

## NOTES ON BREDEMEYERA (COMESPERMA) WITH A NEW PAPUAN SPECIES AND THE AUSTRALIAN SPECIES LISTED (POLYGALACEAE)

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During recent work on *Polygalaceae* for the Flora Malesiana it appeared that a fairly old collection, made in West New Guinea, distributed as *Securidaca*, belongs to the *Bredemeyera-Comesperma* complex, a lineage which has a peculiar trans-Pacific disjunction, true *Bredemeyera* from the Caribbean to Peru and Chile, mainly tropical, and *Comesperma* in Australia and Tasmania.

*Bredemeyera* contains herbaceous species, half-shrubs and sprawling or climbing shrubs. CHODAT whom we owe a rather detailed subdivision in the first edition of the *Pflanzenfamilien* (vol. 3, 4, 1896, 337–338) reduced to it *Catacoma* Bth., *Hualania* Philippi, and *Comesperma* Labill., distinguishing three sections, and within sect. *Comesperma* three subsections, one of the latter with 4 series.

Though it is generally agreed that the New World *Hualania* and *Catacoma* must be definitely referred to the neotropical genus *Bredemeyera*, the opinion about the generic status of *Comesperma* is divided according to Miss BURBIDGE (*Dict. Austr. Pl. Gen.* 1963, 78).

This is largely due to the diversity of characters among the Australian species of *Comesperma* which form a far from homogenous group – shown by the number of infrageneric taxa proposed – though undoubtedly representing a natural (genealogical) entity. For example, in most species the capsule is strictly oblong-cuneate, but in others it is more or less stiped, but in *C. sphaerocarpum* ± orbicular and in *C. aphyllum* obovate. In some species (*C. aphyllum* and *C. scoparium*) the base of the seed is lengthened with a membrane and one of these (*C. scoparium*) has the usual hairy seed but a proper coma is absent. In one species (*C. ciliatum*) the seed is on the flat sides glabrous and cross-ribbed and the coma is developed only along the two edges (*fig. 1 m–n*) as is the case in *C. volubile*. In *C. confertum* the raphe is developed as a swelling along the seed, by KUNTH (1821) called a linear caruncula; in *C. sphaerocarpum* there is hardly any coma. Most *Comespermas* are fairly rigid small shrubs, with virgate habit and small, often ericoid leaves some being almost aphyllous, but *C. scandens*, *C. ciliata*, and *C. integerrima* are distinctly climbing plants, and *C. praeclsum* has rather small but certainly not ericoid leaves. Flower colour varies from yellow to blue and red. In some species the three outer calyx lobes are free, but in others two of them are connate. The keel is mostly entire but can in some species carry horn-like appendages. In some species the alae are adnate to the corolla, but in most they are free. Also the style and stigma can show differences in curvature and degree of developed lobes. These characters

may serve for defining species and small infrageneric taxa, a situation similar as found in *Polygala*, but they clearly expose a considerable variation. This is partly epharmonic, but for the greater part structural.

In the American *Bredemeyera* (incl. *Catacoma* Bth. and *Hualania* Philippi) there is a similar epharmonic diversity, e.g. the thorny aphyllous *B. (Hualania) collectioides* Philippi matching a similar species in *Comesperma*, *C. spinosum* F.v.M. Structurally there seems less diversity than in *Comesperma*.

In 1829 ST. HILAIRE (Fl. Bras. Merid. 2, 36–37, t. 90–91) had suggested that *Bredemeyera* could not be upheld against *Comesperma*. He described a few American species to *Comesperma* which BENTHAM (in Hook. J. Bot. 4, 1862, 101–103) accommodated in a new genus *Catacoma* Bth. which was later found by him the same as *Bredemeyera*. He clearly indicated the difference in coma against *Comesperma*, springing from the hilum. When drawing the excellent account of *Comesperma* for “Flora Australiensis” (vol. 1, 1863, 142) BENTHAM felt again induced to make some critical remarks. In favour of the generic distinction of *Comesperma* he pointed out that in two species of *Bredemeyera* there is no coma, not mentioning however, that this is also occasionally the case in *Comesperma*.

Furthermore, he focussed attention to the difference in habit; this is true for the majority of *Bredemeyera*, but not for *Hualania* and also not for the new Papuan species described here which must be ranged with *Comesperma* but is a rain-forest climber with normal leaves such as usual in *Bredemeyera*. Besides, *Comesperma* has not a single habit, with some species leafless, three climbing, and one with fairly normal leaves (*C. praeaelsum*). If inflorescences are taken as part of the habit, typical *Comespermas* have terminal rigid spikes or racemes, but many may come together in a ‘leafy terminal panicle’, as in *C. scandens* and particularly in *C. praeaelsum*; in fact that of the latter is in habit not essentially different from the one found in *Bredemeyera*.

The most important difference Bentham revealed is that in the New World *Bredemeyera* the coma comes from a hilar caruncula, not from the seed-coat. As far as I could verify this in our material this is true (fig. 1p, q, s). And I have found this the single character for a sharp distinction. It is true that BENNETT (in Fl. Bras. 13, 3, t. 17) pictured the seed of *B. brevifolia* with the usual hilar coma but also with hairs from the seed-coat, but this is an error; the fine comal hairs are sometimes intertwined with the indument of the seed-coat, but not emerging from the latter.

It is rather astonishing that Chodat who must have known and used Bentham’s excellent account, gave a distinctly impractical key to the sections *Bredemeyera* and *Comesperma*, omitting the only trustworthy key character exposed by Bentham, viz. the presence or absence of a caruncula and the insertion of the coma. Already in 1821 KUNTH (in H.B.K., Nov. Gen. Sp. Pl. 5, 49) had differentiated *Comesperma* from *Polygala* by the presence of a coma and also BENNETT (Fl. Bras. 13, 3, 1874, 47) had clearly indicated that *Bredemeyera* differs from *Comesperma* by a coma springing from the hilar caruncula.

Though characteristic I feel its importance should not be overestimated, in

view of the great diversity in both *Bredemeyera* and *Comesperma*. Also in the latter there are two species in which the coma is restricted to a certain part of the seed. And as to the occurrence of a hilar caruncula, there is sometimes a minutely protruding point beyond the proper insertion of the seed in *Comesperma* which I hold for a reduced caruncula (fig. 11, n). Furthermore, the presence and degree of development of a hilar caruncula shows a great diversity within the closely allied genus *Polygala*, so that in Polygalaceous systematics this single character alone can hardly be valued for generic distinction. For this reason Chodat, I believe correctly, subordinated *Comesperma* as a section under *Bredemeyera*.

EWART & DAVIES in their "Flora of the Northern Territory" (1917), in the "Census of Plants of Victoria" 2nd ed. (1928), and EWART in his "Flora of Victoria" (1931) followed Chodat, in reducing *Comesperma* to *Bredemeyera*.

BLACK, in the edition of his "Flora of South Australia" (1948, 504) advanced three arguments against this, but they appear futile, and besides they show that he cannot have studied American material of *Bredemeyera*. His first argument is that the majority of Australian systematists and custodians of herbaria prefer to retain *Comesperma*; this is of course rather a matter of convenience, not of scientific study. Secondly, he remarked that Chodat himself in listing and localizing the Australian species refers the latter to *Comesperma*. This should not be taken too formally, as Chodat definitely accepted *Comesperma* as a section, and furthermore though refraining from effecting all the specific transfers in his concise treatment – possibly in anticipation of a later monograph – he had definitely the intention of doing so, as appears from his use of the name "*B. (Comesperma) ericine* DC." in the legend to fig. 177 on p. 331 of his work, indicating in brackets the sectional name, as often customary. Thirdly, Black stated that *Bredemeyera* has a distinctly succulent capsule, against *Comesperma* with a dry one. This is merely an error or at least greatly exaggerated; the shape, texture and dehiscence of the fruit of a typical *Bredemeyera* is exactly the same as in typical *Comesperma*, though the pericarp is faintly thicker but not less than in *B. papuana*.

Recently, HUTCHINSON in his new "Genera Plantarum" (vol. 1, 1967, 338) upheld *Bredemeyera* and *Comesperma* though their descriptions are nearly identical; curiously he stated that in *Comesperma* the coma can occur next the hilum or all over; I could not find in any of the dozen species I examined that the coma in *Comesperma* originates "next the hilum". His key: "Flowers in terminal sometimes leafy panicles... *Bredemeyera*. – Flowers in terminal sometimes showy and corymb-like racemes ...*Comesperma*" is not of much help towards generic discrimination.

The essential characters of flower structure and fruit agree so much that I have definitely reached the conclusion that the complex consists of only a single genus, its degree of diversity running parallel and of equal weight to that in *Polygala*.

I may add, in addition to Bentham's remarks on the affinity between *Bredemeyera* and *Polygala*, that through several "anomalous" species sharp distinc-

tion is getting dubious. Chodat keyed *Bredemeyera* out by the elongate obconate capsule, seed with coma and without aril, forgetting however that there are in *Comesperma* species (*C. aphyllum*, *C. sphaerocarpum*) which have an orbicular or obovoid capsule strongly reminiscent of that in *Polygala*, furthermore, that in several species of *Comesperma* there is no coma (*C. scoparium*) or only a membranous appendage (*C. aphyllum*, *C. scoparium*), and furthermore that in *Bredemeyera* species have a distinct caruncula as is mostly the case in *Polygala*. *Polygala* has (? almost) always a strophiola and never a coma on the seed.

In provisionally reviewing the situation it appears to me that *Bredemeyera* represents an old tropical rain-forest stock which has been successful in gaining ground in subtropical drought areas in assuming a spiny leafless branch (sect. *Hualania*) in Argentina and Chile and in assuming the virgate-microphyllous habit in Australia as do so many other genera. The new Papuan species would then be the primitive link to the latter.

It would be interesting to know their chromosome structure. While working on the subject I got notice from the Chief of the Division of Botany at Lae, Mr. J. Womersley, that *Bredemeyera* is also recently located in East New Guinea and if this is the same species, opportunity to cytogenetics comes within reach.

#### KEY TO THE SECTIONS

1. Calyx persistent under the fruit.
  2. Liana with well developed leaves. Racemes simple, axillary . . . . . § *Melchiora*<sup>1</sup>
  2. Shrubs with thorny stem and twigs, leaves minute, soon abortive. Flowers in glomerules (? contracted racemes). . . . . § *Hualania* (Philippi) Chodat<sup>2</sup>
1. Calyx caducous, no longer present under the mature fruit. Racemes simple or compound, usually terminal.
  3. Coma on the seed from a hilar caruncula and its close vicinity . . . . . § *Bredemeyera*
  3. Coma if present from the seed-coat, a caruncula not or hardly developed.
 

§ *Comesperma* (Labill.) Chodat

#### *Bredemeyera papuana* Steen., sp. nov. – Fig. 1a–l.

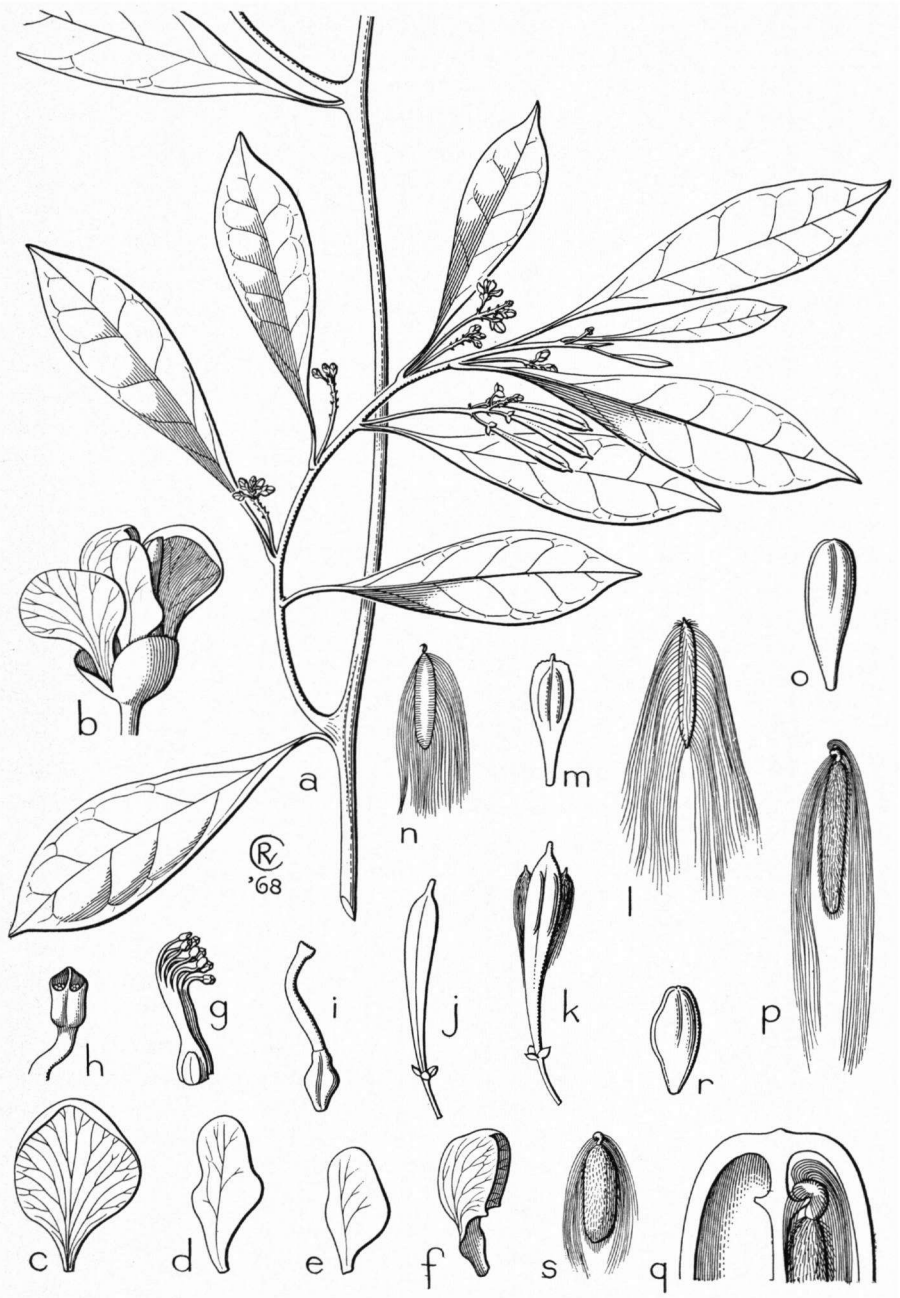
Liana foliis bene evolutis; flores ad racemos axillares 1–2 dispositi.

Typus: *Docters van Leeuwen 10387* (L, isotypus SING, etc.).

<sup>1</sup> *Bredemeyera* sect. *Melchiora*, sect. nov – Affinis § *Comesperma*, sed racemis axillaribus sepalisque exterioribus sub fructu persistentibus a sectionibus ceteris diversa. T: *B. papuana*

<sup>2</sup> The persistence of the sepals was kindly verified by Dr. K.U. Kramer, Utrecht.

Fig. 1. *Bredemeyera papuana* Steen. a. Habit, × 2/3, b. flower, × 4, c. wing, × 4, d–e. lateral petals, × 4, f. keel, × 4, g. androecium and reduced petal, × 4, h. mature opened anthers, × 16, i. gynoeccium, × 4, j. immature fruit sustained by 3 outer sepals, × 4/3, k. mature pod, dehiscing, × 4/3, l. seed, with coma from testa, ± × 3. – *B. ciliata* (Steetz) Steen. m. Pod, × 4/3, n. seed, with transverse-rugose, glabrous testa and laterally attached coma, ± × 3. – *B. floribunda* Willd. o. Pod, × 4/3, p. seed, with coma attached at hilar caruncula, ± × 3, q. detail of p and attachment to funicle in opened pod, × 6. – *B. cuneata* Klotzsch ex Hassk. r. Pod, × 4/3, s. seed, similar in structure to p, ± × 3 (a, e, k, l *Docters van Leeuwen 10387*, b–d, f–i *Ledermann 9395*, m–n *Pritzel 49*, o–q *Burchell 7301*, r–s *Schomburgk 803*).



Glabrous thin liana; ultimate twigs  $\pm$  angular by 2 elevated lines descending from each leaf to the next lower node. *Leaves* herbaceous, entire, obovate-oblong to obovate-lanceolate, rarely  $\pm$  lanceolate, broad-acute to  $\pm$  acuminate at apex, decurrent towards the base, c.  $3\frac{1}{2}$ – $8\frac{1}{2}$  by  $1\frac{1}{2}$ –3 cm; midrib sulcate above; nerves c. 5–7 pairs,  $\pm$  loopedly connected, with a rather dense venation between, not conspicuous. *Racemes* axillary, 1–2 together, 2–6 cm long (incl. peduncle 1 cm). Bracts broad-triangular, c.  $\frac{1}{2}$  mm, bracteoles basal, minute, both short-puberulous. Pedicels 4–5 mm, angular, as the rachis. Outer 3 *sepals*  $\pm$  orbicular, convex, free, persistent, short-ciliate, c.  $1\frac{1}{2}$ –2 mm; 2 large inner sepals caducous, short-ciliate, first convex, boat-shaped, later flat,  $\pm$  orbicular to ovate, c. 4 mm. Lateral *petals* unilateral-oblique ovate-oblong to broad-elliptic,  $\pm$  clawed at base, rounded at apex, c. 3 mm; keel hooded,  $\pm$  clawed, c. 3 mm long, with entire margin; petals and keel only slightly adnate to the staminal tube, easily detached. *Staminal tube* c. 2 mm, slit, free filaments 8, c. 1 mm; anthers basally attached, oblong-ovate when young, apiculate, c. 0.3 mm, opening with a common wide, introrse, apical pore (2 confluent pores) and much wider and blunt. Pistil glabrous, c. 3 mm, 2-celled, the flattened style apically curved, articulated with the ovary; stigma widened, hardly emarginate. *Capsule* 2-celled, linear-cuneate, flattish, with a faint ridge in the middle, shortly beaked at apex, dehiscing along the margins, c. 18–22 by 2– $2\frac{1}{2}$  mm. *Seed* 1 in each cell, apically attached, detaching with a minute funicle c.  $\frac{1}{2}$  mm long; c. 5–7 by 1 mm,  $\pm$  flattened, brown, all over covered with short and many silky white hairs forming a plume extending to the base of the fruit, the whole seed c. 15 mm.

WEST NEW GUINEA. Rouffaer R., forest liana, flowers white with purple wings, 250 m alt., Sept. 1926, *Docters van Leeuwen 10387*, type (L, SING, etc.), distributed as *Securidaca* sp.

TERRITORY OF NEW GUINEA. Sepik area: *Ledermann 9398, 10253* (L).

TERRITORY OF PAPUA. Western Distr., near Ingambit village, 150 m, vine in crown of tree in regrowth on rising ground, leaves pale green, flowers white with red keel, fruit green *NGF 33220*, *Henty*, *Ridsdale & Galore* (L, BRI, CANB, A, K, BO, SING, UH, PNH, US, BISH); ditto, on edge of *Fagaceae-Elaeocarpus* advanced regrowth, *NGF 33380*, distributed as *Apocyn.* indet.

Notes. An interesting addition to the Malesian flora, recognized first by Melchior (in sched.). It stands apart by the little adnation of the petals and staminal tube, the constantly axillary racemes, and the three outer sepals which are persistent in fruit.

#### ENUMERATION OF AUSTRALIAN BREDEMEYERA WILLD. (1801)

Several names have been proposed by Gandoger, Bull. Soc. Bot. Fr. 60 (1913) 456, and one by Hasskarl, but I refrain from transferring these names, as to all probability they will prove to be synonyms.

**B. acerosa** (Steetz) comb. nov. – *Comesperma acerosum* Steetz, in Lehm., Pl. Preiss. 2 (1848) 229.

- B. aphylla* (R. Br. ex Bth.) Chodat, ex Ewart & Davies, Fl. North. Terr. (1917) 160. – *Comesperma aphyllum* R. Br. ex Bth., Fl. Austral. 1 (1863) 143.
- B. calymega* (Labill.) Chodat ex Census Pl. Vict. ed. 1 (1923) 40; Ewart, Fl. Vict. (1931) 716. – *Comesperma calymega* Labill., Nov. Holl. Pl. 2 (1806) 23, t. 162.
- B. ciliata* (Steetz) comb. nov. – *Comesperma ciliatum* Steetz, in Lehm., Pl. Preiss. 2 (1848) 304.
- B. conferta* (Labill.) comb. nov. – *Comesperma confertum* Labill., Nov. Holl. Pl. 2 (1806) 23, t. 161.
- B. defoliata* (F.v.M.) Chodat ex Census Pl. Vict. ed. 1 (1923) 40; Ewart, Fl. Vict. (1931) 716. – *Comesperma defoliatum* F.v.M., Vict. Pl. 1 (1862) 189.
- B. drummondii* (Steetz) comb. nov. – *Comesperma drummondii* Steetz, in Lehm., Pl. Preiss. 2 (1848) 301.
- B. ericina* (DC.) Chodat, in Engl. & Pr., Nat. Pfl. Fam. 3, 4 (1896) 331, sub fig. 177; Census Pl. Vict. ed. 1 (1923) 40; Ewart, Fl. Vict. (1931) 717. – *Comesperma ericinum* DC., Prod. 1 (1824) 334.
- B. flava* (DC.) comb. nov. – *Comesperma flavum* DC., Prod. 1 (1824) 334.
- B. integerrima* (Endl.) comb. nov. – *Comesperma integerrinum* Endl. in Huegel, Enum. Pl. Nov. Holl. (1837) 7.
- B. lanceolata* (R. Br. ex Bth.) comb. nov. – *Comesperma lanceolatum* R. Br. ex Bth., Fl. Austral. 1 (1863) 148.
- B. nudiuscula* (DC.) comb. nov. – *Comesperma nudiusculum* DC., Prod. 1 (1824) 334.
- B. polygaloides* (F.v.M.) Chodat ex Census Pl. Vict. ed. 1 (1923) 40; Ewart, Fl. Vict. (1931) 717. – *Comesperma polygaloides* F.v.M., Trans. Phil. Soc. Vict. 1 (1855) 7.
- B. praeclsa* (F.v.M.) comb. nov. – *Comesperma praeclsum* F.v.M., Fragm. Phyt. Austr. 11 (1878) 2.
- B. retusa* (Labill.) Chodat ex Census Pl. Vict. ed. 1 (1923) 40; Ewart, Fl. Vict. (1931) 717. – *Comesperma retusum* Labill., Nov. Holl. Pl. 2 (1806) 22, t. 160.
- B. rhadinocarpa* (F.v.M.) comb. nov. – *Comesperma rhadinocarpa* F.v.M., Fragm. Phyt. Austr. 11 (1878) 1.
- B. scoparia* (Drumm.) Chodat ex Census Pl. Vict. ed. 1 (1923) 40; Ewart, Fl. Vict. (1931) 716. – *Comesperma scoparium* Drumm. in Hook. J. Bot. 2 (1840) 369; Steetz, in Lehm., Pl. Preiss. 2 (1848) 309.
- B. secunda* (Banks ex DC.) Chodat ex Ewart & Davies, Fl. North. Terr. (1917) 160. – *Comesperma secundum* Banks ex DC., Prod. 1 (1824) 334.
- B. sphaerocarpa* (Steetz) comb. nov. – *Comesperma sphaerocarpum* Steetz, in Lehm., Pl. Preiss. 2 (1848) 314.
- B. spinosa* (F.v.M.) comb. nov. – *Comesperma spinosum* F.v.M., Fragm. Phyt. Austr. 1 (1859) 144.
- B. sylvestre* (Lindl.) Chodat ex Ewart & Davies, Fl. North. Terr. (1917) 160. – *Comesperma sylvestre* Lindl. in Mitch., J. Trop. Austr. (1848) 342.
- B. virgata* (Labill.) comb. nov. – *Comesperma virgatum* Labill., Nov. Holl. Pl. 2 (1806) 21, t. 159.

**B. viscidula** (F.v.M.) comb. nov. – *Comesperma viscidulum* F.v.M., *Fragm. Phyt. Austr.* 10 (1876) 4.

**B. volubile** (Labill.) Chodat ex Censu Pl. Vict. ed. 1 (1923) 40; Ewart, *Fl. Vict.* (1931) 716. – *Comesperma volubile* Labill., *Nov. Holl. Pl.* 2 (1806) 24, t. 163.