



ECOLOGY AND DISTRIBUTION OF THE GENUS *HUMBOLDTIA* VAHL (LEGUMINOSAE) IN INDIA

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ABSTRACT: On the basis of field explorations the ecology and present distribution status of *Humboldtia* Vahl (Leguminosae) in India is assessed here with brief description, distribution map and photographs. An attempt has also been made to determine the present population status of *H. bourdillonii*, *H. brunonis* var. *raktapushpa*, *H. sanjappae* and *H. unijuga* var. *trijuga* which are restricted to their type localities.

Key words: *Humboldtia*, India, distribution, ecology.

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INTRODUCTION

Vahl [1] described the genus *Humboldtia* based on specimens of *H. laurifolia* from Sri Lanka. Sanjappa [2] revised the genus mainly based on collections represented in various herbaria's. Presently the genus is known to have 7 species and 2 varieties, all are confined to the biodiversity hot spot of Southern Western Ghats of India except *H. laurifolia*, extending southwards to Sri Lanka. In connection with the studies on the Legume flora of Kerala state authors could relocate all the species of *Humboldtia* except *H. laurifolia*. On the basis of field explorations a detailed account on the ecology, phenology and present distribution and population status of the genus in India is provided here with an artificial key to the species, distribution maps, photographs and illustrations.

TAXONOMIC TREATMENT

HUMBOLDTIA Vahl,

Symb. Bot. 3: 106. 1794, *nom. cons.*

Key to the species

- 1a. Stipules appendaged at base 2
 1b. Stipules not appendaged 6
 2a. Petals 3 2. *H. brunonis*
 2b. Petals 5 3
 3a. Leaf rachis not winged; Stamens glabrous 4. *H. laurifolia*
 3b. Leaf rachis winged; Stamens pilose at base 4
 4a. Stipules 6-8 cm long; rachis broadly winged
 between leaflets; Petals pinkish-white 3. *H. decurrens*
 4b. Stipules 2-3 cm long; rachis narrowly winged
 between leaflets; Petals white 5
 5a. Inflorescence corymbose, 3-5 cm long; pedicels
 up to 1.5 cm long; Pods falcate, bright red, velvety 1. *H. bourdillonii*
 5b. Inflorescence racemose, 12-15 cm long; pedicels
 0.6-0.8 cm long; Pods straight, greenish, tomentose 7. *H. vahliana*
 6a. Leaflets 4; Inflorescence 6-12 cm long; Petals white;
 Stamens pilose at base 5. *H. sanjappae*
 6b. Leaflets 2 or 6 (var. *trijuga*); Inflorescence up to 3 cm long;
 Petals crimson; Stamens glabrous 6. *H. unijuga*

Humboldtia bourdillonii Prain, J. Asiat. Soc. Bengal 73: 200. 1904; Gamble, Fl. Pres. Madras 411(291). 1919; Sanjappa, Blumea 31: 331. 1986 & Legumes Ind. 30. 1991; Sasidh., Higher Plants of Indian Sub-Continent 8: 209. 1998. (Fig. 2.A)

Medium-sized trees, 20-35 m tall. Stipules 2-3 x 1-1.3 cm, ovate, acuminate, persistent, appendages falcate-reniform. Leaves 6-8 –foliolate: rachis 15-20 cm long narrowly, obcordately winged between the leaflets; leaflets 10-22 x 4-6 cm, long-ovate to elliptic, obtusely acuminate at apex, obtuse-subtruncate at base, glabrous. Racemes 6-10 cm long, corymbose, tawny villous, in fascicles on tubercles on stem and old branches. Flowers white: Calyx brown tomentose; lobes 5. Petals 5, 3 longer and 2 shorter. Stamens 5: filaments 2.5-3 cm long, reddish, pilose at base; anthers 4 x 1.5 mm, oblong. Ovary 7 x 3 mm, oblong, pilose, 5-6-ovuled. Pods 16-18 x 4-4.8 cm, dolabriform, falcate, velvety, crimson pubescent, 3-5 –seeded.

Flowering & Fruiting: January – May.

Ecology: Growing gregariously along streamlets in discrete patches at an altitude of 500 – 800 m asl. Arjunan Kotta and Poonkavanam area of Periyar Tiger Reserve, Western Ghats, Kerala is the only presently known locality of this species. *H. bourdillonii* grows in the wet evergreen forests along with tree species such as *Myristica beddomei* King, *Orophea erythrocarpa* Bedd., *Palaquium ellipticum* (Dalz)Baill., *Sageraea laurina* Dalz., *Vateria indica* L. etc. The estimated population size of *H. bourdillonii* is about 1350 individuals of different age groups and girth classes. Though the regeneration of the species is satisfactory, the extent of occurrence is about 2 km² and the area of occupancy is about 0.5 km², qualifies to Critically Endangered status of IUCN. Ramachandran *et al* [3] has also given Critically Endangered status to *H. bourdillonii* after a detailed field study.

Distribution: Endemic to Southern Western Ghats (Kerala). (Fig. 1.A)

Humboldtia brunonis Wall, Pl. Asiat. Rar. 3: 17. t. 233. 1832; Hook. f., Fl. Brit. India 2: 263. 1878; Gamble, Fl. Pres. Madras 411(291). 1919; Sanjappa Blumea 31: 333. 1986 & Legumes Ind. 30. 1991.

Small trees, 4-10 m tall. Stipules 1.5-2 x 0.5 cm, lanceolate, acute, appendage reniform. Leaves 4-foliolate; rachis obscurely winged between leaflets; leaflets 15-22 x 4-7 cm, elliptic-obovate, obtusely acuminate at apex, cuneate at base. Racemes 10-12 cm long, axillary, many-flowered. Flowers 2.5 cm across, white or crimson. Calyx brown pubescent; lobes 5. Petals 3, white tinged with pink or crimson. Stamens 5: filaments 1.1-1.8 cm long, pink-red, glabrous; anthers 3 x 0.6 mm. Ovary 5 x 2 mm, pubescent, 2-4-ovuled. Pods 4-8.5 x 2-3.5 cm, obovate-oblong, pubescent when young, glabrescent with age, (1-) 2-4-seeded.

Key to the varieties

- 1a. Flowers crimson-red; petals up to 8 mm long; Pods
1-2-seeded var. *raktapushpa*
- 1b. Flowers white tinged with pink; petals 1.2-1.5 cm long;
Pods 3-4-seeded var. *brunonis*

Humboldtia brunonis Wall. var. **brunonis**

(Fig. 2.B)

Flowering & Fruiting: December – April.

Ecology: It is a dominant understorey tree in the evergreen forest of Western Ghats of Northern Kerala, South-west Karnataka and the Nilgiri's of Tamil Nadu. This species grows in moist shady locations at 300 – 800 m altitudes asl. associated with trees like *Dipterocarpus indicus* Bedd., *Kingiodendron pinnatum* (Roxb. ex DC.) Harms, *Poeciloneuron indicum* Bedd, *Syzygium* sp. etc. *H. brunonis* is an ant-plant or myrmecophyte, harbours ants and many endemic invertebrate taxa such as bees that pollinate it as well as arboreal earthworms within swollen hollow internodes [5].

Distribution: Endemic to Western Ghats (Kerala, Karnataka & Tamil Nadu). (Fig. 1.A)

Humboldtia brunonis Wall. var. **raktapushpa** P.S. Udayan , K.V. Tushar & Satheesh George, J.Bot. Res. Inst. Texas 1(1): 121-127. 2007. (Fig.2.C)

Flowering & Fruiting: December – May.

Ecology: This variety is so far known only from the type locality, Kakkayam along the foot hills of Western Ghats of Northern Kerala. It occurs in the semi-evergreen forests at an elevation of 700-750 m in moist shady locations associated with trees like *Elaeocarpus tuberculatus* Roxb., *Euodia lunu-ankenda* (Gaertn.) Merr., *Syzygium laetum* (Buch.-Ham.), *Vateria indica* L. etc. The estimated population size of the taxon is 350 mature individuals of different age groups with a small extent of occurrence (3 km²) and area of occupancy (0.4 km²), therefore, qualifies to Critically Endangered status of IUCN.

Distribution: Endemic to Southern Western Ghats (Kerala). (Fig. 1.A)

Humboldtia decurrens Bedd. ex Oliver in Hook., Ic. Pl. t. 2368. 1890; Gamble, Fl. Pres. Madras 411(291). 1919; Sanjappa, Blumea 31: 334. 1986 & Legumes Ind. 30. 1991. (Fig.2.D)

Medium-sized trees, 10-15 m tall; branchlets fistular. Stipules 5-7 x 2-3 cm, ovate, acuminate, brown tomentose, persistent, appendage reniform. Leaves subsessile, 8-12 -foliolate: rachis 23-28 cm long, obcordately winged between the leaflets; leaflets 15-30 x 6-11 cm, narrowly ovate-long elliptic, acuminate at apex, rounded at base. Racemes 6-10 cm long, axillary, pendulous; rachis tawny villous; peduncle short. Flowers 3.5 cm long, pinkish white. Calyx brown villous; lobes 5. Petals 5. Stamens 5: filaments 3-3.5 cm long, broad and pilose at base; anthers 3.5 x 1.25 mm, oblong. Ovary 7 x 3 mm, obliquely oblong, pilose; ovules 6. Pods 10.5-12 x 3.5-4 cm, obovate or dolabriform, brown tomentose, 2-3-seeded.

Flowering & Fruiting: January – June.

Ecology: A common understorey tree in the evergreen forests of Western Ghats of Southern Kerala (Thiruvananthapuram & Kollam districts) and adjacent Tirunelveli district of Tamil Nadu at an altitude of 350-900 m asl. This species occurs in riparian areas along with trees such as *Actinodaphne tadulingamii* Gamble, *Drypetes malabarica* (Bedd.) Airy Shaw, *Elaeocarpus tuberculatus* Roxb, *Litsea bourdillonii* Gamble etc. *H. decurrens* is also an ant-plant consistently associated with a resident ant colony living in hollow internodes and feeding on nectarines found on the leaves, stipules and flower buds [4].

Distribution: Endemic to Southern Western Ghats (Kerala & Tamil Nadu). (Fig. 1.A)

Humboldtia laurifolia Vahl, Symb. Bot. 3: 106. t. 56. 1794; Hook. f., Fl. Brit. India 2: 273. 1876; Gamble, Fl. Pres. Madras 411(291). 1919; Sanjappa Blumea 31: 335. 1986.

Shrubs to small trees, up to 6 m tall; branches drooping, internodes fistular. Stipules 2-4 x 1.2-1.6 cm, ovate, acute at apex; appendages subreniform. Leaves 2-30 cm long including 4-6(-10) mm long petioles; leaflets 6-12, 6-12.5 x 3-5.2 cm, ovate to oblongly elliptic, abruptly caudate-acutely acuminate at apex, oblique and unequal at base. Racemes 6-10 cm long, axillary, subsessile, dense; rachis brown pubescent-scabrous. Flowers 1.5 cm long, pink or white. Calyx brown pubescent; lobes 5. Petals 5. Stamens 5: filaments 1.5 cm long, glabrous; anthers 3 mm long. Ovary 4 x 2 mm, oblong, brown pubescent; ovules 3-4. Pods 8-12 x 2-3.5 cm, flat, prominently veined, glabrous.

Flowering & Fruiting: January – May.

Ecology: This is a highly gregarious species grows along the river banks at 200-600 m altitude asl. It is a common understorey tree in the lowland rainforest of Sri Lanka and the record of the occurrence of *H. laurifolia* in India is based on a single collection of Robert Wight from the 'Malabar' region of northern Kerala in 1830's. This species has not been recollected from India after Wight's collection and even though explored thoroughly, the authors also failed to rediscover the species and the species is probably extinct in India. *H. laurifolia* is also an ant-plant and Krombein et al [4] reported 14 ant taxa on this species and its fistular internodes provide nesting sites for wasps and bees as well as shelter for other invertebrates.

Distribution: INDIA (Kerala) & Sri Lanka. (Fig. 1.B)

Humboldtia sanjappae Sasidharan et SujanaPal, Rheedeia 17: 21-23. 2007. (Fig. 2.E)

Large trees, 15-30 m tall. Stipules 1 x 0.5 cm, obliquely ovate, acute at apex, pubescent within, persistent, appendages absent. Leaves c. 30 cm long including 2.5-3 cm long petioles; leaflets 2-4, 12-20 x 5.5-7 cm, tender leaflets reddish, drooping. Racemes 6-12 cm long, axillary as well as cauliflorous, lax; peduncle silky tomentose. Flowers 2 cm long, white. Calyx densely villous; lobes 5. Petals-5, white. Stamens 5: filaments 1.5-1.7 cm long, pilose up to the middle; anthers 2 x 1 mm, oblong, red. Ovary 5 x 2 mm, oblong, silky pilose; ovules 3. Pods 14-17.5 x 3.5-4.2 cm, obliquely oblong, compressed, beaked, glabrous, 1-2-seeded.

Flowering & Fruiting: December – April.

Ecology: This is a recently described taxon, reported so far only from the type locality, Neryamangalam along the foot hills of Southern Western Ghats of Kerala. It grows gregariously in 2 discrete patches in the evergreen forests at 275-300 m altitudes asl. *Canarium strictum* Roxb., *Diospyros bourdillonii* Brandis, *Drypetes sp.*, *Mesua ferrea* L., *Palaquium ellipticum* (Dalz.) Baill. and *Vateria indica* L. are the associated trees of *H. sanjappae*. The estimated population size of the species is about 450 mature individuals of different girth classes. The extent of occurrence is estimated to be less than 5 km² and the area occupied is less than 0.8 km², hence it can be placed under Critically Endangered category of IUCN.

Distribution: Endemic to Southern Western Ghats (Kerala). (Fig. 1.B)

Humboldtia unijuga Bedd, Fl. Sylv. 183. 1872; Hook. f., Fl. Brit. India 2: 274. 1876; Gamble, Fl. Pres. Madras 411(291). 1919; Sanjappa, Legumes Ind. 30.1991; Gopalan & Henry, End. Pl. Agasthyamala 260. 2000.

Medium to large-sized trees, 12-20 m tall. Stipules 5-7 x 3 mm ovate, acute, appendages absent. Leaves 2 or 6 – foliolate: petioles 4-6 mm long, glabrous; leaflets 8-17 x 2-5.5 cm, elliptic-ovate, shortly obtusely acuminate at apex, unequal at base. Racemes short, c. 2-3 cm long, axillary as well as cauliflorous, subsessile; peduncle brown pubescent. Flowers 2 cm long, crimson-red. Calyx brown pubescent; lobes 5. Petals 5, glabrous. Stamens 5: filaments 1-1.3 cm long, glabrous; anthers 4 x 1.5 mm, oblong. Ovary 6 mm long, obliquely oblong, brown pubescent; ovules 3. Pods 6-8 x 2-3 cm, oblong, compressed, 2-3-seeded.

Key to the varieties

- 1a. Leaflets 2 var. *unijuga*
 2a. Leaflets (4-) 6 or rarely 8 var. *trijuga*

Humboldtia unijuga Bedd. var. **unijuga** (Fig.2.F)

Flowering & Fruiting: January – May.

Ecology: Highly gregarious tree grows at 800-1250 m altitudes asl. in the dense evergreen forests of Agasthyamala hills of Kerala and adjacent Tirunelveli ghats of Tamil Nadu. This species occurs in moist shady areas along streamlets and away from streamlets associated with trees such as *Actinodaphne bourdillonii* Gamble, *Apollonias arnotti* Nees, *Casearia rubescens* Dalz., *Dipterocarpus indicus* Bedd., *Hopea parviflora* Bedd., *Elaeocarpus tuberculatus* Roxb., *Litsea bourdillonii* Gamble, *Poeciloneuron indicum* Bedd. etc.

Distribution: Endemic to Southern Western Ghats (Kerala & Tamil Nadu). (Fig. 1.B)

Humboldtia unijuga Bedd. var. **trijuga** Joseph & Chandras., JBNHS 81: 729. 1984; Sanjappa, Legumes Ind. 30.1991. *Humboldtia trijuga* (Joseph & Chandras.) Mohanan, Fl. Tvm. 169. 1994; Gopalan & Henry, End. Pl. Agasthyamala 257. 2000. (Fig.2.G)

Flowering & Fruiting: October – July

Ecology: A rare tree in the dense evergreen forests of Agasthyamala hills of Southern Western Ghats at 900-1100 m altitudes. The extent of occurrence is estimated to be less than 5 km² and the area occupied is less than 0.5 km². The number of mature individuals is estimated to be less than 400 and hence it can be placed under Critically Endangered category of IUCN.

Distribution: Endemic to Southern Western Ghats (Kerala). (Fig. 1.B)

Humboldtia vahliana Wight, Ic. t. 1607, 1608. 1850; Hook. f., Fl. Brit. India 2: 274. 1878; Gamble, Fl. Pres. Madras 411(291). 1919; Sanjappa, Blumea 31: 338. 1986 & Legumes Ind. 30. 1991. (Fig.2.H)

Trees, 8-20 m tall. Stipules 1.2-3 x 1.8-2.2 cm, ovate, acute at apex; appendages reniform. Leaves 18-32 cm long including 12-14 cm long rachis; leaflets 6-8, 14-25 x 5-6 cm, narrowly ovate-oblong or elliptic, obtusely acuminate at apex, rounded at base. Racemes 12-15 cm long, axillary, shortly-peduncled; rachis brown-velvety. Flowers c. 3 cm long, white. Calyx brown-villous; lobes 5. Petals 5, glabrous. Stamens 5: filaments 2-2.5 cm long, red, pilose up to the middle; anthers 4 mm long. Ovary 6 x 2 mm, tomentose. Pods 16-20 x 3.5-4.5 cm, oblong-elliptic, tomentellous, 3-4-seeded.

Flowering & Fruiting: December – May.

Ecology: Probably the most common species of *Humboldtia*, grows as single individuals along streams and river banks in evergreen and semi-evergreen forests of Western Ghats of Kerala and Tamil Nadu at 150-400 m altitudes asl. Plants like *Homonoia riparia* Lour, *Ochreinauclea missionis* (Wall. ex G. Don) Ridsd, *Barringtonia acutangula* (L.) Gaertn, *Cinnamomum riparium* Gamble, *Madhuca longifolia* (Koenig) Macbr. etc. are the usual associates of *H. vahliana*.

Distribution: Endemic to Southern Western Ghats (Kerala & Tamil Nadu). (Fig. 1.B)

Figure 1.A

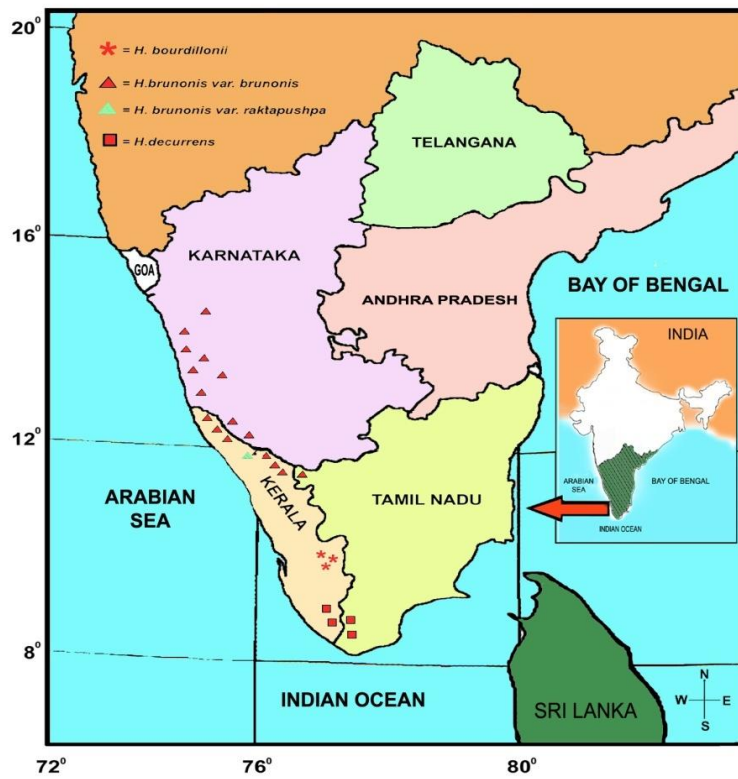


Figure 1.B



Fig. 1.A.: Distribution map of *H. bourdillonii*, *H. brunonis* var. *brunonis*, *H. brunonis* var. *raktapushpa* & *H. decurrens*.

Fig. 1.B: Distribution map of *H. laurifolia*, *H. sanjappae*, *H. unijuga* var. *unijuga*, *H. unijuga* var. *trijuga* & *H. vahliana*.

Figure 2

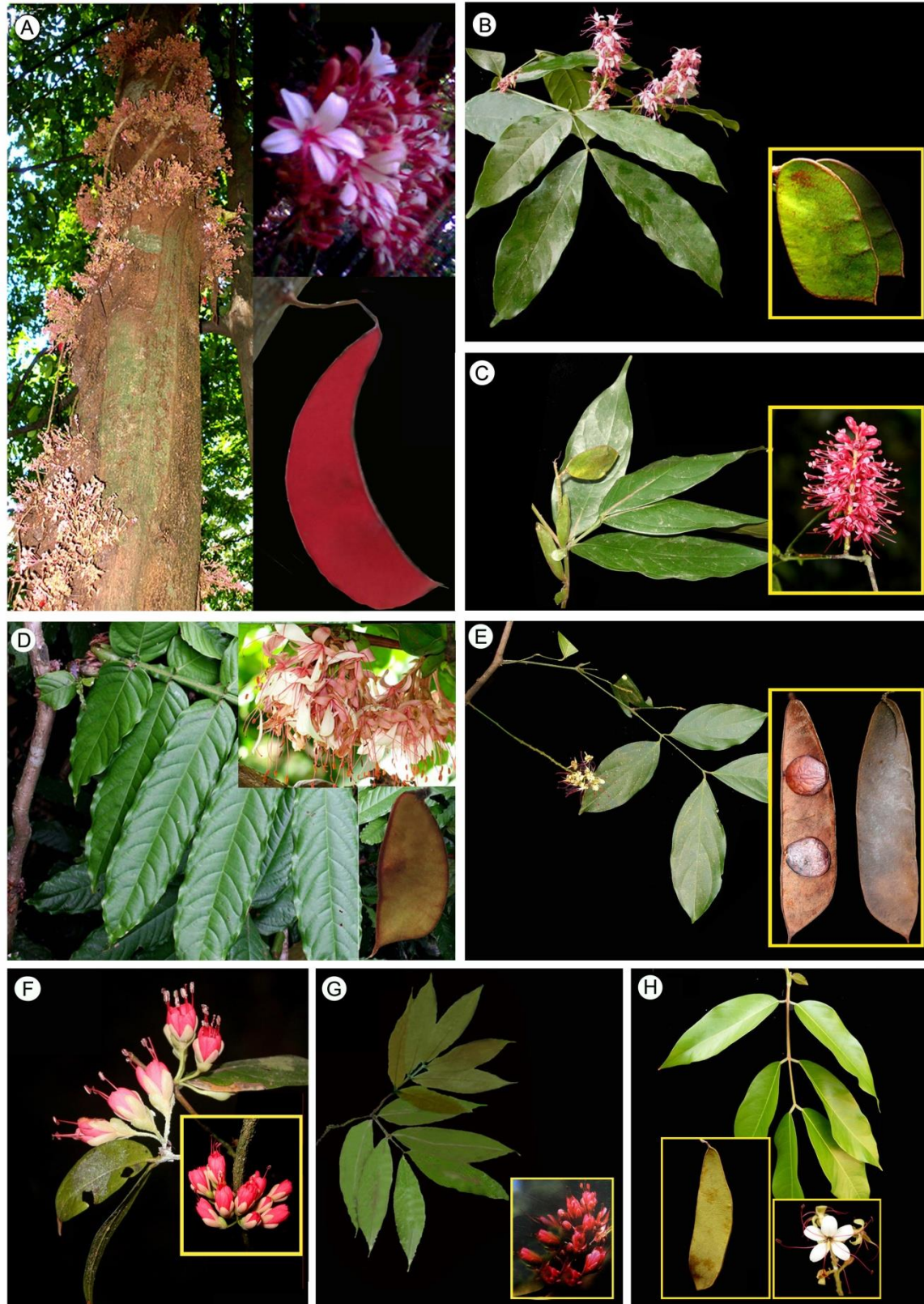


Fig. 2: A, *H. bourdillonii*; B, *H. brunonis* var. *brunonis*, C, *H. brunonis* var. *raktapushpa*; D, *H. decurrens*; E, *H. sanjappae*; F. *H. unijuga* var. *unijuga*; G. *H. unijuga* var. *trijuga* & H. *H.vahliana*.

DISCUSSION

Humboldtia is a legume genus of small to medium-sized trees grows in the moist evergreen and semi-evergreen forests mostly along streams and streamlets at 150-1250 m altitude asl. Most of the species are growing gregariously in patches of few to hundreds of individuals with only a few other taxa intermixed. *H. brunonis*, *H. decurrens* and *H. laurifolia* are myrmecophytes with fistular internodes providing nesting sites for ants, bees and wasps. *H. bourdillonii* is Endangered, *H. decurrens* is Near Threatened, *H. laurifolia* is Vulnerable and *H. vahliana* is Endangered according to IUCN [6]. Field studies reveals that *H. bourdillonii*, *H. brunonis* var. *raktapushpa*, *H. sanjappa* and *H. unijuga* var. *trijuga* which are restricted to their type localities, qualifies to the Critically Endangered status of IUCN and a single threatening event can wipe out the entire taxon from the globe. Immediate efforts are needed to raise the seedlings of threatened species of *Humboldtia* in nurseries for ex-situ conservation or for further reintroduction into the wild. Fortunately most of the localities of *Humboldtia* are well within reserve forests and protected areas, though forest fires, landslides, poor regeneration etc are threats to this genus in India.

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