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NOTES ON THE GENUS *BAUHINIA* IN THAILAND

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The revision of the Caesalpiniaceae for *Flora of Thailand* has now been completed. It is remarkable that no species new to science have been found in the very extensive material studied. A number of species new to Thailand, however, have been discovered, particularly in the evergreen forests of Peninsular Thailand and in the mountains in the north of the country.

The variability of the species have during the work been elucidated to a higher degree than previous and a number of infraspecific taxa described. Furthermore several nomenclatural problems have been solved. The new data have been published currently with the main contribution in *Flore du Cambodge, du Laos et du Vietnam*, Vol. 18. Paris 1980. A few taxonomic and nomenclatural problems remains to be published as the editorial rules do not permit these in *Flora of Thailand*, where the treatment of Caesalpiniaceae will appear as Vol. 4, part 1.

I. Bauhinia glabrifolia (Benth.) Baker

In 1852 Bentham described *Phanera glabrifolia* on a specimen sent out from the Botanical Garden in Calcutta under the name of *Bauhinia piperifolia* Roxb. He correctly in the protologue draws attention to that the specimen in question does not match Roxburgh's description of *Bauhinia piperifolia* in *Flora Indica*, but does not suggest which species Roxburgh's description fit. It is a very short diagnose: "12. *B. piperifolia* R. — Scandent, smooth. Leaves entire, cordate, from five to seven-nerved, lucid. Panicles terminal. Legumes round to oval, one or two-seeded". These combination of characters match only one Indian species of *Bauhinia*, viz. *B. scandens* L. Even if no type-material or drawing have been found there is no doubt that *B. piperifolia* Roxb. is synonymous with *B. scandens* L.

The "Calcutta-specimen" is therefore to be regarded as the type-specimen of *Phanera glabrifolia* Benth. later on transferred to the genus *Bauhinia* by Baker, 1878, in J. D. Hooker's *Flora of British India*, where 2 collections are quoted, viz. the "Calcutta-specimen" and a plant collected by Helfer in Tenasserim, Helfer's specimen, entirely different from the "Calcutta-specimen" was first

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mentioned by Kurz (1876), referring to Helfer's collection *No. 1879* and *1880* as *B. piperifolia* Roxb. In his *Forest Flora of British Burma* 1 : 400, 1877, he probably draw the decription of *B. piperifolia* from these two collections; the description of the pods as being round or oval, glabrous and one–two-seeded, he took from Roxburgh (1.c.) thus mixing characters from *B. scandens* L. and the Helfer-material. He furthermore described the ovary as being smooth, but the ovary in Helfer's material is densely hairy along both sutures. The ovary of this taxon, which is now known from several localities from Tenasserin southwards through the west coast of Thailand and Malaya is 5–6-seeded. The pod, known from Thailand is strap-shaped, 10–11 x 4 cm and 3–4-seeded.

In 1897 Prain wrote a paper on the Leguminosae of India, an addition to Hooker's flora; here he deals with two species, *Bauhinia piperifolia* Roxb. and *B. glabrifolia* Baker. Prain retains the name *B. piperifolia* for the "Calcutta specimen", as he thinks this specimen match the diagnose of Roxburgh only paying attention to the leaf-character, not to the pods. The name *B. glabrifolia* he uses for the "Helfer-specimen" which is not legitimate.

Prain (1.c.) also adds *Bauhinia diptera* Bl. ex Miq. to the synonyms of his *B. glabrifolia* this was corrected by **de Wit** (1956).

The specimens dealt with here, however, are closely related and furthermore closely related to *B. sericea* Lace (see below). The nomenclatural and taxonomic investigation lead up to the establishing of three varieties under *B. glabrifolia.*

KEY TO VARIETIES OF *B. glabrifolia*

1. Ovary glabrous — 1. var. *glabrifolia*
1. Ovary hairy on both sutures
   2. Pedicels up to 17 mm long; flower-buds 2–3 mm diam., bracts 4–5 mm long ± persistent; staminodes O — 2. var. *maritima*
   2. Pedicels more than 18 mm long; flower-buds 4–5 mm diam., bracts 2–3 (–4) mm long; ± caducous, staminodes 3–4 (–5), 3–5 mm long — 3. var. *sericea*

1. Bauhinia glabrifolia (Benth.) Baker var. **glabrifolia**

Bauhinia glabrifolia (Benth.) Baker in Hook. f., Fl. Brit. Ind. **2** : 281. 1879, excl. *Helfer, 1879* (& "*1789*"), 1880.— *Phanera glabrifolia* Benth. in Miq., Pl. Jungh. : 263. 1852 — *B. piperifolia* auct, non. Roxb., Prain J. Asiat. Soc. Bengal, **66**(2) : 500. 1897.

Type: Bot. Gard. Calcutta, cult., lectotype in K.— The origin of the type is unknown.

Tendrilled climber, young branches reddish-brown, later glabrous. *Leaves* ovate, up to 18.5 x 15 cm, 9-nerved; apex shallowly bifid to nearly 2-split with narrow sinus; tips of lobes acuminate often falcate; base cordate; upper surface glabrous, glossy; lower surface of young leaves with reddish hairs on the nerves, later glabrous; petiole up to 9 cm, glabrescent; stipules lanceolate, falcate, ca 5 mm long with reddish hairs outside.

Flowers in densely compound corymbose inflorescences with short axis; indumentum light brown; pedicels c. 25 mm; bracts triangular, 1.5 mm, early caducous; bracteoles setaceous, 1.5 mm, inserted at about the middle of the pedicel; buds globose with pointed apex, light brown, 4–5 mm long; receptacle turbinate 3–4 mm long, striate. *Calyx* splitting into 2–3 ± reflexed segments. *Petals* subequal, obovate to spatulate, 6–8 mm long including the short claw outside with reddish-brown hairs all over, inside hairy at claw and nerves. *Stamens* 3 fertile; filaments, 10–12 mm long; anthers ca 2 mm. *Staminodes* (3–)4, subequal, ca 3 mm long. *Ovary* 3–4 mm with a 1 mm stipe; style 4–5 mm; stigma small, capitate, all glabrous; ovules 8–10. *Young pod* (on inflorescence from C) 5–6 x 1.5 cm; mature pod (a loose pod from C said to belong to same material) woody-valved, oblong 14 x 5 cm with a 6 mm beak; seeds ca 5, flat oblong, 21 x 12 mm dark brown.

Material studied:

This variety is known only through the type sent out from the Botanic Garden Calcutta. We have seen material in the following herbaria C, G, K, M, and P; each place several herbarium-sheets are present. Prain l.c. add *B. lucida* Wall., Cat. No. 5770B as synonym, this is a sterile branch which cannot be determined with certainty.

2. Bauhinia glabrifolia (Benth.) Baker var. **maritima** var. nov.

Bauhinia glabrifolia auct. non (Benth.) Baker; Prain, J. Asiat. Soc. Bengal, **66** (2) : 500. 1897.— *B. piperifolia* auct. non Roxb., Kurz, J. Asiat. Soc. Bengal, **45** (2) : 232. 1876; For. Fl. Br. Burma **1** : 400. 1877.—*Phanera glabrifolia* auct. non Benth.; de Wit, Reinwardtia, **3** : 486. 1956.

Type : *Helfer 1880*, "Tenasserim & Andamans", lectotype in K.

Distribution : Burma (Tenasserim), Thailand (West coast of Peninsula), Malaya (Penang, Perak).

Deviate from var. *glabrifolia* and var. *sericea* (see below) by having smaller buds and all floral parts. Inflorescence narrower but with larger ± persistant bracts and bracteoles; petals outside hairy at base and on the central part of the blade, glabrous towards apex, staminodes absent. Sutures of ovary and stipe densely hairy.

Prain comments that Kurz' treatment of *B. anguina* Roxb. in Burma refers to this taxon, this is not correct. Kurz' description of *B. anguina* Roxb. is matching Roxburgh's, the correct name is *B. scandens* L.

Material studied:

Burma: "Tenasserim and Andamans", *Helfer 1879, 1800.— Helfer No. 1789* occurring in several herbaria (BM, C, GH, L, M, P) is probably a miswriting for *No. 1879.*

Thailand: Peninsular, Ranong, *Geesink 7453, Santisuk 682.*

Malaya: Penang, *Curtis 801, 1541*, Perak, Lurat, *Kings Coll. 4511, 6170, Scortechini s.n.*

3. **Bauhinia glabrifolia** (Benth.) Baker var. **sericea** (Lace) K. & S.S. Larsen in Fl. Camb., Laos, Vietn. **18** : 154 (1980). — *B. sericea* Lace, Kew Bull. 1915: 400. — *B. glabrifolia* (Benth.) Baker subsp. *sericea* (Lace) K. & S.S. Larsen, Nat. Hist. Bull. Siam Soc. **25** : 10 (1973). — *B. prabangensis* Gagnep., Not. Syst. **2** : 279 (1912).

Type: *Lace 6208*, Burma: Maymyo Plateau, lectotype in K.

Distribution: Burma (Maymyo Plateau), Thailand (Kanchanaburi), Laos (Luang Prabang).

In 1913 Gagnepain described *Bauhinia prabangensis* from Laos and in 1915 Lace established *Bauhinia sericea* from upper Burma. These two taxa are identical and so closely related to *B. glabrifolia* that the authors (1973) partly following Prain regarded them as a subspecies, characterized by the sericeous flowerbuds. After a closer study we prefer to treat them as varieties only.

Var. *sericea* deviates from var. *glabrifolia* in having ovary hairy on both sutures, stipe hairy to subglabrous. Leaves slightly emarginate to $\frac{1}{4}$ bifid, tip of lobes subacute to acuminate not falcate, base shallowly cordate to truncate, rarely obtuse, nerves 7–9. From var. *maritima* it is deviated by its larger buds and the longer pedicels.

Material studied:

Burma: Maymyo Plateau, *Lace 6208* & *Lace s.n.* Sept. 1911, April 1913, *Parkinson 6153*; Toungoo Distr., W. Swa Reserve, *C.G. Rogers 371.*

Thailand: Kanchanaburi, E. of Sangkhla, *Beusekom* & *Phengklai 412.*

Laos: Luang Prabang, *Thorel s.n.*; Paklai, *Thorel* s.*u.*

Finally it should be noted that de Wit (l.c.) joins *B. havilandii* Merr. from Borneo with *B. glabrifolia*. This we cannot accept. *B. havilandii* has only superficial resemblance with *B. glabrifolia*.

II. Bauhinia ornata Kurz

An extremely widespread and variable species of which we tentatively recognize 5 varieties. The full synonymy of the species is listed below.

B. ornata Kurz, J. Asiat. Soc. Bengal **42** (2) : 72 (1873). Typus : *Kurz2579*. Burma : Choungmenach, Pegu Yomah (Lecto- CAL).

Phanera rufa Benth. in Miq., Pl. Jungh. : 263(1852); Wall., Cat. No. 5798.

B. rufa (Benth.) Baker in Hook. f., Fl. Brit. Ind. **2** : 280 (1878) nom. illeg. : non *B. rufa* Steud. (1840).

B. kerrii Gagnep., Not. Syst. **2** : 173 (1912); in Fl. Gén. I.–C. **2** : 128, Fig. 3 (1913); Craib, Fl. Siam. Enum. **1** : 523 (1928). Typus : *Kerr 1740*. Thailand : Chiang Mai, Doi Suthep (Lecto- K).

B. balansae Gagnep., Not. Syst. **2** : 180 (1912); in Fl. Gén. I.–C. **2** : 136 (1913) Typus : *Balansa 2140*. Vietnam : Tonkin, Mt. Bavi

B. subumbellata Pierre ex Gagnep., Not. Syst. **2** : 180 (1912); in Fl. Gén. I.-C. **2** : 129 (1913). Typus : *Harmand 1119*. Vietnam : Attopeu (Lecto-P).

B. kerrii Gagnep. var. *grandiflora* Craib, Kew Bull. : 93 (1924); Fl. Siam. Enum. **1** : 523 (1928). Typus : *Kerr 2481*. Thailand : Chiang Mai, Chang Khian. (Lecto-K).

B. inflexiloba Merr., J. Arn. Arb. **21** : 369 (1940). Typus : *Petelot 2169*. Vietnam : Between Lao Cai and Chapa (Lecto-A).

B. petelotii Merr., J. Arn. Arb. **21** : 370 (1940). Typus : *Petelot 4879*. Vietnam: Bac Giang : Pho Vi (Lecto-A).

B. eberhardtii Gagnep., Bull. Mus. Hist. Nat Paris, ser. 2, **24** : 314 (1952). Typus : *Eberhardt 4741*. Vietnam : Bac Thai, Cho Gia (Lecto-P).

B. bakeriana S. S. Larsen, Grana **14** : 126 (1975), nom. superfl.

B. integrifolia auct. non Roxb. : Drake del Cast., in Morot, J. Bot. **5** : 218 (1891).

Key to varieties

1. Inflorescence subumbelliform, axis very short; pedicels filiform; ovary woolly hairy (Burma) 1. var. *ornata*
1. Inflorescence corymbose to racemose, pedicels not filiform.
   2. Leaves hairy at least on the lower surface; ovary hirsute—not appressəd hairy.

3. Style stout, hairy all way up to stigma; leaf-apex most often acuminate (Burma & Thailand) 2. var. *burmanica*

3. Style slender, glabrous towards the stigma; leaf-apex rounded to acute (Thailand, Laos, Vietnam, Burma and China) 3. var. *kerrii*

2. Leaves glabrous–subglabrous; ovary appressed hairy.

4. Flowerbuds globose; receptacle half as long as bud; indumentum of inflorescence reddish-brown; anthers glabrous (Vietnam) 4. var. *balansae*

4. Flowerbuds ovoid; receptacle as long as bud; inflorescence sparsely hairy, indumentum light-brown; anthers hairy (Laos, Vietnam) 5. var. *subumbellata*

1. var. **ornata**

The typical variety is restricted to upper Burma.

2. var. **burmanica** K. & S.S. Larsen, *var. nov. Lobis foliorum apice acuminatis, pedicellis crassioribus, inflorescentia corymbosa vel racemosa a var. ornata diversa.* Typus : *Keenan et al. 735.* Burma : Tavoy prope Paungdaw, alt. 250 m (Holo-E, Iso-A,K).

Material studied besides the type : Burma : *Keenan et al. 611* Tavoy, same locality as type., vern. name : Maha-Gehat. Fruit edible; boiled and distilled used as tonic; *Keenan et al. 745 & 1858* same locality as type; *Keenan et al. 1515* same locality as type but 700 m alt.

Thailand : *Beusekom et al. 4753*, Phrae, Mae Krai, 700 m alt.; *Larsen et al. 31815*, E. of Chaiyaphum, 600 m; *Sangkhachand 978* (*BKF 36558*), Uthai Thani, Ban Rai.

3. var. **kerrii** (Gagnep.) K. & S. S. Larsen in Fl. Camb., Laos, Vietn. **18** : 171 (1980).—*B. kerrii* Gagnep. 1. c.—*Phanera rufa* Grah. ex Benth. 1.c.—*B. rufa* (Grah. ex Benth.) Baker 1.c.—*B. kerrii* var. *grandiflora* Craib 1.c.—*B. eberhardtii* Gagnep. 1.c.—*B. bakeriana* S. S. Larsen.

Widespread from Burma to S. China.

4. var. **balansae** (Gagnep.) K. & S. S. Larsen in Fl. Camb., Laos, Vietn. **18** : 171 (1980).—*B. balansae* Gagnep. 1.c.—*B. petelotii* Merr. 1.c.

Endemic to Laos and N. Vietnam.

5. var. **subumbellata** (Pierre ex Gagnep.) K. & S. S. Larsen in Fl. Camb., Laos, Vietn. **18** , 172 (1980).—*B. subumbellata* Pierre ex Gagnep. 1.c.—*B. inflexiloba* Merr. 1.c.

Endemic to Laos and N. Vietnam.

For descriptions of the Thai varieties see *Flora of Thailand* for the Vietnamese and Laotic varieties see *Fl. Camb., Laos, Vietn.*

III. Bauhinia viridescens Desv.

Another widespread species but less polymorphous than *B. ornata*.

B. viridescens Desv., Ann. Sci. Nat. **9** : 429 (1826); Gagnep. in Fl. Gén. I.-C. **2** : 147 (1913); de Wit, Reinwardtia 3 : 413 (1956); K. & S. S. Larsen, Nat. Hist. Bull. Siam. Soc. **25** : 18 (1973); in Fl. Camb., Laos, Vietn. **18** : 133 (1980). Typus : Timor, without collector (Lecto-P.).

B. timorana Dcne., Nouv. Ann. Mus. Paris **3** : 466 (1834); Herb. Timor Descr. 138 (1835).

B. "*timoriensis*" Dcne. ex Baker in Hook. f., Fl. Br. Br. Ind. **2** : 276 (1878) in syn.

B. polycarpa Wall. ex Benth. in Miq., Pl. Jungh. : 261 (1852); Baker in Hook. f., Fl. Br. Ind. **2** : 276 (1878); Craib, Fl. Siam. Enum. **1** : 525 (1928). Typus : *Wallich, Cat. No. 5787.* Burma : Martaban (Holo-K, Iso-BM).

B. baviensis Drake del Cast. in Morot, J. Bot. **5** : 217 (1891). Typus : *Balansa 2137.* Vietnam : Tonkin, Mont Bavi (Lecto- P).

B. viridescens var. *baviensis* (Drake del Cast.) de Wit 1.c. : 414.

B. fusifera Fischer, Kew Bull. : 86 (1927). Typus : *Parkinson 1571.* Burma : Mandalay : Maymyo Road (Holo- K, Iso- ABD).

B. laui Merr., Lingn. Sc. J. **14** : 9 (1935); Chen, Lingn. Sc. J. **18** : 488, 489 (1939). Typus : *Lau 278.* China : Hainan : Ngai distr., Naam Shan Leng (Holo-NY, Iso- A,E,K,KYO,LU,P).

The species is distributed from Burma to Hainan in north and as far south as 10°N on the northern hemisphere. Besides this it has a small distribution area on the southern hemisphere (Fig. 15) it is one of the bicentric species mentioned by **Larsen, K. & S. S.** (1973) and **van Steenis** (1979).

We have studied the full range of variation and believe to have seen practically all material collected from the entire distribution area. While the species shows little variation in centre of its area some marginal population attracts special interest. Only in one case we have found it necessary to express this variation in the establishing of a new variety, i.e. var. **hirsuta** (see below).

KEY TO VARIETIES

1. Young parts glabrous	1. var. *viridescens*
1. Young parts densely covered with patent hairs	2. var. *hirsuta*

1. var. **viridescens.**

Amplified description:

Polygamous shrub up to 4 m high, in drier areas deciduous; young branches glabrous, rarely hirsute (var. *hirsuta*). *Leaves* : Stipules triangular

Figure 15. Distribution of *Bauhinia viridescens*. Following areas are dealt with in the text : a. Maymyo Plateau; b. Hainan; c. Lesser Sunda Islands; d. Sam Roi Yot. Open circles indicate area in which var. *hirsuta* occurs together with var. *viridescens*.

to setaceous 1.5–3.5 mm; intrastipular hairs often present, varying from tiny setae to a 3 mm long, curved spines; petiole glabrous to hairy 2–5 cm; blade ovate-orbicular 4–15 cm diam., bifid to $\frac{1}{3}$–$\frac{2}{3}$ with a broad sinus; base truncate to cordate, tip of lobes acute to acuminate, glabrous on upper side, rarely hairy (var. *hirsuta*), glabrescent or shortly pubescent on the lower side, particularly on the nerves; nerves 7–11.

Inflorescence in lax terminal and lateral racemes, 4–15 cm; bract deltoid, 1.5–5 mm; pedicels filiform, 1–3 mm, carrying in the lower half two minute bracteoles; buds varying in shape from narrow fusiform with 5 free sepal-tips c. 1 mm long or less, to ellipsoid with pointed to rounded apex and no free sepal-tips, glabrous to hairy, up to 10 mm. (shape also varying whether, ♂ ♀, or bisexual flowers, the ♀ normally more slender than the ♂); receptacle very short. *Calyx* spathaceous at anthesis. *Petals* subequal, greenish to whitish, obovate to lanceolate, 7–12 mm with a short claw. *Male flowers*: *Stamens* 10 fertile, shorter than the petals, the 5 exterior longer than the 5 interior; filaments hairy at base mainly adaxially; anthers oblong, 1–2 mm. *Ovary* rudimentary 2–5 mm; stigma 0; ovules 0. *Female flowers* : *Stamens* reduced, varying in number and size but without pollen. *Ovary* shortly stipitate, 6–8 mm, pubescent, style very short; stigma peltate. *Pods* dehiscent, flat with thin valves, glabrous, 5–9 by 0.7–1 cm; seeds 6–10, elliptic flat, c. 5 × 3 cm.

The following deviating populations have been found.

a. The Burmese collections. Most of the material from Burma originates from the Maymyo Plateau E. of Mandalay. It was described as *B. fusifera* Fischer on account of its fusiform buds often with the very apex of the sepals free in bud. We have found no other distinguishing characters, and also from other parts of the distribution area plants with slender buds and free sepal-tips have been recorded, e.g. Hainan, the Lesser Sunda Islands and from Thailand. As there is a considerable variation in size of buds we do not find it reasonable to maintain this species.

b. The Hainan collections. Material from Hainan was described as *B. laui* Merr. Only the rather larger buds separate most of these populations from typical *B. viridescens*; but plants with smaller buds are also found.

c. The Lesser Sunda Island collections. Only 5 collections exsist from Indonesia, i.e. from Timor, Flores and Wetar. All have rather small and slender flower buds even if not exactly of the same type as the Burmese collections. As mentioned above the type is from Timor.

d. The Sam Roi Yot population. In 1974 the authors had the opportunity to study an isolated population of *B. viridescens* growing on the extremely windswept limestone promontory, Sam Roi Yot at the E. coast of peninsular Thailand,

South of Prachuap Khiri Khan. The specimens were forming a shrub of cribbled bushes but with a distinct main stem, 3–4 cm diam. The leaves are the smallest found in the whole material, 4–5 cm diam. Flowers have not been seen but pods and seeds match well. We regard this as an ecotype which should be studied further under experimental cultivations. It should be noticed that small-leaved specimens also were found from Phrae in northern Thailand and in one collection from Burma.

2. **var. hirsuta** K. & S.S. Larsen *var. nov.* *Ramis juvenibus, paginis inferioribus foliorum, tota inflorescentia dense patenter hirsutis a var. viridescenti diversa.* Typus : *Larsen, R. & S. S. 33801*, Thailand : Kanchanaburi, Si Sawat, 600–700 m alt. (Holo-AAU).

Material studied other than type : Thailand : *Kostermans 1112A*. Kanchanaburi, King Saiyok, alt. 100–150 m; *Kasem 549* Kanchanaburi, Khao Monglai.

Several populations of this distinctive variety have been studied in nature by the authors in the limestone hills in the Kanchanaburi province. It occur over a fairly large area, and often together with var. *viridescens*. Besides the characteristic indumentum there is also a tendency to develop coarse intrastipular spines, a character which should be studied further.

LITERATURE

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