A REVISION OF THE MALESIAN AND CEYLONESE SPECIES OF THE GENUS GAERTNERA LAMK. (RUBIACEAE)

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SUMMARY

In chapter 1 the systematical position of *Gaertnera* is discussed and arguments are given for its arrangement in the *Rubiaceae-Psychotrieae* as well as the characters by which it can be distinguished from *Psychotria*.

In chapter 2, section a, the morphology is explained of the various types of inflorescence and their derivation. It appeared that in most species the inflorescence is fairly characteristic. In G. *vaginans*, however, it gradingly varies from widely paniculate to condensed and from very profuse to depauperate. Section b offers new interesting data on the three types of flowers, bisexual and heterostylic, bisexual and homostylic, and unisexual-dioecious. Each individual plant carries only one kind of flowers. These kinds of flowers have within the genus also a distinct geographical significance: bisexual-heterodistylic flowers are peculiar to all Ceylonese and African species, possibly also to the Madagascan ones, whereas all Indo-Malesian species are dioecious, G. *vaginans* excepted. G. *vaginans* possesses in Africa and Ceylon bisexual-heterodistylic flowers, in Indo-Malesia dioecious flowers, and in some local Bornean populations bisexual flowers without heterodistylism. Section b contains further an evaluation of distinctive characters of other floral parts. Section c, on fruit and seed, shows the great uniformity of these in all species, except those of the Madagascan area. Sections d and e deal with the bracts and stipular sheath and their structure. Section f is devoted to the leaf, the size of which is hardly of specific value, but the indument does. On poor sandy soils and on ridges and summits leaves appear smaller and thicker.

Chapter 3 embraces a discussion of the distribution; one species, G. *vaginans*, is covering the entire range of the genus, from West Africa to Borneo, included Madagascar. The greatest species density is found in Madagascar and the Mascarenes where all species, except G. *vaginans*, are endemic. Ceylon has 4 endemic species of which two may prove to be races of one. In Malaya and Borneo 7 endemic species occur, whilst G. *vaginans* covers all this area including also scattered localities in Thailand and Indochina. All Malesian, Ceylonese, and presumably all African species are mutually related and share with the omnipresent G. *vaginans* the same kind of fruit. Most of the Madagascan species, however, are different in this respect and this leads to the view that the Madagascan area is probably the primary distributional centre. From this centre G. *vaginans* emanated which must be the ancestral species of all others outside the Madagascan area. The likeliness of this assumption is derived from the fact that its range is enormous and its plasticity greatest among all other species. The fact that its floral dimorphism from Ceylon westward to Africa is opposed to its dioecism in Indo-Malesia, leads to the view that the former part of the area is more ancient than the latter, and that the proportionally youngest extension of the genus was from Ceylon eastward towards continental Asia and Malesia, in which a secondary centre of speciation was formed.

The special part comprises the taxonomical treatment with a key to and descriptions of 12 species, among which 2 are new (G. *fractiflexa* and G. *globigera* from Borneo). A fairly large number of names has been reduced, 6 to G. *oblanceolata*, 14 to G. *vaginans* among which several from continental Asia and one from Africa; they are both rather variable species and in the first a new variety, in the latter a new subspecies is recognized.

G. *divaricata* from Ceylon which was mostly reduced to varietal rank is reinstated as a species.

The widest spread and commonest species was mostly called G. *koenigii* but its proper name is G. *vaginans* as already recognized by Merrill in 1921.

Among the excluded taxa there are several new reductions, mostly to *Psychotria*: G. *australiana* C. T. White, G. *rufinervis* Stapf, and G. *violascens* Ridl. are all *Psychotrias*, but pending a revision of the latter genus I have refrained from making recombinations as they may easily appear to be superfluous. G. *lasianthoides* C. E. C. Fischer is reduced to *Psychotria rhinocerotis* Bl.; G. *hongkongensis* Seem. is a *Randia*.

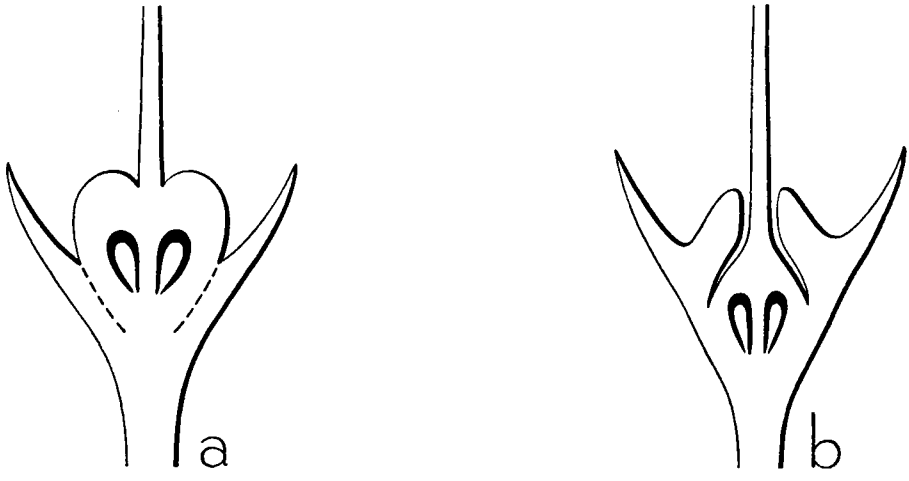

Fig. 1. Longitudinal sections of different ovary-types. a. *Gaertnera*: ovary quasi half-inferior, upper part swollen; b. *Psychotria*: ovary inferior, disk present. Both figures semi-diagrammatical, × 10.

1. SYSTEMATICAL POSITION OF GAERTNERA

The systematical position of *Gaertnera* is not undisputed. A historical survey of it has been given by Petit (1959).

The genus joins the *Rubiaceae* in practically all characters. Therefore its classification would give no trouble, if not the ovary were quasi half-inferior, the fruit even quite superior. For that reason the tribe *Gaertnereae* (comprising *Gaertnera* and the Central American *Pagamea*) has often been placed in the *Loganiaceae*. Nowadays there are not many advocates of the latter view left. Specialists in the *Loganiaceae* and the *Rubiaceae*, such as K. Schumann (1891), Klett (1924), Bremekamp (1954), and Verdcourt (1958) agree on arranging the *Gaertnereae* in the *Rubiaceae*.

Several arguments plead for this:

1. The almost entirely superior ovary in the *Gaertnereae* is not such an important feature as originally was assumed, because this condition is also found in some genera of the tribe *Hedyotideae*, according to Bremekamp (1966). Besides, a half-inferior ovary is present in *Mastixiodendron*, a genus which has recently been transferred from the *Cornaceae* to the *Rubiaceae*.
2. In anatomical respect the *Gaertnereae* fit in the *Rubiaceae* and differ from the *Loganiaceae*, because of the occurrence of raphides and the absence of intraxylary phloem, as was clearly shown by Solereder (1890).
3. The ovules in the *Gaertnereae* are placed basally, a feature which is common in the *Rubiaceae*, while in the *Loganiaceae* they are fixed on central or parietal placentas.

Within the *Rubiaceae* the *Gaertnereae* come closest to the tribe *Psychotrieae*, *inter alia* on account of the one basal ovule per locule, the valvate aestivation, and the position of the anthers. Verdcourt (1958) would even not hesitate to place them in that tribe. *Gaertnera* particularly resembles *Psychotria*, *Chasalia*, and *Grumilea*. Consequently it is not surprising that species of *Gaertnera* have often been described under these genera. Yet *Gaertnera* is not difficult to recognize, if one considers the following characters:

1. The quasi half-inferior ovary of *Gaertnera* is only adherent to the torus, not adnate

to it, like the inferior ovary in for instance *Psychotria*. In contrast with the latter, it can therefore be easily removed from the torus. See fig. 1. The fruit in *Gaertnera* is always very distinctly superior, which can be easily ascertained by the presence of the persistent calyx below it.

2. *Gaertnera* never has a disk, as is usually found in the flowers of the *Psychotrieae*. The upper part of the ovary, however, is always swollen and may be mistaken for a disk and possibly function as such, but at closer investigation the difference is obvious, as appears from fig. 1.

3. The albumen in *Gaertnera* is never ruminate, as is always the case in *Chasalia* and *Grumilea*, and usually in *Psychotria*.

4. There are also some useful vegetative characters, but these are not nearly so conclusive as those of ovary and fruit. First, in *Gaertnera* the stipules are always connate into a sheath, but this can be likewise in species of *Psychotria*, *Chasalia*, and *Grumilea*. Moreover, ribs or ridges on this sheath, such as usually occur in *Gaertnera*, are, as far as I know, not found in the latter three genera. Second, the leaves in *Gaertnera* have never a marginal nerve and the lateral nerves are always ascending. These characters may be found in the *Psychotrieae*.

2. NOTES ON THE MORPHOLOGY

a. Inflorescence

Position and structure of the inflorescence provide important characters which are useful for the distinction of some species and groups of species.

The position of the inflorescence is essentially terminal, on main as well as on side-branches. See fig. 2 a—b. In three species, however, the cymes are placed seemingly axillary, which is caused by a certain degree of reduction of the flower-bearing lateral branches. The following stages occur:

1. The leaves are small or reduced, the lateral branches themselves are usually long and thin (fig. 2c): *G. divaricata* and *G. oblanceolata* var. *diversifolia*.

2. The leaves are absent, but the stipules are still present (fig. 2d): *G. oblanceolata* var. *diversifolia*.

3. Both leaves and stipules are wanting, which may go along with a considerable shortening of the lateral branches (fig. 2 e—f): *G. divaricata*, *G. obesa*, and *G. oblanceolata* var. *oblanceolata*.

These 'flowering shoots' may be placed opposite supra-axillary, particularly in *G. divaricata* and *G. oblanceolata*. See fig. 2 e.

The structure of the inflorescence in *Gaertnera* exhibits the following picture:

The basic type is a many-flowered dichasial panicle. The main axis bears a few pairs of decussate side-axes, which ramify up to *c.* five times, at first following the branching mode of the main axis, finally branching quite dichasially. All axes end in a terminal flower. See fig. 3 a. This basic type is well realised in *G. grisea* and in the more profusely developed forms of *G. vaginans*.

The inflorescence is often more or less contracted, a phenomenon which may be restricted to the ultimate ramifications, e.g. in *G. grisea* and in some forms of *G. vaginans*, or may concern the inflorescence as a whole, so that this at last becomes more or less capituliform. The latter occurs in forms of *G. oblanceolata* and *G. vaginans*. Maximum contraction to a cluster, respectively a capitulum, is displayed by *G. schizocalyx* and *G. globigera* (fig. 3 h). Contraction by another pattern is found in *G. obesa*, where it results into a dense-flowered corymb (fig. 3 g).

A second tendency is the depauperation of the cymes to a variable degree, whether

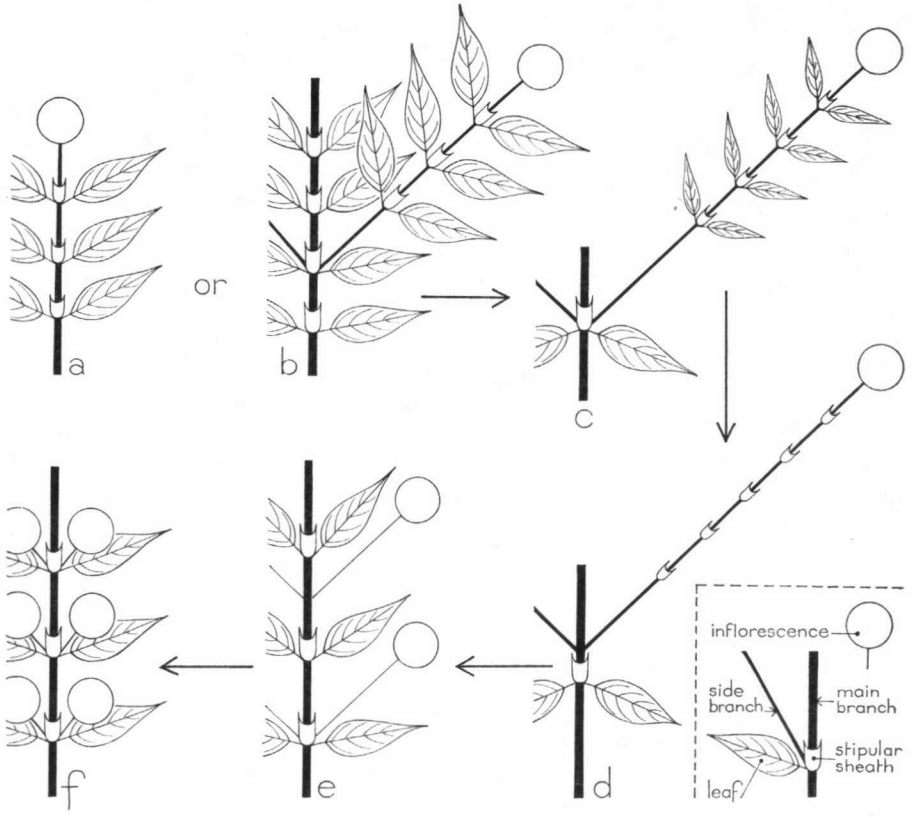

Fig. 2. Semophylesis of the pseudo-axillary inflorescence in the genus *Gaertnera*. For explanation see the text.

or not in combination with contraction. Especially the polymorphous *G. vaginans* displays a wide variation in this respect. *G. viminea* takes an intermediate position (fig. 3 d), followed by the still fewer-flowered *G. walkeri*. The reduction series is closed by the 3-flowered *G. rosea* and the 1-flowered *G. ternifolia*. See fig. 3 e and f.

From the basic type we can further derive the inflorescence of *G. divaricata*, which initially follows the usual kind of ramification, the ultimate ramifications, however, ending in long cincinnae (fig. 3 c). Finally [1]) the dichasial panicle can pass into a thyrsus (fig. 3 b). This we find realized, with some transitional stages, in *G. oblanceolata*. The thyrsoid inflorescence often grows partly racemiform, as a result of reduction of the cymes. A thyrsoid inflorescence is likewise found in *G. fractiflexa*.

b. Flower

The flower is comparatively uniform in the species dealt with in this revision. Yet there are some valuable characters which have been largely overlooked or as yet neglected.

[1]) I have not taken into consideration a few other types of inflorescence of species not dealt with in this study, as for instance the African *G. spicata*, in which the flowers are arranged in a spike.

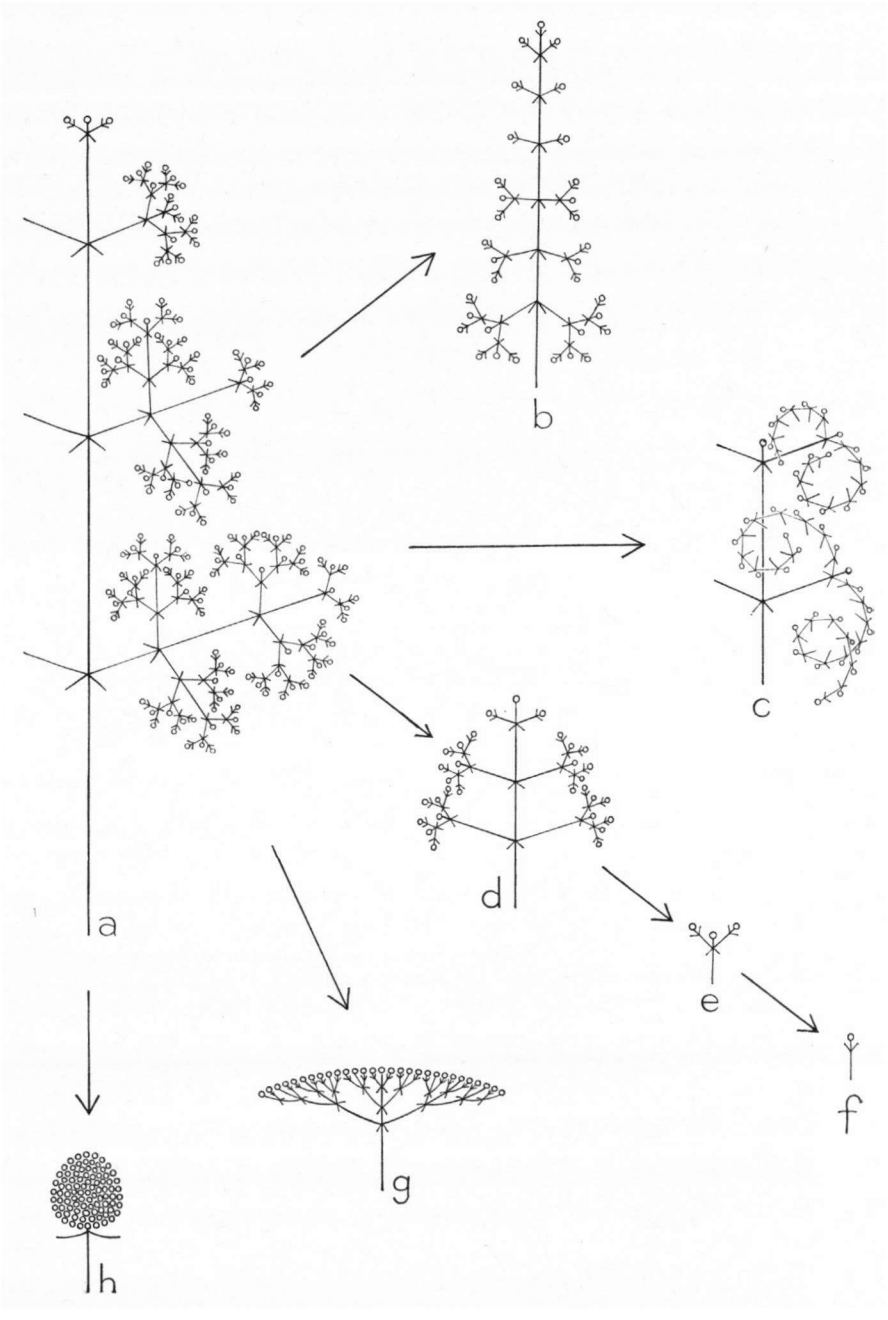

Fig. 3. Hypothetical derivation of the different types of inflorescences in *Gaertnera* from the dichasial panicle. See the text.

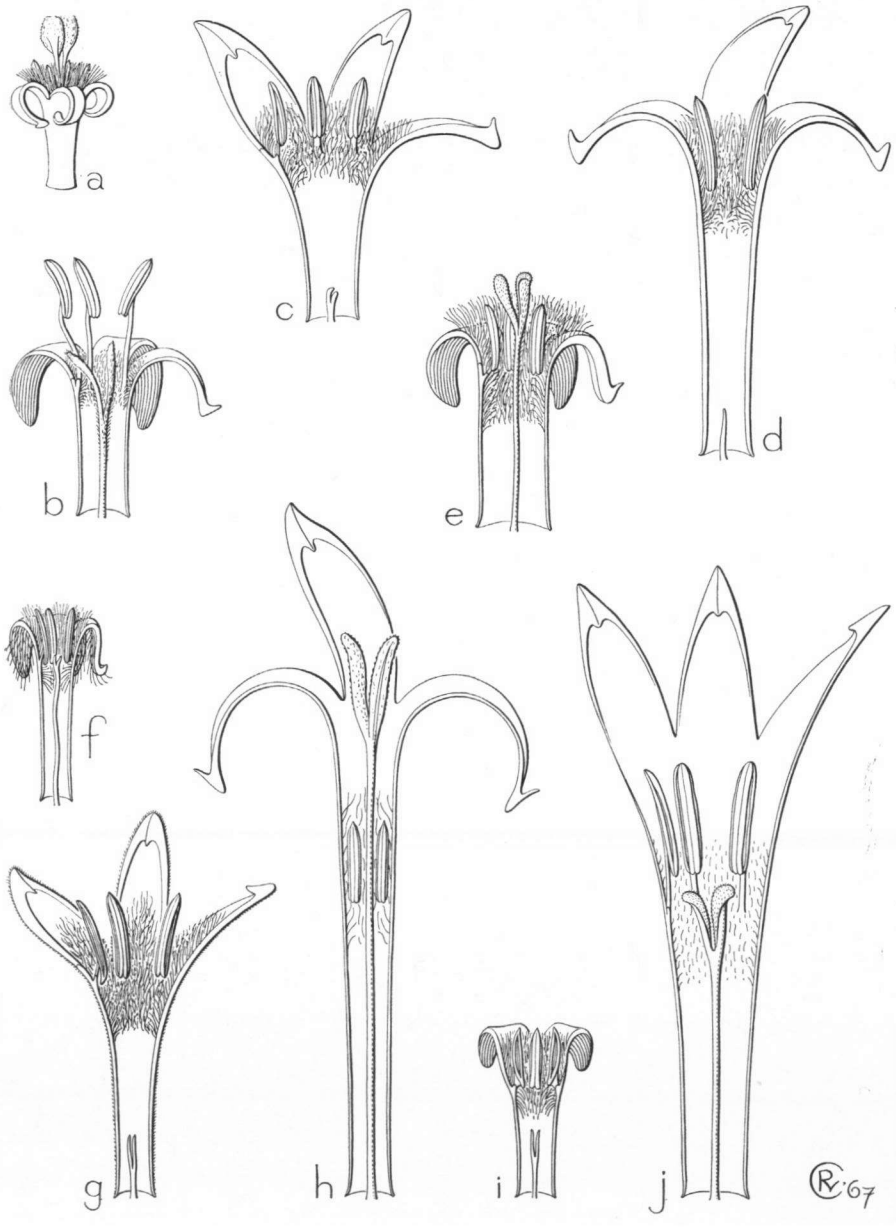

Fig. 4. Corollas, anthers, and styles in *Gaertnera* species. a. *G. vaginans* ssp. *junghuhniana*, ♀ flower; b. *G. vaginans* ssp. *vaginans*, heterodistylic flower with short style; c. and d. *G. vaginans* ssp. *junghuhniana*, ♂ flower; e. *G. vaginans* ssp. *junghuhniana* f. *hermaphroditica*, bisexual flower; f. *G. schizocalyx*, ♂ flower; g. *G. grisea*, ♂ flower; h. *G. rosea*, heterodistylic flower with long style; i. *G. viminea*, ♂ flower; j. *G. walkeri*, heterodistylic flower with short style. All × 4½ (a. from *Kostermans 6419*; b. from *Walker s.n.*; c. from *Ramos 1484*; d. from *Burkill & Holttum SFN 8552*; e. from *Smythies, Wood & Ashton S 5909*; f. from *Beccari PB 1799*; g. from *Rachmat 8*; h. from *Thwaites CP 2673*; i. from *Ridley s.n.*; j. from *Macrae 602*).

First, there can be distinguished three kinds of flowers:
1. Bisexual, heterodistylic flowers. These have either sessile anthers and a long style, or anthers on rather long filaments and a rather short style. Only one kind of flowers is found on one plant. See fig. 4 b (♂ fl.), h (♀ fl.), and j (♂ fl.). All Ceylonese and African species, perhaps also those of the Mascarenes, have this type of flowers.
2. Bisexual flowers without heterostylism. The anthers are always sessile or nearly so, the style is fairly long, and the stigmas are exserted from the corolla tube. Both anthers and stigmas are well developed. See fig. 4 e. This type is very rare; I have only found it in some local Bornean populations of *G. vaginans*.
3. Unisexual flowers (plant dioecious!), with either ill-developed anthers (never containing pollen!) and well-developed style with exserted stigmas, or well-developed anthers (always with pollen!), a more or less ill-developed style and always ill-developed stigmas. The anthers are sessile or may have very short filaments. See fig. 4 a (♀ fl.) and 4 c, d, f, g, i (all ♂ fl.). This kind of flowers is present in all Malesian species with only one very rare exception just mentioned under 2.

According to these flower characters the *Gaertnera* species fall apart mainly in two groups. Only the wide-spread *G. vaginans* takes a very special place, as the African and Ceylonese specimens have bisexual heterodistylic flowers, but those in Malesia on the contrary unisexual (very rarely bisexual but not heterostylic) flowers.

The second important character divides *Gaertnera* into species with 5-merous and species with 4-merous flowers. The latter are only *G. divaricata*, *G. fractiflexa*, *G. rosea*, and *G. viminea*. Besides, useful characters are found in the dimension of the corolla, the place of the hair-ring in the corolla, and the place of insertion of the anthers.

The dimension of the corolla can only be used in a few species, e.g. *G. rosea*, *G. ternifolia*, and *G. walkeri* (fig. 4 h and j), as there is usually a wide range of overlap in this character, and, especially in *G. vaginans* (fig. 4 a—e), a large measure of variability.

The hair-ring is usually found in the throat and the upper part of the corolla tube. There are, however, a few exceptions in which this ring is found distinctly lower in the tube, viz. *G. rosea*, *G. ternifolia*, and *G. walkeri* (fig. 4 h and j).

As a rule the anthers are partly or entirely surrounded by this hair-ring. This is not the case in *G. obesa*, where they are inserted much lower. See fig. 11 f and g.

Finally, additional characters are the hispidulous pubescence outside on the corolla lobes in *G. schizocalyx* (fig. 4 f) and the peculiar curved shape of the anthers in *G. viminea* (fig. 4 i).

Other characters of the flower, e.g. in external indument, shape of style and stigmas, shape of calyx and ovarium, and most of the dimensions, have proved to be unreliable for the distinction of species.

c. Fruit and seed

The Malesian, the Ceylonese, and, as far as known to me, also the African species of *Gaertnera* have very uniform fruits and seeds. In the herbarium they do not possess characters which are useful for specific delimitation. The shape of the fruit depends mainly on the state of development of the two seeds, one of which is often abortive. Likewise, the colour of the fruit may be different depending on the degree of maturity, being black when ripe.

d. Bracts

All ramifications of the inflorescence are provided with bracts which can highly

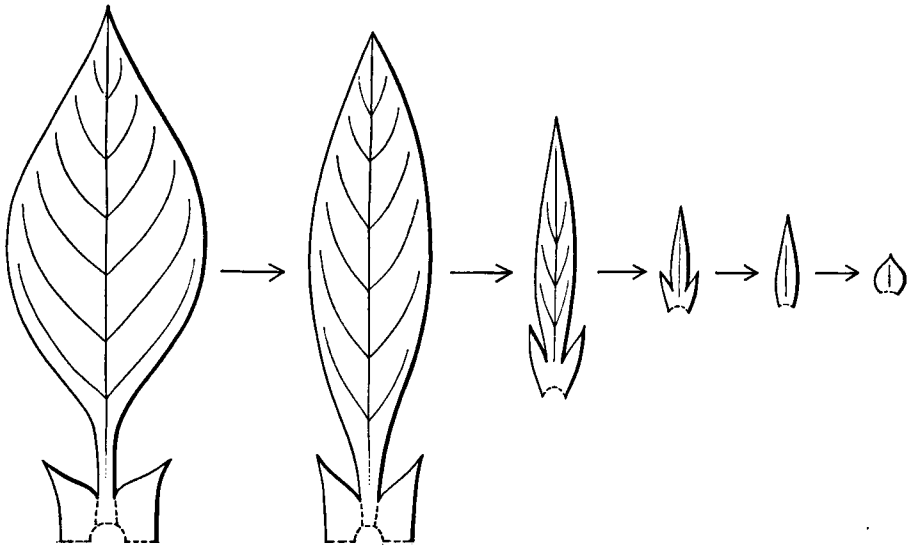

Fig. 5. Semi-diagrammatical sketches of different kinds of bracts in *Gaertnera*, arranged according to an increasing degree of reduction of the leaf-like type. Within most species the whole range may be found. All drawings about natural size.

vary in dimension and shape. They are decrescent upwards, becoming smaller and assuming a more simple structure.

Those present at the base of the inflorescence are often large and sometimes leaf-like. In the latter case they are, moreover, furnished with only interpetiolarly connate stipules. From this basic type all other kinds of bracts can be derived. These are often tripartite or supplied with two lateral lobules. It is obvious to explain these lobules as to be homologous with the stipules. This conception is illustrated in fig. 5. In practice all possible transitions can be found.

Apart from this variability the bracts are, however, highly uniform, so that they have practically no value for the distinction of species, except in the case of *G. schizocalyx*.

With the exception of the terminal flower of the dichasia, all flowers have, of course, bracteoles. These do not differ essentially from the bracts.

e. Stipular sheath

In all species the stipules are connate, forming a cylindrical sheath which can be short to rather long and is sometimes uni- or bilaterally cleft. Such clefts are characteristic in *G. fractiflexa*, *G. globigera*, *G. obesa*, *G. oblanceolata*, and in the Ceylonese specimens of *G. vaginans* (fig. 8 a, d, j, l, and fig. 11 a); in other species they are more or less exceptional.

The stipular sheath is in several species rather thin, soon marcescent, and therefore often damaged, at last mostly partly or entirely disappearing. This especially often concerns the margin of the sheath, which is usually supplied with four short to long teeth. These should be considered as extensions of the main nerves of the stipules. In some species the teeth are connivent or more or less connate in pairs, either intrapetiolarly, as in *G. globigera*, *G. obesa*, *G. oblanceolata*, and sometimes in *G. vaginans*, or interpetiolarly,

as in G. *fractiflexa* and G. *rosea* (fig. 8 a, d, j, l, and fig. 11 a). The connation is often correlated with a 2-cleft sheath (fig. 8 d, l, and fig. 11 a).

If the teeth are completely connate, there are seemingly only two of them instead of four. (The three teeth of G. *ternifolia*, a species with deviating phyllotaxis, represent, consequently, in principle six teeth, interpetiolarly connate in pairs. See fig. 8 k.)

As a rule the teeth are rather short, sometimes even almost lacking, e.g. in G. *divaricata* and G. *walkeri*. Besides, they may be indistinct as a result of wear and tear and age. Long teeth, on the other hand, occur in G. *rosea* and G. *schizocalyx*.

Moreover, the stipular sheath is usually provided with four longitudinal ribs or ridges, united in twos all around the petiole-bases and sometimes forming wings there. These ribs occur in all species, however indistinct they sometimes may be. Well developed ridges with wings surrounding the petiole-bases, are found in G. *globigera*, G. *obesa*, G. *oblanceolata*, G. *schizocalyx*, and in some populations of G. *vaginans* (fig. 8 e, i, l, and fig. 11 a).

The stipular sheath is nearly always glabrous or practically so. Only in G. *grisea*, G. *schizocalyx*, G. *ternifolia*, and very rarely in G. *vaginans* there is a distinct pubescence.

Some species can be recognized by their stipular sheath, but this yields little profit as these particular species are also well distinct by other characters. In general then the stipules do not supply prominent characters for specific delimitation.

f. Leaf

To many former authors shape and size of the leaf passed as important standards for specific discrimination. In my opinion leaf characters should not be considered very reliable. There is a lot of overlap in them between most of the species and, generally speaking, they are hardly or not useful.

The pubescence of the underside of the leaf, however, is of great importance for recognizing G. *grisea* from G. *schizocalyx*, as well as from all other species, which possess, apart from a very exceptional specimen, always quite glabrous leaves.

3. DISTRIBUTION AND DISTRIBUTIONAL CENTRE

Gaertnera occurs throughout the Old World Tropics.

The greatest density of species (see fig. 6) is found on Madagascar and the Mascarenes. According to the Kew Index and to Baker (1877) the quantity of species in this region amounts to about 25. The number of good species may be somewhat smaller, but will remain proportionally large. Only one of these species, G. *vaginata*, occurs in Madagascar as well as in the Mascarenes; all others seem to be endemic with the exception of G. *vaginans*.

For Africa 11 species have been recorded by Petit (1959), one of which (G. *vaginans*) occurs also in Ceylon and SE. Asia. The other species are not found outside tropical Africa.

On Ceylon there are, next to G. *vaginans*, also 4 endemic species: G. *divaricata*, G. *rosea*, G. *ternifolia*, and G. *walkeri* [1]).

In SE. Asia the presence of the genus is largely restricted to the western part of Malesia, including some scattered localities in Thailand, Cambodia, Laos, and S. Vietnam. Here 8 species occur, one of which, the aforesaid G. *vaginans*, is represented throughout the

[1]) G. *ternifolia* and G. *walkeri* may possibly be considered as only one species; see the remarks below the descriptions.

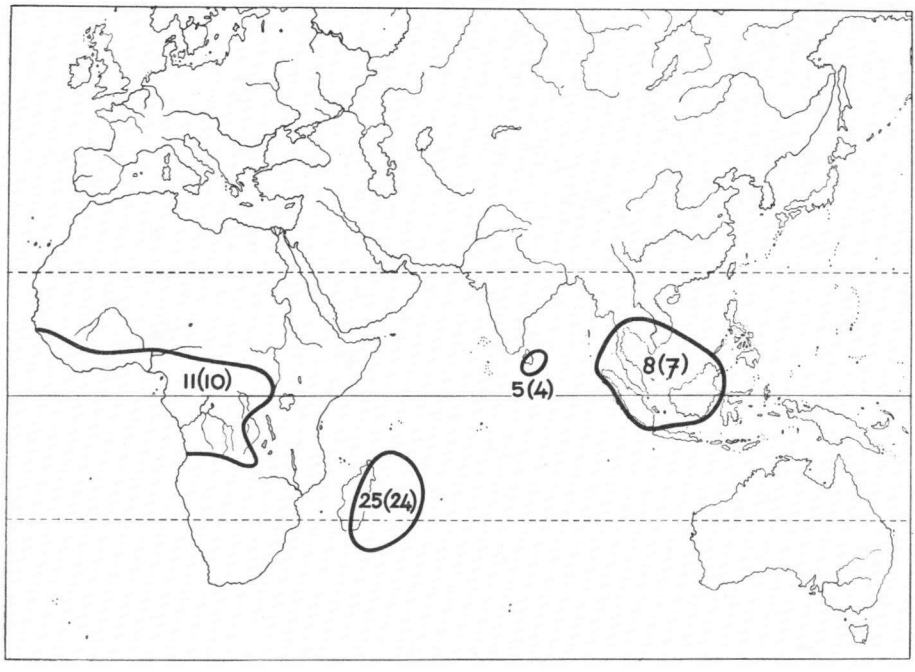

Fig. 6. Generalized area of *Gaertnera*. In each part of the area is indicated the number of species, in brackets the number of endemics.

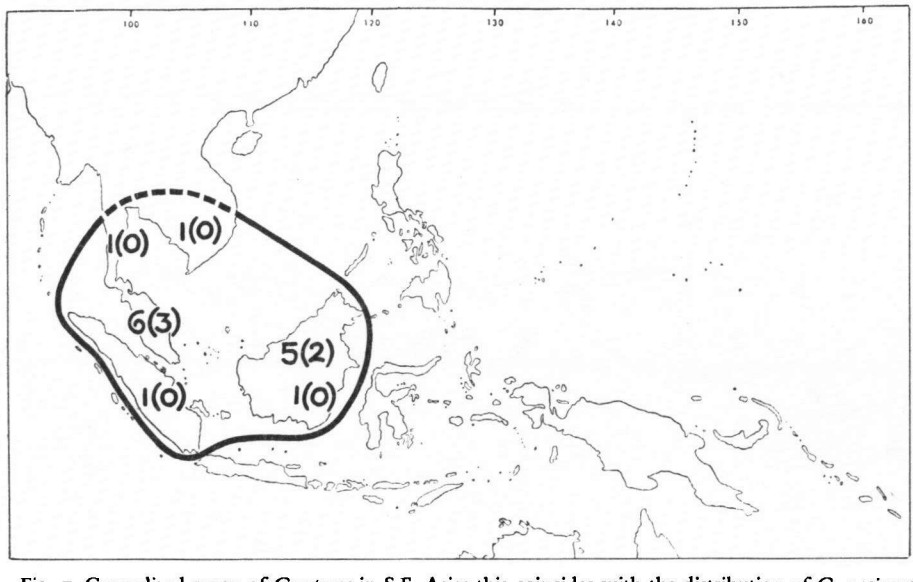

Fig. 7. Generalized range of *Gaertnera* in S.E. Asia; this coincides with the distribution of *G. vaginans* ssp. *junghuhniana*. In each part of the area is indicated the total number of species, in brackets the number of endemics.

entire area. As appears from the map (fig. 7), in Malesia the genus is predominantly developed in Malaya and Borneo. *G. oblanceolata* and *G. schizocalyx* occur in both Malaya and Borneo, *G. grisea*, *G. obesa*, and *G. viminea* are endemic in S. Malaya, *G. fractiflexa* and *G. globigera* are probably restricted to N. Borneo.

From this survey we see that nearly all species have a comparatively small area. This does not apply to the wide-spread *G. vaginans* which is doubtless an old species and which possesses a very large measure of polymorphism. This species is highly variable in nearly all characters, with the exception of those of the fruit.

Now it is striking that all Malesian, Ceylonese and, as far as I know them, also the African species [1]), display a usually very distinct morphological relationship with certain forms of *G. vaginans*. They show, moreover, no difference in fruit. Therefore, there seems good reason to assume that *G. vaginans* is the prototype from which the other species have been derived.

This does not hold for most of the species from Madagascar and the Mascarenes. From the material and the descriptions I have seen, it has become clear to me that these have developed fruit and flower characters which cannot be easily correlated with those of *G. vaginans*. They cannot be considered as very closely related to *G. vaginans* and its allies and belong to one or more separate '*Sippen*'.

Consequently, I consider Madagascar and the Mascarenes as the probable primary distributional centre of the genus. This point of view is supported by the proportionally high number of species in this part of the area. Furthermore, Ceylon is a rather critical site in the generic distribution, as its species and all West of it have bisexual heterodistylous flowers, even within *G. vaginans*, and all SE. Asian and Malesian species are dioecious.

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5. NOTES ON KEY AND DESCRIPTIONS

a. The generic description is mainly based on the Malesian and the Ceylonese representatives. A closer examination of the Madagascan species may widen the circumscription.

b. All types have been mentioned. The abbreviations of the herbaria are in accordance with Index Herbariorum, 5th ed. 1964.

c. The given measurements of the leaves comprise the lamina with the exception of the usually more or less elongated (acuminate to caudate) apex.

d. By the term 'cyme' is always meant the whole inflorescence except the peduncle.

e. By the length of the stipular sheath is understood the distance from the petiole-base to the margin, hence not including the teeth.

[1]) A few of these appear to be only forms of *G. vaginans sens. lat.*

f. In almost all sheets of fertile specimens all flowers are in bud. For that reason the given corolla measurements are not only taken from mature flowers but also from well developed buds.
g. During the development of the fruit the persistent calyx considerably enlarges. Therefore the measurements of the calyx only apply to the flowering stage.

GAERTNERA

Lamk., Tabl. Enc. Bot. Ill. 2 (1791) 273, t. 167, and Texte 1 (?1792) 379, *nom. cons.*, *non* Med., Phil. Bot. 1 (1789) 45 ('*Gaertneria*'), *nec* Schreb., Gen. Pl. 1 (1789) 290, *nec* Neck., Elem. 2 (1790) 15 ('*Gaertneria*'), *nec* Retz., Obs. 6 (1791) 24; Gaertn., Fruct. 3 (1805) 58, t. 191; Juss., Ann. Mus. Hist. Nat. 10 (1807) 325; Arn., Pug. (1836) 352; Boj., Hort. Maur. (1837) 216; Endl., Gen. Pl. (1838) 577; DC., Prod. 9 (1845) 32; Boj., Nouv. Mém. Soc. Helv. Sc. 8 (1847); Bl., Mus. Bot. 1 (1850) 173; Miq., Fl. Ind. Bat. 2 (1856) 381; Bureau, Fam. Log. (1856) 57; Benth., J. Proc. Linn. Soc. 1 (1857) 86; Bedd., Fl. Sylv. 3 (1869) 164; Benth. in Benth. & Hook. *f.*, Gen. Pl. 2 (1876) 798; Baill., Hist. Pl. 7 (1880) 412; Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 91; Soler., Ber. Deut. Bot. Ges. 8 (1890) 70; Trim., Fl. Ceyl. 3 (1895) 176; K. Sch. in Engl. & Prantl, Pflanzenfam. 4 (4) (1897) 124; Boerl., Handl. (1899) 457; K. & V., Bijdr. 8 (1902) 218; Baker, Fl. Trop. Afr. 4 (1) (1904) 542; King & Gamble, J. As. Soc. Beng. 74, ii (1908) 622; Dop, Mém. Bull. Soc. Bot. Fr. 19 (1910) 26; Ridl., Fl. Mal. Pen. 2 (1923) 426; Hutch. & Dalz., Fl. Trop. W. Afr. 2 (1) (1931) 21; Petit, Bakh. v. d. Brink & Van Steenis, Taxon 7 (1958) 233; Abeywickrama, Taxon 8 (1959) 30; Petit, Bull. Jard. Bot. Brux. 29 (1959) 37, 377; Rickett, Taxon 10 (1961) 125. — *Andersonia* Willd. *ex* Roem. & Schult., Syst. Veg. 5 (1819) 21, *non* R. Br. (1810). — *Frutesca* DC. *ex* Meissn., Gen. Comm. 1 (1839) 259; ibid. 2, 168. — *Sykesia* Arn., Pug. (1836) 351; DC., Prod. 9 (1845) 35; Bureau, Fam. Log. (1856) 63; O. K., Rev. Gen. Pl. 2 (1891) 425. — *Pristidia* Thw., En. Pl. Zeyl. (1859) 149.

Small trees or shrubs, up to 15(—20) m, in all parts glabrous or pubescent except the always glabrous upper side of the leaves. *Branches* slender to stout, terete or flattened, not seldom supra-axillary; internodes sometimes very short. *Leaves* decussate, rarely ternate [1]), obovate to ovate-lanceolate, rarely linear-lanceolate, (½—)1—55 by (1/10—) ½—19 cm, acute or attenuate to rounded at the base, acuminate to caudate, sometimes acute at the apex, entire, shining to dull above, dull and usually paler beneath, penni-nerved; nervation distinct, rarely invisible, open; nerves ascending, usually flat or impressed above, always prominent beneath; midrib prominent on both sides, but especially so beneath; petiole sometimes absent, usually short, usually flat above. *Stipules* connate in a cylindrical sheath, very short to a few cm long, whether or not cleft, semi-persistent or soon marcescent and partly or entirely wearing off, often with a few ribs, often forming ridges or wings all around the petiole-bases, with 4, rarely 3 [1]), marginal, triangular to filiform teeth which are sometimes connate or connivent in pairs. *Cymes* terminal or axillary [2]), usually paniculiform or corymbiform, rarely thyrsi form, capituliform or spiciform, lax or congested, sometimes clustered, expanded to contracted, usually many-, sometimes few-flowered, usually with 1—6 pairs of decussate primary side-axes whether or not repeatedly dichasially branching, rarely ending in cincinnae; axes more or less flattened; peduncle absent or present. *Bracts* mostly present at all ramifications, rarely partly absent, triangular to filiform, usually small, more or less acuminate, whether or not toothed, sometimes auriculate or divided into 3 lobes; those

[1]) Only in *G. ternifolia*.
[2]) In essence not axillary but modifiedly terminal: pseudo-axillary!

at the base of the cyme often leaf-like and much larger. *Bracteoles* usually present in all flowers except the apical ones, inserted on the pedicel or on the calyx, bract-like, but smaller. *Flowers* sessile or on short pedicels, usually 5-, sometimes 4-merous [1]), uni- or bisexual, often heterodistylous. *Calyx* broadly cup-shaped or campanulate, rarely urceolate, persistent and much widened in fruiting stage, entire or with 5, 4, or 6 sometimes very unequal teeth or lobes, inside often with a more or less distinct ring of usually appressed, short, whitish hairs. *Corolla* trumpet- or funnel-shaped, (3—)4 mm to 2—3 cm long, white, greenish, cream, or pink; lobes 5, sometimes 4, valvate, rarely contorted [2]), shorter to longer than the tube; throat and/or upper part of the tube with or without a faint to dense ring of villous, whitish hairs often surrounding the anthers; tube cylindric, suddenly or gradually widened to the top. *Stamens* 5 (4), inserted on the corolla-tube, alternipetalous; anthers sessile or on short filaments, adnate, ± linear, introrse, staminodial in ♀ flowers. *Ovary* superior, usually partly sunken in the torus and somewhat adherent with it, therefore quasi half-inferior, glabrous, containing many raphids, the lower part 2-celled, with 1 erect ovule in each cell, the upper part solid, more or less swollen and somewhat disk-like, often truncate and wrinkled; style filiform, glabrous or shortly pubescent, divided at the top into 2 linear to clavate, often flattened stigmatic lobes, in ♂ flowers ill developed or rudimentary. *Fruit* a drupe, berry-like, globose, didymous, obovate or fusiform, smooth or ribbed [3]), usually black when ripe, with a thin, fleshy mesocarp, containing 1 or 2 pyrenes; pyrenes one-seeded, with a thin, dry, ± crustaceous, light-coloured wall (endocarp); seed erect, globose to semiglobose; testa thin, distinctly nerved, containing many raphids, with a distinct hilum near the base; embryo basally in the abundant horny endosperm, small, straight.

Type species: *Gaertnera vaginata* Lamk., l.c., (a species restricted to Madagascar and Mauritius).

Distribution: About 30 species, tropical-African and tropical-Asian. — Fig. 6.

Remarks: *Gaertnera* displays many similarities with *Psychotria* with which it has not seldom been confused vice versa [4]), but can always be distinguished from that genus. See chapter 1.

KEY TO THE SPECIES

1. Undersurface of the leaves (especially the nerves), young branches, stipules, and cymes densely pubescent or pilose.
   2. Pubescence villous to hirsute. Cyme a dense, hispidulous cluster. Calyx-teeth 1—4 mm long. **1. G. schizocalyx**
   2. Pubescence short, velutinous on the touch. Cyme distinctly paniculiform, puberulous. Calyx-teeth never longer than 1 mm . . . . . **2. G. grisea**
1. Undersurface of the leaves glabrous, very rarely sparsely puberulous. Young branches, stipules, and cymes glabrous or puberulous.
   3. Flowers sessile, in terminal or axillary, slenderly peduncled, up to 4 times dichasially branched, lax, slender cymes; the ultimate bifurcations cincinnate, with few to numerous, secund, closely set, 4-merous flowers . . . . . **3. G. divaricata**
   3. Flowers never in cincinnae, 4- or 5-merous.
      4. Cymes bent down abruptly to the branches, long, thyrsoid, with 4-merous flowers. **4. G. fractiflexa**

[1]) By way of exception are sometimes one or a few 6-merous flowers present.
[2]) The Ceylonese and Malesian species have always valvate corolla-lobes.
[3]) The Ceylonese and Malesian species have always globose to didymous, ½—1 cm wide, smooth fruits.
[4]) See under Species excludendae.

4. Cymes not bent down, with 4- or 5-merous flowers, only rarely thyrsoid and then with 5-merous flowers.
   5. Flowers 4-merous [1]). Leaves at most 10 by 4 cm.
      6. Leaves with 3—6 pairs of nerves. Stipular teeth in interpetiolar pairs. Cymes sessile, 3-flowered. Mature corolla at least 1½ cm long, pink. Flowers bisexual, heterodistylous. **5. G. rosea**
      6. Leaves with 5—7 pairs of nerves. Stipular teeth not in pairs. Cymes peduncled, few- to many-flowered, never 3-flowered. Mature corolla 4—5½ mm long, white. Flowers unisexual. **6. G. viminea**
   5. Flowers 5-merous.
      7. Cymes terminal, capituliform, densely and very many-flowered. Stipular sheath firm, deeply cleft, with indistinct teeth and very distinct ridges surrounding the petiole-base. **7. G. globigera**
      7. Cymes terminal or axillary, only rarely more or less capituliform but then with at most a few tens of flowers and a stipular sheath not answering the above description.
         8. Mature corolla 13—19 mm long; tube *c.* 3 times as long as the lobes. Flowers always bisexual. Leaves at most 8 by 4 cm.
            9. Leaves decussate, ± oblong, 1½—8 by ½—4 cm, cuspidate, with distinct nerves. Internodes without distinct ribs or grooves. Cymes 3—11-flowered, flowers erect. **8. G. walkeri [2])**
            9. Leaves in whorls of three, at most 2½ cm long, very narrow, coriaceous, without nerves. Internodes shortly ribbed or grooved. Flowers solitary, nodding. **9. G. ternifolia [2])**
         8. Mature corolla (3—)4—11(—13) mm long; tube ½—2(—3) times as long as the lobes. Corolla very rarely slightly longer but then the flowers always unisexual.
            10. Cymes axillary [3]) or opposite supra-axillary at the end of very short to very long shoots which are whether or not provided with stipules and/or small or reduced leaves, at most half as long as the normal leaves. Leaves (10—)13—55 cm long.
               11. Anthers inserted low in the corolla, hardly or not reaching the hair-ring. Plant usually very coarse. Leaves 25—55 cm long. Stipules 2½—5 cm long. Cymes about corymbiform . . . . . **10. G. obesa**
               11. Anthers inserted at the height of the hair-ring. Plant usually rather slender. Leaves (10—)13—32 cm long. Stipules at most 2½(—3) cm long. Cymes usually distinctly paniculiform . . . . . **11. G. oblanceolata**
            10. Cymes either distinctly terminal, or axillary to opposite supra-axillary but then always at the end of shoots provided with leaves which do not or not so much deviate from the stem-leaves [4]). Leaves 3—20(—27) cm long. Stipules up to 15 mm long . . . . . **12. G. vaginans**

1. Gaertnera schizocalyx Bremek., Kew Bull. (1940) 193. — Type: *Beccari P.B. 1799*, holotype and one isotype in K. — **Fig. 4 f and 8 i.**

Shrub, *c.* 1½ m. *Branches* terete, 2—4 mm ∅, when young covered with close-set, patent, curved, villous, yellowish hairs, when older glabrescent; cortex whitish yellow. *Leaves* obovate-lanceolate to lanceolate, 3—4 times as long as wide, (4—)7—17 by (1½—)2½—6 cm, acute at the base, acuminate to caudate at the apex, rather coriaceous, glabrous above, grey to yellow hirsute beneath, densely so on midrib and nerves, sparsely for the rest; nerves (4—)5—9 pairs; petiole 2—8 mm, glabrous above, densely hirsute beneath. *Stipular sheath* loosely enveloping the twig, ½—1½ cm, usually not cleft, marcescent and often damaged when older, more or less densely villous, with 4 more or less distinct ribs forming broad wings all around the petiole-bases and running out into the 2—12 mm long, outside villous teeth. *Cymes* terminal or axillary, forming a very

[1]) Rarely a few 5-merous flowers occur in inflorescences which have otherwise 4-merous ones.
[2]) Proportionally many intermediate forms between *G. walkeri* and *G. ternifolia* occur!
[3]) Sometimes rising above the terminal bud.
[4]) Rarely a specimen may be found with characters intermediate between *G. vaginans* and *G. oblanceolata*.
See note 3 on p. 386.

dense, many-flowered, subglobose cluster, 1½—3 cm across, densely hispidulous; peduncle absent or up to 2½ cm, densely villous. *Bracts* varying in shape and size, mostly divided into 3 unequal, linear lobes, up to *c.* 10 mm long, hispidulous, especially on the margin; the outer lobes shorter than the middle one, often very small or absent, especially in the bracts of higher rank; bracts at the base of the cyme sometimes presenting transitional stages to the leaves, the linear-lanceolate middle lobe being often rather long, up to 1½ cm. *Bracteoles* linear, 2—3 mm long, hispidulous, often with 2 minute auricles near the base. *Pedicels* 0—2 mm, hispidulous. *Flowers* 5-merous [1], unisexual. *Calyx* campanulate, *c.* 1½ mm wide and as much high, outside hispidulous, inside glabrous and without hair-ring, with 5 triangular to linear-lanceolate, 1—4 mm long, often unequal, hispidulous lobes. *Corolla* when closed clavate, when open trumpet-shaped, white; tube cylindric, suddenly widened into the throat, 3—4½ mm, *c.* 1 mm across, glabrous; throat with a dense ring of villous hairs; lobes 5, narrowly triangular, 2—2½ mm, obtuse, outside hispidulous, inside glabrous. *Stamens* 5; anthers inserted in the throat, on short filaments, 1—1½ mm, well developed (♂ flowers) or probably staminodial in ♀ flowers [2]). *Style* 4—5½ mm, glabrous, stigmas absent or ill developed [2]).

Distribution: Borneo (Sarawak: Matang, one specimen), Malaya (Johore: Sungai Kayu, two specimens). — Fig. 9.

Ecology: Low country, near river bank, in swamp.

Remarks: This very characteristic but obviously very rare species occupies an isolated position on account of its villous to hirsute pubescence, the very condensed flowers, and the long calyx-lobes.

2. Gaertnera grisea Hook. *f. ex* Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 92; Boerl., Handl. 2 (1899) 461; King & Gamble, J. As. Soc. Beng. 74, ii (1908) 625; Ridl., Fl. Mal. Pen. 2 (1923) 431. — *Sykesia grisea* (Hook. *f.*) O. K., Rev. Gen. Pl. 2 (1891) 425. — Type: *Wallich 8389*, holotype and one isotype in K. — **Fig. 4 g and 8 h.**

Shrub or small tree, up to 5 m. *Branches* stout, *c.* ½ cm ∅, rather densely pubescent, especially when young; internodes (2—)3—10 cm. *Leaves* oblong to lanceolate, sometimes ovate-oblong or obovate to oblanceolate, 2—4 times as long as wide, 9—27 by 4—10 cm, acute to obtuse at the base, more or less acuminate at the apex, coriaceous, usually pretty shining and always glabrous above, variously patently yellowish-cinereous-pubescent beneath, especially densely and more appressedly so on the nerves and the veins; nerves 7—9 pairs, often impressed above; petiole ½—1½ cm, with 2 lateral ridges, densely pubescent beneath and less so above. *Stipular sheath* loosely enveloping the twig, 1—2½ cm, usually more or less shallowly cleft at the apex, firm, semipersistent, densely appressed-pubescent, with 4 rather distinct ribs running from all around the petiole-bases to the 3—5 mm long teeth. *Cymes* terminal, paniculiform, pyramidal, 5—12 cm, densely cinereous-yellowish-puberulous in all parts, with 3—4 pairs of spreading primary side-axes bearing many flowers crowded and congested at the ends of the ramifications. *Bracts* triangular to ovate, 1—3 mm, entire or with a few minute teeth; those at the base of the cyme assuming the shape of the leaves and 3—10 cm. *Bracteoles* situated at the base of the calyx, bract-like, minute. *Pedicels* absent or up to 3 mm. *Flowers* 5-merous, unisexual. *Calyx* campanulate, 2—3 mm wide, with 5 broad and short, triangular teeth, inside with a hair-ring. *Corolla* when closed cylindric and more or less widened towards the obtuse apex, trumpet-shaped when open (rarely!), white; tube 4—7 mm, *c.* 1½ mm

[1]) Once I have found a 4-merous flower among the normal ones.
[2]) I have seen only ♂ flowers.

across; throat with a dense ring of villous hairs, especially above the insertion of the anthers; lobes 5, ovate-oblong, *c.* 3 mm, acute. *Stamens* 5; anthers inserted in the throat or in the upper part of the tube, sessile, *c.* 2½ mm, well developed (♂ flowers) or staminodial (♀ flowers). *Style* in length varying with the length of the corolla, 3—5 mm (♀ flowers) or ill developed and minute (♂ flowers), glabrous or with a few hairs; stigmas linear, thick, *c.* 2 mm, not or hardly developed in ♂ flowers.

Distribution: Malaya (Johore, Selangor?), Singapore, Riouw Arch., Banka. — Fig. 9.

Ecology: Lowland and hill forests.

Remarks: From Selangor (Ulu Gombak) I have seen only one very depauperated specimen (*H. L. Hume 8930*). I do not think the species is common there.

From Singapore I have seen a very anomalous specimen (*Cantley's Collector 3008*) with characters intermediate between *G. obesa* and *G. grisea*. I feel certain that this is a hybrid between these two species.

3. Gaertnera divaricata (Thw.) Thw., En. Pl. Zeyl. (1864) 420. — *Pristidia divaricata* Thw., En. Pl. Zeyl. (1859) 149. — *Grumilea divaricata* Thw. mss. *ex* Thw., l. c., *nomen in synom., invalid.*; Ind. Kew. 1: 1067. — *G. koenigii* var. *divaricata* (Thw.) Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 91; Trim., Fl. Ceyl. 3 (1895) 177. — Type: *Thwaites CP 2991*, holotype and one isotype in K, isotypes seen from BM, BR, CGE, P, W.

Shrub, glabrous, sometimes puberulous on the flowers. *Branches* terete or flattened, 1½—3½ mm ∅; internodes 3—10 cm. *Leaves* oblong or ovate, (1½—)2—3 times as long as wide, 8—13 by 2½—7½ cm, acute to rounded, sometimes attenuate at the base, acuminate to cuspidate at the apex, coriaceous; nerves often very inconspicuous, 5—7 pairs, thin, flat and hardly visible above, slightly prominent beneath; midrib more or less dark-coloured; petiole ½—1 cm. *Stipular sheath* closely enveloping the twig, ¾—1½ cm, soon marcescent and wearing off, with indistinct teeth and with 4 faint ribs running from all around the petiole-bases to the margin. *Cymes* terminal or at the end of opposite, axillary or supra-axillary shoots, very lax, up to 10 cm long and wide, with 1—3 pairs of primary side-axes each up to 4 times dichasially branched; ultimate bifurcations cincinnate, with few to numerous, secund, closely set flowers; shoots slender, 4—14 cm, with or without small stipules and up to 2 pairs of small, up to 6 cm long leaves. *Bracts* more or less embracing the axis, deltoid, ½—1½ by ½—2 mm, often wider than long, acuminate, sometimes slightly puberulous on the margin; those below the flowers always small, *c.* ½ mm; those at the base of the cyme sometimes replaced by small leaves. *Bracteoles* absent. *Flowers* sessile, 4-merous, bisexual. *Calyx* barrel-shaped, 1½—2 mm wide and high, fleshy, with 4 faint teeth, outside subglabrous, inside with a well developed hair-ring. *Corolla c.* 5 mm in bud (mature flower not seen), with a very short tube and proportionally long lobes, outside subglabrous to puberulous, with a more or less well developed ring of villous hairs in the throat. *Stamens* 4; anthers inserted in the throat, subsessile, *c.* 2 mm. *Style c.* 3 mm, slightly hairy to the top; stigmas ± clavate, *c.* ½ mm, densely hairy.

Distribution: Ceylon (Mapalagam, near Galle, Hinidoon Pattoo), probably rare.

Remarks: Only the type specimens of this species were available to me. It occupies a very exceptional position within the genus, because of the peculiar structure of the cyme. Beddome, Fl. Sylv. 3 (1869) 164, Clarke, l.c., and Trimen, l.c., underestimated in my opinion this important character, and that of the 4-merous flower, subordinating *G. divaricata* to the rank of a variety of *G. koenigii* (= *G. vaginans*).

4. **Gaertnera fractiflexa** Van Beusekom, *spec. nov.* — Type: *Haviland s.n.*, coll. date 18-7-1890, holotype in SING. — **Fig. 8 a—c.**

Frutex omnibus partibus (sub)glaber. *Rami* teretes, 1½—3 mm ∅, internodiis ramorum principalium ½—1, lateralium 2—4 cm longis. *Folia* lanceolata, apice acuminata vel cuspidata, basi acuta vel attenuata, subcoriacea, 4—10 × 1—3 cm, nervis (4—)5—7(—8) paribus; petiolus usque ad ¾ cm longus. *Vagina stipulanea* ramum ± distanter includens, ¾—1¼ cm longa, uni- vel bilateraliter in partes ovatos vel triangulares acutos interdum breviter bifidos intrapetiolariter fissa, mox marcescens et partim vel omnino evanescens, costis 4 inconspicuis petiolum basi amplectentibus, in dentes 2 mm longos interpetiolariter binatos excurrentibus. *Inflorescentia* in ramis lateralibus terminalis, abrupte deorsum flexa, thyrsiformis, laxa, 7—11 cm longa, axibus lateralibus primariis c. 10-paribus usque ad 2½ cm longis, inferioribus reflexis, superioribus patentibus; cymula flore unito vel floribus pluribus. *Pedunculus* 2½—5 cm longus. *Bracteae* (anguste) triangulares, usque ad 3 mm longae, inferiores generaliter auriculatae, eae ad basim thyrsi lineari-lanceolatae 1½—3 cm longae. *Bracteolae* parum infra calycem insertae, ovatae, minutae. *Pedicelli* usque ad 3 mm longi. *Flores* 4-meri, unisexuales. *Calyx* campanulatus, c. 1½ mm diam., intus annulo pilorum sat obscuro vel nullo praeditus, dentibus 4 brevibus late triangularibus. *Corolla* in alabastro tantum cognita, abrupte in tubum contracta, alba; tubus usque ad 2½ mm longus, c. ¾ mm diam., intus fauce et parte inferiore loborum leviter barbatus; lobi 4, lanceolati, 2—3 mm longi. *Stamina* 4; antherae fauce insertae, c. 2½ mm longae, filamentis brevissimis (flos ♂). *Stylus stigmataque* male evoluta, glabra, c. 2 mm longa (flos ♂). Flos ♀ et *drupa* ignota.

Shrub, glabrous in all parts or nearly so. *Branches* terete, 1½—3 mm ∅; internodes of main branches short, ½—1 cm, those of the side-branches longer, 2—4 cm. *Leaves* lanceolate, 3—4 times as long as wide, 4—10 by 1—3 cm, acute to attenuate at the base, acuminate to cuspidate at the apex, hardly or not coriaceous; nerves (4—)5—7(—8) pairs; petiole up to ¾ cm. *Stipular sheath* more or less loosely enveloping the twig, ¾—1¼ cm, usually more or less deeply intrapetiolarly cleft into one or two ovate to triangular, acute or shortly bifid parts, soon marcescent and partly or entirely wearing off, provided with 4 faint ribs or ridges surrounding the petiole-bases and running out into the up to 2 mm long, interpetiolarly paired teeth. *Cymes* only on the side-branches, terminal, bent down abruptly, thyrsiform, lax, 7—11 cm, with *c.* 10 pairs of primary side-axes of which the lower ones are reflexed, the higher ones spreading; primary side-axes up to 2½ cm, bearing cymelets with 1-several flowers; peduncle 2½—5 cm. *Bracts* triangular to narrowly triangular, up to 3 mm, the lower ones usually auriculate; those at the base of the thyrsus linear-lanceolate, 1½—3 cm. *Bracteoles* inserted just below the calyx, ovate, minute. *Pedicels* up to 3 mm. *Flowers* 4-merous, unisexual. *Calyx* campanulate, *c.* 1½ mm wide, with 4 broad and short, triangular teeth, inside with or without an indistinct hair-ring. *Corolla* when closed cylindric, suddenly narrowed into the tube, white; tube up to 2½ mm, *c.* ¾ mm across; throat and lower part of the lobes inside with a slightly developed ring of villous hairs; lobes 4, lanceolate, 2—3 mm. *Stamens* 4; anthers inserted in the throat, on very short filaments, *c.* 2½ mm (♂ flower). *Style* and *stigmas* ill developed, *c.* 2 mm, glabrous (♂ flower; ♀ flower unknown).

Distribution: Borneo, Sarawak: Matang, Peakes tea plantation, near bungalow once found. — Fig. 10.

Remarks: The thyrsoid, suddenly recurved, pendulous inflorescence is highly characteristic.

Fig. 8. a—c. *Gaertnera fractiflexa*. a. Flowering twig, × $\frac{2}{3}$; b. bud, and c. halved bud of ♂ flower, × 4. — d—l. Different types of stipular sheaths. d. *G. vaginans* ssp. *vaginans* (Ceylon specimen!), × 1; e. and f. *G. vaginans* ssp. *junghuhniana*, × 1; g. *G. viminea*, × 3; h. *G. grisea*, × 1; i. *G. schizocalyx*, × 1; j. *G. rosea*, × 3; k. *G. ternifolia*, × 4; l. *G. globigera*, × 1 (a.—c. from *Haviland s.n.*; d. from *Walker s.n.*; e. from *Zen S 12957*; f. from *Bakar SAN 25031*; g. from *Holttum SFN 18091*; h. from *Rachmat 8*; i. from *Kiah SFN 32015*; j. from *Thwaites CP 2673*; k. from *Thwaites CP 440*; l. from ? *collector, Sarawak 9863*).

5. Gaertnera rosea Thw. *ex* Benth., J. Proc. Linn. Soc. 1 (1857) 111; Thw., En. Pl. Zeyl. (1860) 201; Bedd., Fl. Sylv. 3 (1869) 164; Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 92; Trim., Fl. Ceyl. 3 (1895) 177. — *Sykesia rosea* (Benth.) O. K., Rev. Gen. Pl. 2 (1891) 425. — Lectotype: *Thwaites CP 2673*, holotype in K, isotypes seen from BM, BO, CGE, P, W; syntype *Walker s.n.*, in K. — **Fig. 4 h and 8 j.**

Shrub, up to 3 m, glabrous in all parts or practically so. *Branches* slender, terete, 1—2 mm ∅, with 2 more or less elevated ribs; internodes usually 1—3 cm. *Leaves* elliptic to oblong, sometimes ovate or ovate-oblong, 1—3 times as long as wide, 1—5½ by (½—)¾—2¾ cm, attenuate at the base, decurrent on the petiole, acuminate to caudate at the apex, somewhat revolute at the very edge; nerves 3—6 pairs; petiole absent or up to 5 mm. *Stipular sheath* more or less closely enveloping the twig, 2—5 mm, not cleft, gradually marcescent and wearing off, with 1—4 mm long, filiform teeth, placed in opposite, interpetiolar pairs (one pair often seemingly a bifid tooth), with 6 more or less distinct ribs, 3 below each pair of teeth, running closely together, 4 of them running from all around the petiole-bases to the teeth, the 2 other ones extending from the ribs on the branches to between a pair of teeth. *Cymes* terminal on main or side branches, 3-flowered; peduncle absent or very short. *Bracts* only present at the base of the cyme, varying from about ovate and 3-toothed to linear-lanceolate and with 2 teeth near the base, 2—12 mm. *Bracteoles* on or at the base of the calyces of the 2 outer flowers, ± narrowly triangular, ½—1½ mm, acuminate. *Pedicels* absent or up to 1 mm. *Flowers* 4-merous, bisexual, probably heterodistylous (see remarks). *Calyx* rather deeply cup-shaped, *c.* 2 mm wide, with 4—6 short, irregularly placed, pointed teeth, without a hair-ring inside. *Corolla* trumpet-shaped, pink; tube cylindric, *c.* 15 mm, *c.* 1½ mm across; throat and upper part of the tube with a slight ring of villous hairs; lobes 4, linear-lanceolate, *c.* 7 mm. *Stamens* 4; anthers hidden in the corolla-tube, inserted just above the base of the hair-ring, subsessile, *c.* 2½ mm. *Style c.* 15 mm, glabrous; stigmas exerted from the corolla-tube, linear, *c.* 2½ mm, very papillose.

Distribution: Ceylon (Ambagamuwa and Saffragam districts). Recorded to be rare.

Ecology: Forests in moist, low country, up to 600 m.

Remarks: I had only the type material available for the description. Only one specimen of this has mature flowers, hence the doubt expressed about their heterodistylous nature.

6. Gaertnera viminea Hook. *f. ex* Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 91; Boerl., Handl. 2 (1899) 461; King & Gamble, J. As. Soc. Beng. 74, ii (1908) 623; Ridl., Fl. Mal. Pen. 2 (1923) 427. — *Psychotria viminea* Wall., Cat. (1847) n. 8354, *nomen.* — *Sykesia viminea* (Hook. *f.*) O. K., Rev. Gen. Pl. 2 (1891) 425. — Type: *Wallich 8354*, holotype in K, isotypes seen from K, CGE. — **Fig. 4 i and 8 g.**

Shrub. *Branches* very slender, 1½—2 mm ∅, glabrous. *Leaves* oblong to lanceolate, or ovate-oblong to -lanceolate, 2—3 (—4) times as long as wide, (3—)4—10 by (¾—)1—4 cm, acute, sometimes obtuse to rounded at the base, longer or shorter cuspidate at the apex, glabrous on both sides; nerves 5—7 pairs; petiole 2—10 mm, glabrous. *Stipular sheath* closely enveloping the twig, 4—10 mm, usually not cleft, soon evanescent, glabrous or with some minute hairs towards the top, with 4 more or less distinct ribs running from below the petiole-bases to the 1—2 mm long teeth. *Cymes* terminal on main or side branches, paniculiform, expanded, lax, (1½—)2—5 by (2—)2½—7 cm, usually wider than long, in all parts glabrous or puberulous, sometimes very few-flowered, with 2 or 3 pairs of spreading primary side-axes, each bearing 1—17 flowers. *Bracts* triangular to lanceolate, 1—4 mm, acuminate, often with some minute teeth; those at the base of the cyme often much larger, presenting all transitions between bracts and normal

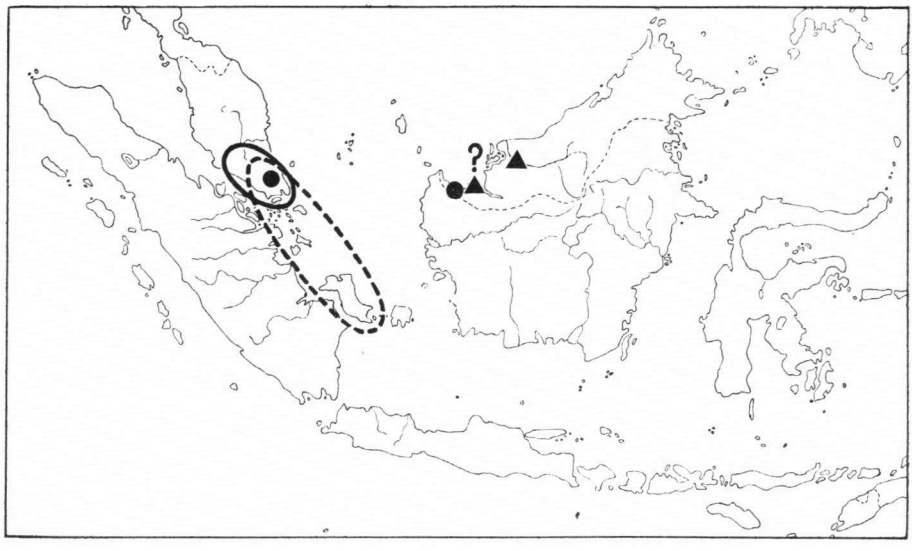

Fig. 9. Distribution of *Gaertnera grisea* (- - - -), *G. schizocalyx* (●), *G. viminea*(——), and *G. globigera* (▲).

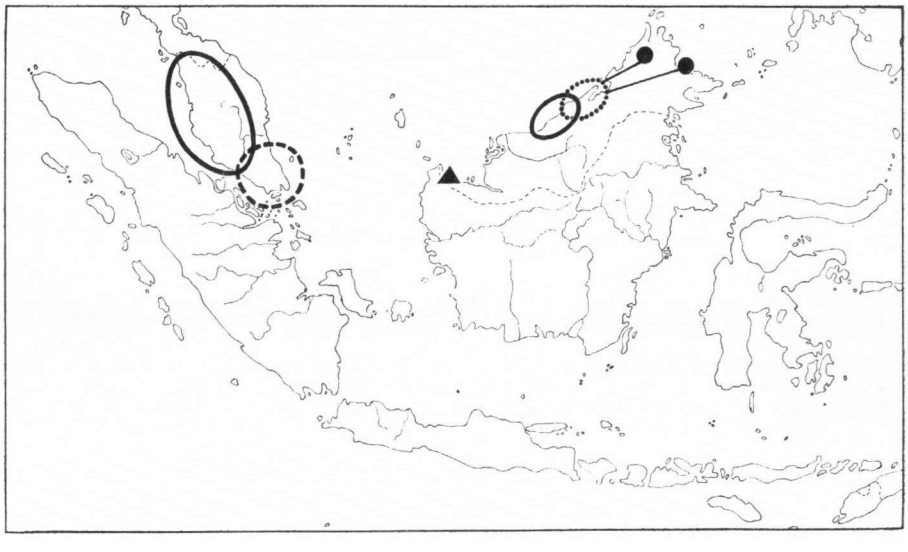

Fig. 10. Distribution of *Gaertnera fractiflexa* (▲), *G. obesa* (- - - -), *G. oblanceolata* (——), and *G. vaginans* ssp. *junghuhniana* f. *hermaphroditica* (. . . . ●).

leaves. *Bracteoles* on the pedicels or at the base of the calyx, ± deltoid, ½—1 mm. *Pedicels* 0—5 mm, upwards widened into the calyx. *Flowers* unisexual, 4-merous (see remarks). *Calyx* cup-shaped, shallow, 1—2 mm wide, inside with a more or less distinct hair-ring, with 4 more or less distinct, short, triangular, sometimes pointed teeth. *Corolla* trumpet-shaped, 3½—5½ mm, white; tube cylindric, as long as or slightly longer than the lobes, *c.* ¾ mm across; throat with a dense ring of villous hairs; lobes 4, triangular to oblong, blunt. *Stamens* 4; anthers inserted in the throat, subsessile, with very short, basal, somewhat laterally arising filaments, slightly curved, *c.* 1½ mm and well-developed (♂ flower) or shorter and staminodial (♀ flower). *Style c.* 3 mm (♀ flower) or 1—2 mm and ill developed (♂ flower), sometimes with some hairs; stigmas thick, blunt, *c.* 1 mm and very papillose (♀ flower) or ill developed (♂ flower).

Distribution: Malaya (Johore and Negri Sembilan), Singapore. — Fig. 9.

Ecology: Common in forests.

Remarks: The species is mentioned from Borneo by Merrill, Enum. Born. Pl. (1921) 580. This seems, however, not to be correct. I have seen some of the specimens cited by him and these represent doubtless a narrow-leaved form of *G. vaginans* ssp. *junghuhniana*. *G. viminea* does probably not occur in Borneo and seems to be endemic in S. Malaya and Singapore.

I found in specimens 4-merous flowers normally represented, but rarely a few 5-merous ones were observed.

7. Gaertnera globigera Van Beusekom, *spec. nov.* — Type: ? *collector, Sarawak 9863*, holotype in SAR. — **Fig. 8 l.**

Frutex glaber. *Rami* sat validi, teretes, c. ½ cm ∅, internodiis 4—5 cm longis. *Folia* lanceolata, apice ± acuminata, in petiolum ½—1 cm longum extenuata, 20—25 × 4—5 cm, nervis 9—11 paribus. *Vagina stipulanea* ramum ± distanter includens, 1½—2 cm longa, in partes duos late oblongas indisticte bifidas interpetiolariter fissa, firma, semi-persistens, costis 4 latiusculis munita, alas angustas petiolum basi amplectentes formantibus. *Inflorescentia* terminalis, capituliformis, dense multiflora, c. 3½ cm diam. *Pedunculus* brevis. *Bracteae* late ovatae vel triangulares, breviter acuminatae, usque ad 3 mm longae, eae ad basim capituli foliiformae c. 2 cm longae. *Bracteolae* bracteis minoribus similes. *Flores* sessiles. *Calyx* late cupuliformis, truncatus, (sub)glaber, c. 3 mm diam., dentibus 5 ± distinctis breviter triangularibus. Cetera ignota.

Shrub, glabrous or practically so in all parts. *Branches* rather stout, terete, *c.* ½ cm ∅; internodes 4—5 cm. *Leaves* lanceolate, 5 times as long as wide, 20—25 by 4—5 cm, cuneate to attenuate at the base, decurrent on the ½—1 cm long petiole, slightly acuminate at the apex, coriaceous; nerves 9—11 pairs. *Stipular sheath* loosely enveloping the twig, 1½—2 cm, deeply interpetiolarly cleft in two broadly oblong, obscurely bifid parts, firm, semi-persistent, provided with 4 rather coarse ridges forming narrow wings all around the petiole-bases. *Cymes* terminal, capituliform, densely and very many-flowered, *c.* 3½ cm across; peduncle short. *Bracts* broadly ovate to triangular, up to 3 mm, shortly acuminate; those at the base of the capitulum assuming the shape of the leaves, *c.* 2 cm. *Bracteoles* like the smaller bracts. *Flowers* sessile. *Calyx* broadly cup-shaped, truncate, *c.* 3 mm wide, with 5 more or less distinct, triangular, short teeth, without a hair-ring inside. *Corolla*, *stamens*, and *style* and *stigmas* unknown, as well as the *fruit*.

Distribution: Borneo. Sarawak: Sibu district, path from Agriculture Station Rantau Panjang to Teku; on the label is stated that the species has also been observed in kĕrangas forest in Bako Nat. Park. — Fig. 9.

Ecology: In kĕrangas forest (note on the label).

8. Gaertnera walkeri (Arn.) Bl., Mus. Bot. 1 (Febr. 1850) 174; Wight, Ill. 2 (1850) 172, t. 156, b. 2; Benth., J. Proc. Linn. Soc. 1 (1857) 111, *pro parte*; Thw., En. Pl. Zeyl. (1860) 202; Bedd., For. Man. 3 (1869) 164; Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 92, *pro parte*; Trim., Fl. Ceyl. 3 (1895) 178, *pro parte*; Dop, Mém. Bull. Soc. Bot. Fr. 19 (1910) 27. — *Sykesia walkeri* Arn., Pug. (1836) 354; DC., Prod. 9 (1845) 35; O. K., Rev. Gen. Pl. 2 (1891) 425. — Lectotype: *Walker 102*, holotype in GL (first description based on an unnumbered specimen, legit Walker). — **Fig. 4 j.**

Shrub, up to 3 m, either glabrous in all parts or faintly puberulous on the cymes and the stipules. *Branches* slender, terete, often somewhat flattened, 1—2½ mm ∅; internodes usually 2—7 cm. *Leaves* ovate-oblong or oblong, rarely lanceolate, 2—3 times as long as wide, 1½—8 by ½—4 cm (sometimes cataphylls present), acute to attenuate at the base, cuspidate to long caudate, sometimes acute at the apex, often somewhat revolute at the very edge, ± coriaceous; nerves (3—)4—5(—6) pairs; petiole 3—12 mm. *Stipular sheath* more or less closely enveloping the twig, 3—10 mm, usually not cleft, sometimes slightly puberulous on the edge, gradually marcescent and wearing off, with minute, often rudimentary teeth placed in opposite pairs, with or without 2 pairs of more or less distinct ribs running out into the teeth, with or without faint ridges all around the petiole-bases. *Cymes* terminal on main or (sometimes somewhat reduced) side-branches, paniculiform, lax, 3—11-flowered, 1—4½ cm, in all parts glabrous or minutely puberulous. *Bracts* triangular to filiform, up to several mm, often tripartite or auriculate; those at the base of the cyme often larger and leaf-like, up to 3 cm. *Bracteoles* on or just below the calyx, triangular to lanceolate, usually 1—3 mm, but sometimes minute or absent. *Pedicels* 1—17 mm. *Flowers* 5-merous, bisexual, heterodistylous. *Calyx* cup-shaped to shortly campanulate, 2½—3½ mm wide and about as high, with 4—6 usually very unequal, up to 1(—2) mm long, triangular teeth, inside with a rather indistinct hair-ring. *Corolla* funnel-shaped, white; tube gradually dilated to the top, 9—13 mm, 1½—3½ mm across, with a slightly developed, 3—5 mm high ring of villous hairs, situated just above the middle of the tube; lobes 5, ovate-oblong, 4—6 mm, more than 2 times shorter than the tube. *Stamens* 5; anthers inserted halfway or in the upper part of the tube, either sessile and quite hidden (♀ flower) or on 2—3 mm long filaments and partly or just not exerted (♂ flower), *c.* 3 mm. *Style* about as long as the corolla-tube (♀ flower) or shorter, *c.* 5 mm (♂ flower), glabrous or with some hairs to the top; stigmas linear, *c.* 2½ mm.

Distribution: Ceylon (Central Provinces, abundant about Nuara Eliya).

Ecology: Mountain forests, 900—2000 m.

Remarks: This species and *G. ternifolia* seem to be quite different. Yet there have been found many specimens with intermediate characters in general habit, pubescence, phyllotaxis, size and shape of the leaves, and number of flowers in a cyme. Some of these have been united with *G. walkeri* as *G. walkeri* var. *angustifolia* Benth, l.c., *pro parte*, or *G. walkeri* var. *gardneri* (Thw.) Clarke, l.c.; Trim., l.c. Var. *gardneri* has also been described as a separate species: *G. gardneri* Thw., l.c.; Bedd., l.c. p. 165; Alston in Trim., Fl. Ceyl. 6 (Suppl.) (1931) 197.

Some specimens are clearly of a hybrid nature, and, in my opinion, all intermediates are probably hybrids, whether or not fertile. The material available to me, however, was not sufficient to reach a definite decision about the two species and their intermediates. This question can only be solved by studying populations in the field.

Typification of intermediate forms: *Gaertnera gardneri*, *Gaertnera walkeri* var. *gardneri*: Lectotype: *Thwaites CP 346*, holotype in BM, isotype seen from W; syntype: *Thwaites CP 363*, seen from K. — *Gaertnera walkeri* var. *angustifolia*: see under *G. ternifolia*.

9. Gaertnera ternifolia Thw., En. Pl. Zeyl. (1860) 202; Bedd., Fl. Sylv. 3 (1869) 165; Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 92; Trim., Fl. Ceyl. 3 (1895) 178; Dop, Mém. Bull. Soc. Bot. Fr. 19 (1910) 27. — *Sykesia ternifolia* (Thw.) O. K., Rev. Gen. Pl. 2 (1891) 426. — Type: *Thwaites CP 440*, holotype in P, isotypes seen from BM, CGE, K, P, W; syntype: *Thwaites CP 457*, in K.

Gaertnera walkeri var. *angustifolia* Benth., J. Proc. Linn. Soc. 1 (1857) 111, *pro parte*. — Lectotype: same as of *G. ternifolia*; syntypes: *Thwaites CP 363, 457*, both in K, and *Walker s.n.* (several seen from BM, CGE, K, L). — **Fig. 8 k.**

Shrub, up to 2 m, more or less densely puberulous usually in all parts except the leaves. *Branches* numerous, terete, ¾—3 mm ∅, with 3 raised ribs; internodes very short, up to *c.* 2½ cm. *Leaves* very numerous, in whorls of 3, subsessile, linear-lanceolate, (5—)10—25 by 1—3 mm, very acute at both ends, shortly mucronate, more or less revolute at the very edge, very coriaceous; nerves not visible; midrib flat or hardly prominent above, distinctly prominent beneath. *Stipular sheath* very short, up to *c.* 1 mm, semipersistent, with 3 distinct ribs being the extension of the ribs on the branch and running out into 3 *c.* 1 mm long, triangular, acuminate, often somewhat bifid teeth, with 3 other, more or less distinct ribs running all around the petiole-bases. *Bracts* usually 3 in a whorl, linear-lanceolate, varying in size, often equalling the leaves. *Bracteoles* 3, situated on the calyx or below it, not always sharply distinguishable from the bracts, triangular to lanceolate, sometimes auriculate, usually not longer than 3 mm. *Pedicels* *c.* ¾ cm or shorter. *Flowers* solitary, terminal, nodding, otherwise not differing from those of *G. walkeri*, except for the calyx having 1½—2 mm long, about equal teeth.

Distribution: Ceylon (Adam's Peak and adjacent parts of Maskeliya and Ambagamuwa).

Ecology: Mountain forests, 1200—1800 m.

Remarks: Though very distinct in general appearance, numerous intermediates are found between this species and *G. walkeri* (see there). Whether there are two (perhaps more!) species or only one, viz. *G. walkeri*, cannot be established without performing population studies in the field. Provisionally I assume that not more than two interbreeding species are concerned which produce fertile hybrids.

10. Gaertnera obesa Hook. *f. ex* Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 92; O. K., Rev. Gen. Pl. 2 (1891) 426; Boerl., Handl. 2 (1899) 461; King & Gamble, J. As. Soc. Beng. 74, ii (1908) 624; Ridl., Fl. Mal. Pen. 2 (1923) 431. — *Psychotria obesa* Wall., Cat. (1847) n. 8328, *nomen*. — Type: *Wallich 8328*, holo- and isotype in K; syntypes: *Maingay 925*, *Walker 212*, both seen from K. — **Fig. 11.**

Shrub, sometimes treelet, up to 4½ m. *Branches* very stout, flattened, (½—)1—1½ cm ∅, glabrous; internodes up to 11 cm, often not more than 2—3 cm. *Leaves* obovate-oblong to oblong, 2½—3 times as long as wide, 25—55 by (7—)9—19 cm, gradually narrowed into the petiole, more or less shortly acuminate at the apex, fleshy coriaceous, glabrous on both sides; nerves 9—13 pairs; petiole 2—10 cm, *c.* ½ cm across, glabrous, winged towards the leaf-blade. *Stipular sheath* loosely enveloping the twig, 2½—5(—7½) cm, very wide, finally deeply interpetiolarly cleft into two broadly oblong, acute and often obscurely bifid parts, semi-persistent, glabrous or faintly pubescent, provided with many slightly prominent, parallel, anastomosing nerves and 4 very coarse ridges forming wings all around the petiole-bases and running out along the fissure-edges. *Cymes* axillary, in 1—3 opposite pairs, near the top of the branches, corymbiform, very dense, many-flowered, 2½—5½ cm long, 3—8 cm wide, more or less puberulous in all parts except the corolla; peduncle stout, 2—11 cm. *Bracts* triangular to ovate, up to *c.* 6 mm, acute, with or without some minute teeth; those at the base of the cyme sometimes

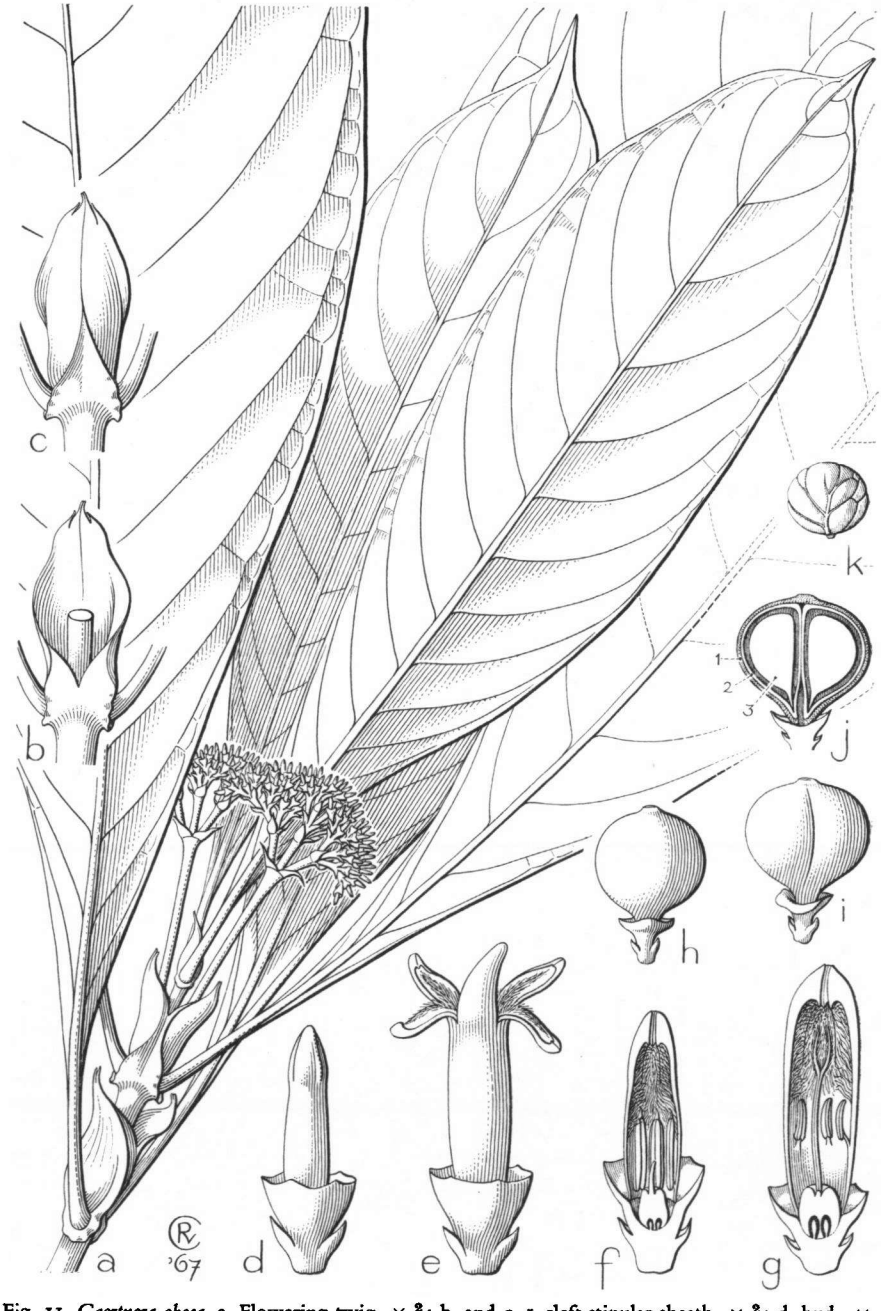

Fig. 11. *Gaertnera obesa*. a. Flowering twig, × $\frac{2}{3}$; b. and c. 1-cleft stipular sheath, × $\frac{2}{3}$; d. bud, × 4; e. open flower, × 4; f. and g. halved ♂ and ♀ flower, × 4; h. and i. 1- and 2-seeded fruit, × 2; j. halved 2-seeded fruit, × 2; k. seed, × 2 (a., d.—g. from *Ridley 2680* and *s.n.*; b.—c. from *Ridley s.n.*; h.—k. from *Kiah SFN 32110*).

larger, linear-lanceolate, up to 10 cm. *Bracteoles* situated at the base of the calyx, ± deltoid, *c.* ¾ mm. *Pedicels* up to 1 mm. *Flowers* 5-merous, unisexual. *Calyx* broadly cup-shaped to campanulate, truncate, 2—3 mm wide, entire-edged or with 5 hardly developed short teeth, with a more or less distinct hair-ring inside. *Corolla* when closed cylindric and acute, when open trumpet-shaped, white, glabrous except for the dense ring of villous hairs in the throat and the upper part of the tube, which continues on the 5 oblong, *c.* 3 mm long, acute lobes; tube 5—8 mm, 1½—2 mm across. *Stamens* 5; anthers inserted near the base of the tube, just reaching the hairy part of it, subsessile, 1½—3 mm, well developed (♂ flowers) or staminodial (♀ flowers). *Style* 3—5 mm (♀ flower) or minute (♂ flower), glabrous; stigmas always hidden in the corolla-tube, linear, 1—1½ mm, densely papillose, hardly developed in ♂ flowers.

Distribution: Malaya (Johore and Malacca), Singapore. — Fig. 10.

Ecology: Damp or swampy lowland forests.

Remarks: This very characteristic species is probably endemic in S. Malaya and Singapore. It is closest related to *G. oblanceolata*. — King & Gamble, l.c., record a var. *angustifolia* which is also mentioned by Ridley, l.c. The type specimen of this variety has been collected by Scortechini in Perak. I have not seen it, but both from the description and the locality I suppose it to be a specimen of *G. oblanceolata* var. *oblanceolata*.

I have seen a very anomalous specimen (*Cantley's Collector 3008*) which is doubtless a hybrid between *G. grisea* and *G. obesa* (see under *G. grisea*).

It was twice reported in field-notes that the collected plants harboured ants.

11. Gaertnera oblanceolata King & Gamble, J. As. Soc. Beng. 74, ii (1908) 624; Ridl., J. Linn. Soc. Bot. 38 (1908) 317; Fl. Mal. Pen. 2 (1923) 429; Burk. & Hend., Gard. Bull. Str. S. 3 (1925) 316, 400; Calder *et al.*, Rec. Bot. Surv. Ind. 11 (1926) 56. — Syntypes (not seen): *Scortechini 253, Wray 1948, 2283, King's Coll. 8449.*

Gaertnera diversifolia Ridl., J. Fed. Mal. St. Mus. 6 (1915) 163; Fl. Mal. Pen. 2 (1923) 430; ibid. 5 (1925) 323. — Lectotype: *Kellsall 1995*, holotype in SING; syntype: *Ridley 7429*, in SING.

Gaertnera intermedia Ridl., J. Fed. Mal. St. Mus. 6 (1915) 163; Fl. Mal. Pen. 2 (1923) 430; Burk. & Hend., Gard. Bull. Str. S. 3 (1923) 61. — Type: *Ridley 12080*, holotype in SING.

Gaertnera lanceolata Ridl., J. Fed. Mal. St. Mus. 6 (1915) 162, *non* Bouton *ex* DC. 1845; Fl. Mal. Pen. 2 (1923) 430. — *G. oblanceolata* (*non* K. & G.) Ridl., J. Linn. Soc. Bot. 38 (1908) 317. — Lectotype: *Wray & Robinson 5343*, holotype in SING; syntype: *Ridley 16255*, seen from SING.

Gaertnera ovata Ridl., J. Str. Br. R. As. Soc. 86 (1922) 301; Fl. Mal. Pen. 2 (1923) 431. — Type: *Ridley s.n.*, holotype in K.

Gaertnera rigida Ridl., J. Str. Br. R. As. Soc. 86 (1922) 301; Fl. Mal. Pen. 2 (1923) 430. — Type: *Ridley s.n.*, holotype in K.

Gaertnera latifolia Ridl., J. Bot. 62 (1924) 299; Fl. Mal. Pen. 5 (1925) 323; Henderson, Gard. Bull. Str. S. 4 (1927) 100. — Type: *Burkill & Holttum 8606*, holotype in SING.

Treelet or shrub, up to 3 m. *Branches* slender to rather stout, terete or depressed, 2½—7 mm ∅, glabrous; internodes usually short, 1½—8 cm. *Leaves* of vegetative shoots obovate-oblong to obovate-lanceolate, sometimes oblong to lanceolate, rarely linear-lanceolate, 2½—5(—7) times as long as wide, 13—32 by (2¾—)4—11 cm, cuneate to attenuate at the base, shortly decurrent on the petiole, acuminate, rarely acute at the apex, more or less coriaceous, glabrous on both sides; nerves (7—)8—12 pairs; petiole (½—)1—3½ cm, glabrous, with 2 lateral ridges. *Stipular sheath* of vegetative shoots more

or less loosely enclosing the twig, (1—)1½—2½(—3) cm, usually with 1 or 2 deep interpetiolar fissures, firm, but soon marcescent and partly wearing off, glabrous, with 4 more or less elevated ribs forming distinct wings all around the petiole-bases and running out into the usually paired, up to 6 mm long teeth. *Cymes* at the end of 2½—40 cm long axillary or supra-axillary, opposite shoots, usually paniculiform, sometimes partly thyrsiform, lax to congested, many-flowered, (1—)1½—8 cm, glabrous or puberulous in all parts, with reduced or up to 2 cm long primary side-axes bearing few to many often crowded flowers; shoots 1—2½ mm ∅, sometimes branched, glabrous or puberulous, with or without small stipules and/or 1—many pairs of reduced or small, up to 11 cm long leaves, always distinctly differing in size from stipules and leaves of the stem. *Bracts* often partly absent, triangular to linear-lanceolate, up to 5 mm, often acuminate, sometimes with 2 minute teeth or auricles near the base, those at the base of the cyme often much larger, assuming shape and size of small leaves. *Bracteoles* often absent, at the base of the calyx, ± ovate, sometimes with some teeth, up to 1 mm. *Pedicels* absent or very short, up to 4 mm. *Flowers* 5-merous, unisexual. *Calyx* broadly cup-shaped to campanulate, 1½—2 mm wide and about as much high, entire-edged or with 5 more or less distinct, very short, triangular teeth, with a more or less dense hair-ring inside. *Corolla* trumpet-shaped, 3—6 mm, glabrous or puberulous, white; tube cylindric, sometimes with a slight constriction, *c.* 1 mm across, about as long as or slightly longer than the 5 triangular to oblong, blunt lobes; throat with a faint to dense ring of villous hairs. *Stamens* 5; anthers inserted high in the corolla-tube, sessile or on very short filaments, (½—)1—2 mm, well developed (♂ flowers) or staminodial (♀ flowers). *Style* up to 5 mm, glabrous or shortly pubescent, in ♂ flowers usually hardly developed; stigmas variable in shape, mostly short, thick, and blunt, up to 1½ mm, densely papillose, in ♂ flowers hardly developed.

Distribution: Malaya and N. Borneo. — Fig. 10.

Ecology: Forests on hills and mountains up to 1500 m. Local.

Remarks: This is a variable species, with remarkable local differences in the shape of the leaves and the length and leafiness of the flowering shoots. It must be closely related to G. *vaginans* ssp. *junghuhniana* on one side and G. *obesa* on the other.

Within the species I have distinguished two varieties, distinctly differing in the flowering shoots.

KEY TO THE VARIETIES

1. Flowering shoots 2½—8 cm, without stipules and leaves . . . . . var. **oblanceolata**
1. Flowering shoots 7—40 cm, with stipules and/or leaves . . . . . var. **diversifolia**

var. **oblanceolata**. — G. *oblanceolata* K. & G.

Distribution: Malaya: Perak (Gunong Bintang, Gunong Bubu, Taiping Hills, Maxwell's Hill, Birch's Hill, Gunong Hijau, Gunong Bujong Malacca, Kelidang Saiong For. Res.), Selangor (Bukit Batu Berdinding, Semangkok Pass); Borneo: one specimen known from Sarawak (Niah).

var. **diversifolia** (Ridl.) Van Beusekom, *stat. nov.* — G. *diversifolia* Ridl. — G. *intermedia* Ridl. — G. *lanceolata* Ridl. — G. *ovata* Ridl. — G. *rigida* Ridl. — G. *latifolia* Ridl. — For complete references, see the species.

Distribution: Malaya: Pahang (Fraser's Hill, Pine Tree Hill, Gunong Tahan), Selangor (Semangkok Pass, Bukit Hitam, Bukit Etam), Negri Sembilan (Bukit Sutu, Gunong

Angsi); Borneo: two specimens known, from Brunei (K. Ingei) and Sarawak (Similajau F. R.).

Vernacular names: Malaya: *Kayu bangkal bukit* (Negri Sembilan, once noted).

12. Gaertnera vaginans (DC.) Merr., En. Born. (1921) 580; Alston in Trim., Fl. Ceyl. 6 (Suppl.) (1931) 197; Ridl., Kew Bull. (1934) 124. — *Psychotria vaginans* DC., Prod. 4 (1830) 520; Wight & Arn., Prod. 1 (1834) 434. — *Ophioxylon arboreum* Koenig *in sched. ex* DC., Prod. 4 (1830) 520, *nomen, in synom.*; Ind. Kew. 2: 353. — *Sykesia vaginans* (DC.) O. K., Rev. Gen. Pl. 2 (1891) 426. — *Sykesia koenigii* Arn., Pug. (1836) 353, *nom. illeg.*; DC., Prod. 9 (1845) 35. — *G. koenigii* (Arn.) Wight, Ic. 4 (1848) t. 1318 ('*konegii*'); Bl., Mus. Bot. 1 (1850) 174; Miq., Fl. Ind. Bat. 2 (1856) 382; Benth., J. Proc. Linn. Soc. 1 (1857) 112; Thw., En. Pl. Zeyl. (1860) 202; Bedd., Fl. Sylv. 3 (1869) 164, Anal. Gen. t. 21 f. 3; Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 91; Trim., Fl. Ceyl. 3 (1895) 177; Boerl., Handl. 2 (1899) 460; K. & V., Bijdr. 8 (1902) 219; King & Gamble, J. As. Soc. Beng. 74, ii (1908) 623; Dop, Mém. Bull. Soc. Bot. Fr. 19 (1910) 27; Koord., Exk. Fl. Java 3 (1912) 276; Ridl., J. Fed. Mal. St. Mus. 5 (1914) 42; ibid. 6 (1915) 51; J. Str. Br. R. As. Soc. 79 (1918) 98; Burk. & Holtt., Gard. Bull. Str. S. 3 (1923) 61. — Type: *Koenig s.n. ex* Ceylon in herb. Van Royen no 108, holo- and one isotype in L.

Sykesia thyrsiflora Arn., Pug. (1836) 353; DC., Prod. 9 (1845) 35. — *G. thyrsiflora* (Arn.) Bl., Mus. Bot. 1 (1850) 174; Benth., J. Proc. Linn. Soc. 1 (1857) 112. — *G. koenigii* var. *thyrsiflora* (Arn.) Thw., En. Pl. Zeyl. (1860) 202; Trim., Fl. Ceyl. 3 (1895) 177. — Lectotype: *Walker 58*, holotype in GL, isotype seen from E; Arnott, l.c., does not mention a type specimen, but states in the preface of his paper that most of his descriptions have been based on specimens collected by Walker.

Gaertnera junghuhniana Miq., Fl. Ind. Bat. 2 (1856) 383. — *Sykesia junghuhniana* (Miq.) O. K., Rev. Gen. Pl. 2 (1891) 426. — Lectotype: *Junghuhn s.n.*, holotype in L, isotype seen from U; syntype: *Teijsmann s.n.*, seen from BO, GH.

Gaertnera zollingeriana Miq., Fl. Ind. Bat. 2 (1856) 382; Boerl., Handl. 2 (1899) 461. — *Sykesia zollingeriana* (Miq.) O.K., Rev. Gen. Pl. 2 (1891) 426. — Type: *Zollinger 3051*, holotype in P, isotypes seen from P, A.

Psychotria oxyphylla Wall., Cat. (1847) n. 8374, *nomen.* — *G. oxyphylla* Benth., J. Proc. Linn. Soc. 1 (1857) 112; Ridl., J. Fed. Mal. St. Mus. 7 (1916) 47; J. Str. Br. R. As. Soc. 79 (1918) 78. — *G. koenigii* var. *oxyphylla* (Benth.) Clarke in Hook. *f.*, Fl. Br. Ind. 4 (1883) 91; Ridl. J. Fed. Mal. St. Mus. 4 (1909) 48; ibid. 5 (1914) 42. — *Sykesia oxyphylla* (Benth.) O.K., Rev. Gen. Pl. 2 (1891) 425. — *G. acuminata* var. *oxyphylla* (Benth.) Ridl., Fl. Mal. Pen. 2 (1923) 428. — Type: *Wallich 8374*, holo- and two isotypes in K (one of the isotypes belongs to *G. viminea*!).

Gaertnera acuminata Benth., J. Proc. Linn. Soc. 1 (1857) 112; Ridl., J. Fed. Mal. St. Mus. 6 (1915) 51; J. Str. Br. R. As. Soc. 79 (1918) 98; Fl. Mal. Pen. 2 (1923) 427. — *Sykesia acuminata* (Benth.) O.K., Rev. Gen. Pl. 2 (1891) 425. — Type: *Wallich 8342*, holo- and one isotype in K.

Psychotria longevaginalis Schweinf. *ex* Hiern, Fl. Trop. Afr. 3 (1877) 201. — *G. longevaginalis* (Hiern) Petit, Bull. Jard. Bot. Brux. 39 (1959) 45. — Type: *Schweinfurth s.n.* (not seen).

Gaertnera ramosa Ridl., J. Linn. Soc. Bot. 38 (1908) 317; J. Fed. Mal. St. Mus. 6 (1915) 162; Fl. Mal. Pen. 2 (1923) 429. — Type: *Robinson & Wray 5458*, holo- and one isotype in SING.

Gaertnera borneensis Val., Bot. Jahrb. 44 (1910) 568; Merr., En. Born. (1921) 579; Anders., Gard. Bull. Sing. 20 (1963) 181. — Type: *Hub. Winkler 3321* (not seen).

Gaertnera caudata Ridl., J. Fed. Mal. St. Mus. 6 (1915) 51; Fl. Mal. Pen. 2 (1923) 429. — Type: *Robinson s.n.*, holotype in K.

Gaertnera pedicellata Ridl., J. Str. Br. R. As. Soc. 79 (1918) 99; Fl. Mal. Pen. 2 (1923) 429. — Type: *Robinson s.n.*, holotype in K, isotype seen from SING.

Gaertnera sessiliflora Ridl., J. Str. Br. R. As. Soc. 79 (1918) 99; Fl. Mal. Pen. 2 (1923) 427. — Type: *Robinson s.n.*, holo- and one isotype in K.

Gaertnera acuminata var. *montana* Ridl., Fl. Mal. Pen. 2 (1923) 428. — Type: *Robinson s.n.*, holotype in K.

Uragoga sralensis Pierre *ex* Pitard, Fl. Gén. I.-C. 3 (1924) 344. — *Psychotria sralensis* Pierre, mss., *nom. in synon.* — *G. sralensis* (Pitard) Kerr, Kew Bull. (1940) 180; Petit, Bull. Jard. Bot. Brux. 29 (1959) 380. — Lectotype: *Pierre 1253*, holotype in L, no isotypes seen; syntypes (not seen): *Pierre s.n.*, *Poilane s.n.*, *Talmy s.n.*, *Thorel s.n.*

Gaertnera brevistylis Ridl., Kew Bull. (1934) 124. — Type: *Creagh s.n.*, holo- and one isotype in K; paratype: *Wood 7651*, seen from A and K.

Gaertnera taiensis Kerr, Kew Bull. (1940) 180. — Type: *Kerr 19137*, isotype seen in L. — **Fig. 4 a—e and 8 d—f.**

Small tree or shrub, up to 15(—20) m, either glabrous in all parts, or more or less puberulous on the young branches, the stipules, and in all parts of the cymes [1]). *Branches* very slender to stout, terete or flattened, 1—5(—6) mm ∅; internodes 1—11 cm. *Leaves* variable in shape from obovate and ovate-lanceolate to, rarely, linear-lanceolate, 1½—5(—7) times as long as wide, 3—20(—27) by (¾—)1—8(—9) cm, those of the main and the side-branches always about equal in size [2]), obtuse, acute, cuneate, or attenuate, rarely rounded, at the base, shortly acuminate to long caudate, sometimes acute, at the apex, usually more or less coriaceous; nerves (3—)4—11(—12) pairs; petiole absent or up to 2½ cm. *Stipular sheath* loosely to closely enveloping the twig, 2—15 mm, cleft or not, semipersistent or soon marcescent and wearing off, with paired or unpaired, up to 7 mm long, not always distinct teeth, with or without 4 more or less distinct ribs running from the petiole-bases to the teeth and often forming ridges or wings all around the former. *Cymes* terminal on main or side branches, paniculiform to clustered, rarely partly thyrsiform, expanded to congested, very few- to very many-flowered, 1—15(—20) cm long and wide, with up to 6 pairs of simple to repeatedly (up to 5 times) branched primary side-axes; peduncle 0—8 cm. *Bracts* varying from ovate or triangular to linear-lanceolate or filiform, entire or with some minute teeth, often tripartite or auriculate, up to 1½(—2) cm; those at the base of the cyme often much longer and leaf-like. *Bracteoles* on the pedicel or on the calyx, ovate to triangular, sometimes auriculate or with some teeth, up to 2 mm. *Pedicels* 0—1(—1½) cm. *Flowers* 5-merous [3]), unisexual or bisexual, heterodistylous or not. *Calyx* broadly cup-shaped to campanulate, rarely urceolate, usually truncate, 1—3(—4) mm wide, entire or with 5 more or less distinct, triangular, up to 1 mm long, often acuminate teeth, with or without a hair-ring inside. *Corolla* funnel- to trumpet-shaped, (3—)4—11(—13) mm, white, cream, or greenish; tube cylindric or gradually dilated to the top, ½—2(—3) times as long as the lobes; throat

[1]) Some specimens from Borneo (*Brunig S 2465, S 9929, Carrick & Enoch J. C. 86 & 355, J. & M. S. Clemens 21961, Jaheri/Nieuwenhuis 1397, 1893, Ilias Paie 8347, Purseglove P. 5026*, unknown coll. *S 7000*) are faintly puberulous on the undersurface o^c^ the leaves, especially on midrib and nerves.

[2]) I have seen only two specimens from Sumatra (*Posthumus 787* and *Teijsmann 4237*) and one from Borneo (*Buwalda 7777*) which deviate in this respect, having unusual small leaves on the flowering side-branches.

[3]) Only 2 specimens, being probably anomalous, are found by me to have 4-merous flowers. These are: *Burkill & Holttum SFN 8552* and *Kiah SFN 31756*.

and upper part of the tube with a faint to dense ring of villous hairs; lobes 5, triangular to oblong, usually obtuse. *Stamens* 5, anthers inserted in the throat or in the upper part of the corolla-tube, sessile or on *c.* 2 mm long filaments, exerted from the corolla-tube, or not (1—)1½—2½ mm, staminodial in ♀ flowers. *Style* up to 10 mm, glabrous or shortly pubescent, in ♂ flowers usually hardly developed; *stigmas* linear to more or less clavate, often flattened, usually very papillose, *c.* 2 mm, recurved when the flower is open, in ♂ flowers hardly developed.

Distribution: Tropical Africa, Madagascar, Ceylon, a few localities in the southern parts of Thailand, Cambodia, Laos, and South Vietnam, Malaya, Sumatra, Borneo, and some interjacent isles.

Remarks: The species is very complex and displays in its large area a considerable variability. From Madagascar I have seen but a few specimens, one of which belongs doubtless to *G. vaginans* being not distinguishable from the Ceylonese part of this species. From Africa I have examined only material (not the type!) of *G. longevaginalis* (Hiern) Petit and this appaears to possess quite the same characters as that from Ceylon and SE. Asia. The species is, however, broken up into two subspecies, which can be sharply distinguished by their flowers.

KEY TO THE SUBSPECIES

1. Flowers bisexual and heterodistylous; either with sessile hidden anthers and exerted stigmas on a long style, or with exerted anthers on well developed filaments and hidden stigmas on a short style; anthers and stigmas always well developed . . . . . ssp. **vaginans**

1. Flowers usually unisexual, rarely bisexual, never heterodistylous; if unisexual either with staminodial anthers and well developed style and stigmas, or with well developed anthers, more or less ill-developed style and always hardly developed stigmas. Anthers always (sub)sessile, at most ¾ mm long. ssp. **junghuhniana**

ssp. **vaginans**. — *Ophioxylon arboreum* Koenig *ex* DC. — *Psychotria vaginans* D.C. — *Sykesia koenigii* Arn. — *Sykesia thyrsiflora* Arn. — *G. koenigii* (Arn.) Wight, *quoad plantae zeylanicae, incl.* var. *thyrsiflora* (Arn.) Thw. — *G. thyrsiflora* (Arn.) Bl. — *Psychotria longevaginalis* Schweinf. *ex* Hiern. — *Sykesia vaginans* (DC.) O.K. — *G. longevaginalis* (Hiern) Petit. — For complete references, see under the species. — **Fig. 4 b and 8 d.**

As the African and Madagascan part of the subspecies is not completely known by me, the following description is only based on the Ceylon specimens I have seen.

Shrub, glabrous except the cymes. *Leaves* obovate or elliptic to obovate-oblong or oblong, sometimes lanceolate, 2—4 times as long as wide, 5—20 by (1—)3—7(—9) cm, acute or attenuate, sometimes rounded at the base, shortly acuminate to cuspidate at the apex, usually rather coriaceous; nerves 4—8 pairs; petiole ¼—2 cm. *Stipular sheath* rather loosely enveloping the twig, ½—3 cm, usually with 1 or 2 interpetiolar fissures, firm, rather long persistent, with up to 3 mm long, often undistinct, paired teeth (one pair often connate to one tooth), often with 4 ribs running from the teeth to the petiole-bases and sometimes forming a small ridge all around these. *Cymes* ± pyramidal, paniculiform, lax to dense, expanded, usually many-, sometimes few-flowered, 4—16 by 2—13 cm, with (3—)4—6 primary side-axes, more or less puberulous in all parts; peduncle absent or up to 9 cm. *Pedicels* (0—)1—10 mm. *Flowers* bisexual, heterodistylous. *Calyx* 2—3 mm wide, with a hair-ring inside. *Corolla* (6—)7—9 mm; tube ± as long as or slightly longer than the lobes; throat with well-developed hair-ring. *Stamens* hidden in the tube and sessile (♀ flower) or exerted and on *c.* 2 mm long filaments (♂ flower), never staminodial. *Style* (3—)4—8 mm, densely and shortly pubescent;

stigmas exerted from the tube (♀ flower) or remaining in it (♂ flower), always well developed.

Distribution: Tropical parts of Africa (exact distribution not known to me), Ceylon, Madagascar.

Ecology: Forests. According to Clarke, l.c., very abundant on Ceylon, ascending up to *c.* 1000 m.

Vernacular names: On Ceylon: *Péra-tambala* or *Plere-tambele* (several times noted on the labels).

Remarks: I have not thoroughly examined the African and Madagascan species of *Gaertnera*. Petit (1959) has revised the Congo representants of the genus. His species *G. longevaginalis* belongs undoubtedly to *G. vaginans* and has been reduced by me to *G. vaginans* ssp. *vaginans*, together with the Ceylonese specimens of *G. vaginans*.

Within the Ceylonese material there can be distinguished two forms, usually interpreted as varieties, for instance by Thwaites, l.c., and Trimen, l.c., formerly even as separate species, as was done by Arnott, l.c., Bentham, l.c., and Clarke, l.c. The following characters can be established:

Typical form: *Leaves* 2—3 times as long as wide, (7—)10—20 by (2½—)3½—7(—9) cm; apex shortly acuminate; nerves 6—8 pairs. *Cymes* copiously branched, usually bearing many flowers on the primary side-axes; *flowers* on (0—)1—3 mm long pedicels.

Var. *thyrsiflora* (Arn.) Thw.: *Leaves* 3—4 times as long as wide, 5—9 by 1—3 cm; apex cuspidate; nerves 4—6 pairs. *Cymes* poorly branched, very lax, bearing few flowers on the primary side-axes; *flowers* on (0—)1—10 mm long pedicels.

Judging from the general appearance of 'var. *thyrsiflora*', this might grow in drier and more exposed localities than the typical form does. Though most of the specimens I have seen can easily be recognised, yet there are some with intermediate characters. More material from diverse localities might show a grading from the two forms into each other. (This feature can also be noticed in the numerous forms which are part of ssp. *junghuhniana*!). I am not able, therefore, to ascertain their identity satisfactorily.

ssp. **junghuhniana** (Miq.) Van Beusekom, *stat. nov.* — *Psychotria oxyphylla* Wall. — *G. koenigii* (Arn.) Wight, *plantae zeylanicae excl., incl.* var. *oxyphylla* (Benth.) Clarke. — *G. junghuhniana* Miq. — *G. zollingeriana* Miq. — *G. acuminata* Benth., *incl.* var. *oxyphylla* Ridl. *et* var. *montana* Ridl. — *G. oxyphylla* Benth. — *Sykesia acuminata* (Benth.) O.K. — *Sykesia junghuhniana* (Miq.) O.K. — *Sykesia oxyphylla* (Benth.) O.K. — *Sykesia zollingeriana* (Miq.) O.K. — *G. ramosa* Ridl. — *G. borneensis* Val. — *G. caudata* Ridl. — *G. pedicellata* Ridl. — *G. sessiliflora* Ridl. — *Uragoga sralensis* Pierre *ex* Pitard. — *Psychotria sralensis* Pierre *ex* Pitard. — *G. sralensis* (Pierre *ex* Pitard) Kerr. — *G. brevistylis* Ridl. — *G. taiensis* Kerr. — For full references, see under the species. — **Fig. 4 a, c, d, e and 8 e and f.**

Flowers unisexual, rarely bisexual, but never heterodistylous. *Stamens* (sub)sessile, whether or not exerted from the corolla-tube, well developed or staminodial, but always present. *Style* in length corresponding to the length of the corolla-tube, in ♂ flowers usually ill developed. — For further description, see under the species.

Distribution: Thailand (Trang, Trat), Cambodia (Samrong tong), S. Laos, S. Vietnam (Baria), throughout Malaya, incl. Langkawi Is., Singapore, throughout Sumatra, Riouw Arch., Lingga Arch., Banka, Billiton, throughout Borneo, incl. Labuan, Balambangan, Jambongan, and Banggi Is. [1]) — Fig. 7.

[1]) I have seen one sterile and perhaps dubious *Gaertnera* specimen from Java (Cheribon): *Houter 17*.

Ecology: Common in primary and secondary forests on rich as well as on poor soils, from sea-level up to 1800 m (see also under remarks).

Compilation of field-notes: Girth up to 45(—60) cm. Outer bark white to greyish, or pale brown, smooth, *c.* 1 mm, inner bark red, *c.* 2 mm. Cambium and sapwood yellowish to white. Exudation reddish brown. (All notes from Sandakan labels). The flowers are often reported as to be very fragrant.

Vernacular names: Malaya: *Měngkuan hutan* (Johore, once noted), *Nyarom batu* (twice noted from Pahang, Fraser's Hill). Sumatra: *Kaju si landit*, *Kaju doman* (both once noted from Asahan), *Kaju andjaldjal* (Kota Pinang, once noted), *Kaju si bisa*, *Kaju ubar gariang* (both once noted from Tapanuli), *Měngkudu utan*, *Pělampung tenok* (both once noted from Palembang), *Salung putie* (Lampong, twice noted). Banka: (*Kaju*) *Mangkumang* (*putie*) and orthographic variants (many times noted), *Kaju buwang kětjil* (once noted). Borneo: *Madang*, *Djampari*, *Api-api* (all once noted from Pontianak), *Kupi-kupi* (Brunei dial., Sabah, once noted), *Kopi-kopi* (once noted from Banggi Is.), *Masintan* (Sampit, once noted), *Pělěked* or *Plěkit* (Dajak language, W. Kutai, several times noted), *Lěhěk bini* (Dajak language, once noted from W. Kutai), *Pingan pingan*, *Lilingan*, *Labuk* (Dusun dial.), *Baruas* (Dusun dial.), *Sakai*, *Enduropis*, *Supot* (dial. Sg. Kinabatangan), *Olah puteh* (Mal.), *Jambu hutan* (Bajan dial.), *Tambar dimidua* (Banggi dial.), all once noted from Sabah, *Mengkuan hutan*, *Santan hutan* (Mal., each once noted from Brunei), *Pitaling* (once noted from Brunei), *Enteburok* (once noted from Lawas, Sarawak), *Merpisang* (twice noted from Baram and Brunei).

Remarks: This subspecies is very polymorphous. Several modifications have been described as separate taxa. Since these are all mutually connected by numerous intermediates, none of them can be uphold.

On the richer soils in the lowland parts of the area the subspecies usually develops as a big shrub or small tree, with rather large leaves and large, many-flowered, expanded cymes with medium-sized flowers. It does not vary very much in general appearance, though regional differences occur, chiefly in the shape of leaves and stipules, the absence or presence of a hair-ring in the calyx, and the degree of pubescence of the corolla.

In Malaya, Thailand, Cambodia, Laos, and S. Vietnam the subspecies occurs practically exclusively in the mountains between 800 and 1800 m. Here it remains low and shrubby, having usually small, sometimes very coriaceous leaves and small, depauperated, clustered to lax, few-flowered cymes with sessile ('*G. sessiliflora*') to long-pedicelled ('*G. pedicellata*'), often big flowers.

Also in Borneo a great variety of forms occurs, adapted to unfavourable environmental conditions, prevalent on hill-tops, on sandstone-ridges, in heath-forests, peat-forests, and similar places. These too are usually shrublets of minor size and tend to have very coriaceous, often small, sometimes very narrow leaves; the cymes, however, can still be many-flowered, but are mostly much more congested and smaller than in the usual form and have often very small flowers. Whereas few-flowered, glomerate cymes frequently occur in Malayan specimens, they seem to be rare in Borneo; I have only found this character in the following specimens: *Bakar San 18542* (Tawao), *Elmer 21526* (Tawao), *Hallier 1623* (vicinity of Smitau), *Jaheri/Nieuwenhuis 1397* (Central Borneo) and an unnamed specimen from Singkawang.

There is one dubious specimen which does not fit in my delimitation of *G. vaginans*. It might be a separate species, but I cannot reach a decision until more material has been found. It is the following: *Teijsmann 19412* (Lingga Arch.): Stipular sheath with *c.* 1 cm long, filiform teeth. Cymes consisting of a few subsessile flowers ('*G. filistipula*' Val. *mss*).

From a few localities in Borneo I have seen specimens with bisexual flowers. This

feature is very remarkable, because all other Malesian *Gaertnera* species are constantly dioecious! As the bisexual specimens do not differ essentially in other respects from the unisexual ones of spp. *junghuhniana*, I regard them only as a separate form, viz.

forma **hermaphroditica** Van Beusekom, *forma nova*. — Flores hermaphroditi. — Type: *Smythies, Wood & Ashton S 5909*, holotype in L, isotypes seen from BO, KEP, SAR, and SING. — **Fig. 4 e.**

Distribution: Brunei (Andalau For. Res., Berakas For. Res., Tutong, Seria), Sabah (Sepitang), all specimens of the same character. Sabah (Mt Kinabalu), only two specimens: *Carr SFN 26698, J. & M. S. Clemens 40466*. Sabah (Sandakan *sine loco*, Leila For. Res.), only two specimens: *Sam San 26393, D. D. Wood 1094*. — Fig. 10.

The form is not homogeneous. The material can be divided into some groups, which have certainly developed independently from each other. Besides, these groups differ rather widely from the unisexual *junghuhniana* which can be met with in the same region. As I have not seen unisexual plants from the localities where f. *hermaphroditica* occurs (for instance Brunei!), obviously local populations comprise specimens of one kind.

EXCLUDED TAXA

Gaertnera australiana C. T. White, Proc. R. Soc. Queensl. 53 (1942) 223 = *Psychotria sp.* I have studied the type specimen (*Flecker, N.Q. Nat. Club 5313*) and 3 additional collections in BRIS; these appear clearly to represent a species of *Psychotria*. I refrain from a recombination as it may appear a mere synonym of an already described species of *Psychotria*.

Gaertnera barbata Seem., Bonplandia 9 (1861) 257, *nomen*. — *Couthovia corynocarpa* A. Gray. — *Couthovia seemanni* A. Gray = *Neuburgia corynocarpa* (A. Gray) Leenh., Fl. Mal. I, 6 (1962) 365 (*Loganiaceae*).

Gaertnera hongkongensis Seem., Bot. Voy. Herald (1857) 384. — *Sykesia hongkongensis* (Seem.) O.K. = *Randia cf. densiflora* Benth. The only known specimens are the type ones in K (*Champion s.n.*); these are anomalous plants with invirescences of the flowers.

Gaertnera koenigii var. *multicostulata* Miq., Fl. Ind. Bat. 2 (1856) 382 = *Psychotria robusta* Bl. I have seen the type specimen in L (*Junghuhn s.n.*), which was already correctly reduced by S. H. Koorders in 1909.

Gaertnera lasianthoides C. E. C. Fischer, Kew Bull. (1927) 209 = *Psychotria rhinocerotis* Reinw. *ex* Bl. I have examined the type sheet in K (*C. E. Parkinson 1607*) on which C. E. B. Bremekamp already correctly made the reduction to this species.

Gaertnera lushaiensis C. E. C. Fischer, Kew Bull. (1928) 141 = *Chasalia lushaiensis* (C. E. C. Fischer) C. E. C. Fischer, Kew Bull. (1931) 282. Type specimen (*Mrs. N. E. Parry 180*) seen from K.

Gaertnera obtusifolia Roxb., Fl. Ind. ed. Carey 2 (1832) 369. — *Hiptage obtusifolia* (Roxb.) DC. = *Hiptage benghalensis* (L.) Kurz. See Jacobs in Fl. Mal. I, 5 (1955) 132 (*Malpighiaceae*).

Gaertnera pangati Retz., Obs. 6 (1791) 24 = *Sphenoclea zeylanica* Gaertn. See Roxb., Fl. Ind. ed. Carey 2 (1832) 170 (*Campanulaceae*).

Gaertnera pyramidalis Seem., Bonplandia 9 (1861) 257, *nomen* = *Couthovia macrocarpa* A. C. Smith, Sargentia 1 (1942) 105. This should be classified under the generic name *Neuburgia*, but Dr. Leenhouts refrained from a recombination pending a revision of the Pacific species (*Loganiaceae*).

Gaertnera racemosa (Cav.) Roxb., Pl. Corom. 1 (1795) 19, t. 18 = *Hiptage benghalensis* (L.) Kurz. See Jacobs in Fl. Mal. I, 5 (1955) 132 (*Malpighiaceae*).

Gaertnera rufinervis Stapf, Trans. Linn. Soc. Bot. 2 (4) (1894) 183 = *Psychotria sp.* I have examined a type specimen from SING (*Haviland 1210*, photogr. in L) and this is certainly a *Psychotria* species. Again I refrain from a recombination pending a revision of Malesian *Psychotria*.

Gaertnera violascens Ridl., J. Fed. Mal. St. Mus. 6 (1915) 164 = *Psychotria sp.* The type specimen (*Ridley 16285*) in SING (photogr. in L) belongs undoubtedly to *Psychotria*. See the remark under the last species.

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Names have been referred to the species under which they are treated in the systematical part; names occurring in the other chapters are referred to the number of the chapter; names under excluded taxa are referred to as excl. Synonyms are in *italics*, new epithets are in **bold type.**