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A REVISION OF THE GENUS *BALIOSPERMUM* BL. (EUPHORBIACEAE) FOR THE INDIAN SUBCONTINENT

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ABSTRACT

A revision of the genus *Baliospermum* Bl. (Euphorbiaceae) for India and adjoining countries is presented. The genus is divided into two sections. Two species and Nine varieties are recognized for the region. Keys to taxa, nomenclature, descriptions and illustrations are presented. The opportunity is availed to reduce *B. balansae* Gagnep. of Vietnam to a variety of *B. calycinum* Muell.-Arg.

INTRODUCTION

The genus *Baliospermum* was established by Blume in 1825 with a single species, based on a collection from Java. The generic name is derived from Greek (*balios* = mottled, *sperma* = seed) referring to the marbled seeds. The type species, *B. axillare* Bl., is now known to be synonymous to *B. montanum* (Willd.) Muell.-Arg. based on *Jatropha montana* Willd. (1805), antedating *B. axillare* by 20 years. The species, owing to its wide range of distribution and variability, was described several times separately during the nineteenth century. Mueller-Argoviensis (1864, 1865, 1866) eventually described 3 additional species, namely *B. calycinum, B. sinuatum* and *B. micranthum,* from NE. India and Bangladesh. However, another 2 species attributed subsequently to the genus, viz. *B. reidioides* Kurz (1877) and *B. malayanum* Hook. f. (1887) have since been removed to other genera. J. D. Hooker (1887) added another species, *B. corymbiferum* from E. Himalaya. Craib (1911) described *B. siamense* from Thailand, while Pax & Hoffmann proposed 3 new species, viz. *B. effusum* (1912) from S. China (Yunnan), *B. suffruticosum* (1914) from NE. India and *B. meeboldii* (1914), also from NE. India. Gagnepain (1925) added *B. balansae* from Tonkin and Hurusawa & Tanaka (1966) *B. nepalense* from E. Himalaya. Recently Chakrabarty & Balakrishnan (1985) described a new variety of *B. calycinum* from NE. India and Long (1986) described *B. densiflorum* from Bhutan, Myanmar (Burma) and Yunnan.

The present revision reveals that *Baliospermum* is a small but difficult genus. Airy Shaw (1973) recognizes 6 species in the genus. However, in the present work only 2 species, *B. montanum* and *B. calycinum,* are recognized. It may be mentioned that except for *B. montanum,* the boundaries between all the other species described so far are by no means clear-cut and they appear to be closely linked to each other through innumerable transitions and therefore it seems impossible to demarcate them as distinct species. The extremes, however (recognized herein as varieties) may look like distinct species in absence of intergrading material. Both *B. montanum* and *B. calycinum* are in fact exceedingly variable polymorphic species.

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Of the two species, *B. montanum* is widespread from W. Himalaya and S. India to Indo-China, and W. Malesia. *B. calycinum* is less widespread, occurring in E. Himalaya (var. *calycinum*, var. *densiflorum*, var. *corymbiferum*, var. *nepalense*), NE. India (var. *calycinum*, var. *bracteatum*, var. *micranthum*, var. *sinuatum*), Bangladesh (var. *micranthum*), Myanmar (var. *corymbiferum*, var. *densiflorum*, var. *effusum*, var. *micranthum*, var. *siamense*), SW. China (var. *densiflorum*, var. *effusum*, var. *calycinum*), Vietnam (var. *balansae*) and Thailand (var. *effusum*, var. *micranthum*, var. *siamense*).

It is rather unfortunate that most of the collectors still do not note down adequate field data. From the meagre data which could be obtained from the field notes and compared with literature, it seems that species of the genus occur mainly in primary or secondary deciduous forests forming thick undergrowth and may also be found in open forests or mixed forests in damp places or along watercourses or in scrub jungles, waste places and cultivated fields (*B. montanum*), from sea level up to about 2000 m altitude (E. Himalaya).

The two species, *B. montanum* and *B. calycinum* are somewhat isolated taxonomically from each another, deserving distinct sectional ranks. The plants of *B. montanum* are mostly monoecious or rarely dioecious. The inflorescences are borne on main leafy branches and the male disk glands are connate into a column. The fruits are subglobose to turbinate-obovoid and intruded at the apex. The plants of *B. calycinum*, on the other hand, are dioecious or very rarely monoecious with axillary leafless inflorescences. The male disk glands are distinct and the fruits are depressed and slightly smaller than in *B. montanum* and not intruded at the apex. The sepals in female flowers of *B. montanum* do not enlarge in fruit but are more or less accrescent in *B. calycinum*.

As already stated, both *B. montanum* and *B. calycinum* are much variable, particularly with regard to the characters of leaves, inflorescences and male flowers. The varietal distinctions in *B. montanum* are not clear and without critical population studies, it does not seem possible to assign varietal names. On the contrary, most of the specimens of *B. calycinum* can be grouped more or less clearly on the above stated characters, leaving aside some intergrading materials. *B. calycinum* var. *micranthum* is recognizable at once by the thinly membranous leaves. Such thin texture of leaves is to be found only in one more variety, var. *effusum* which has broader leaves and narrower male inflorescences. Var. *effusum* is in fact somewhat intermediate between var. *micranthum* and var. *corymbiferum*. In addition to var. *effusum*, very narrow male inflorescences also occur in var. *sinuatum* and var. *corymbiferum*. Var. *sinuatum* connects var. *corymbiferum* to var. *calycinum*. Var. *siamense* is very close to var. *micranthum*, differing only in the stiffer texture of the leaves. Var. *nepalense* is closest to var. *corymbiferum*, its somewhat broader male inflorescence being the only distinction. Var. *densiflorum* differs from var. *nepalense* only in its elongate peduncle of male inflorescence with much shorter rachis. Var. *bracteatum* is exactly identical to var. *calycinum* except for the foliaceous bracts.

The male flowers of var. *micranthum* are usually minute (up to 1.5 mm in diameter) but this character is not always constant, to be found sometimes in var. *calycinum*, var. *corymbiferum*, var. *effusum* and var. *nepalense* and also occasionally in the other varieties. It is sometimes very difficult to identify the female plants as the characters of female inflorescences, flowers and fruits are rather uniform amongst the varieties of *B. calycinum*. The foliar characters of such female specimens are the only features which may be employed for varietal distinctions.

Perry (1943) reported the chromosome number of *B. montanum* to be 2n=28 (material obtained from cultivated plant in Arnold Arboretum, USA) while Sarkar *et al.* (1976) recorded the chromosome number for the same species to be n=22 (material obtained from Uttar Pradesh, India). In case both these counts are correct, the basic chromosome number may be x=7 and 11.

Punt (1962) studied the pollen grains of *B. montanum*. The grains are inaperturate with characteristic "Crotonoid" pattern of polygonally arranged clavate sexinous processes. The diameter of grain is about 43 μ m and the diameter of clavae is about 1.5 μm.

Baliospermum Bl., Bijdr. 603. 1825 ; Endl., Gen. Pl. 1116. 1836-40 ; Baill., Et. Gen. Euphorb. 394. 1858 ; Muell.-Arg. in DC., Prodr. 15(2) : 1125. 1866 ; Kurz, For. Fl. Brit. Burma 2 : 410. 1877 ; Benth. & Hook. f., Gen. Pl. 3(1) : 324. 1880 ; Hook. f., Fl. Brit. India 5 : 461. 1887 ; Pax in Engl. & Prantl, Pflanzenfam. III. 5 : 89. 1890 ; Prain, Bengal Pl. 2 : 946. 1903 ; Brandis, Indian Trees 583. 1906 ; Cooke, Fl. Pres. Bombay 2 : 608. 1906. Talbot, For. Fl. Bombay Pres. & Sind 2 : 478. 1911 ; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 24. 1912 & in Engl. & Harms, Pflanzenfam. ed. 2. 19c : 182. 1931 ; Haines, Bot. Bihar & Orissa 115. 1921 ; Ridley, Fl. Malay Penins. 3 : 312. 1924 ; Gamble, Fl. Pres. Madras 1342. 1925 ; Kanjilal *et al.*, Fl. Assam 4 : 201. 1940 ; Backer & Bakh. f., Fl. Java 1 : 497. 1963 ; Whitmore, Tree Fl. Malaya 2 : 68. 1973 ; Airy Shaw in Kew Bull. 36 : 267. 1981. *Type species* : *B. montanum* (Willd.) Muell.-Arg. (*B. axillare* Bl.).

Monoecious (*B. montanum*) or dioecious (*B. calycinum*, rarely *B. montanum*) shrubs, often somewhat herbaceous, rarely small trees (*B. montanum*, *B. calycinum* var. *corymbiferum* & var. *effusum*) or climbers or creepers (*B. calycinum* var. *micranthum*) up to 2 (-6) m tall ; branchlets angled or striate when young, often becoming more or less terete by age. *Leaves* simple, alternate, of various shapes, mostly broadly cordate-ovate, ovate to ovate-lanceolate or elliptic-oblong to obovate and oblanceolate, sometimes shallowly to deeply 3-5-lobed (*B. montanum*, *B. calycinum* var. *sinuatum*), 3-38 cm long, 1.5-13.0 cm broad, rounded to cordate or obtuse to acute or often subtruncate or cuneate at base, irregularly glandular-sinuate-dentate-serrate or occasionally subentire (*B. calycinum* var. *micranthum*) at margins, caudate-acuminate (cauda or acumen 5-35 mm long, acute) or occasionally subacuminate to acute (*B. montanum*) at apex, thinly membranaceous to thinly coriaceous, scabrid pubescent to glabrous above, softly puberulous or hirtellous to glabrous beneath, remaining green or turning yellow, brown or dark reddish-brown when dry, penninerved (as in *B. calycinum* var. *calycinum*, var. *bracteatum*, var. *micranthum*, var. *siamense*) or basally trinerved (as in *B. montanum*, *B. calycinum* var. *corymbiferum*, var. *densiflorum*, var. *nepalense*) ; midrib mostly flat or sometimes slightly raised above, raised beneath ; lateral nerves 3-18 pairs (the first pair often prominent and ascending to 25-55% way up to lamina), more or less prominent above, distinct beneath, ascending, uniformly curved (arcuate) or somewhat straight, terminating at margins and also joining the superadjacents forming loops (craspedodromous to semicraspedodromous) ; tertiary nerves faint to prominent above, prominent beneath, scalariform (percurrent), mostly unbranched or also branched in equal proportions, occasionally forming reticulations ; petioles 1 11 (-17) cm long, sparsely puberulous to glabrous, biglandular at apex (on upper side) ; glands discoid, sessile ; stipules lanceolate or obsolete, deciduous. *Inflorescences* leafy at the end of main branches (*B. montanum*) or axillary and leafless (*B. calycinum*), bisexual (*B. montanum*)

or unisexual (*B. calycinum*, occasionally in *B. montanum*), crowded towards ends of branches (*B. calycinum*), thyrsoid, the females often initially subcorymbose (few-flowered), finally thyrsoid or often racemiform (by elongation of rachis); bracts triangular, deltoid, subulate to linear-lanceolate, 0.5 - 4.0 mm long in male, 2 - 15 mm long in female, occasionally foliaceous (*B. calycinum* var. *bracteatum*). *Male flowers* : 1 - 5 mm diam.; pedicels 1.5 - 7.0 mm long, slender; sepals (4-) 5 (-6), free or shortly connate, orbicular, imbricate, thin, 1 - 3 × 1 - 3 mm, petals 0; disk glands connate and shortly cupular (*B. montanum*) or distinct, in the latter case transversely oblong or obcordate. Stamens 12 - 25, free, the outer shorter than the inner, 1.0 - 2.5 mm long; filaments slender (as in *B. calycinum* var. *micranthum*) or stout (as in *B. montanum*); anthers orbicular to wide ellipsoid or oblong or often squarish or reniform (*B. montanum*), 2-celled, adnate to a broad connective, basifixed, longitudinally and laterally dehiscent; pistillode 0; receptacle convex. *Female flowers* : pedicels 1.5 - 10.0 mm long, puberulous to glabrous; sepals 5 - 6 (- 10), sometimes accrescent in fruit (*B. calycinum*), lanceolate to oblong-elliptic or ovate or triangular, free or shortly connate, imbricate, 1 10 mm long, 1 - 3 mm broad; petals 0; disk cupular, crenate to entire; staminodes 0; ovary 3-locular, 1.0 - 2.1 × 1.2 - 2.8 mm, glabrous to sparsely or densely (*B. montanum*) puberulous, locules 1-ovuled; ovules anatropous; styles 3, free or shortly connate at base; stigmas mostly expanded and flabelliform, bilobed or bifid, recurved, rarely capitate (*B. calycinum* var. *calycinum*), 2.0 - 4.5 mm long. *Capsules* tricoccous, more or less depressed (*B. calycinum*) or not (*B. montanum*), often intruded at apex (*B. montanum*), 5 - 10 mm long, 7 - 13 mm diam.; sepals up to 11 × 4 mm; seeds ovoid or oblong-ellipsoid or orbicular, 4 - 9 mm long, 4.0 - 6.5 mm diam., glabrous, carunculate, marbled; endosperm fleshy; cotyledons broad.

The genus as circumscribed above is a natural one consisting of 2 species distributed from India to S. & SE. Asia, Yunnan, Tonkin and Malesia. It is placed by Webster (1975) under the tribe *Codiaeae* of subfamily *Crotonoideae* along with another 18 genera, of which *Baliospermum* is closely related to *Blachia* Baill., differing in being less shrubby (often subherbaceous), in the presence of foliar glands, the thyrsiform inflorescences and the apetalous flowers. From *Ostodes* Bl., it differs in being herbaceous, in apetalous flowers and in the free glabrous filaments of the stamens.

KEY TO THE SECTIONS

1a. Plantae plerumque monoeciae; inflorescentiae foliiferae; glandes disci masculi connatae in cupula (Plants usually monoecious; inflorescences leaf-bearing; male disk glands connate into a cup) .. *Sect. Baliospermum*

b. Plantae semper dioeciae; inflorescentiae aphyllae; glandes disci masculi liberae (Plants always dioecious; inflorescences leafless; male disk glands free) .. *Sect. Gymnanthemum*

KEY TO THE SPECIES

1a. Plants mostly monoecious; upper leaves often appreciably smaller than the leaves at lower nodes; inflorescences leafy; male disk glandes connate into a cup; ovary tomentellous; fruits often turbinate-obovioid, intruded at apex, larger, 8 - 10 × 11 - 13 mm .. 1. *B. montanum*

b. Plants dioecious; upper leaves not appreciably smaller than the leaves at lower nodes; inflorescences leafless; male disk glands distinct; ovary glabrous or sparsely pubescent; fruits depressed, not intruded at apex, smaller .. 2. *B. calycinum*

Sect. I. **Baliospermum**

Plantae plerumque monoeciae ; inflorescentiae foliiferae ; glandes disci masculi connatae in cupula

1. Baliospermum montanum (Willd.) Muell.-Arg. in DC., Prodr. 15(2): 1125. 1866 ; Kurz, For. Fl. Brit. Burma 2 : 410. 1877 ; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 25, fig. 6. 1912 ; Haines, Bot. Bihar & Orissa 2 : 115. 1921 ; Gamble, Fl. Pres. Madras 1342. 1925 ; Kanjilal *et al.*, Fl. Assam 4 : 202. 1940 ; Backer & Bakh. f., Fl. Java 1 : 497. 1963 ; Hurusawa & Tanaka in Fl. E. Himalaya 147, 4. f. 20 G, 1966 ; Airy Shaw in Kew Bull. 26 : 222. 1972 & 36 : 267. 1981 & 37 : 8. 1982 ; Whitmore, Tree Fl. Malaya 2 : 68. 1973 ; Srivastava, Fl. Gorakhpur 289. 1976 ; Oomachan, Fl. Bhopal 336. 1977 ; Babu, Herb. Fl. Dehra Dun 455. 1977 ; Naik, Fl. Osmanabad 315. 1979 ; Deb, Fl. Tripura 320. 1981 ; Short & Vickery in Enum. Fl. Pl. Nepal 3 : 194. 1982 ; T. Chakrab. in J. Econ. Taxon. Bot. 11 : 21. 1987.

Jatropha montana Willd., Sp. Pl. 4 : 563. 1805. *Type* : India, *Klein s.n.*, Herb. Cat. No. 17927 (B-WILLD : Microfiche ! -2 sheets).

Croton solanifolius Geisel., Croton. Monogr. 74. 1807. *Type* : India, Vahl *s.n.* (C : Microfiche !).

Baliospermum axillare Bl., Bijdr. 604. 1825 ; Baill., Et. Gén. Euphrob. 395. 1858 ; Miq., Fl. Ind. Bat. 1, 2 : 410. 1859 ; Hook. f., Fl. Brit. India 5 : 461. 1887 ; Woodrow in J. Bombay Nat. Hist. Soc. 12 : 372. 1899 ; Prain, Bengal Pl. 2 : 946. 1903 & in Rec. Bot. Surv. India 3(1) : 102. 1904 ; Cooke, Fl. Pres. Bombay 2 : 608. 1906 ; Brandis, Indian Trees 583. 1906 ; Haines, For. Fl. Chota Nagpur 233. 1910 ; Talbot, For. Fl. Bombay Pres. & Sind. 2 : 479, f. 508. 1911 ; Duthie, Fl. Upp. Gang. Plain 3(1): 107. 1915 ; Fischer in Rec. Bot. Surv. India 9(1) : 167. 1921 ; Ridley, Fl. Malay Penins. 3 : 312. 1924 ; Cowan & Cowan, Trees N. Bengal 119. 1929. *Type* : Java, *Blume* (L ?, *n.v.*).

Croton polyandrus Roxb., Fl. Ind. 3 : 682. 1832 ; Voigt, Hort. Sub. Calcutta. 156. 1845. *Type* ; "a native of the borders of hills of sweet water and moist high places amongst the Circar mountains", Roxburgh Icon. No. 452 *vide Roxburgh s.n.* (K)-left hand side specimen, BSI Neg. No. 8590 A (type ?).

Baliospermum indicum Decne. in Jacquem., Voy. Bot. 154, t. 155. 1841-4 ; Baill., Et. Gén. Euphorb. 395. 1858 ; Stewart, Punjab Pl. 192. 1869. *Type* : Bombay, n.d., Herb. *Lambert s.n.* (K : photo !) ; Assam, n.d., *no collector s.n.* (K : photo !) (types ?).

B. polyandrum (Roxb.) Wight, Ic. Pl. Ind. Or. t. 1885. 1842 ; Dalz. & Gibs., Bombay Fl. 232. 1861.

B. moritzianum Baill., *l.c.* 1858. *Type* ?

B. axillare Bl. var. *dioica* Haines, For. Fl. Chotanagpur 234. 1910. *Type* : India, Bihar, Chotanagpur, *Haines* (*n.v.*).

B. montanum (Willd.) Muell.-Arg. var. *dioica* (Haines) Haines, Bot. Bihar & Orissa 2 : 115. 1921.

B. calycinum sec. Balakr. & T. Chakrab. in J. Econ. Taxon. Bot. 5 : 197, f. 1. 1984, *non* Muell.-Arg. 1864.

B. razianum Keshav. et Yog. *apud* Keshava Murthy *et al.* in Curr. Sci. 56(10) : 486. 1987 (*sphalm.* '*raziana*') ; Tom Jose *et al.* in J. Econ. Taxon. Bot. 12(1) : 225, 1988, *synon. nov. Type* : India, Karnataka, Coorg dist., 24.10.1983, *Keshava Murthy* 4218 (Herb. RRCBI, Bangalore)—*n.v.* (Fig. 1).

Dioecious or rarely monoecious shrubs (often bushy), sometimes somewhat herbaceous or very rarely trees, up to 2 m tall ; branchlets angled and striate (often anafractuous), terete by age, brown or yellowish or greenish-yellow or greyish, 1.5-12.0 mm thick, glabrous, scattered adpressed yellow-puberulous when young. *Leaves* elliptic to oblong or broadly ovate to ovate-lanceolate

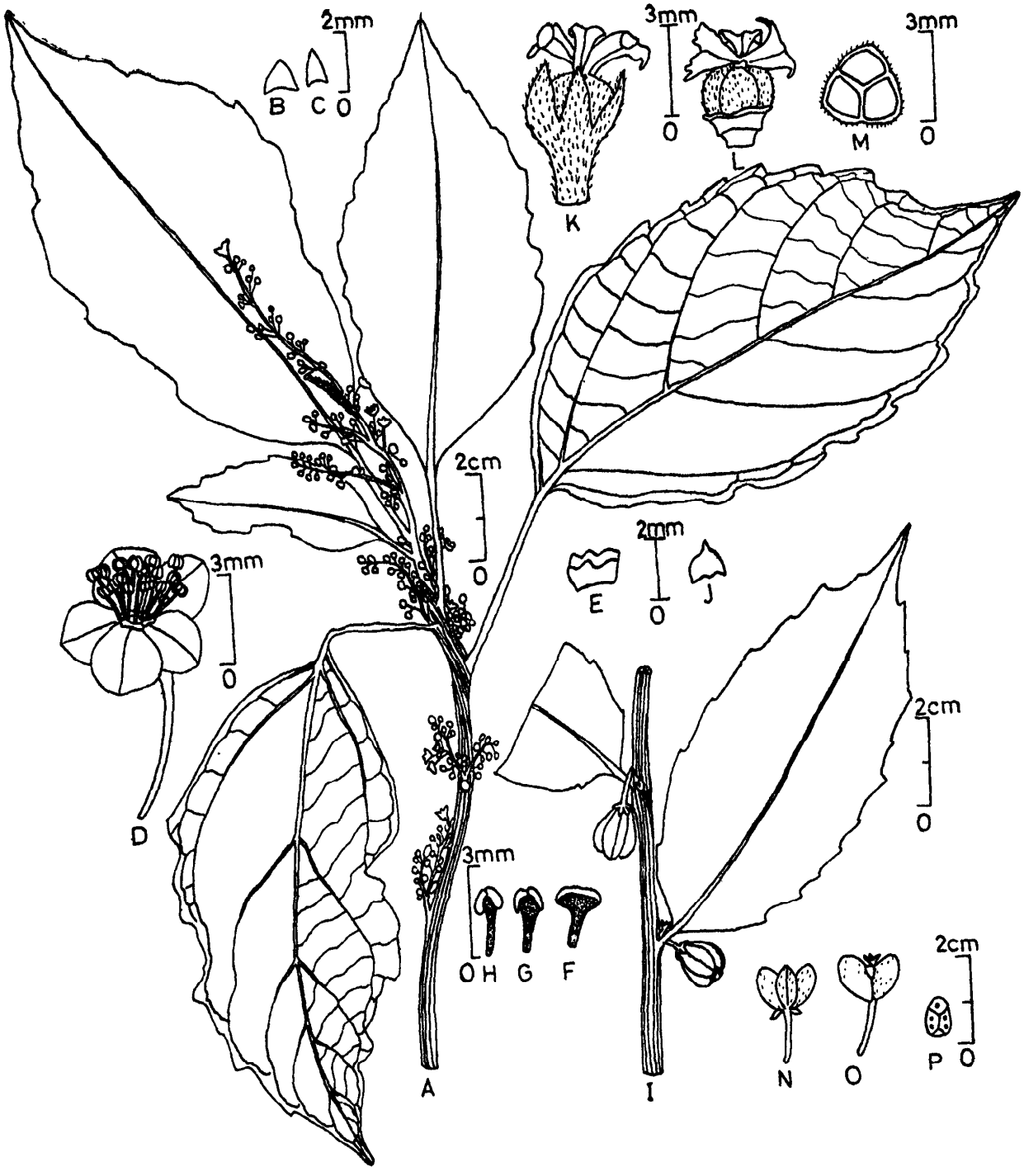


Fig. 1. *Baliospermum montanum* (Willd.) Muell.-Arg. A. Habit with male inflorescences. B—H. *Male*: B—C. Bracts. D. Flower. E. Disk (connate). F—H. Stamens. I—M. *Female*: I. Twig with flowers and fruits. J. Bract. K. Flower. L. Ovary with disk. M. T.S. of ovary. N—O. Fruits. P. Seed. [A: *Sebastine* 13882 (CAL); B—H: *Ansari* 122003 (BSI); I: *V. Singh* 3719(CAL); J—P: *Talbot* s.n. (BSI)].

or obovate or suborbicular, sometimes shallowly to deeply 2-5-lobed, 5 - 25 (- 38) cm long, 2.5 - 13.0 (- 18) cm broad (the upper leaves frequently much smaller than the lower ones), cordate to rounded or truncate or acute to obtuse or often cuneate at base, distantly repand-denticulate to coarsely sinuate- or crenate-dentate at margins, caudate-acuminate (acumen 5 - 25 mm long) or sometimes subacuminate to acute or occasionally rounded to obtuse at apex, chartaceous to membranaceous, scattered adpressed yellow-hispidulous to glabrous above, thinly tomentellous to sparsely pilose (on nerves) or glabrous beneath ; remaining green or greyish or orange-brown to dark brown or blackish above when dry, paler beneath, penninerved or prominently 3-plinerved at base ; lateral (secondary) nerves prominent, 3 - 15 pairs (the first pair short and weak or strong and extending to 30 - 55% way up the lamina), arcuate or somewhat straight or often irregularly curved ; tertiary nerves obscure to prominent above, faint to distinct beneath, scalariform, mostly unbranched or also branched in equal proportions ; minor nerves often prominent beneath ; petioles 1 11 (- 17) cm long, 1 - 4 mm thick, often striate, sparsely puberulous. *Inflorescences* bisexual or often unisexual, thyrsiform (as a whole), occasionally pseudoracemose, borne on main leafy branches, sparsely adpressed whitish- or yellowish-pilose ; bracts deltoid-orbicular or triangular to subulate, up to 1.5 mm long. *Male flowers*: 2.0 - 2.5 mm diam.; pedicels 2 - 7 mm long, up to 1.0 mm thick, sparsely adpressed, tomentellous to glabrous ; sepals 5, orbicular, 1 -2 mm long, 1.0 - 2.2 mm broad, sparsely adpressed yellow- or brown-puberulous to glabrous ; disk shortly cupular, lobed or crenate, *ca* 0.8 mm high ; stamens 14 - 25, 1 - 2 mm long ; filaments stout ; anthers reniform or orbicular, 0.3 - 0.5 mm long. *Female flowers* : pedicels 1.5 - 5.0 mm long, 1.0 - 1.7 mm thick, ochraceous-tomentellous or scattered strigose ; sepals 5, narrowly to broadly ovate to triangular or suborbicular to deltoid, 1.0 - 2.5 mm long, 0.5 - 2.0 mm broad, sometimes shortly acuminate ; disk cupular, 0.7 - 1.0 mm high, entire to crenate ; ovary subglobose, *ca* 2 mm long, 2.1 - 2.8 mm diam., 3-lobed, yellow-tomentellous ; styles 3, bifid, inconspicuous ; stigmas prominent, 2 - 3 mm long, bifid. *Capsules* subglobose to turbinate-obovoid, 8 - 10 mm long, 11 13 mm diam., strongly 3-lobed, intruded at apex, minutely adpressed yellow-pubescent to glabrous, greyish or brownish-pubescent to glabrous, greyish or brownish or blackish when dry ; pedicels 7 - 10 mm long ; seeds oblong to ovoid, 8 - 9 mm long, 5.5 - 6.5 mm diam.

Fl. & Fr. : Jan.-Dec.

Local names : Arabic : *Habbussaltine barri, Habbul saltinesahrai* ; Assamese : *Phul-jelong* ; Bengali : *Danti, Hakum* ; Burmese : *Nat-cho* ; Garo : *Phan-thap* ; Gujarati : *Dantimul* ; Hindi : *Danti, Hakum, Jungli-jamalgota* ; Kannada : *Danti, Kaduhalaru* ; Khasi : *Laam-dumuin* ; Malayalam : *Dantika, Nagadanti, Neruvaam, Nirantimuttu* ; Marathi : *Danti, Dantimul, Jamalgota* ; Persian : *Bedanjire khatai* ; Oriya : *Danti* ; Sanskrit : *Anukheti, Anukula, Bhadra, Danti, Dantika, Erandapatri, Gunapriya, Jayapala, Kumbhi, Madhupushpa, Mukunda, Nagadanti, Nagasphota, Nepala, Nikumbhi, Nishalya, Nishkumbha, Pratyakaparni, Raktadanti, Rechani, Ruksha, Shighara, Shweta ghanta, Sheynaghanta, Taruni, Udumbaraparani, Upachitra, Varahangi, Vishalaya, Vishodhini* ; Tamil : *Katalamanakku, Niradimuthu, Nirettimuthu, Peyamanakku* ; Telugu : *Ettadundiga, Kanakapala, Kondamudam, Nelajidi.*

Uses : A review of available literature (Roxburgh, 1832 ; Voigt, 1845 ; Dalzell & Gibson 1862 ; Cooke, 1906 ; Talbot, 1911 ; Duthie, 1915 ; Anonymous 1948 ; Oomachan, 1977 ; Perry, 1980) and field data reveals that *B. montanum* is used throughout its range as a medicinal plant since ancient times. Most of the data emphasize the high medicinal

value of the root and seed, particularly the drastic purgative property of the seed. In addition, the seeds are used externally as stimulant and rubefacient. The seed-oil is a powerful hydragogue, cathertic and is useful for external application in rheumatism. The stem is full of clear juice. Decoction of leaves is useful in asthma. The root is pungent, purgative, anthelminthic, diuretic, alexiteric, and also useful in pains, skin diseases and abdominal diseases. The root is also used in piles, wounds, enlarged spleen, itching, inflammations, anaemia, leucoderma and jaundice. As already stated by Watt (1889), "the vernacular names of *B. montanum, Croton tiglium, Jatropha glandulifera,* and *J. curcas* are confounded with each other in most districts of India."

In E. Himalaya, the species is much damaged by grazing.

Specimens examined (cited selectively) : BANGLADESH. dist. ? : Oude, n.d., *Wallich* 7763 (CAL, K-WALL : Microfiche). Chittagong dist. : Kodala hills, 30 miles from Chittagong, Apr. 1887, *King's coll.* 370 (CAL). Jessore dist. : Jessore, Dec. 1866, *Clarke* 4195 (CAL). Silhet dist. : Silhet, n.d., *Wallich* 8030 (? 8029G) (CAL). BURMA. Bhamo dist. : Bhamo, 10 Feb. 1868, *Henderson s.n.,* Herb. Acc. No. 417914 (CAL). Maymyo dist. : Mandalay, Laughing water, 8 Sept. 1931, *Ba Pe* 12215 (DD). Minbu dist. : Shinyedi, Jan. 1903, *Mokim* 1186 (CAL). Pegu : Prome, n.d., *Kurz* 2456 (CAL) ; Toukyeghat, n.d., *Kurz* 1593 (CAL) ; Prome et Repoe, Irrawaddy, 1876, *Wallich* 7727F (CAL, K-WALL Microfiche !). Rangoon, 22 Feb. 1914, *Rodger* 22 (CAL). S. Shan States : Taungyi, 1894, *Khalil s.n.,* Acc. Nos. 417898/903 (CAL) ; Keng Tung, Dec. 1909, *Mac Gregor* 926 (CAL). Tenasserim : *s.l. exact.,* Mar. 1911, *Meebold* 14556 (CAL). INDIA. Andhra Pradesh. E. Godavari dist. : Marendumilli, 21 May 1966, *Subba Rao* 27294 (MH). Kurnool dist. : Way to Ramanapenta-Nallamalais, 25 Oct. 1964, *Ellis* 22198 (MH). Assam. Kamrup dist. : Guahati, Loronia hills, 28 Feb. 1897, *Watt* 12232 (CAL). Nowgong dist. : Diphu, Saraikuchi plains, Feb. 1937, Bor 14072 (ASSAM). Bihar. Patna dist. : Mahuwar bagicha, 11 Mar. 1956, *Saran* 25584 (LWG) Singbhum dist. : Ladaburu, 28 Dec. 1960, *Subba Rao* 22872 (ASSAM, CAL). Nagar-Haveli : Dongerpad-Umberkoi, 7 Nov. 1970, *M. Y. Ansari* 122003 (BSI). Goa : Between Canacona & Balli, 13 Nov. 1962, *R. S. Rao* 847112 (CAL). Gujarat : Baroda dist. : Sheorajpur, 9 Jan. 1955, *Kaul* 18399 (LWG). Jammu & Kashmir : Kalpi, near Jammu, 18 Dec. 1952, *Hira Lal* 4039 (LWG). Karnataka : N. Kanara dist. : Kirwulloe, 5 Dec. 1884, *Talbot s.n.,* Acc. No. 8688 (BSI) ; *s.l. exact.,* 21 Dec. 1884, *Talbot* 1123 (CAL). Kerala. Malappuram dist. : Mancheri, 24 Feb. 1970, *Ellis* 33537 (MH). Palakkad dist. : Panthanthode, 18 Dec. 1969, *Vajravelu* 33124 (MH). Maharashtra. Amaravati dist. : Chikalada, 4 Feb. 1959, *Balapore* 57784 (LWG). Thane dist. : Way to Asheri, Manor range, 29 Oct. 1967, *Billore* 113303 (CAL). Madhya Pradesh. Bilaspur dist. : Shahpur, 14 Apr. 1965, *Panigrahi & Arora* 8519 (CAL). Rewa dist. : Rewa town, beside river Kutlai, 11 Feb. 1959, *Sebastine* 7703 (MH, CAL). Orissa. Kalahandi dist. : Sagoda village, near forest dept. quarter, 22 Mar. 1964, *Kapoor* 71347 (LWG). Mayurbhanj dist. : Karangia div., Simlipal hills, Barigaon forest, 30 Mar. 1964, *Kapoor* 72997 (LWG). Rajasthan. Banswara dist. : Khora forest block, 13 Oct. 1976, *V Singh* 3719 (CAL). Kota dist. : Chhabra, 17 Jan. 1969, *V. Singh* 90943 (LWG). Sikkim : *s.l. exact.,* n.d., *Gamble s.n.,* Acc. No. 417859 (CAL) ; Teesta valley, Reang, 19 Nov. 1908, *Craib* 201 (CAL). Uttar Pradesh. Almora dist. : Near Bageshwar, 15 May 1950, *Awasthi* 652 (LWG). Garhwal dist. : Kumaon, Jeolikote, 30 Oct. 1909, *Gill* 298 (CAL) ; Mirzapur dist. : Banmoshai, 14 Mar. 1970, *Panigrahi* 12634 (CAL). West Bengal. 24-Parganas dist. : Behala, n.d., *Sarkar* 91 (CUH).

Darjeeling dist. : Bamunpukur, Nov. 1897, *Gamble* 7421 (DD). JAVA : *sine loc. exact.* n.d., *Korthals s.n.*, Acc. No. 417936 (CAL); *ibid.*, n.d., *Horsfield s.n.*, Acc. No. 417937 (CAL). NEPAL : Beyond border off Bhiknathoree, 15 Mar. 1958, *Srivastava* 48917 (LWG); Between Teetagoon & Jagarkot, Bheri R., 2 Apr. 1952, *Polunin et al.* 3809 (CAL); Illam-Jog Mai-Ranga Pan, 8 Dec. 1963, *Hara et al.* 6306821 (CAL). THAILAND : Loc. illegible, 15 Jan. 1916, *Annadale* 1562 (CAL); Chiengmai, 16 Jan. 1910, *Kerr* 742 (CAL); Rehang div., Wang Chaw, 21 Jan. 1904, *Lindhard s.n.*, Acc. No. 418026 (CAL).

Distribution : India to SE. Asia, Indo-China, Malaya & W. Malesia.

Ecology : Peninsular India : In moist deciduous forests or forest undergrowths up to 1000 m altitude. SW. India : Frequent in open forests or in forest undergrowths or on hill slopes at low altitudes. Central India : Common in deciduous forests or scrub or moist shaded localities or along roadsides or waste places up to 1000 m altitude. NW. India : In cultivated fields, up to about 200 m altitude. N. India : Common in damp shaded forests or forests clearings or scrubs or along roadsides, ascending to 1300 m on W. Himalaya. E. India : Scarce in deciduous forests or scrubs up to 750 m altitude. E. Himalaya : In forests between 300-1200 m altitude. NE. India : In forests up to about 1000 m altitude. Bangladesh : No data available. Myanmar : Fairly common in evergreen forests, mixed forests or deciduous forests up to about 1250 m altitude.

Sect. II. **Gymnanthemum** T. Chakrab. & Balakr., *sect. nov.*

Plantae semper dioeciae; inflorescentiae aphyllae; glandes disci masculi liberis. (Plants always dioecious; Inflorescences leafless; male disk glands free).

Typus : *B. calycinum* Muell.-Arg.

2. Baliospermum calycinum Muell.-Arg. in Flora 47 : 470. 1864 & in DC., Prodr. 15(2) : 1126. 1866; Kurz, For. Fl. Brit. Burma 2 : 410. 1877, *in clavi*; Hook. f., Fl. Brit. India 5 : 462. 1887; Brandis, Indian Trees 583. 1906; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 28. 1912; Kanjilal *et al.*, Fl. Assam 4 : 203. 1940, *pro parte, excl. quoad* Khasi & Jaintia hills; Mukerjee & Malik in Rec. Bot. Surv. India 20(2) : 190. 1973. *Type* : NE. India, Mishmee, *Griffith* KD 4744 (K-holo; CAL-Iso).

KEY TO THE VARIETIES

1a.	Bracts of male inflorescences foliaceous	.. 2.2. *var. bracteatum*
b.	Bracts of male inflorescences not foliaceous	.. 2
2a.	Leaves thinly membranaceous	.. 3
b.	Leaves stiffer in texture	.. 4
3a.	Male inflorescences very narrow (lowest branches up to 1 cm long), almost racemiform towards apex	.. 2.5. *var. effusum*
b.	Male inflorescences broader (lowest branches 0.5-4 cm long), not racemiform towards apex	.. 2.6. *var. micranthum*
4a.	Male inflorescences very narrow (lowest branches 0.5-1.5 cm long)	.. 5
b.	Male inflorescences broader (lowest branches up to 4 cm long)	.. 6
5a.	Leaves narrowing towards base, often 3-lobed, penninerved	.. 2.9. *var. sinuatum*
b.	Leaves not narrowing towards base, unlobed, often basally trinerved	2.3. *var. corymbiferum*
6a.	Leaves narrow, 1 — 5.5 cm broad, elliptic, oblong-elliptic to obovate elliptic, penninerved	.. 2.8. *var. siamense*
b.	Leaves broad, 5 — 12 cm broad, ovate, cordate-ovte to orbicular or obovate, or often ovate-oblong, often strongly trinerved at base	.. 7
7a.	Rachis of male inflorescences up to 5 cm long, subtended by long bare peduncles	2.4. *var. densiflorum*
b.	Rachis of male inflorescences longer, subtended by shorter peduncles	.. 8
8a.	Leaves narrowing towards base, elliptic-oblong to obovate	.. 2.1. *var. calycinum*
b.	Leaves not narrowing towards base, mostly ovate	.. 2.7. *var. nepalense*

2.1. var. **calycinum** (Fig. 2).

Shrubs or undershrubs up to 2 m tall; young shoots densely fulvous-tomentose; branchlets angled and striate, often herbaceous, 2-6 mm thick, reddish-brown to greenish, sparsely fulvous-puberulous to glabrous. *Leaves* elliptic to oblong (often narrowly) or widely obovate to oblanceolate or panduriform, 13-34 cm long, 3.5-12 cm broad, rounded or acute or often subtruncate at base; shallowly denticulate-serrulate to coarsely crenate-dentate or sinuate toothed along margins, caudate at apex (cauda 10-35 mm long, acute); thinly chartaceous to thinly coriaceous, sparsely ochraceous-hispid to glabrous above, thinly and minutely fulvous- or yellowish-pilose beneath (mainly on nerves), remaining green or turning blackish-brown or purplish above when dry, pennineryed; lateral nerves 7-15 pairs (the first pair equal to or weaker than the subsequent pairs), prominent, arcuate or somewhat straight; tertiary nerves obscure to prominent above, distinct beneath, scalariform; petioles 1-10 cm long, 1.5-2.0 mm thick, puberulous. *Male inflorescences* axillary, 6-32 cm long, pubescent towards apex; peduncles (0-) 3.5-18.0 cm long; lower branches 3-8 cm long; bracts subulate, 1-2 mm long. *Flowers* : 2-4 mm diam.; pedicels 2-5 mm long, 0.3-0.5 mm thick, sparsely puberulous; sepals 5, orbicular, 1.5-2.5 mm long, 2-3 mm broad, shortly somewhat adpressed fulvous-puberulous; disk glands 5, transversely oblong, 0.5-0.7 mm long, 0.7 1 mm diam.; stamens 12-20, 2.0-2.5 mm long; anthers orbicular or squarish, 0.4-0.6 mm long. *Female inflorescences* initially appearing subcorymbose, finally thyrsiform or falsely recemiform, rarely flowers solitary, 3-17 cm long, puberulous; peduncles 1.5-14.0 cm long; bracts lanceolate to linear, 2-7 mm long. *Flowers* : pedicels 1-5 mm long, 0.5-1 mm thick; sepals 5-6 (-8), oblong-lanceolate to linear-lanceolate, 4-10 mm long, 1-2 mm broad, adpressed fulvous-puberulous; disk cupular, 0.4-1 mm high; ovary subglobose, 1.5-2.0 mm long, 2.0-2.5 mm diam., 3-lobed, scattered adpressed fulvous-puberulous; styles 3, more or less free; stigmas 2-3 mm long, stout, initially erect, finally recurved. *Capsules* tricoccous, depressed, 5-8 mm long, 9-10 mm diam., glabrous, brown when dry; seeds orbicular, 4-5 mm diam.

Fl. & Fr. : Jan.-Dec.

Specimens examined : INDIA. Arunachal Pradesh. Abor hills, Between Janakamukh to Dieng, 17 Dec. 1911, *Burkill* 37241 (CAL). Lohit dist. : Around Glow village, Dec. 1969, *Joseph* 48533 (CAL). Tirap dist. : Khonsa to Kheli, 22 Aug. 1958, *Panigrahi* 14929 (ASSAM). Subansiri dist. : Kimin to Khunipahad, 25 Sept. 1959, *Panigrahi* 19403 (ASSAM, CAL). Assam. Mikir hills dist. : Kaliani, 18 June 1963, *Deb* 35099 (ASSAM). BHUTAN : Sarbhanga div., *s.l. exact.*, 21 Dec. 1963, *Sen Gupta* 996 (CAL).

Distribution : NE. India, E. Himalaya.

Ecology : Common in shaded places in forests or amidst grasses, ranging from 300 m to 2000 m altitudes on E. Himalaya.

The date of publication of both *B. calycinum* and *B. sinuatum* are same (1864), and the former name is chosen for the combined species.

The leaves are usually narrowing down towards base. The male inflorescences are broader than in all other varieties. The female inflorescences initially appear subcorymbose but finally become thyrsiform or sometimes falsely racemiform by elongation of the rachis.

2.2. var. **bracteatum** T. Chakrab. & Balakr. in J. Econ. Taxon. Bot. 7 : 359. 1985. *Type* : India, Arunachal Pradesh, Lohit dist., Korom village, on way to Bishmak nagar, 5 Oct. 1969, *A. S. Rao* 48252 (CAL-Holo, et ASSAM-Iso.). (Fig. 3).

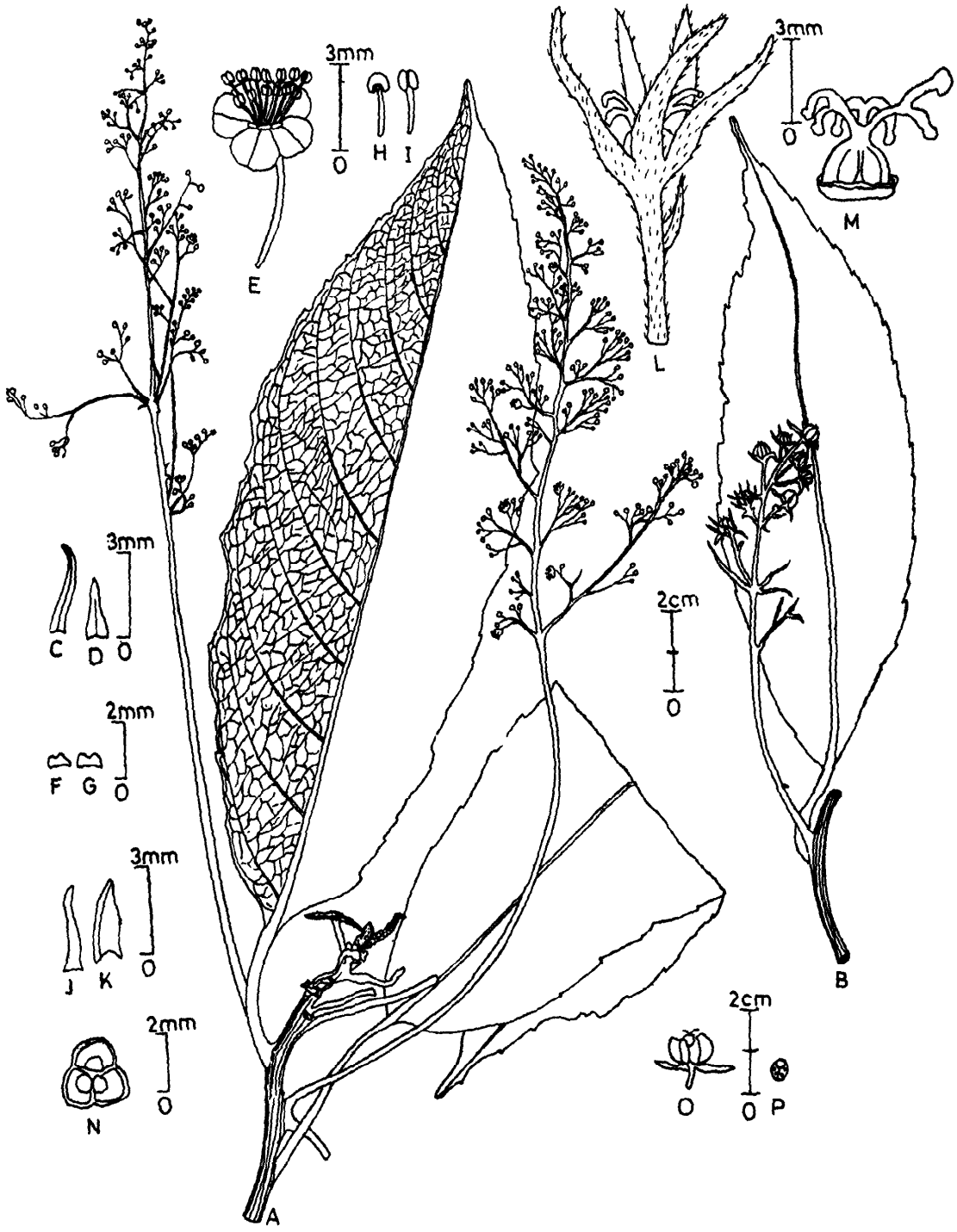


Fig. 2. *Baliospermum calycinum* Muell.-Arg. var. *calycinum* A. Habit with male inflorescences. B. Twig with female flowers. C—I. *Male*: C—D. Bracts. E. Flower. F—G. Disk glands. H—I. Stamens. J—N. *Female*: J—K. Bracts. L. Flower. M. Ovary with disk. N. T.S. of ovary. O. Fruit. P. Seed. [A: *Joseph* 48833 (CAL) ; B—H: *Panigrahi* 19403 (CAL) ; I: *Joseph* 48533 (CAL) ; J—N: Burkill 37241 (CAL)].

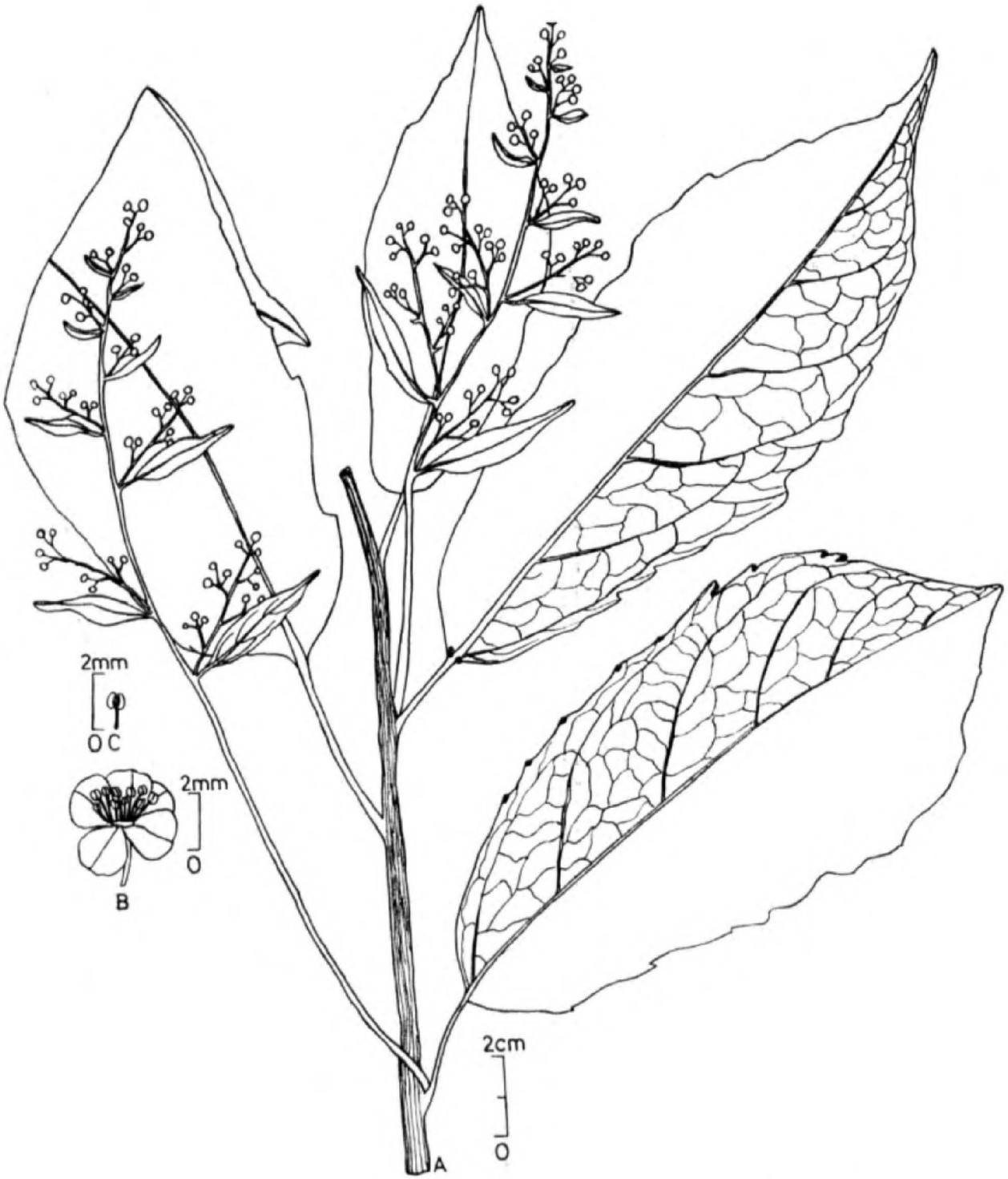


Fig. 3. *Baliospermum calycinum* Muell.-Arg. var. *bracteatum* T. Chakrab. & Balakr.
A. Habit with male inflorescences. B. Male flower. C. Stamen (All from type specimen).

Shrubs up to 2 m tall. *Leaves* obovate-oblong, 14 - 18 cm long, 4.5 - 7.5 cm broad, rounded at base, sinuate-dentate at margins, shortly caudate at apex, chartaceous, glabrous above, thinly fulvous-pubescent beneath (on nerves), penninerved ; lateral nerves 8 - 11 pairs, prominent ; tertiary nerves scalariform ; petioles *ca* 3 cm long. *Male inflorescences* 15 - 20 cm long, adpressed yellow-puberulous towards apex ; peduncles 5 - 10 cm long ; lower branches 3 - 5 cm long ; bracts foliaceous, narrow, oblong to lanceolate, 2.0 - 2.5 cm long, successively smaller. *Flowers* : 2 - 3 mm diam. ; pedicels 2 - 3 mm long, slender ; sepals 5, orbicular, 1.5 - 2.5 mm long, 1.8 - 3 mm broad, sparsely adpressed yellow-puberulous ; stamens *ca* 12, *ca* 2 mm long ; anthers orbicular, *ca* 0.5 mm long ; disk glands 5, transversely oblong, 0.4 - 0.6 mm long, 0.6 - 0.8 mm diam. *Female flowers* & *fruits* not seen.

Fl. : Sept.-Oct.

Specimen examined : Type only.

Distribution : NE. India (Arunachal Pradesh)-Endemic.

Ecology : No data available.

This variety is known only from the type. The leaves, male inflorescences and flowers are like those of var. *calycinum* but the foliaceous bracts are unique. The female plant is unknown.

2.3. var. **corymbiferum** (Hook. f.) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum corymbiferum Hook. f., Fl. Brit. India 5 : 463. 1887 ; Brandis, Indian Trees 583. 1906 ; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 26. 1912 ; Cowan & Cowan, Trees N. Bengal 114. 1929 ; Hurusawa & Tanaka in Fl. E. Himalaya 174. 1968 ; Mukerjee & Malick in Rec. Bot. Surv. India 20(2) : 190. 1973 ; Short & Vickery in Enum. Fl. Pl. Nepal 3 : 194. 1982 ; Balakr. & T. Chakrab. in J. Econ. Taxon. Bot. 5(2) : 249, fig. 1. 1984. *Types* : India, Sikkim, *King s.n.*, (K-Lectotype chosen herein, BSI Neg. No. 8594C in CAL) ; *ibid.*, 1875-6, *King s.n.*, (CAL-7 sheets) ; *ibid.*, *King s.n.*, (DD) ; *ibid.*, Pomong, 1219 m alt., 17 Aug. 1874, *King s.n.*, (CAL-5 sheets) ; *ibid.*, Paiheem, *J. D. Hooker s.n.* (K). West Bengal, Darjeeling dist., Sept. 1869, *Clarke* 9107 A (K, *n.v.*). East Nepal, Mai valley, *J. D. Hooker s.n.* (K). (Fig. 4).

Shrubs or woody herbs very rarely small trees up to 2(-3) m tall ; branchlets angled, striate, 3 - 8 mm thick, often subherbaceous, grey or brown, shortly ochraceous-pubescent to glabrous. *Leaves* ovate to elliptic or oblong-elliptic, 11 - 33 cm long, 6 - 13 cm broad, cordate to rounded or obtuse (sometimes subtruncate) at base, irregularly and coarsely sinuate-dentate or crenate-dentate along margins, caudate at apex (cauda 10 - 25 mm long, acute), thinly coriaceous to firmly membranaceous or rarely membranaceous, evanescently scattered ochraceous-hispidulous above, sparsely and softly ochraceous-puberulous (mainly on nerves) to glabrous beneath, remaining green or turning light to dark brown or reddish or blackish above when dry, penninerved or often trinerved at base ; lateral nerves 7 - 11 pairs (the first pair often strong and ascending to 25 - 45% way up the lamina), prominent, arcuate or somewhat straight ; tertiary nerves obscure to prominent above, distinct beneath, scalariform, occasionally forming reticulations ; petioles 1 - 11 cm long, 1.5 - 2.0 mm thick, sparsely puberulous to glabrous. *Male inflorescences* 5 - 35 cm long, very narrow (flowers often arranged in corymbiform clusters), sparsely ochraceous-puberulous to glabrous ; peduncles 1.5 - 23.0 cm long ; lower branches up to 1 cm long ; bracts triangular to subulate, 0.8 - 3.0 mm long. *Flowers* : (1.5-) 2.0 - 4.0 mm diam. ; pedicels 1.5 - 4.0 mm long, 0.4 - 0.6 mm thick, glabrous ; sepals 5 - 6, orbicular, 1.4 - 2.5 mm long, 1.5 - 2.5 mm broad ; disk glands 5 - 6, obcordate, 0.2 - 0.6 mm long, 0.6 - 0.9 mm

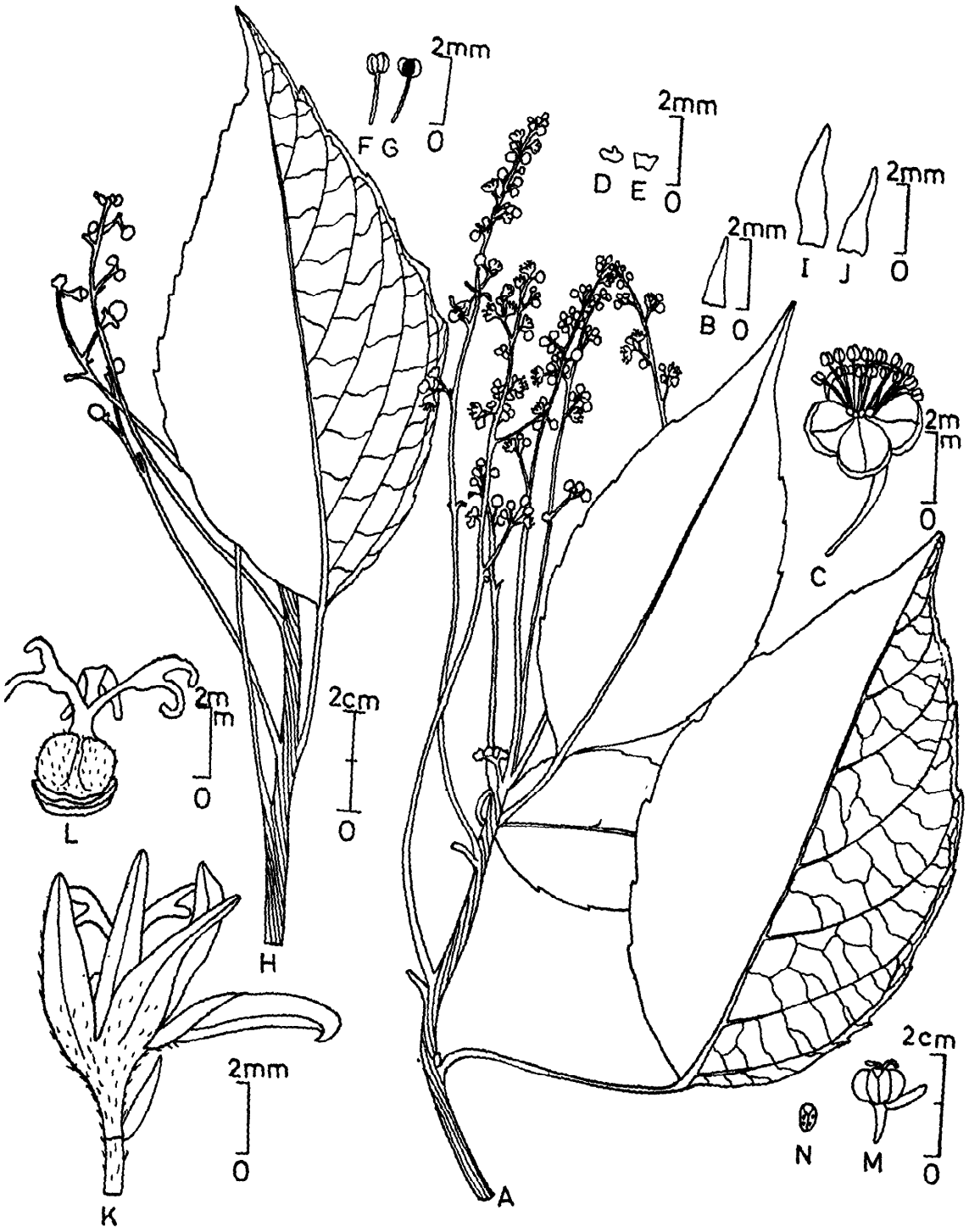


Fig. 4. *Baliospermum calycinum* Muell.-Arg. var. *corymbiferum* (Hook.f.) T. Chakrab. & Balakr. A. Habit with male flowers. B—G. *Male:* B. Bract. C. Flower. D—E. Disk glands. F—G. Stamens. H—L: *Female:* H. Twig with female flower buds. I—J. Bracts. K. Flower. L. Ovary with disk. M. Fruit. N. Seed. [A—G: *Smith* 210 (CAL) ; H, M—N: *Ribu* & *Rhomoo* 6828 (CAL) ; I—L: Coll. uncertain 222 (CAL)].

diam. ; stamens 16 - 18, 1 - 2 mm long ; anthers broadly ellipsoid to orbicular, 0.3 - 0.6 mm long. *Female inflorescences* 8 - 24 cm long, ochraceous-puberulous ; peduncles 5 - 22 cm long ; bracts subulate to linear, 4 - 13 mm long. *Flowers* : pedicels 1.5 - 4.0 mm long, 0.5 - 1.3 mm thick, puberulous ; sepals 5 - 6 (-10), unequal, oblong to lanceolate or narrowly ovate, 2.5 - 7.0 mm long, 1 - 2.5 mm broad, puberulous, accrescent in fruit ; disk cupular, crenate, 0.5 - 0.6 mm high ; ovary subglobose, 1 - 2 mm long, 1.3 - 2.5 mm diam., sparsely adpressed-pilose ; styles 3, very shortly connate, 2.0 - 4.5 mm long, bifid ; stigmas simple or flabelliform. *Capsules* tricoccous, slightly depressed, *ca* 7 mm long, *ca* 8 mm across, glabrous, smooth, dark reddish or reddish-brown when dry ; pedicels 5 - 7 mm long ; sepals 5 - 8 mm long ; seeds oblong-ellipsoid, *ca* 5 mm long, *ca* 4 mm diam.

Fl. & Fr. : May-Dec.

Specimens examined : BHUTAN : Samalachora, 11 Nov. 1964, *Deb* 56 (CAL). MYANMAR (BURMA). S. Shan States : Saga, 1893, *Khalil s.n.*, Herb. Acc. Nos. 418011/2/3 (CAL). INDIA. Sikkim : *s.l. exact.*, 21 Aug. 1872, *Gammie s.n.*, Acc. No. 417990 (CAL) ; Dikchu to Gangtok, 19 May 1955, *R. S. Rao* 664 (ASSAM, CAL) ; Singhik to Dikchu, 17 May 1927, *Coll. uncertain* 222 (CAL) ; Dikchu, 9 Dec. 1913, *Ribu & Rhomoo* 6823 (CAL) ; *ibid.*, 13 May 1959, *S. K. Mukerjee* 4972 (CAL) ; Tumlong, 8 July 1906, *J. M. Cowan* 20 (CAL). West Bengal. Darjeeling dist. : Mungpoo, 5 Oct. 1908, *W. W. Smith* 210 (CAL) ; Takdah, 3 Oct. 1903, *Quastru s.n.*, Acc. No. 417993 (CAL). Jalpaiguri dist. : Way to Buxaduar, 12 Aug. 1976, *Sikdar* 4599 (CAL).

Distribution : E. Himalaya (N. Bengal, Sikkim, Bhutan), Burma (S. Shan States).

Ecology : In open forests, between 600-1900 m altitude.

Nearest to var. *nepalense*, differing only in its very narrow male inflorescences. The male flowers are often arranged in corymbiform clusters.

2.4. var. **densiflorum** (Long) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum densiflorum Long in Notes R.B.G. Edinburgh 44 : 171. 1986. *Type* : Bhutan, Tashigang dist., E. side of Kori La, 27°17′ N, 91°20′ E, 2100 m, Evergreen Oak forest, "Dioecious shrub 2-3 m, male flowers white" ; 17 June 1979, *Grierson & Long* 2017. (E-Holo ; Iso in K, TI, THIMPHU)-*n.v.*

B. corymbiferum sec. Balakr. & T. Chakrab. in J. Econ. Taxon. Bot. 5 : 197. 1984, *non* Hook. f. 1887.

Erect herbs or shrubs, up to 1 m tall ; branchlets yellowish, angled and striate, 3 - 4 mm thick, glabrous. *Leaves* broadly ovate, cordate-ovate to narrowly ovate-oblong, 12 - 28 cm long, 4 - 10 cm broad, cordate to subcordate at base, coarsely dentate to denticulate-serrulate along margins, caudate-acuminate at apex (acumen 10 - 30 mm long), firmly membranaceous to thinly chartaceous, scattered adpressed ochraceous-hispidulous above, sparsely hirtellous to subglabrous beneath, weakly to prominently trinerved at base ; lateral nerves 6 - 10 pairs (the first pair ascending to 30 - 50% way up the lamina), more or less arcuate, tertiary nerves faint to prominent above, distinct beneath, scalariform ; petioles 2.5 - 10.0 cm long, 1.5 - 2 mm thick, glabrous. *Male inflorescences* 12 - 30 cm long, shortly ochraceous- or tawny-pubescent towards apex ; peduncles 7.5 - 25 cm long ; lower branches 1.5 - 3.5 cm long ; bracts subulate to linear-lanceolate, up to 11 mm long. *Flowers* : *ca* 4 mm diam., glabrous ; pedicels 2 - 4 mm long, 0.3 - 0.5 mm thick ; sepals 5, orbicular, 2 - 3 mm broad ; disk glands 5, transversely oblong to widely obovate, 0.2 - 0.3 mm long, 0.3 - 0.4 mm diam. ; stamens 14 - 20, 1.3 - 2.5 mm long ; anthers broadly ellipsoid to orbicular or oblong, 0.5 - 0.8 mm long. *Female inflores-*

cences 7.5 - 20.0 cm long, puberulous towards apex; peduncles 6.0 - 17.5 cm long; bracts 2 - 10 (-25) mm long, subulate. *Flowers* : pedicels 2.0 - 2.5 mm long, 1.0 - 2.5 mm thick; sepals 5, elliptic-lanceolate to ovate-lanceolate, 7 - 9 mm long, 1.7 - 3 mm broad, serrulate along margins; disk shortly cupular, crenate; ovary subglobose, 1.6 - 1.8 mm long, *ca* 2 mm diam., 3-lobed, glabrous; styles 3, *ca* 2 mm long, free, bifid. *Capsules* not seen.

Fl. : May-Sept.

Specimens examined : MYANMAR (BURMA). Kachin State : Kachin hills, Sidin, Sept. 1899, *Mokim* 38 (CAL); Myit Kyina, Hkam Kawn, 20 May 1929, *Coll. uncertain* 9972, 9973 (CAL).

Distribution : Myanmar, China (Yunnan), Bhutan (*vide* Long, *l.c.*).

Ecology : At 1200-1900 m in Myanmar (in evergreen Oak forests at 2100 m in type locality).

The long-peduncled male inflorescence with short rachis is distinctive for this variety.

2.5. var. **effusum** (Pax & Hoffm.) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum effusum Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 27, f. 7. 1912; Airy Shaw in Kew Bull. 26 : 222. 1972. *Type* : SW. China, Yunnan, Szemo, Waldern, 1600 m, *Henry* 12053 B, 12200 B-*n.v.* (Fig. 5).

Shrubs up to 2 m or trees 4 - 6 m tall; branchlets brown, angled, 3 - 5 mm thick, glabrous. *Leaves* broad, oblong to oblong-elliptic or ovate-oblong, rarely narrowly oblong, 15 - 33 cm long, 7 - 12 cm broad, rounded at base, shallowly and irregularly sinuate-dentate at margins, caudate at apex (cauda 15 - 25 mm long, acute), thinly (occasionally firmly) membranaceous, sparsely and evanescently white-puberulous above, glabrous beneath, remaining green or turning pale to dark brown above when dry, pennineerved, weakly trinerved at base; lateral nerves 6 - 10 pairs (the first pair somewhat prominent and ascending to 20 - 40% way up the lamina), arcuate; tertiary nerves faint to prominent above, distinct beneath, scalariform; petioles 3 - 10 cm long, 1.0 - 2.5 mm thick, glabrous. *Male inflorescences* very narrow, 10 - 18 cm long; peduncles 5 - 13 cm long; lower branches up to 1 cm long. *Flowers* : 1.5 - 2 mm diam.; pedicels 2 - 3 mm long, slender, sparsely puberulous to glabrous; sepals 5, orbicular, 1.5 - 2.0 mm long, 1.8 - 2.5 mm broad, sparsely puberulous to glabrous; disk glands 5, transversely oblong, 0.3 - 0.4 mm diam.; stamens 12 - 16, 1.5 - 2.0 mm long; anthers oblong, 0.3 - 0.4 mm long. *Female flowers & fruits* : not seen.

Fl. : Nov.

Specimens examined : MYANMAR (BURMA). S. Shan States : Fort Stedman, Nov. 1892, *Abdul Huk s.n.*, Herb. Acc. No. 418015 (CAL); *ibid.*, 1893, *Khalil s.n.*, Acc. No. 418016 (CAL); Taungyi, 1893, *Khalil s.n.*, No. 418014 (CAL).

Distribution : Endemic to Myanmar.

Airy Shaw (*l.c.*) has stated that this plant is somewhat intermediate between var. *micranthum* and var. *corymbiferum* "Male inflorescence narrow and long-peduncled, and leaves broad, as in the latter, but leaves thinly membranous and male flowers nearly as small as in the former."

2.6. var. **micranthum** (Muell.-Arg.) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum micranthum Muell.-Arg. in Linnaea 34 : 215. 1865 & DC., Prodr. 15(2) : 1126. 1866; Hook. f., Fl. Brit. India 5 : 462. 1887; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 26. 1912; Kanjilal *et al.*, Fl. Assam 4 : 204. 1940; Airy Shaw in Kew Bull. 26 : 222. 1972; Balakr., Fl. Jowai 2 : 430. 1983; Balakr. & T. Chakrab. in J. Econ. Taxon. Bot. 5: 197, f. 2. 1984. *Syntypes*: Bangladesh,

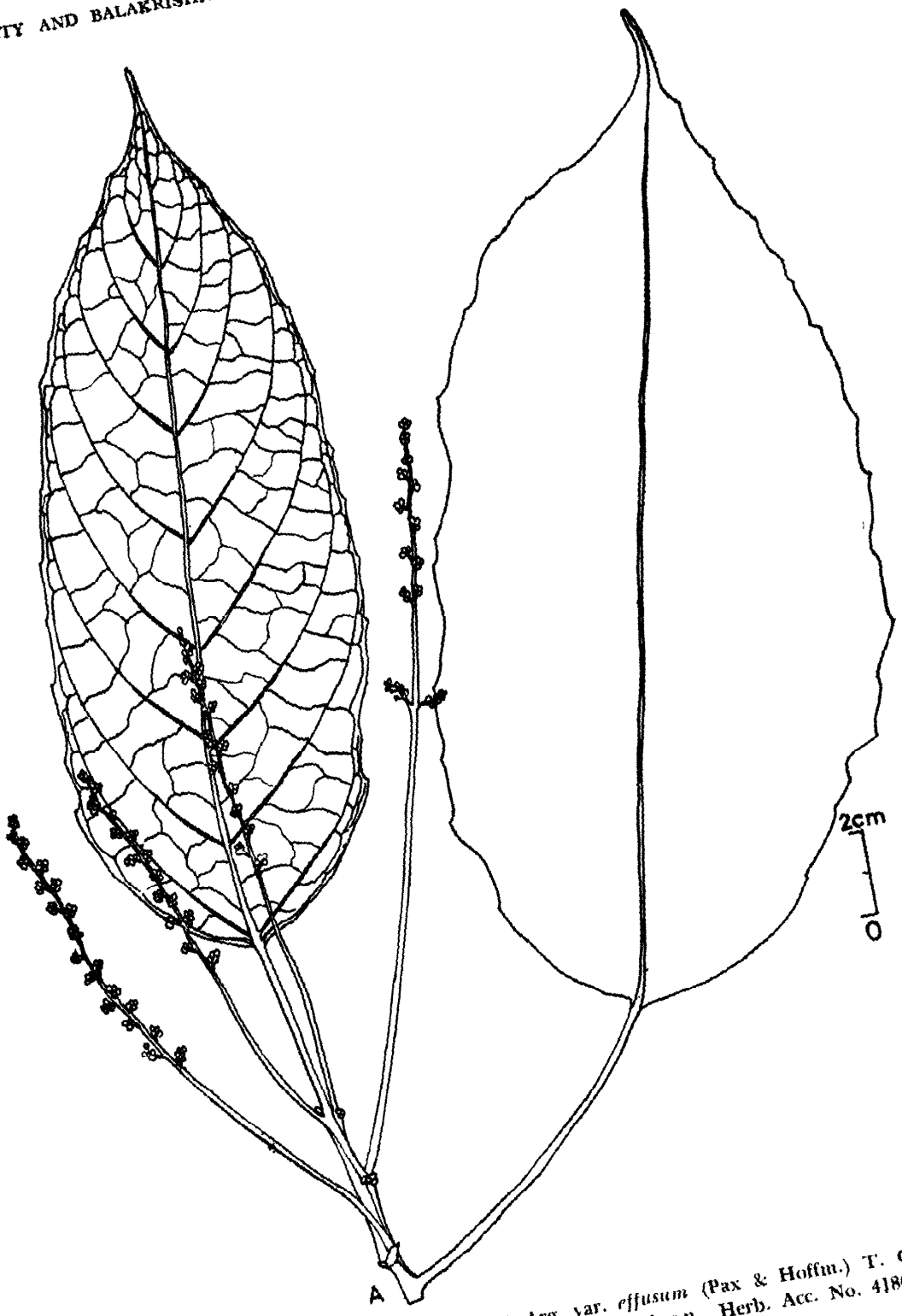


Fig. 5. *Baliospermum calycinum* Muell.-Arg. var. *effusum* (Pax & Hoffm.) T. Chakrab. & Balakr. A. Habit with male inflorescences. [*Abdul Huk* s.n., Herb. Acc. No. 418015 (CAL)].

Sylhet, n.d., *Wallich* 7715 A (CAL, K-WALL : Photo-4 twigs). India, Meghalaya, Khasi hills, 1861, *J. D. Hooker & T. Thomson s.n.* (K, *n.v.*, G-DC : Microfiche-2 sheets ; CAL, Acc. No. 417957) ; *ibid.*, n.d., *Griffith* EIC 392 (CAL, K : photo) ; *ibid.*, *Griffith s.n.* (K : photo).

B. meeboldii Pax & Hoffm. in Engl., Pflanzenr. IV. 147. vii : 414. 1914 ; Kanjilal *et al. l.c.* 202. 1940, *syn. nov. Type* : India, Manipur, Makru, Nov. 1907, *Meebold* 6278 (CAL).

B. suffruticosum Pax & Hoffm. in *l.c.* 414. 1914, *e. descr. Type* : India, Manipur, Narum, Nagaberge, n.d., *Meebold* 7437, *n.v.*

B. calycinum sec. Kanjilal *et al. l.c.* 203. 1940, *pro parte,* quoad Khasi & Jaintia Hills ; Balakr. *l.c.* 430. 1983 ; *non* Muell.-Arg. 1864. (Fig. 6).

Shrubs or often herbs, up to 3 m tall (twice noted as climber or creeper or scandent shrub-*Prazer* 144 in CAL & *Deb* 28473 in ASSAM) ; branchlets angled, striate, semiterete in age, 1.2 - 7.0 mm thick, green or yellow or brown ; scattered ochraceous puberulous to glabrous. *Leaves* elliptic, oblong-elliptic to elliptic-lanceolate or obovate to oblanceolate, 5 - 33 cm long, 1.5 - 8.0 cm broad, rounded, obtuse to acute at base, shallowly crenate-dentate-serrate to subentire along margins, caudate-acuminate (acumen 5 - 25 mm long, acute) to subacuminate at apex, thinly membranaceous, scattered ochraceous scabrid-pubescent to glabrous above, sparsely hirtellous on nerves beneath, remaining green or turning yellow or brown when dry, pennineerved or rarely weakly trinerved at base ; lateral nerves prominent, 6 - 18 pairs, arcuate or straight ; tertiary nerves obscure to prominent above, faint to distinct beneath, scalariform or sometimes forming reticulations ; petioles 0.5 - 10.5 cm long, 1 - 2 mm thick, puberulous to glabrous. *Male inflorescences* 2.5 - 30.0 cm long, minutely adpressed-pubescent ; peduncles 1 - 12 cm long ; lower branches 0.5 - 4.0 mm long ; bracts triangular to subulate, 0.5 - 1 mm long. *Flowers* : 1 1.5 mm diam. ; pedicels 2 - 5.5 mm long, 0.1 - 0.3 mm thick, sparsely puberulous to glabrous ; sepals 5, orbicular, 1 1.5 mm long, 1 - 1.6 mm broad, hyaline, adpressed ochraceous-puberulous to glabrous ; disk glands 5, transversely oblong, 0.2 - 0.3 mm long, 0.2 - 0.4 mm diam. ; stamens 10 - 20, 1 - 2 mm long ; filaments filiform ; anthers broadly oblong to squarish or orbicular, 0.2 - 0.6 mm long. *Female inflorescences* 2.5 - 14 cm long, few-flowered, often racemiform, scattered adpressed ochraceous-puberulous ; peduncles 1.5 - 10 cm long, slender ; bracts triangular, subulate to linear-lanceolate, 1 - 4 mm long. *Flowers* : pedicels 2 - 10 mm long, 0.4 - 0.6 mm thick, densely puberulous to glabrescent ; sepals 5, narrowly oblong-elliptic or triangular to ovate-lanceolate, 2 - 6 mm long, 1 - 2 mm broad, densely and evanescently adpressed ochraceous-puberulous, accrescent ; disk shortly cupular, 0.3 - 0.6 mm high, entire to crenate ; ovary subglobose, 1 1.8 mm long, 1.2 - 2 mm diam., 3-lobed, sparsely puberulous ; styles 3, 2 - 2.5 mm long, shortly connate below ; stigmas simple. *Capsules* tricoccous, depressed, 5 - 7 mm long, 7 - 10 mm diam., glabrous, green, brown or yellow-brown when dry ; seeds ovoid, 4.5 - 5 mm long, 3 - 4 mm diam.

Fl. & Fr. : Jan.-Dec.

Local names : Khasi : *Ja-pung-dih, Thilliski.*

Use : Leaves and flowers used as vegetable in NE. India.

Specimens examined : MYANMAR (BURMA). Chin hills, June 1892, *Huk s.n.*, Acc. Nos. 417977/85 (CAL). Kanpetlet dist. : Mindut, 9 July 1956, *Chit ko ko* 5670 (DD). Katha dist. : Kadu hills, 10 July 1911, *Lace* 5327 (CAL). Mandalay : Maymyo plateau, 6 Aug. 1912, *Lace* 5874 (CAL) ; *ibid.*, 5 Oct. 1912, *Lace* 5979 (CAL) ; *ibid.*, 27 June 1915, *Rodger* 164 (CAL). Mogok : Ruby mines

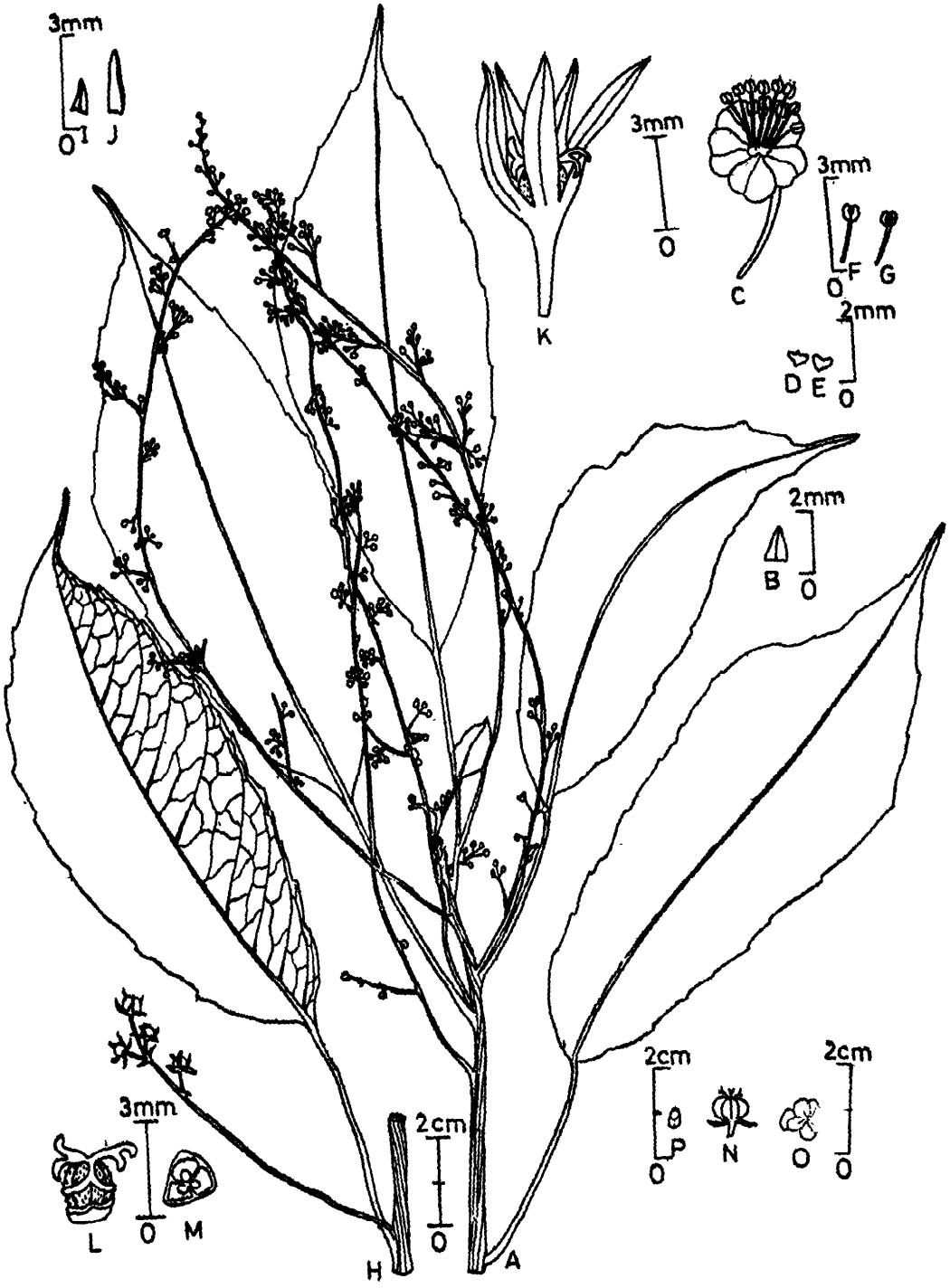


Fig. 6. *Baliospermum calycinum* Muell.-Arg. var. *micranthum* (Muell.-Arg.) T. Chakrab. & Balakr. A. Habit with male inflorescences. B—G. *Male*: B. Bract. C. Flower. D—E. Disk glands. F—G. Stamens. H—M. *Female*: H. Twig with female inflorescences. I—J. Bracts. K. Flower. L. Ovary with disk. M. T.S. of ovary. N—O. Fruits. P. Seed. [A.: Coll. uncertain, *Clarke* ? s.n. (CAL) ; B—G: *Balakrishnan* 42791 (CAL) ; H: *Clarke* 44810 B (CAL) ; I—M: *Griffith* s.n. (CAL) ; N—P: *Clarke* 15613 A (CAL)].

div., July 1910, *Rodger* 106 (CAL). Sebong hills, 7 July 1890, *Prazer* 144 (CAL). S. Shan States : *sine loc. exact.*, 1909, *Mac Gregor* 728 (CAL). Saikaw, 1896, *Abdul Khalil s.n.*, Herb. Acc. No. 417986 (CAL). INDIA. Meghalaya. Jowai dist. : Jaintia hills, Aug. 1883, *Clarke* 417950 (CAL) ; Dawki forest, 31 May 1935, *G. K. Deka* 12231 (ASSAM) ; Jarain, 13 Dec. 1885, *Clarke* 42469 (CAL) ; *ibid.*, 19 Aug. 1968, *Balakrishnan* 46808/33 (CAL) ; Jowai, 20 July 1965, *Balakrishnan* 42892 (CAL) ; Between Mawmluh to Mawshamok, 12 Oct. 1962, *Kapoor* 75681 (LWG) ; Mawmluh forest, 13 Oct. 1914, *Kanjilal* 4564 (ASSAM) ; Mawsynram to Balan side, 16 Sept. 1962, *Kapoor* 71506 (LWG). Khasi hills dist. : Nongstoin, 30 Sept. 1915, *Kanjilal* 5970 (ASSAM, CAL) ; *ibid.*, 21 June 1958, *Panigrahi* 16571 (CAL) ; Pynursulah, 4 Nov. 1938, *R. N. De* 18871 (ASSAM) ; *ibid.*, 26 Nov. 1956, *Panigrahi* 4582 (ASSAM, CAL) ; *ibid.*, 4 Oct. 1962, *Kapoor* 7555 (LWG) ; Cherrapunji, 12 July 1944, *G. K. Deka* 21813 (ASSAM) ; Khasi hills, 1841, *Griffith s.n.*, Acc. No. 417956 (CAL) ; *ibid.*, *Griffith* KD 4742 (CAL) ; *ibid.*, June 1877, *Kurz* 129 (CAL) ; *ibid.*, 28 Sept. 1867, *Clarke* 5433 (CAL) ; Laitlyngkot, 11 Aug. 1938, *R. N. De* 16854 A-B (ASSAM) ; Mawsmai, 17 Sept. 1913, *Kanjilal* 2597 (ASSAM, CAL, DD) ; *ibid.*, 22 Sept. 1967, *H. Deka* 37731 (ASSAM) ; Nongklaw, 14 Sept. 1886, *Clarke* 44810 B (CAL) ; *ibid.*, 26 Aug. 1885, *Clarke* 40167 E (CAL) ; Ramkhangswing, 23 Sept. 1913, *Kanjilal* 2638 (ASSAM, CAL) ; Thevia, 22 Oct. 1871, *Clarke* 15613 (CAL) ; Wah-Maw-iong, 20 Oct. 1917, *Kanjilal* 7283 (ASSAM) ; Walong, 21 Oct. 1877, *Clarke* 16210 A (CAL). Mizoram : Aizal, n.d., *Godfrey* 561 (CAL) ; Nashvanlaiphai, 21 Jan. 1963, *Deb* 31096 (ASSAM, CAL). Nagaland : Naga hills, June 1936, *Bor* 20772 (ASSAM).

Distribution : NE. India, Bangladesh, Myanmar, Thailand.

Ecology : NE. India : Common in primary forests or evergreen forests or open forests in shaded places or forest undergrowths at 300 - 2800 m altitude. Bangladesh : No data available. Myanmar : In primary forests or by the sides of springs in gullies or near watercourse at 500 - 1100 m altitude.

Recognizable by the thinly membranous leaves and minute (1.0 - 1.5 mm diam.) male flowers. Differs from var. *siamense* in the thinner texture of the leaves and from var. *effusum* in the narrower leaves and broader male inflorescence. *B. suffruticosum* (type not seen) does not appear to be distinct from this moderately variable variety. The supposed differences, *i.e.* the suffruticose habit, the fewer secondary nerves of leaves and the smaller fruits, do not hold good. Several collections bear more than one twig having both male and female specimens, giving a wrong impression that the plant is monoecious. There is otherwise no indication of monoecism.

2.7. var. **nepalense** (Hurusawa & Tanaka) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum nepalense Hurusawa & Tanaka in Fl. E. Himalaya 174. 1966 ; Short & Vickery in Enum. Fl. Pl. Nepal 3 : 194. 1982. *Type* : East Nepal, Below Mai Majuwa Dhara-Pani, 1500-1600 m, 4 Dec. 1963, *Collector* ?. TJ No. 6306822 (TI), *n.v.* (Fig. 7).

Shrubs, *ca.* 1 m high ; branchlets angled or somewhat compressed, striate, dark reddish or blackish or yellowish, 3 - 6 mm thick, scattered strigose to glabrous. *Leaves* broad, ovate, cordate-ovate to elliptic, often orbicular or occasionally narrowly ovate-oblong, 12 - 31 cm long, 5 - 12 cm broad, cordate to rounded or rarely subacute at base, irregularly and coarsely dentate-serrate to sinuate-serrulate at margins, caudate-acuminate (acumen 10 - 30 mm long, acute), firmly membranaceous to thinly chartaceous, rarely thinly coriaceous, scattered yellow-hispidulous to glabrous above, softly and sparsely puberulous (on

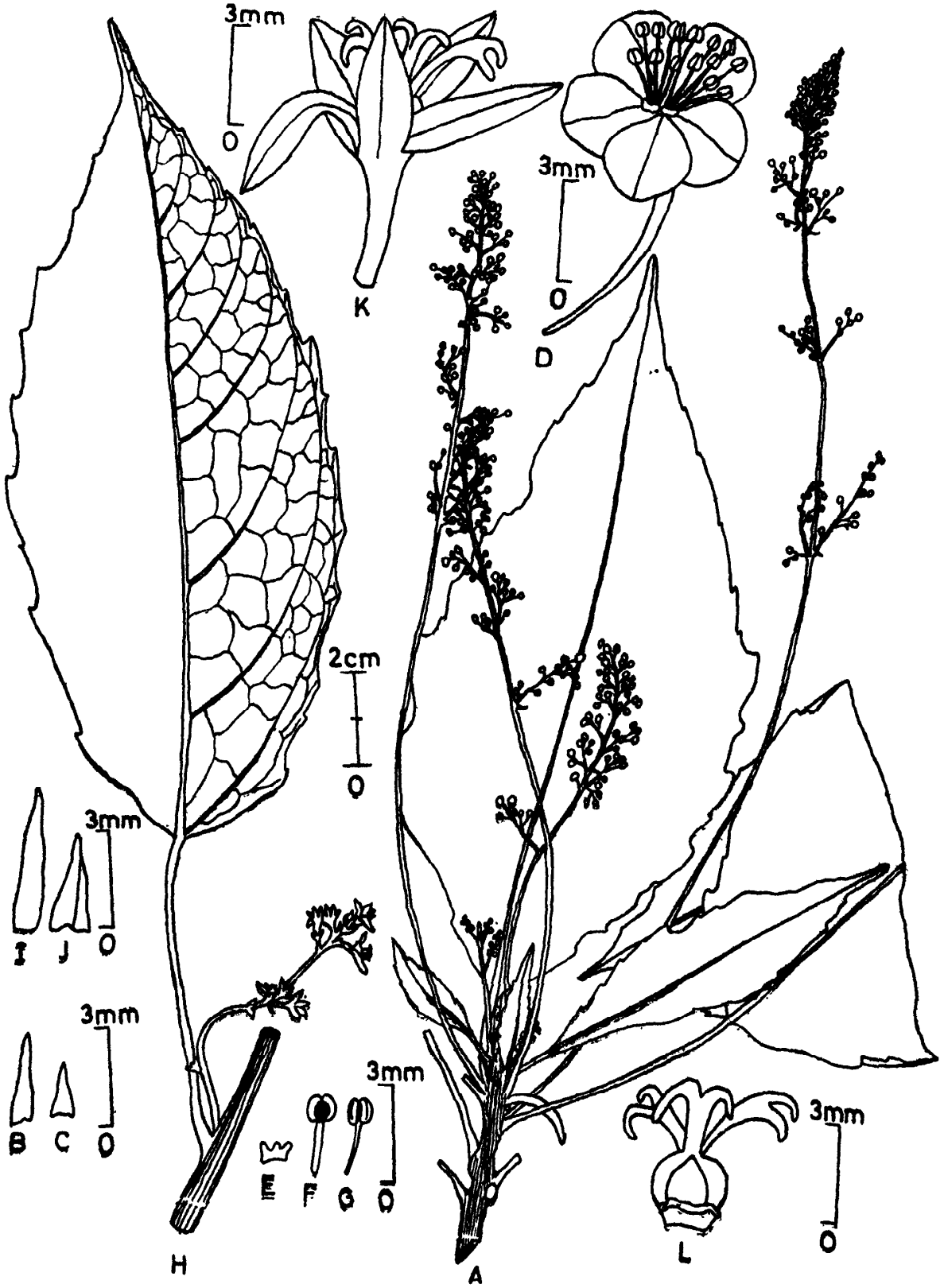


Fig. 7. *Baliospermum calycinum* Muell.-Arg. var. *nepalense* (Hurusawa & Tanaka) T. Chakrab. & Balakr. A. Habit with male inflorescences. B—G. *Male*: B—C. Bracts. D. Flower. E. Disk gland. F—G. Stamens. H. Twig with female inflorescence. I—J. Bracts. K. Flower. L. Ovary with disk. [A—G: *Mrs Townsend* 618 (CAL) ; H—L: *Parkes* s.n. (CAL)].

nerves) to glabrous beneath ; greenish to dark brown or dark reddish when dry, weakly to strongly trinerved at base ; lateral nerves 6 - 11 pairs (the first pair ascending to 20 - 50% way up the lamina), faint to prominent above, distinct beneath, arcuate ; tertiary nerves faint to prominent above, distinct beneath, scalariform ; petioles 2 - 10 cm long, 1.5 - 2 mm thick, sparsely puberulous to glabrous. *Male inflorescences* 6 - 35 cm long, adpressed yellow-puberulous to glabrous ; peduncles 2 - 16 cm long ; lower branches 2 - 5 cm long ; bracts subulate to linear-lanceolate, 1.5 - 4 (-11) mm long. *Flowers* : 2 - 5 mm diam. ; pedicels 3 - 4 mm long, 0.3 - 0.9 mm thick, glabrous ; sepals 5, orbicular, 1.5 - 3 mm broad ; disk glands 5, obcordate to transversely oblong, 0.3 - 0.5 mm long, 0.5 - 0.7 mm diam. ; stamens 14 - 20, 1.5 - 2.5 mm long ; anthers broadly oblong to orbicular, 0.5 - 0.8 mm long. *Female inflorescences* 2 - 20 cm long, yellow-strigose towards apex ; peduncles 1 - 17 cm long ; bracts triangular to linear-lanceolate, 2 - 15 mm long. *Flowers* : pedicels 2 - 6 mm long, 1 - 2.5 mm thick, puberulous ; sepals 5, wide-ovate or triangular to lanceolate, 3.5 - 9 mm long, 1.7 - 3 mm broad, sparsely puberulous to glabrous ; disk cupular, thin, 0.5 - 0.7 mm high, 2 - 2.5 mm diam. ; ovary 3-lobed, 1.6 - 2 mm long, 2 - 2.6 mm diam., glabrous ; styles 3, free, 2 - 3.5 mm long, bifid, stigmas simple or stout and flabelliform. *Capsules* not seen (said to be *ca* 6 mm long, *ca* 9 mm diam.).

Fl. : May-Nov.

Specimens examined : E. HIMALAYA : *sine loc. exact.*, n.d., *Mrs. Townsend* 618 (CAL). BHUTAN : *sine loc. exact.*, 1885, *Parkes s.n.*, Herb. Acc. No. 418006/7/8 (CAL). INDIA. *Sikkim* : *sine loc. exact.*, 14 Sept. 1887, *T. Thomson s.n.*, Acc. No. 418010 (CAL) ; Gangtok, 30 June 1945, *Bor's coll.* 119 (DD) ; Dikchu, 27 May 1959, *S. K. Mukherjee* 4977 (CAL) ; Teesta, 23 Oct. 1869, *Clarke* 10208 C (CAL) ; Toong, 6 July 1909, *Smith & Cave* 853 (CAL).

Distribution : E. Himalaya - Endemic.

Ecology : At 600-1850 m altitude.

Hurusawa & Tanaka (*l.c.*) compared *B. nepalense* with *B. balansae* Gagnep. of Tonkin., which has "inflorescentia mascula minore 20 - 30 mm longa et racemoso-spiciforme" However, var. *nepalense* is obviously near to var. *corymbiferum* and var. *densiflorum*, differing from the former in its somewhat broader male inflorescences and from the latter in the longer rachis of male inflorescences.

2.8. var. **siamense** (Craib) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum siamense Craib in Bull. Misc. Inf. Kew 1911 : 467. 1911 & in Aberdeen Univ. Stud. No. 57 : 194. 1912 ; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 26. 1912 ; Airy Shaw in Kew Bull. 26 : 223. 1972 ; T. Chakrab. & Balakr. in J. Econ. Taxon. Bot. 7 : 359. 1985. *Type* : Thailand, Chiengmai, Doi Sootep, 1219 m, 5 Sept. 1909, Kerr 790 (K : Lectotype, chosen herein)-BSI Neg. No. 8595 A ; *ibid.*, 1280 m, 4 Sept. 1910, *Kerr* 1365 (K : photo). (Fig. 8).

Habit unknown (shrubs or woody herbs, up to 1.5 m in Thailand). *Leaves* narrow, elliptic, oblong-elliptic to obovate-elliptic, 7 - 20 cm long, 2.5 - 5 cm, subcordate or rounded at base, denticulate to coarsely crenate-dentate along margins, shortly caudate at apex, chartaceous, glabrous (except for scattered adpressed-puberulous midrib beneath), ochraceous when dry ; lateral nerves 9 - 13 pairs, prominent, arcuate ; petioles 1 - 5.5 cm long, 0.8 1.5 mm thick. *Male inflorescences* often shortly supra-axillary, narrow, 5 - 28 cm long, scattered adpressed fulvous-puberulous ; peduncles 2 - 18 cm long ; lower branches 1.5 - 4 cm long ; bracts triangular-subulate, up to 2 mm long. *Flowers* 2 - 2.5 mm diam. ; pedicels 2 - 3 mm long, sparsely adpressed fulvous-puberulous ; sepals 5, orbicular, 1 1.5 mm long, 1.2 - 2 mm broad, sparsely fulvous-



Fig. 8. *Baliospermum calycinum* Muell.-Arg. var. *siamense* (Craib) T. Chakrab. & Balakr. A—H. *Male*: A. Habit with inflorescences. B. Stipule. C. Bract. D. Flower. E—F. Disk glands. G—H. Stamens. [(All from *Mokim* s.n. (CAL)].

puberulous; disk glands 5, transversely oblong, 0.4-0.6 mm diam.; stamens *ca* 12, *ca* 1.5 mm long; anthers 0.4-0.5 mm long orbicular or squarish. *Female flowers & fruits* not seen.

Fl. & Fr. : Period not known (Sept.-Oct. in Thailand).

Specimens examined : MYANMAR. Kachin State : Kachin hills, *Mokim s.n.*, Herb. Acc. No. 417982 (CAL). S. Shan States : Saikaw, 1896, *Khalil s.n.*, Herb. Acc. No. 417986 (CAL).

Distribution : Myanmar, Thailand.

Ecology : No data available (common in evergreen forests at 1200-1300 m altitude in type locality).

Airy Shaw (*l.c.*) remarked that the plant resembles var. *corymbiferum* in it's narrow, long-peduncled male inflorescences, but leaves are narrow, oblong-elliptic or narrowly obovate. The plant appears to be even closer to var. *micranthum*, differing in it's stiffer texture of the leaves and somewhat larger male flowers.

2.9. var. **sinuatum** (Muell.-Arg.) T. Chakrab. & Balakr., **comb. et stat. nov.**

Baliospermum sinuatum Muell.-Arg. in Flora 47 : 470. 1864 & in DC., Prodr. 15(2) : 1125. 1866; Hook. f., Fl. Brit. India 5 : 462. 1887; Brandis, Indian Trees 583. 1906; Pax & Hoffm. in Engl., Pflanzenr. IV. 147. iv : 28. 1912; Kanjilal *et al.*, Fl. Assam 4 : 203. 1940. *Type* : NE. India, Mishmee, n.d. *Griffith* KD 4740 (K : Holo.). (Fig. 9).

Shrubs or herbaceous undershrubs, up to 2 m high; branchlets angled to semiterete, 3-8 mm thick, evanescently ochraceous-puberulous. *Leaves* oblong to elliptic or narrowly so or obovate-oblong, often triangular (from an acute base), sometimes 3-lobed towards apex, 7.5-29.0 cm long, 2-11 cm broad, rounded to subcordate or acute or cuneate at base, irregularly and shallowly sinuate-dentate-serrate to subentire along margins, caudate at apex (cauda 10-25 mm long, acute); firmly membranaceous to thinly coriaceous, sparsely tawny-hispidulous to glabrous above, finely adpressed-puberulous beneath (on nerves), remaining green or turning brown to blackish above, penninerved or weakly trinerved at base; lateral nerves 8-12 pairs (the first pair shorter than subsequent pairs), faint to prominent above, distinct beneath, arcuate or straight; tertiary nerves faint to prominent above, distinct beneath, scalariform; petioles 1-9 cm long, 1.0-2.5 mm thick. *Male inflorescences* very narrow, lax, 3.5-26.0 cm long, sparsely yellow-puberulous to glabrous; peduncles 2-15 cm long; lower branches up to 1.5 (-2.0) cm long; bracts triangular to subulate, 0.8-1.6 mm long. *Flowers* : 2-3 mm diam.; pedicels 1.5-3.0 mm long, 0.3-0.6 mm thick, glabrous; sepals 5-6, orbicular, 2.0-2.5 mm long and broad; disk glands 5-6, obcordate, 0.3-0.6 mm long, 0.5-0.9 mm diam.; stamens 13-18, 1.5-2 mm long; anthers oblong or broadly ellipsoid, 0.5-0.6 mm long. *Female inflorescences* 5-15 cm long, glabrous; peduncles 2-5 cm long; bracts triangular to subulate, 5-10 mm long. *Flowers* : pedicels 2-2.5 mm long, 0.8-1.2 mm thick, minutely pubescent; sepals 5 or 5+5, elliptic to oblong, 3-4.5 mm long, 2-3 mm broad, sparsely puberulous to glabrous; disk cupular; ovary globose, *ca* 2 mm diam., 3-lobed, glabrous; styles 3, 3.5-4.0 mm long, shortly connate below, bifid above; stigmas simple. *Capsules* not seen.

Fl. & Fr. : Oct.-Feb.

Specimens examined : INDIA. Arunachal Pradesh. *sine loc. exact.*, n.d. *R. S. Rao* 1688, 1714 (CAL). Lohit dist. : Forest around Parasuram Kund, 1 Jan. 1970, *Joseph* 48855 (CAL, ASSAM).

Distribution : NE. India-Endemic.

Ecology : No data available.

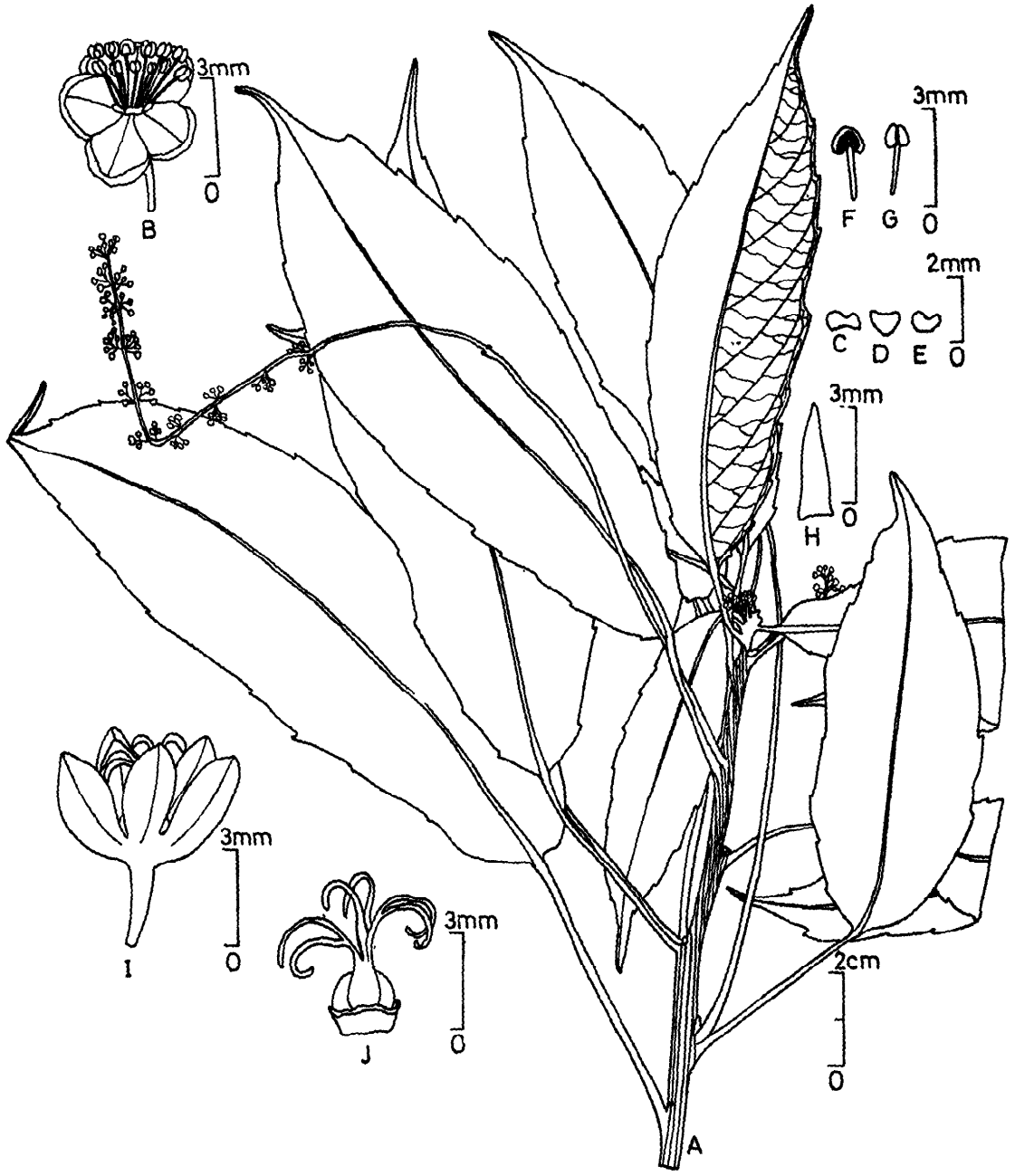


Fig. 9. *Baliospermum calycinum* Muell.-Arg. var. *sinuatum* (Muell.-Arg.) T. Chakrab. & Balakr. A. Habit with male inflorescence. B—G. *Male*: B. Flower. C—E. Disk glands. F—G. Stamens. H—J. *Female*: H. Bract. I. Flower. J. Ovary with disk. [A: *R.S. Rao* 1688 (CAL); B—G: *King* s.n. (DD); H—J: *R.S. Rao* 1714 (CAL)].

Somewhat intermediate between var. *calycinum* and var. *corymbiferum* with leaves narrowing down towards base like the former, while male inflorescences narrow as in the latter.

Enumeration of some intergrading specimens in B. calycinum

1. Var. *calycinum* : India, Arunachal Pradesh, Tirap dist., Waka, 27 Aug. 1958, *Panigrahi* 14929 (ASSAM)-Flowers minute (1.5-2 mm diam.) as in var. *micranthum*.
2. Var. *calycinum* : India, Arunachal Pradesh, Tirap dist., Wakka (Chowka), 4 July 1961, *Deb* 26516 (ASSAM)-Leaves not narrowing towards base, recalling var. *corymbiferum* or var. *nepalense*.
3. Var. *corymbiferum* : India, West Bengal, Jalpaiguri dist., Way to Baxaduar, 12 May 1976, *Sikdar* 4599 (CAL)-Male inflorescences tending to be broader, thus approaching var. *nepalense*.
4. Var. *corymbiferum* : India, Sikkim, Singhik to Dikchu, 17 May 1927. *coll. uncertain* 222 (CAL)-Leaves membranaceous like var. *effusum* and var. *micranthum*.
5. Var. *corymbiferum* : India, Sikkim, Tumlong, 8 July 1906, *J. M. Cown* 20 (CAL)-Male inflorescences tending to be broader, approaching var. *nepalense* ; flowers minute as in var. *micranthum*.
6. Var. *micranthum* : India, Meghalaya, Jowai dist., Mawsynram forest at 14 miles towards Balat side, 16 Sept. 1962, *Kapoor* 71506 (LWG)-Leaves large and male inflorescences broad as in var. *calycinum*.
7. Var. *micranthum* : India, Meghalaya, Jowai dist., Pangtung, 27 Sept. 1939, *R. N. De* 19333 (ASSAM)-Male inflorescences much narrow, simulating those of var. *corymbiferum*, var. *effusum* and var. *sinuatum*.
8. Var. *micranthum* : India, Meghalaya, Khasi hills dist., Wah-Maw-iong, 20 Oct. 1917, *Kanjilal* 7283 (ASSAM)-The large leaves at once recalling var. *calycinum*.
9. Var. *micranthum* : India, Meghalaya, Khasi hills dist., Barapani forest, 21 July 1944, *G. K. Deka* 21725 (ASSAM)-This female plant, with narrowly thyrsiform, long-peduncled, 3-7.5 cm long inflorescences is indistinguishable from var. *calycinum*, except for the thinly membranous leaves.
10. Var. *micranthum* : India, Meghalaya, Khasi hills dist., July 1878, *coll. uncertain* 1074, Herb. Acc. No. 417951 (CAL)-Leaves broad as in var. *effusum* ; male inflorescences short (4-5 mm long) as in var. *balansae* and narrow as in var. *corymbiferum*, var. *effusum* and var. *sinuatum*.
11. Var. *micranthum* : India, Meghalaya, Khasi hills dist., n.d., *coll. uncertain s.n.*, Herb. Acc. No. 417952 (CAL)-Leaves broad, recalling var. *effusum*.
12. Var. *micranthum* : India, Meghalaya, Jowai dist., Jowai, 20 July 1965, *Balakrishnan* 42791 (CAL)-Leaves membranous-chartaceous, like in var. *siamense* ; male inflorescences short, as in var. *balansae*.
13. Var. *micranthum* : India, Meghalaya, Khasi hills dist., Cherrapunji, July 1878, *Gallatly* 424 (CAL)-Leaves large (to 32 × 7 cm) and long-petioled (to 12 cm), strongly resembling var. *calycinum* except for thin texture.
14. Var. *micranthum* : Myanmar, Kanpetlet dist., Mindut, 9 July 1956, *Chit ko ko* 5670 (DD)-Leaves broad and male inflorescences tending to be narrow, thus approaching var. *effusum*.
15. Var. *nepalense* ; Bhutan, *sine loc.*

exact., 1885, *Parkes s.n.*, Herb. Acc. Nos. 418007/8 (CAL)-Leaves somewhat narrowing down towards base, strongly resembling those of var. *calycinum*; male inflorescences also identical.

16. *Cf.* var. *nepalense* : India, Sikkim, Teesta, 23 Oct. 1869, *Clarke* 10208 A (CAL)-Leaves broadly ovate and long-petioled as in var. *nepalense* but male inflorescences (7 - 14 cm long with 3 - 4 cm long lower branches) much broader; flowers minute.

17. *Baliospermum calycinum* var. ? : India, Arunachal Pradesh, Tirap dist., Noglo (Myanmar border), 29 June 1961, *Deb* 26327 (ASSAM, CAL)-A puzzling female specimen with leaves of var. *corymbiferum*; in absence of the corresponding male material, its status is not ascertainable.

APPENDIX

Baliospermum calycinum Muell.-Arg. var. **balansae** (Gagnep.) T. Chakrab. & Balakr., **comb. et stat. nov.**

B. balansae Gagnep. in Bull. Soc. Bot. France 72 : 460. 1925.

Distribution : Vietnam (Tonkin).

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