6cm, linear-lanceolate to oblong-elliptic, acute to oblique, sessile, jointed, many-veined. Inflorescence lateral, arising from leafless stem, 2–4-flowered. Flowers 4–5 cm across; sepals and petals white lined with purple at tips, lip white with large purple patch on the disc.

Habitat: Epiphytic on tree trunks. Voucher specimen: Gogoi *et al.*, 0061. Flowering: April–May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma.

Didymoplexis Griffith

About 2 species in India, 1 in Assam and Joypur Reserve Forest.

Didymoplexis pallens Griff. in Calcutta Jour. Nat. Hist. 4: 383, t. 17. 1843; Hook. f., Fl. Brit. India 6: 122. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 329. 1998.

Plant erect, leafless, slender, ridged, glabrous, distantly 1 to 3-sheathed, 8–16cm tall, pale buff-coloured, tubers fusiform, often moniliform, 1.8–3.5×0.5–0.6cm. Inflorescence laxly 3–7-flowered. Flowers white, 0.8 cm across. Habitat: Terrestrial, growing in bamboo forest. Voucher specimen: Gogoi *et al.*, 0198. Flowering: May–June. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, N Fujian, Taiwan, Afghanistan, Bangladesh, Indonesia, Japan, Malaysia, New Guinea, Philippines, Thailand, Vietnam; Australia, SW Pacific islands. (Figure 16)

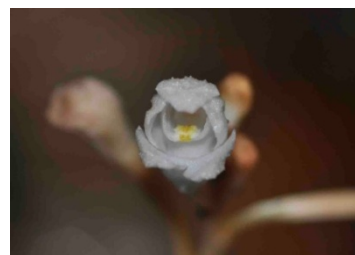


Figure 16. *Didymoplexis pallens*

Epipogium Gmelin ex Borkhausen

6 species in India, 1 in Assam and Joypur.

Epipogium roseum (D. Don) Lindl. in Jour. Linn. Soc. 1: 177. 1857; Chowdhery, Orch. Fl. Arunachal Prad. 343. 1998; Mishra, Orch. India 296. 2007.

Plant 13–46cm tall; rhizome tuberous, internodes many. Stem 9–23cm tall, erect, glabrous, sheathed. Inflorescence pale pink, laxly many-flowered, 5–20cm long, suberect to pendent. Flowers white with faint purple spots on lip.

Habitat: Terrestrial in evergreen forest. Voucher specimen: Gogoi *et al.*, 0712. Flowering: October–December. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Tropical Africa, tropical continental Asia, Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi, Moluccas, New Guinea, Philippines, Australia, Vanuatu, New Caledonia.

Eria Lindley

Approximately 900 species, distributed in Sri Lanka, India, Nepal, Myanmar, Malaya, Thailand, Cambodia, Philippines, China, Japan to Java, Sumatra, Borneo, Celebes, New Guinea, Australia, and New Zealand. In India it represents 59 species and nearly 10 species in Assam among them Joypur Reserve Forest consist of 10 species of *Eria*.

Eria acervata Lindl. in Jour. Hort. Soc. 6: 57. 1851; Hook. f., Fl. Brit. India 5: 57. 1851; Chowdhery, Orch. Fl. Arunachal Prad. 350. 1998.

Pseudobulbs 3.5–6×1–2cm, compressed, flask-shaped to ellipsoid, stacked to clustered, furrowed, sheathed when young. Leaves 4–7, 6–15×1.8–2.5cm, narrowly oblong to oblanceolate-oblong, obtuse-emarginate, tapered towards base, petiolate. Inflorescence 2–5, 6–15cm long, laxly many flowered. Flowers white, about 1.5 cm across.

Habitat: Epiphyte in dense humid evergreen forest. Voucher specimen: Gogoi *et al.*, 0501. Flowering: May– July. Local distribution: Joypur R. F, Assam. General distribution:

N.E. India, Nepal, Bhutan, Burma, Tibet, China, Thailand, Cambodia, Vietnam.

Eria amica Reichb. f., Xen. Orchid. 2: 162, t. 168. f. 6-9. 1870; Hook. f., Fl. Brit. India 5: 800. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 350. 1998.

Plant 13–28cm tall. Pseudobulbs 5–14×0.8–1.5cm, superposed, erect-cylindric, sheathed at base. Leaves 2, 11–14×1.7–2.1cm, arising from pseudobulb apex, linear-lanceolate to oblong-lanceolate, acute, tapered to petiolate base. Inflorescence arising from axils of leaf-sheaths, 1–3 from each pseudobulb apex, erect to suberect, laxly many flowered, 5–10cm long, pubescent. Flowers pale-yellow, with reddish-brown nerves, about 1.2 cm across.

Habitat: Epiphyte in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0482. Flowering: March-May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, Burma, China, Taiwan, Thailand, Cambodia, Vietnam.

Eria connata Joseph, Hegde & Abbareddy in Bull. Bot. Surv. India 24: 114, f. 1-7. 1982; Chowdhery, Orch. Fl. Arunachal Prad. 361. 1998; Mishra, Orch. India 297. 2007.

Plant up to 25 cm long including leaves; roots wiry; Pseudobulbs 5–15×0.8–1cm, subcylindric. Leaves 4 or 5, 6–8×1.2–1.8cm, narrowly elliptic, subfalcate, acuminate, distichously, sessile. Inflorescence axillary or leaf-opposed, pendent, racemose, globose to subglobose, proteranthous, densely many-flowered. Flowers fragrant; sepals and petals white, lip yellow.

Habitat: Epiphyte in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0480. Flowering: July-September. Local distribution: Joypur R. F, Assam. General distribution: N.E. India and Bhutan.

Eria ferruginea Lindl. in Bot. Reg. n.s. 25: t. 35. 1839; Hook. f., Fl. Brit. India 5: 804. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 363. 1998.

Plant 19–37cm tall. Pseudobulbs stem-like, cylindric, internodes 4 or 5, branched, sheathed, 7–9cm long. Leaves 2, 11–16×1.7–3cm, arising from pseudobulb apex, narrowly oblong-elliptic, to elliptic, acute to subacuminate, coriaceous, petiolate, jointed. Inflorescence arising from pseudobulb base, racemose, laxly 6–11-flowered, 7–10cm long, tomentose, sheathed. Flowers 2.4–3cm, yellowish-green, washed with purple-pink, lip white with red-purple spotted.



Figure 17. *Eria ferruginea*

Habitat: Epiphyte in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0507. Flowering: June- July. Local distribution: Joypur R. F, Assam. General distribution:

N.E. India and Bhutan. (Figure 17)

Eria lasiopetala (Willd.) Ormerod, Opera Bot. 124: 22. 1995. *Eria pubescens* (Hook. f.) Lindl. in Jour. Linn. Soc. 3: 54. 1858; Chowdhery, Orch. Fl. Arunachal Prad. 373. 1998; Barua, Orch. Fl. Kamrup Dist. 138. 2001.

Plant 19–33cm tall; rhizome woody, sheathed. Pseudobulbs 3.6–5×2.3–3.5cm, borne at intervals of 3–5cm along rhizome, fusiform-ellipsoid, laterally compressed, furrowed, basally sheathed. Leaves 2–5, 7–14×2–3.5cm, lanceolate-oblong, acute to acuminate, petiolate. Inflorescence lateral, arising from pseudobulb base, erect, racemose, subdensely 6 to 13-flowered, 7–12cm long, softly white-tomentose. Flowers fragrant, 1.8–2.2cm across, green to yellow, lip with crimson-purple.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Voucher specimen: Gogoi et al, 0065. Flowering: March-April. Local distribution: Joypur R. F, Assam. General distribution: India, Himalayas, China, Taiwan, Yunnan, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam, Java and Sumatra.

Eria paniculata Lindl. in Wall., Pl. Asiat. Rar. 1: 32, t. 36. 1830; Hook. f., Fl. Brit. India 5: 789. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 373. 1998.

Plant 30–44cm tall. Stems caespitose, pendent, woody, covered in sheaths, 0.5–0.6cm thick. Leaves many, 10–25×1–1.5cm, linear-oblong, acuminate, fleshy, subsessile to shortly petiolate. Inflorescence 2–4, terminal, fasciculate to paniculate, densely many-flowered, 8–10cm long. Flowers 0.8–1.1cm across, acrid-scented; sepals pale yellowish-green, petals, lip and column with brownish-purple blotches.

Habitat: Epiphyte in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0225. Flowering: December-March. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Nepal, Bhutan, Bangladesh, Burma, Thailand, Cambodia, Vietnam.

Eria pannea Lindl. in Bot. Reg. 64. misc. 79. 1842; Hook. f. Fl. Brit. India 5: 804. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 373. 1998.

Plant 11–16cm tall. Rhizome slender, covered by hairy sheaths. Leaves 3–6, 4–17×0.3–0.5cm, linear, laterally flattened, fleshy, subterete. Inflorescence arising amidst from leaves, 2 to 5-flowered. 2–3cm long, weakly zigzag, densely woolly. Flowers 1–2cm wide, fragrant, pale yellow-green, lip dark purplish.

Habitat: Epiphyte in dense evergreen forest. Voucher specimen: Gogoi et al, 0147. Flowering: May-July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Singapore, Sumatra, Borneo.

Eria pudica Ridl. in Jour. Linn. Soc. 32: 294. 1896; Chowdhery, Orch. Fl. Arunachal Prad. 377. 1998; Mishra, Orch. India 298. 2007.

Plant erect, pseudobulbs 2.5–3.5×1–2cm, crowded, ovate, fusiform, 3–4×0.5–0.7cm. Leaves solitary, 12–15×3–3.5cm, elliptic, oblong, acute, petiolate. Inflorescence lateral, arising from the base of the pseudobulb, 3–4cm long, densely grayish white pubescent, many flowered. Flowers

spreading, pinkish white, pubescent, buff with darker Strips.

Habitat: Epiphyte in deciduous forest and evergreen forest. Voucher specimen: Gogoi et al, 0495. Flowering: April-August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Peninsular Malaysia and Borneo.

Eria pumila Lindl. Gen. sp. Orchid 68. 1830; Hook. f. Fl. Brit. India 5: 791. 1890.

Plant 11–16cm tall; rhizomatus, covered with fibrous sheaths. Pseudobulbs 4–6cm long, crowded, subcylindric to clavate, compressed, weakly falcate, sheathed. Leaves 3 or 5, 4.4–10.6×1–2cm, linear-lanceolate, acute, tapered to a short, sheathing petiole, jointed. Inflorescence short, globose-capitate, densely many-flowered, 1–1.3cm across, 2–4mm long. Flowers 4–5mm across, white flushed with pink, lip lateral lobes and column apex red.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Flowering: January- March. Voucher specimen: Gogoi et al, 0502. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan and Myanmar.

Eria tomentosa (Koen.) Hook. f., Fl. Brit. India 5: 803. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 385. 1998.

Plant rhizomatus, up to 15cm long including leaves; rhizomes woody with nodal scars. Pseudobulbs 2.5–5×1.5–2 cm, 4–5 cm apart, ovate- oblong. Leaves 1–3, 7–12×1.5–2cm, obovate- lanceolate, narrowed at base, acute. Inflorescence 10 to 15-flowered, tomentose racemes. Flowers about 1.5 cm across, orange- yellow.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Voucher specimen: Gogoi et al, 0503. Flowering: September- November. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, Thailand, Vietnam.

Flickingeria Hawkes

About 60 species in S.E. Asia, Malaya, Archipelago, Pacific Islands and N. E. Australia; 7 species in India, 2 in Assam and 1 in Joypur.

Flickingeria fugax (Reichb. f.) Seidenf. in Dansk Bot. Arkiv 34: 46. 1980; Kumar et. Monilal, Cat. Ind. Orch. 74. 1994; Chowdhery, Orch. Fl. Arunachal Prad. 399. 1998.

Plants erect or pendulous. Stems long, branched; internodes 1.7–2.8cm long; pseudobulbs 3.4–5.8×0.8–1cm, borne on stem nodes, narrowly fusiform, compressed, shining, grooved. Leaf solitary, 9–17×2–2.5cm, terminal from pseudobulbs, linear-oblong to narrowly oblong-elliptic, minutely emarginated, veined, sessile. Inflorescences adaxial, 1 or 2-flowered, short. Flowers 0.8–1.5cm across, white, 3–3.5cm across, fugacious.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Voucher specimen: Borah et al, 0067. Flowering: March – October. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Bhutan, Myanmar, Thailand and Vietnam. (Figure 18)

Gastrochilus David Don

About 20 species in E. Asia, India, Malaysia and adjoining Islands; 12 species in India, 3 in Assam and Joypur.



Figure 18. *Flickingeria fugax*

Gastrochilus calceolaris (Buch.-Ham. ex J.E. Smith) D. Don, Prodr. Fl. Nepal. 32. 1852; Kumar et. Monilal, Cat. Ind. Orch. 75. 1994; Chowdhery, Orch. Fl. Arunachal Prad. 413. 1998.

Plant pendent, 9–22cm long, sheathed. Leaves 3–7, 8–20×1.7–3.2cm, distichous, expetiolate, strongly falcate, linear-lanceolate to oblong-lanceolate. Inflorescence short, corymbose to subracemose, much shorter than the leaves, pendent, subdensely 6–8 flowered. Flowers widely opening; sepals and petals yellow, with purplish brown markings; lip white with purple-red marks.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Voucher specimen: Gogoi et al, 0320. Flowering: October – November. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Bhutan, Malaysia, Myanmar, Nepal, Thailand, Vietnam.

Gastrochilus dasypogon (J.E. Smith) O. Ktze., Rev. Gen. Pl. 2: 661. 1891; Kumar et. Monilal, Cat. Ind. Orch. 75. 1994; Chowdhery, Orch. Fl. Arunachal Prad. 413 1998.

Plant 9–16cm tall. Leaves 4–5, 8–18×2.6–3.4cm, alternate, broadly ovate, fleshy, smooth above, minutely scaly beneath, apex acute, unequally 3-toothed, margins revolute, base sheathing. Inflorescence 3–4cm long, corymbose to umbellate, densely 4–11-flowered. Flowers yellow with brownish-purple spots, 1.5–2 cm across.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Voucher specimen: Gogoi et al, 0130. Flowering: October–November. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, Thailand and Vietnam. (Figure 19)

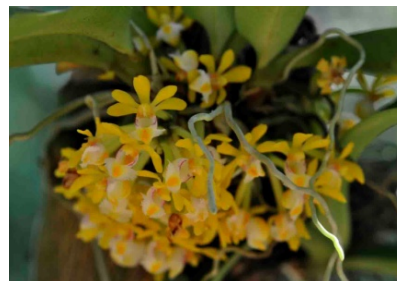


Figure 19. *Gastrochilus dasypogon*

Gastrochilus inconspicuus (Hook. f.) O. Ktze., Rev. Gen. Pl. 2: 661. 1891; Kumar et. Monilal, Cat. Ind. Orch. 75. 1994; Chowdhery, Orch. Fl. Arunachal Prad. 413. 1998.

Plant 10–30cm tall. Stem terete, flexuous, branched, covered by leaf sheaths, red-brown, 3.5–15cm long. Leaves 2.8–8×0.1–0.2cm, terete, straight to weakly curved,

rugose-striate, dark green, sessile. Inflorescence lateral, racemose, 4–6 flowered, short, sheathed. Flowers white or yellowish-green, 0.5cm across.

Habitat: Epiphyte in humid evergreen forest, mixed deciduous forest. Voucher specimen: Borah et al, 0070. Flowering: June - July. Local distribution: Joypur R. F, Assam. General distribution: India, Himalayas, Bangladesh and Nepal.

Geodorum G. Jackson

About 10 species in India, S.E. Asia, Australia, and S.W. Pacific Islands; 1 species in India, Assam and Joypur.

Geodorum densiflorum (Lamk.) Schltr. in Fedde Report. Behi. 4: 259. 1919; Kumar et. Monilal, Cat. Ind. Orch. 75. 1994; Chowdhery, Orch. Fl. Arunachal Prad. 418. 1998.

Plant 30–40cm tall. Pseudobulb 2–4×3–3.5cm, tuberous, subglobose, enclosed by scarious sheaths. Leaves 3–4, 10-31×5-9cm, fasciculate, plicate, suberect, lanceolate, lanceolate-elliptic, or oblong-elliptic, acute to acuminate, petiolate. Inflorescence usually shorter than the leaves, compact, subglobose, pendent, 10–14-flowered, 16–30cm long, sheathed. Flowers white to pinkish, lip with a central yellow callus and crimson-purple venation and streaks.

Habitat: Terrestrial in evergreen forest, also in grass land. Voucher specimen: Gogoi et al, 0238. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, China, Taiwan, Yunnan, Cambodia, Indonesia, Japan, Laos, Malaysia, Myanmar, New Guinea, Thailand, Vietnam; Australia. (Figure 20)



Figure 20. *Geodorum densiflorum*

Goodyera Robert Brown

About 40 species widely distributed in Mexico, S. E. Asia, Pacific Islands, New Guinea, Australia and Madagascar; 17 species in India, 4 in Assam, 1 species in Joypur.

Goodyera procera (Wall. ex Ker.-Gawl.) Hook., Exot. Fl. 1, 3: t. 39. 1823; Hook.f., Fl. Brit. India 6: 111. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 431. 1998.

Plant 27–63cm tall, leafy in the basal third, bearing 3 or 4 sheaths above. Leaves 7–14×3.7–6cm, linear-lanceolate to ovate-lanceolate, petiolate, acuminate. Inflorescence densely many-flowered, 7–19cm long, pubescent. Flowers fragrant, opening weakly, white tinged pale green.

Habitat: Terrestrial at the bank of a small stream and in evergreen forest, also on rock in a stream. Voucher specimen: Borah et al, 0205. Flowering: April– June. Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, Nepal, Bhutan, Burma, China, Taiwan, Japan, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines. (Figure 21)

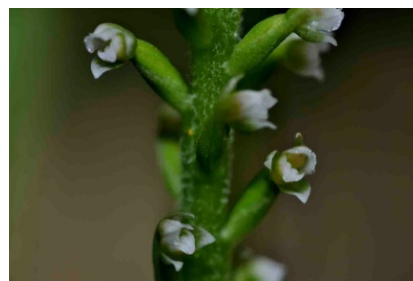


Figure 21. *Goodyera procera*

Hetaeria Blume

6 species in India, 2 in Assam and 1 in Joypur.

Hetaeria affinis (Griff.) Seidenf. & Ormerod, Oasis, Suppl. 2: 9, 2001; Mishra, Orch. India, 304, 2007.

Plant 25–38cm tall. Stem leafy, glabrous. Leaves 7.5–12 × 4–5cm, ovate-elliptic, more or less oblique to subacute, 5-veined. Inflorescence densely many-flowered, 7–14cm long, densely glandular-pubescent. Flowers opening slightly, 5–6 mm across, green, tipped with pink; lip white.

Habitat: Terrestrial in secondary evergreen forest close to a small stream. Voucher specimen: Gogoi et al, 0505. Flowering: April- May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, Burma, China, Thailand, Peninsular Malaysia, Philippines.

Kingidium P.F. Hunt

About 5 species distributed in India, Sri Lanka, Myanmar, Thailand, Malaya, Indonesia and Philippines; 2 species India and Assam, 1 in Joypur.

Kingidium deliciosum (Reichb. f.) Sw. in Amer. Orchid Soc. Bull. 39: 1095. 1970; Mishra, Orch. India 304. 2007; Chowdhery, Orch. Fl. Arunachal Prad. 463. 1998.

Plant forming clumps, stem short, 0.5–1×0.5–0.9cm, tufted. Leaves 3 or 4, obovate-oblong, obtuse to subacute, margins undulate, base narrowed, sessile, jointed, 7–16×2.5–4.8cm. Inflorescence basal, one to several, paniculate or racemose, 5–9 flowered, 10–15cm long, glabrous. Flowers greenish yellow; lip purple spotted.

Habitat: Epiphyte in gallery forest along a large river, in a shady spot in humid evergreen forest. Voucher specimen: Gogoi et al, 0210. Flowering: May– July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi, Philippines. (Figure 22)

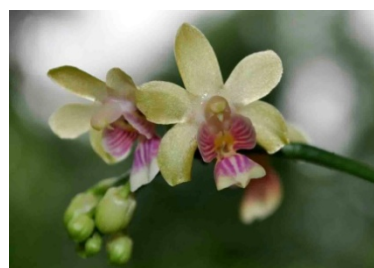


Figure 22. *Kingidium deliciosum*

Liparis L.C. Richard

About 250 species distributed mainly in the tropics of the world and comparatively less frequent in the temperate

region; 45 species in India, 9 in Assam and 2 in Joypur.

Liparis mannii Reichb. f. in Flora 55: 275. 1872; Hook. f., Fl. Brit. India 5: 701. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 479. 1998.

Plant 19–28cm tall. Pseudobulbs 1.5–3×0.6–0.9cm, crowded, narrowly ovoid, enveloped in ovate-lanceolate, acute, scarios sheaths. Leaf 9–21×0.7–1cm, solitary, arising from apex of pseudobulb, linear-oblong, acute, narrowed to a convolute. Inflorescence densely many-flowered, 5–14cm long. Flowers yellowish, 5 mm across.

Habitat: Epiphyte in humid evergreen forest. Voucher specimen: Gogoi et al, 0124. Flowering: November – January. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, S Yunnan, Vietnam. (Figure 23)



Figure 23. *Liparis mannii*

Liparis viridiflora (Bl.) Lindl., Gen. Sp. Orchid. 31. 1830; Hook.f., Fl. Brit. India 5: 704. 1890.

Plant 12–23cm tall. Pseudobulbs 1.8–3.5×1.5–2.5cm, clustered, stem like, ovoid at base, long-cylindric above. Leaves 2, 8–16×2–3cm, obovate-oblong to oblanceolate, obtuse, acute or acuminate. Inflorescence cylindric, slender, densely many flowered, 6–11cm long. Flowers small, greenish white or pale greenish yellow.

Habitat: Epiphyte in humid evergreen forest and mixed deciduous forest. Voucher specimen: Gogoi et al, 0073. Flowering: April- May. Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, Nepal, Bhutan, Burma, China, Thailand, Vietnam, Malaysia, Sumatra, Java, Borneo, New Guinea, Philippines, Fiji.

LUISIA Gaudichaud

About 40 species in tropical Asia, Malaysia, Australia and Japan; 16 species in India, 5 in Assam, 2 in Joypur.

Luisia trichorhiza (Hook. f.) Bl. Mus. Bot. 1: 63. 1849; Hook. f., Fl. Brit. India 6: 23. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 495. 1998.

Plant 30–60cm long. Stem stout, branched, covered by leaf sheaths. Leaves 7–16×0.4–0.5cm, distichous, fleshy, terete, rugose, jointed. Inflorescence leaf-opposed, stout, 4 or 6-flowered, 6–8mm long. Flowers 0.8–1.1cm across; sepals pale green with faint purple lines, lip dark purple, the base outlined with green lines, the apical ridges green, column purple.

Habitat: Epiphyte in humid evergreen forest. Voucher specimen: Gogoi et al, 0060. Flowering: March – May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bangladesh, Bhutan, Burma, China, Thailand, Myanmar. (Figure 24)

Luisia zeylanica Lindl., Fol. Orchid. Luisia, 3. 1853;

Chowdhery, Orch. Fl. Arunachal Prad. 501. 1998.



Figure 24. *Luisia trichorhiza*

Plant 23–37cm tall. Stem stout, covered by leaf sheaths; internodes 1–1.5×0.4–0.6cm. Leaves 6–15×0.2–0.5cm, distichous, terete, subacute, sessile. Inflorescence extra-axillary, arising in centre of internode, on same side as the leaf, few flowered, 2–3mm long, attenuate. Flowers greenish yellow, with purple base.

Habitat: Epiphyte in humid evergreen forest. Voucher specimen: Gogoi et al, 0496. Flowering: April- May. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bangladesh, Bhutan, Burma, China, Thailand, Myanmar, Sri Lanka, Cambodia, Vietnam, Borneo, Sumatra, Java, New Guinea, Philippines, Australia.

MALAXIS Soland. ex Swartz

300 species distributed throughout the world, specially in S. E. Asia and adjoining Island; 19 species in India, 2 in Assam and 2 in Joypur.

Malaxis acuminata D. Don. Prodr. Fl. Nepal 29. 1852; Chowdhery, Orch. Fl. Arunachal Prad. 502. 1998.

Plant 15–20cm tall. Stem glabrous, sheathed at base. Leaves 3 or 4, 6–14×2.8–7cm, thinly membranous, ovate-lanceolate, acute to acuminate, narrowed to sheathing base, petiolate, margins undulate. Inflorescence racemose, laxly many-flowered, 12–25cm long, ribbed. Flowers 7–9mm long, uniformly purple.

Habitat: Terrestrial in dense humid evergreen forest on rocky terrain, also in the lowlands. Voucher specimen: Gogoi et al, 0499. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China, Thailand, Cambodia, Vietnam, Sumatra, Java, New Guinea, Philippines, Australia. (Figure 25)

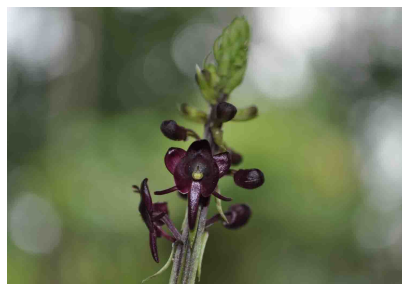


Figure 25. *Malaxis acuminata*

Malaxis latifolia J.E. Smith in Rees, Cyclop. 22, no. 3. 1819; Pradhan, Indian Orchid-II: 208. 1979; Chowdhery, Orch. Fl. Arunachal Prad. 504. 1998.

Plant 10–30cm tall. Pseudobulbs 3.5–8×1.5–2cm,

enveloped in remnant of leaf sheaths. Leaves 3–6, lamina 6–18×4–7.5cm, unequal, elliptic-lanceolate, acute or acuminate, channeled sheathing petiole, light green above and whitish green suffused with purple below, many-nerved. Inflorescence single, apical, 15–37cm long, erect, striated. Flowers pale purple, 0.5 cm across.

Habitat: Terrestrial in open humid evergreen forest. Voucher specimen: Gogoi et al, 0200. Flowering: May – June. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China, Thailand, Myanmar, Sri Lanka, Cambodia, Vietnam, Borneo, Sumatra, Java, New Guinea, Philippines, Australia.

Micropera Lindley

3 species in India, 3 in Assam and 2 in Joypur.

Micropera mannii (Hook. f.) T. Tang & F.T. Wang in Acta Phytotax. Sin. 1(1): 94. 1951; Pradhan, Indian Orchid-II: 497. 1979; Chowdhery, Orch. Fl. Arunachal Prad. 512. 1998.

Plant pendulous, branched, covered by leaf sheaths, 20–40cm long. Leaves 8–12×0.8–1.2cm, distichously, linear-oblong, keeled beneath, obtuse to subacute, minutely bifid at apex, sessile, jointed. Inflorescence straight, laxly 10–15 flowered, 8–10cm long. Flowers pale-pink, 0.6–0.7 cm across.



Figure 26. *Micropera mannii*

Habitat: Epiphyte on tree trunk in evergreen tropical forest. Voucher specimen: Gogoi et al, 0324. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: India (Assam), Bangladesh and Eastern Himalayas. (Figure 26)

Micropera rostrata (Roxb.) Balakr. in Jour. Bombay Nat. Hist. Soc. 67: 66. 1970; Mishra, Orch. India 307. 2007; Chowdhery, Orch. Fl. Arunachal Prad. 512. 1998.

Plant pendulous, branched, covered by leaf sheaths, 30–60cm long. Leaves 7–10×2–3cm, coriaceous, obtusely bifid at apex, sessile, jointed. Inflorescence laxly many flowered racemes, exceeding the leaves, 10–15cm long, glabrous. Flowers pale-purple, 1.5–2 cm across.

Habitat: Epiphyte on tree trunk in evergreen tropical forest. Voucher specimen: Gogoi et al, 0312. Flowering: April – May. Local distribution: Joypur R. F, Assam. General distribution: India (Assam), Bangladesh and Eastern Himalayas.

Oberonia Lindley

About 100 species mainly distributed to tropical Asia, a few are known from pacific Islands and Australia, a single species in Madagascar and tropical Africa; 50 species in

India, 13 in Assam, 1 in Joypur.

Oberonia mucornata (D. Don.) Ormerod & Seidenfaden in Seidenfaden, Contr. Orchid Fl. Thailand 13: 20. 1997; Mishra, Orch. India 309. 2007.

Plant 21–34cm tall. Stem very short. Leaves 4–6, 5–22×1.7–2.5cm, broadly ensiform, acute to mucronate, overlapping at base, fleshy, the lower ones smaller. Inflorescence decurved, densely many-flowered, 15–24cm long, slender, ridged. Flowers small, yellowish.

Habitat: Epiphyte on tree trunk in evergreen tropical forest. Voucher specimen: Gogoi et al, 0055. Flowering: September – October. Local distribution: Joypur R. F, Assam. General distribution: India, Bangladesh, Bhutan, Indonesia, Laos, China, Malaysia, Myanmar, Nepal, Philippines. (Figure 27)



Figure 27. *Oberonia mucornata*

Papilionanthe Schlechter

About 11 species in India, S.E. Asia, and Malaya Archipelago; 4 species in India, 2 in Assam, 1 in Joypur.

Papilionanthe teres (Roxb.) Schltr. in Orchis 9: 78: 1915; Mishra, Orch. India 311. 2007; Chowdhery, Orch. Fl. Arunachal Prad. 570. 1998.

Plant 60–155cm long, some times more, branched, terete, long, covered by leaf sheaths. Leaves 7–19×0.6–0.8cm, suberect, curved, terete, linear, ridged, jointed. Inflorescence leaf-opposed, racemose, laxly 3 to 5-flowered, 10–15cm long, ridged, sheathed. Flowers 4.8–7.5cm across; sepals and petals whitish pink, lip darker pink with a yellow base veined with pink, spur with a yellow mouth.

Habitat: Epiphyte in mixed deciduous forest, also on solitary roadside trees. Voucher specimen: Gogoi et al, 0059. Flowering: April – May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Nepal, Bhutan, Burma, China, Thailand. (Figure 28)



Figure 28. *Papilionanthe teres*

PHAIUS Loureiro

7 species in India, 4 in Assam, 2 in Dibrugarh district.

Phaius mishmensis Reichb. f. in Bonplandia 5: 43. 1857; Hook. f., Fl. Brit. India 5: 817. 1890; Mishra, Orch. India 313.

2007; Chowdhery, Orch. Fl. Arunachal Prad. 583. 1998.

Plant 40–123cm tall. Pseudobulbs 3.5–6.7×1.3–2cm, narrowly fusiform-cylindric, fleshy. Leaves 6–8, 14–34×5.5–11cm, elliptic-lanceolate to oblong-ovate, acuminate to acute, sheathing at base. Inflorescence 1 or 2, 15–20cm long, axillary, laxly few-flowered, weakly zigzag, sheathed. Flowers 4–5 cm across, white, greenish yellow or pinkish purple.

Habitat: Terrestrial, on the bank of a small stream in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0484. Flowering: November- January. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, Burma, China, Ryukyu Arch., Vietnam, Thailand. (Figure 29)

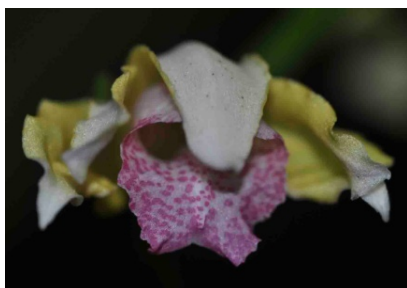


Figure 29. *Phaius mishmensis*

Phaius tancarervilliae (Banks ex L'Herit.) Bl., Mus. Bot. Lugd.- Bat. 2: 177. 1856; Mishra, Orch. India 313. 2007; Chowdhery, Orch. Fl. Arunachal Prad. 583. 1998.

Plant 54–100cm tall. Pseudobulbs 3.5–7cm long, conical to ovoid, green, sheathed by leaf bases. Leaves 4–5, 30–75×9–18cm, elliptic-lanceolate, acuminate, thin-textured; petiole 11–19cm long. Inflorescence 23–95cm tall, lateral, laxly 6 to 20-flowered. Flowers 7–12 cm across; sepals and petals whitish outside, reddish brown or brown inside; lip white toward base, pink or red-pink toward entrance with white stripes on inside.

Habitat: Terrestrial, shaded and damp places in forests. Voucher specimen: Gogoi et al, 0512. Flowering: January-March. Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, Bhutan, Burma, China, Japan, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, New Guinea, Philippines, Australia, Pacific Is.

Phalaenopsis Blume

About 46 species in India, S. E. Asia, Indonesia, Philippines and N. Australia; 7 species in India, 3 in Assam, 2 in Joypur.

Phalaenopsis mannii Reichb. f. in Gard. Chron. 902. 1871; Hook. f., Fl. Brit. India, 6: 30, 1890; Chowdhery, Orch. Fl. Arunachal Prad., 587, 1998.

Plant pendulous, stem short, enclosed by overlapping leaf sheaths. Leaves 4–5, 10–30×4–7.5cm, coriaceous, oblong-lanceolate to narrowly oblong, acute or obtuse, sessile, jointed. Inflorescence 1–4, 12–31cm long, slender, pendent, racemose or paniculate, laxly 6 to 14-flowered. Flowers 3–4 cm across; sepals and petals yellow with dark brown spots and bars; lip mid-lobe white; column yellow.

Habitat: Epiphytic on tree trunks in evergreen forests. Voucher specimen: Gogoi et al, 0344. Flowering: March – May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, China, Myanmar, Nepal, Vietnam.

Phalaenopsis parishii Reichb. f. in Gard. Chron. 410. 1865; Hook.f. Fl. Brit. India 6: 31. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 587. 1998.

Plant epiphyte; roots copious, flattened; stems clustered, abbreviated, branching basally. Leaves 2–4, 5–8×3.5–4 cm, subbasal, broadly elliptic, obliquely bilobed. Inflorescences erect racemes, 5–10 cm, 4–8 flowered. Flowers white with two chestnut bands on lip, 2 cm across.

Habitat: Epiphytic on tree trunks in open forests. Voucher specimen: Gogoi et al, 0258. Flowering: March – April. Local distribution: Joypur R. F, Assam. General distribution: India, China, Bhutan, Myanmar, Vietnam. (Figure 30)

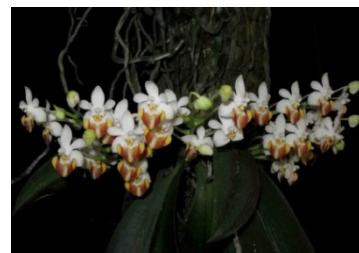


Figure 30. *Phalaenopsis parishii*

Pholidota Lindl. ex. Hook. f.

About 30 species in India, China, Malaysia, Indonesia, New Guinea, Pacific Islands and Australia; 10 species in India, 7 in Assam, 2 in Joypur.

Pholidota articulata Lindl. Gen. Sp. Orchid. 38, 1833; Hook. f., Fl. Brit. India, 5: 844, 1890.

Plant 22–43cm long. Pseudobulbs 4–9cm long, slender to swollen; internodes 1.9–5mm long. Leaves 2, 6.5–11×2–3.7cm, ovate to linear-lanceolate, acute to acuminate. Inflorescence synanthous, many flowered, 4–7cm long, straight to zigzag. Flowers greenish white or white and slightly tinged with reddish, 5 mm across.

Habitat: Epiphyte in dense humid evergreen forest close to a waterfall. Voucher specimen: Gogoi et al, 0435. Flowering: July – October. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Bhutan, Burma, China (Yunnan), Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Sulawesi, Philippines.

Pholidota imbricata (Roxb.) Lindl. in Hook., Fl. Exot. 2: t. 138. 1825; Hook. f., Fl. Brit. India 5: 845. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 589. 1998.

Plant 16–41cm tall. Pseudobulbs 5–11×1.8–2cm, ovoid-conical, sheathed at base. Leaf solitary, 19–38×4.7–8.5cm, arises from pseudobulb apex, oblong, obovate-oblong to linear-lanceolate, acute to acuminate, coriaceous. Inflorescence synanthous, densely many-flowered, 17–20cm long. Flowers white, 5 mm across.

Habitat: Epiphyte on tree humid evergreen forest. Voucher specimen: Gogoi et al, 0106. Flowering: June – August. Local distribution: Joypur R. F, Assam. General

distribution: India, Nepal, Bhutan, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, New Guinea, Philippines, Australia. (Figure 31)



Figure 31. *Pholidota imbricata*

Podochilus Blume

4 species in India, 2 in Assam, 2 in Joypur.

Podochilus cultratus Lindl., Gen Sp. Orchid. 234. 1833; Hook. f., Fl. Brit. India 6: 80. 1890.

Plant 7–15cm long, glabrous, completely covered by leaves. Leaves many, 0.9–1.2×0.6–0.8cm, equitant, lanceolate, falcate, acute, many-veined. Inflorescence slender, 2 to 4-flowered, 1.1–1.2cm long. Flowers white, 5 mm long.

Habitat: Epiphyte on tree trunk in wet evergreen tropical forest. Voucher specimen: Gogoi et al, 0497. Flowering: April– May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Nepal, Myanmar, Thailand and Vietnam.

Podochilus khasianus Hook. f., Fl. Brit. India 6: 81. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 616. 1998.

Plant 9–14cm long slender, tufted, suberect, covered by sheathing leaf bases. Leaves many, 0.9–1.3×0.0.2–0.3cm, linear to linear-oblong, acute, coriaceous, jointed, sometimes twisted, sheathing at base. Inflorescence 3–5 flowered, 0.4–0.6cm long, glabrous, weakly zigzag. Flowers white, very small.

Habitat: Epiphyte on tree trunk in wet evergreen tropical forest. Voucher specimen: Gogoi et al, 0400. Flowering: June – August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bhutan, China, Vietnam. (Figure 32)

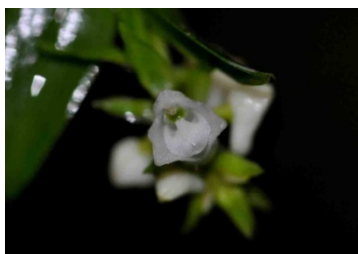


Figure 32. *Podochilus khasianus*

Promatocalpa Breda, Kuhl & Hasselt

8 species in India, 1 in Assam and Dibrugarh district.

Promatocalpa undulatum (Reichb. f.) J.J. Smith in Nat. Tijdschr. Ned. Ind. 72: 107. 1912; Chowdhery, Orch. Fl. Arunachal Prad. 622. 1998; Mishra, Orch. India 315. 2007.

Plant upto 28cm long covered by leaf sheaths. Leaves 7–15×1.5–2cm, narrowly oblong to oblong-elliptic, apex obscurely 2-lobed, acuminate to obliquely obtuse.

Inflorescence racemose, many flowered, 2–2.5cm long, narrow, glabrous, sheathed. Flowers 8 mm across, yellow with purple blotched; lip with purple blotched.



Figure 33. *Promatocalpa undulatum*

Habitat: Epiphyte in the wet evergreen tropical forest. Voucher specimen: Gogoi et al, 0498. Flowering: March– May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bangladesh and China. (Figure 33)

Pteroceras Hasselt ex Hassk.

5 species in India, 1 in Assam and Joypur.

Pteroceras suaveolens (Roxb.) Holtt. in Kew Bull. 14: 271. 1960; Chowdhery, Orch. Fl. Arunachal Prad. 624. 1998.

Plant pendulous, 15–24cm long, unbranched. Leaves 4–12, 5–15×1.5–3cm, linear-oblong to lanceolate, oblique, bilobed, sessile, jointed. Inflorescence 1 or many, 4–12-flowered, 4.5–7.5cm long, terete, glabrous, dilated, nodes winged. Flower yellow with brownish spots, about 1.5 cm across; lip tip dark purple.

Habitat: Epiphyte in the wet evergreen tropical forest. Voucher specimen: Gogoi et al, 0489. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: India (NE), Nepal, Burma, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines. (Figure 34)

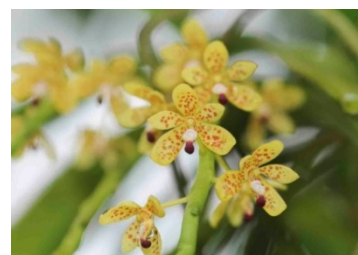


Figure 34. *Pteroceras suaveolens*

Rhynchostylis Blume

About 4 species distributed in India, Srilanka, Myanmar, S. E. Asia, Malaysia, Philippines and Indonesia; 2 in India and Assam, 1 in Joypur.

Rhynchostylis retusa (Lindl.) Bl., Bijdr. 286, t. 49. 1825; Hook. f., Fl. Brit. India 6: 32. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 626. 1998.

Plant 8–31cm long, some times more, stout, covered by leaf sheaths. Leaves distichous, 12–40×2–3.8cm, spreading to arching, lorate, apex obliquely 2-lobed, coriaceous, deeply channeled, sessile, jointed. Inflorescence 20–40cm long, densely many-flowered. Flowers 1.7–2.3 cm across; sepals and petals white and spotted with pink or pale purple; lip purplish pink, apex white.

Habitat: Epiphyte in the wet evergreen tropical forest.

Voucher specimen: Gogoi et al, 0049. Flowering: May – June. Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, Nepal, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Philippines. (Figure 35)



Figure 35. *Rhynchostylis retusa*

Robiquetia Gaudichaud

About 25 species in Indonesia, Malaysia, Philippines, Papua New Guinea, Australia and Pacific Island; 4 species in India, 2 in Assam, 1 in Joypur.

Robiquetia spatulata (Bl.) J.J. Smith in Nat. Tijdschr. Ned. Ind. 72: 115. 1912; Chowdhery, Orch. Fl. Arunachal Prad. 630. 1998; Mishra, Orch. India 315. 2007.

Plant 60–90cm long, pendulous, covered in leaf sheaths, 0.8–1.2cm thick. Leaves 10–18×3.6–4.5cm, broadly oblong-elliptic, apex unequally and broadly bilobed, narrowed to sessile, jointed base. Inflorescence racemose, densely many-flowered, 10–15cm long. Flowers yellow with purplish brown spots and stripes.

Habitat: Epiphyte humid evergreen forest. Voucher specimen: Gogoi et al, 0450. Flowering: May – July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines.

Taeniophyllum Blume

7 species in India, 2 in Assam and 1 in Dibrugarh district.

Taeniophyllum crepidiforme (King & Pantl.) King & Pantl. in Ann. Roy. Bot. Gard. Calcutta 8: 245, t. 325. 1898; Chowdhery, Orch. Fl. Arunachal Prad. 656. 1998; Mishra, Orch. India 317. 2007.

Plant small, stemless, leafless, epiphytic herb devoid of pseudobulbs with comparatively thick, flat greenish roots; Inflorescence 7–9mm long, filiform. Flowers minute, greenish white with purple tinge.

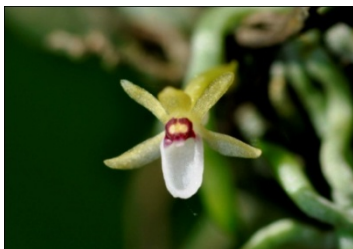


Figure 36. *Taeniophyllum crepidiforme*

Habitat: Epiphyte in humid evergreen forest. Voucher specimen: Gogoi et al, 0506. Flowering: August- September. Local distribution: Joypur R. F, Assam. General distribution: Eastern Himalayas, Sikkim and Assam. (Figure 36)

Tainia Blume

About 50 species in India China, S. E. Asia; 9 species in India, 4 in Assam, 3 in Joypur.

Tainia latifolia (Lindl.) Benth. ex. Hook. f., Fl. Brit. India 5: 820. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 657. 1998.

Plant 80–140cm tall. Pseudobulbs 7–1×0.5–1.3cm, cylindrical-ovoid, swollen towards base. Leaf 14–38×5–9cm, solitary, petiolate, elliptic to ovate-obovate, acute to acuminate, margins entire, many-veined. Inflorescence arising from above base of pseudobulb, many flowered, 40–50cm long. Flowers 2 cm across, dark brown, lip yellow.

Habitat: Terrestrial in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0350. Flowering: March – May. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Bangladesh, China, Bhutan, Burma, Thailand, Vietnam, Myanmar.

Tainia minor Hook. f. Fl. Brit. India 5: 821. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 661. 1998.

Plant 23–36cm tall. Pseudobulbs 3.5–6.8×0.7–1.1cm, cylindrical, expanded at base, scale-bracts at apex persistent. Leaf solitary, 13–25×3.5–5.7cm, elliptic, acuminate, many-veined, petiolate. Inflorescence terminal, many flowered, 11–23cm long, sheathed. Flowers 1.5 cm across, purplish brown with deep purple spots; lip white, tinged with purplish brown.

Habitat: Terrestrial in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0488. Flowering: June-August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, China, Myanmar.

Tainia waryana (Hook. f.) J.J. Smith in Bull. Jard. Bot. Buitenz. 2, 8: 6. 1912; Pradhan, Indian Orchid-II: 242. 1979; Chowdhery, Orch. Fl. Arunachal Prad. 661. 1998.

Plant 10–15cm long including leaves. Pseudobulbs 8–10cm long, narrowly fusiform, one leaved, with membranous sheaths. Leaves solitary, 10–15×7–9cm, ovate-elliptic, cordate at base, 7–9 nerved, petioles stout, terete. Flowers greenish flushed with red, 3 cm across; lip white.

Habitat: Terrestrial in dense humid evergreen forest. Voucher specimen: Gogoi et al, 0481. Flowering: June – July. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Thailand, Malaysia to Sumatra. (Figure 37)



Figure 37. *Tainia waryana*

Thelasis Blume

4 species in India, 2 in Assam and Joypur.

Thelasis longifolia Hook. f., Fl. Brit. India 6: 87. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 662. 1998.

Plant 16–23cm tall. Pseudobulbs 1.3–2.5×1.2–2.7cm, conical. Leaf solitary, 9–18×1.3–2.2cm, arising from apex of

the pseudobulb, narrowly oblong to oblanceolate, minutely bifid at the apex or rounded, sessile. Inflorescence arising from newly developing pseudobulb, many flowered, longer than leaves, sheathed at base, 14–19cm long, glabrous, sheathed. Flowers green, not opening widely, small.

Habitat: Epiphytic in evergreen forest. Voucher specimen: Gogoi et al, 0355. Flowering: June– August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Himalayas.

Thelasis pygmaea (Griff.) Lindl. in Jour. Proc. Linn. Soc. 3: 63. 1859; Hook. f., Fl. Brit. India 6: 86. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 662. 1998.

Plants 6–10cm tall. Pseudobulbs 0.8–1.4×0.9–1cm, ovoid-globose. Leaves 1 or 2, 3–7.5×1.2–1.4cm, linear-oblong, sessile, fleshy, tip slightly biforked. Inflorescence lateral, 5–9cm long, arising from base of pseudobulbs, densely many-flowered, 4–6cm long, sheathed. Flowers yellowish green, not opening widely, small.

Habitat: Epiphytic in mixed deciduous and evergreen forest. Voucher specimen: Gogoi et al, 0487. Flowering: July- September. Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Burma, China, Thailand, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, New Guinea, Philippines.

***Thrixspermum* Loureiro**

About 100 species distributed widely from the Himalayas to Philippines and the tropical Islands of S.W. Pacific; 9 species in India, 3 in Assam, 3 in Joypur.

Thrixspermum acuminatissimum (Bl.) Reich. f. Xen. Orchid. 2: 121. 1867; Scidenfaden et al, Orchid. Thailand iv-I: 518. 1962.

Plant monopodial. stem very short, 1–2cm long. Leaves 3.5–5×1–1.5cm, distichous, subsessile, bilobed at apex, articulated to sheathing leaf base, coriaceous, oblong; peduncles 10–12cm long, arising from one point on the stem, curved, naked. Inflorescence raceme, 5–6.5cm long, bracts ovate, incurved coriaceous, subacute; pedicel and ovary 0.7cm long, slender. Flowers yellow; lip white with yellow and reddish-brown spots.

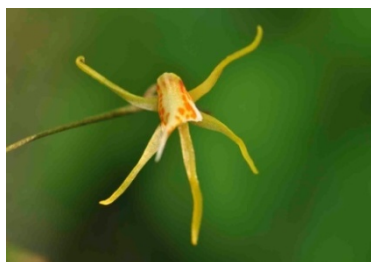


Figure 38. *Thrixspermum acuminatissimum*

Habitat: Growing on lateral branches of lower canopy of host tree, cool and shady place. Voucher specimen: Gogoi et al, 0510. Flowering: July- December. Local distribution: Joypur R. F, Assam. General distribution: India (Assam), Thailand, Cambodia, S. Vietnam, Malacca, Java, Sumatra, Kalimantan, Philippines. (Figure 38)

Thrixspermum centipeda Lour., Fl. Cochinch. 520. 1790; Chowdhery, Orch. Fl. Arunachal Prad. 665. 1998;

Chowdhery & Pal, Orch. Arunachal Prad. 140. 1997.

Plant erect, covered by persistent leaf sheaths; internodes 1.5–2cm long. Leaves 7–9, 8–11×2–2.6cm, coriaceous, linear-oblong, apex minutely bifid, jointed. Inflorescence leaf-opposed, 5–10cm long, 1 or 2-sheathed, glabrous; rachis 4–12cm long, laterally flattened. Flowers white or creamy yellow, turning yellow later.

Habitat: Epiphyte in mixed deciduous forest, in humid evergreen forest. Voucher specimen: Gogoi et al, 0430. Flowering: May – August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines.

Thrixspermum pygmaeum (King & Pantl.) Holtt. in Kew Bull. 14: 275. 1960; Chowdhery, Orch. Fl. Arunachal Prad. 666. 1998; Mishra, Orch. India 318. 2007.

Plant 2–4cm tall, covered by leaf sheaths. Leaves 2–5, 2–7×0.4–0.9cm, linear-oblong, acuminate, jointed. Inflorescence distantly 1–2 flowered, 1.5–2cm long, slender, minutely sheathed. Flowers about 1 cm across, white.

Habitat: Epiphyte in mixed deciduous forest, in humid evergreen forest. Voucher specimen: Gogoi et al, 0714. Flowering: May – August. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, China, Thailand, Cambodia, Vietnam, Peninsular Malaysia, Sumatra, Java, Borneo, Philippines.

***Trichotosia* Blume**

50 species widely distributed from Himalayas to the S.W. Pacific Island; 3 species in India, 2 in Assam and 1 in Joypur.

Trichotosia velutina (Lodd. ex Lindl.) Kranz. in Engler & Prantl, Pflanzenz. 50: 140. 1911; Chowdhery, Orch. Fl. Arunachal Prad. 672. 1998; Mishra, Orch. India 318. 2007.

Plant 40–60 cm long, pendulous, covered with persistent sheaths and tubular leaf bases, reddish brown tomentose. Leaves, many, alternate, well spread over the stem, 5–8 cm long, oblong-lanceolate, thickly coriaceous. Inflorescence leaf opposed, short, 3–6 flowered. Flowers pale- white, 1 cm across.

Habitat: Epiphyte on tree trunks in humid forest. Voucher specimen: Gogoi et al, 0391. Flowering: August – September. Local distribution: Joypur R. F, Assam. General distribution: N.E. India, Burma, Thailand, Malaysia, Sumatra, Java, New Guinea and Borneo.

***Tropidia* Lindley**

3 species in India, 2 in Assam and 1 in Joypur.

Tropidia curculigioides Lindl., Gen. Sp. Orchid. 497. 1840; Chowdhery, Orch. Fl. Arunachal Prad. 676. 1998.

Plant 33–65cm tall. Stem slender. Leaves 9–22×2–3cm, oblong-elliptic, tapering, acute to acuminate, sessile with sheathing base, plicate. Inflorescence short, leaf-opposed, subglobose, densely flowered. Flowers greenish white, 1.5 cm long.

Habitat: Terrestrial in dense humid evergreen forest and evergreen montane forest. Voucher specimen: Gogoi et al, 0479. Flowering: September- November. Local distribution: Joypur R. F, Assam. General distribution: India, Burma, China, Taiwan, Thailand, Cambodia, Vietnam, Malaysia,

Java, Borneo, New Guinea, Australia.

Tylostylis Blume

1 species in India, Assam and Joypur.

Tylostylis discolor (Lindl.) Hook. f. in Ann. Roy. Bot. Gard. Calcutta 5: 22. 1895; Pradhan, Indian Orchid-II: 344. 1979; Chowdhery, Orch. Fl. Arunachal Prad. 677. 1998.

Plant 25–33cm tall; rhizome thick, woody, sheathed. Pseudobulbs 10–21×2.5–3.6cm, thick, cylindrical, furrowed. Leaves 3–5, 10–18×2.7–4cm, arising from pseudobulbs apex, narrowly oblong to elliptic, emarginated at apex, sessile. Inflorescence lateral, few-flowered, 3–8cm long, erect to arching, sheathed, pubescent. Flowers few, 1.3–1.6cm across, tomentose externally, yellow-ochre, lip with a dark purplish patch near base.

Habitat: Epiphytic on trees in mixed forests. Voucher specimen: Gogoi *et al.*, 0201. Flowering: January– March. Local distribution: Joypur R. F, Assam. General distribution: India, China, Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam.

Zeuxine

There are about 50 species (King and Pantling, 1898; Garay and Sweet, 1974; Seidenfaden, 1978; Bose and Bhattacharjee, 1980; Hashimoto and Kanda, 1981; Davis and Steiner, 1982; Kanda, 1984; Deva and Naithani, 1986; Comber, 2001) to 90 species (Ormerod, 2005) of *Zeuxine* in the tropics and subtropics of the old World of which 19 species has been estimated from India (Misra, 2007). 9 species were recognized in Assam (Chowdhury, 2005) and 5 in Joypur.

Zeuxine clandestina Bl., Coll. Orchid. 70. 1858; Barua, Orch. fl. Kamrup Dist. 56. 2001; Mishra, Orch. India 320. 2007.

Plant 10–15cm tall, stems and peduncles glabrous. Leaves 2–4, 3–4×2cm, linear, glabrous, 3 nerved, sheathed, scarious. Inflorescence spikes, 8–10 flowered. Flowers greenish-white, small.

Habitat: Growing in dense forest, cool and shady place. Voucher specimen: Gogoi *et al.*, 0508. Flowering: January–March. Local distribution: Joypur R. F, Assam. General distribution: India, Thailand, Malaya and Java.

Zeuxine glandulosa King & Pantling in Ann. Roy. Bot. Gard. (Calcutta) 8: 288. t. 384. 1898; Pradhan, Indian Orchid-I: 118. 1969; Mishra, Orch. India 320. 2007.

Plants 5–20 cm high. Leaves oblong – lanceolate, acute, shortly petiolate, 2.5–5×0.6–1 cm, blackish- purple; petiole expanded into a wide hyaline sheath. Inflorescence laxly few flowered. Flowers 0.5 cm long olivaceous green, column and central contracted part of lip white.

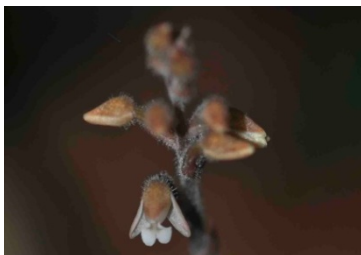


Figure 39. *Zeuxine glandulosa*

Habitat: Growing in dense forest, cool and shady place. Voucher specimen: Gogoi *et al.*, 0511. Flowering: March–April. Local distribution: Joypur R. F, Assam. General distribution: Bhutan, Sikkim Himalaya, North Bengal and Assam. (Figure 39)

Zeuxine goodyeroides Lindl. Gen. Sp. Orchid. 486. 1840; Hook. f., Fl. Brit. India 6: 107. 1890.

Plant 15–27cm tall, sheaths 0.7–1.1cm, clasping. Leaves 3–5, 2.6–4×1.2–2cm, oblong-ovate, acute, shortly petiolate. Inflorescence laxly many flowered, 4–10cm long, ridged, sparsely pubescent, with 1 or 2 linear-lanceolate sheaths. Flowers resupinate, white, small.

Habitat: Growing in dense forest, cool and shady place. Voucher specimen: Gogoi *et al.*, 0483. Flowering: January–February. Local distribution: Joypur R. F, Assam. General distribution: Himalayas, Nepal, Myanmar and Vietnam. Present ecological status: Common.

Zeuxine longilabris (Lindl.) Trim. in Joour. Ceylon Br. Roy Asiat. Soc. 9: 90. 1885; Hook. f., Fl. Brit. India 6: 107. 1890; Chowdhery, Orch. Fl. Arunachal Prad. 695. 1998.

Plant 15–20cm tall. Leaves 2–3×1–2cm, ovate to ovate-oblong, acute, 5–7 nerved, drooping, copper-brown white, shortly petioled. Inflorescence terminal, few-flowered, 2–6cm long, glandular-pubescent racemes on elongate, slender, purple scapes. Flowers greenish-white, small.

Habitat: Terrestrial, growing in grassland. Voucher specimen: Gogoi *et al.*, 0509. Flowering: March - May.

Local distribution: Joypur R. F, Assam. General distribution: India, Nepal, Sri Lanka, Bangladesh, Thailand, Myanmar and Cambodia.

Zeuxine nervosa (Wall. ex Lindl.) Benth. ex Trimen, J. Ceylon Branch Roy. Asiat. Soc. 9: 90 (1885).

Plants 20–35 cm tall, slender, 3–6-leaved. Leaves clustered at stem apex, not usually withering at anthesis, ovate to ovate-elliptic, 4–6×1.5–2.5 cm, apex acute. Inflorescence 18–28 cm, with 2 or 3 widely spaced sterile bracts, sparsely villous, many flowered. Flowers resupinate, white, small.

Habitat: Damp places in forests. Voucher specimen: Gogoi *et al.*, 0713. Flowering: January–March. Local distribution: Joypur R. F, Assam. General distribution: India, Sri Lanka, Eastern Himalayas, Nepal, Thailand, Taiwan, China, Bangladesh, Vietnam, Ryukyu Island, New Guinea and Philippines.

4. Results and Discussion

During recent field survey, 107 Orchid species with 47 genera have been recorded from different part of the Joypur reserve forest of Dibrugarh district of Assam. Of them, 82 are epiphytic and 23 are terrestrial and 2 species like *Didymoplexis pallens* and *Epipogium roseum* are saprophytic in habitat. Out of them 30 species is very common in this region but others are rare in occurrence. It is observed that whole Orchidaceae family facing high risk of

threat in habitat in comparison with other plant species in the study areas. Rapid destruction of natural habitat by many means like deforestation, extension of agricultural lands, urbanization, developmental schemes, atmospheric pollution, pesticidal and weedcidal pollution and many more anthropogenic activities in the study areas are the main reasons. Therefore, protection and conservation of natural habitat are the only prominent way to save our precious natural wealth like Orchid species of the regions.

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