

NOTES ON NEW GUINEA RUBIACEAE

Versteegia and Maschalodesme

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Within the rain forests of New Guinea there are many small pachycaul treelets belonging to the *Rubiaceae*. Generally these are rare in occurrence and poorly represented in the herbarium, due in part to the problem of protecting rami- or cauliflorous flowers and fruits during routine processing and storage. All have a similar general appearance and are difficult to assign to a particular genus. Indeed, the generic limits and relationships of many have been in doubt since they were described and few have been re-investigated in light of more recent collections and ideas. *Versteegia* and *Maschalodesme* are two of the better known genera. These are considered from a taxonomic point of view together with notes on the wood anatomy and cuticular structures. The other genera are less well known and include *Airosperma* in the *Albertyeae* and many problematic species and genera in the *Psychotrieae*. These are distinct from both *Maschalodesme* and *Versteegia* and are not considered in the present paper.

VERSTEEGIA

Val., Nova Guinea 8 (1911) 483, K. Schum. in E. & P., Nat. Pfl. Fam. Nachtr. 4 (1915) 299; Val., Bot. Jahrb. 61 (1927) 67; Merr. & Perry, J. Arn. Arb. 26 (1945) 258. — *Psychotria* (L.) K. Schum. & Laut., Fl. Schutzgeb. (1900) 574 p.p.

Small understorey treelets or trees with leaves clustered at the ends of the branches. *Stipules* interpetiolar, carinate, persistent. *Leaves* obovate to oblanceolate. *Flowers* 4-merous, cauli- or ramiflorous. *Bracts* small, sometimes cupular. *Calyx* cupular, scarcely lobed. *Corolla* salmon pink, lobes imbricate. *Style* not elongating in ixoroid manner. *Ovary* bilocular. *Fruit* red; seeds 2, bilaterally compressed.

KEY TO THE SPECIES

1. Mature leaves generally over 50 cm long.
 2. Corolla tube less than 4 mm; fruit large, c. 25 by 20 mm; leaves broadly obtuse at apex, abruptly apiculate. *Mainland New Guinea* 1. **V. grandifolia**
 2. Corolla tube over 4 mm long; fruit small, c. 15 by 8 mm; leaves gradually acuminate at apex. *Solomon Islands* 2. **V. solomonensis**
1. Mature leaves less than 50 cm long.
 3. Leaves narrowly elliptic to narrowly oblanceolate, less than 4 cm wide; calyx and corolla densely pubescent 3. **V. puberula**
 3. Leaves over 4 cm wide.
 4. *Mainland New Guinea*; leaves obovate to oblanceolate.
 5. Trees; leaves over 8 cm wide.

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6. Fruit to 3 cm long, pericarp thin; corolla tube *c.* 2 mm. Lowland rain forest.
 4. *V. cauliflora*
6. Fruit over 3 cm long, pericarp thick, fleshy; flowers unknown. Mid montane forest.
 4a. *V. sp.*
5. Treelets; leaves less than 8 cm wide 5. *V. minor*
4. *Solomon Islands and Bougainville*; leaves narrowly elliptic; corolla tube *c.* 8 mm; fruit *c.* 1.5 by 8 mm.
 2. *V. solomonensis*

1. *Versteegia grandifolia* Val., Nova Guinea 8 (1911) 483, t. 73; Bot. Jahrb. 61 (1927) 67.

A rare pachycaul treelet to 3 m high. *Stipules* lanceolate, *c.* 4 cm long, carinate. *Leaves* broadly obovate to oblanceolate, 35—105 by 12—30 cm; apex obtuse, abruptly acuminate, almost mucronate; base long attenuate, sub-auriculate; lateral nerves *c.* 35. *Flowers* cauliflorous. *Ovary* 1 mm, puberulous; pedicel 5—10 mm. *Calyx* *c.* 0.75 mm long, truncate. *Corolla* tube *c.* 2 mm long, glabrous; lobes *c.* 3 mm long. *Fruit* ovoid, *c.* 2.5 by 2 cm wide; seeds *c.* 6 mm long.

NEW GUINEA. *West. Branderhorst 320* (BO); *Kanehira & Hatusima 12396* (BO); *Versteeg 1039* (BO, L).

2. *Versteegia solomonensis* Ridsdale, *sp. nov.*

Arbuscula usque ad 5 m. alta. *Folia* anguste obovato-lanceolata usque ad oblanceolata, (28—)50—75 cm. longa, (6—)13—16 cm. lata; apice acuminata, basi sensim attenuata. *Calyx* pubescens, 1.5 mm. longus; lobis 4, triangularibus. *Flores fructusque* caulini. *Corollae* tubus parum pubescens, 8 mm. longus, lobis 4 mm. longis. *Stamina* exserta. *Fructus* ruber, 15 mm. longus, 8 mm. diam., calycis residuis coronatus, utrinque verticaliter constrictus. — Typus: *BSIP 1364* (L).

Treelet to 5 m high. *Stipules* *c.* 10 mm. *Leaves* narrowly obovate to oblanceolate (rarely narrowly elliptic), (28—)50—75 by (6—)13—16 cm; apex acuminate; base gradually attenuate. *Flowers* and *fruit* cauliflorous. *Calyx* pubescent, 1.5 mm; lobes 4, triangular. *Corolla* tube slightly pubescent, 8 mm; lobes 4 mm long. *Stamens* exserted. *Fruit* red, 15 mm long by 8 mm diameter, vertically constricted about the mid point, crowned by the calyx remains.

SOLOMON ISLANDS. *BSIP 1364* (K, L), *1866, 2949* (K, L), *15875* (K, L); *RSS 6161* (K), *6192* (K).
 BOUGAINVILLE. *NGF 16387* (L, LAE).

The present species differs from *V. grandifolia* in the dimensions of the flowers and fruits and in leaf shape. The flowers of *V. grandifolia*, reputed to be preserved as a spirit collection at Bogor, have not been examined.

3. *Versteegia puberula* Ridsdale, *sp. nov.*

Arbuscula usque ad 1 m. alta. *Stipulae* haud visae. *Folia* anguste elliptica, (21—)26—35 cm. longa, 2—3 cm. lata, apice acuminata, basi auriculata. *Nervis* lateralibus utrinque 11—15, costa subtrus pubescenti. *Flores* caulini. *Calyx* 2 mm. longus, lobis breviter denticulatis, 0.5 mm. longis. *Corolla* nondum bene evoluta, 6 mm, in sicco griseo-puberula. — Typus: *Aet 107* (BO).

A small treelet up to 1 m high. *Stipules* not seen. *Leaves* narrowly elliptic, (21—)26—35 by 2—3 cm; apex acuminate; base ± auriculate. Lateral nerves 11—15 on each side; costa pubescent below. *Flowers* cauliflorous. *Calyx* 2 mm, lobes shortly denticulate, *c.* 0.5 mm long. *Corolla* immature, 6 mm, drying greyish puberulous.

NEW GUINEA. *West. Aet (Exped. Lundquist) 107*, Anakasi near Babo.

4. *Versteegia cauliflora* (K. Schum. & Laut.) Val., Nova Guinea 8 (1911) 483 in note; Bot. Jahrb. 61 (1927) 67. — *Psychotria? cauliflora* K. Schum. & Laut., Fl. Schutzgeb. (1900) 574.

A small understorey tree attaining 10 m, bole c. 3 m high, 20 cm diameter. Outer bark grey-brown, smooth, flakey; inner bark pale brown to salmon brown. Wood hard, pale brown to straw. *Stipules* lanceolate, c. 12 mm. *Leaves* narrowly obovate, (20—)25—30 by 9—14 cm, glabrous; apex obtusely apiculate; base long attenuate; lateral nerves 12—14. *Flowers* and *fruits* ramiflorous. *Calyx* cupular, scarcely lobed. *Corolla* tube 1—2 mm, lobes 5—6 by 2 mm, salmon pink. *Fruit* ovoid, 1.5—2.5 cm long, red.

NEW GUINEA. West. BW 3390, 3440, 5536. — Territory of New Guinea. Brass 29171; Hartley 10248, 11877; NGF 3916, 7236, 9933, 10662, 13460, 14855, 27470, 30740, 31744, 33904, 40414, 48334; Pullen 971; Schlechter 17562 (L); Schodde 420. Cited Historical collections not seen: Lauterbach 163, 193, 910, 2482; Ledermann 7555, 8377, 8552, 12337. — Papua. Hoogland 3586; NGF 42930.

4a. *Versteegia* sp.

Tree c. 18 m high. *Stipules* as *V. cauliflora*. *Leaves* narrowly obovate, 35—45 by 14—17 cm, glabrous; apex acuminate; base attenuate; lateral nerves 17—19. Cauliflorous, *flowers* unknown. *Fruit* obovoid, 4 by 3 cm, red with a thick (5—10 mm) fleshy pericarp.

NEW GUINEA. East. NGF 17867 (L, LAE), 21542 (L, LAE).

Ecology. The only representative so far known from mid montane rain forest.

Notes. *V. cauliflora* is a typical component of the lowland rain forest. The second entity has larger fruits which appear to have a different structure. Flowering material is required to establish the taxonomic status. It may prove to fall within the range of variation of *V. cauliflora* as it is not absolutely possible from the material at hand to distinguish the two using vegetative features.

5. *Versteegia minor* Val., Bot. Jahrb. 61 (1927) 67, in clavi.

Understorey treelet c. 1 m high. *Stipules* c. 6 mm. *Leaves* oblanceolate, 18—28 by 4—7 cm; apex acuminate; base cuneate; lateral nerves 13—18 on each side. *Flowers* cauliflorous. *Calyx* cupular. *Corolla* immature, glabrous.

NEW GUINEA. West. Beaufort. R.: Pille 347 (Lectotype; BO, L) 348 (sterile, L).

Note. The latter collection differs from the type in the absence of the small cuticular hairs on the upper epidermis.

WOOD ANATOMY

Two wood samples of *Versteegia* were available, *V. cauliflora* (K. Schum. & Laut.) Val., NGF 33904, diam. 6 cm, and *V. solomonensis* Ridsdale, BSIP 1364, diam. 1.5 cm.

In spite of the difference in diameter there is a very good agreement between the two samples. The number of the vessels differs slightly, and the ratio of uniseriate to biseriate rays is slightly smaller in *V. solomonensis*. In the axial parenchyma of *V. solomonensis* no elongated crystals have been observed. The description is based upon the sample of *V. cauliflora*.

Wood pale brown to straw; hard; texture very fine; grain straight; volume weight 0.90—1.00; a splinter of the heartwood burns to charcoal.

Wood structure. *Growth rings*: absent. *Vessels*: nearly exclusively solitary, very few radial and tangential pairs, on average 30(20—46)/mm²; cross section roundish or oval with greatest dimension radially; tangential diameter 30—60 μ , mostly 40—55 μ ; vessel elements on average 885 (600—1300) μ long 'tails', included; perforations simple, smaller than the diameter of the vessels, oblique; walls 2—5 μ thick. *Fibre tissue*: walls 3—6 μ thick; diameter of the lumen 3—8 μ ; fibre length on average 1480 (1000—1760) μ ; bordered pits frequent on radial and tangential walls, 4—5 μ , apertures included. *Rays*: predominantly uniseriate, composed of upright cells; some rays with short 2- or 3-seriate parts, composed of procumbent cells of variable sizes, some cells almost square; many disjunctive elements in the rows of procumbent and upright cells; width 15—40 μ , height on average about 1 mm, sometimes up to 1650 μ ; some rays dissected by oblique, parenchyma-like cells; in some rays perforated ray cells; pits to vessels alternate, 4—5 μ , vested, apertures included; brown contents in some cells, number of rays on average 17 (16—19) per mm. *Parenchyma*: apotracheal, predominantly in 1—4-seriate, slightly irregular bands and islands, sometimes laterally adjoining a vessel; some solitary strands scattered between the fibre tissue; rarely a few cells paratracheal parenchyma; strands mostly of 8 (5—12) cells; elongated crystals in some cells, often two or three crystal cells in one strand.

EPIDERMAL FEATURES

Cuticular membranes were isolated by maceration techniques, stained in Sudan IV, mounted in glycerine jelly, and studied with the light microscope. Additional information on the cuticular striations was obtained by studying nail varnish replicas of the leaf surface under the light microscope and by use of the stereoscan electron microscope. Using the latter instrument the leaf surface could also be studied. It was found that the replica gave clearer results of the fine pattern.

Generic features. — *Stomata* parallelocytic (Payne, 1970), confined to the abaxial surface; subsidiary cells usually 4, rarely 3; cuticle of the stomatal chamber well developed in one or two taxa. *Unspecialized cells* with straight or slightly curved walls, anticlinal cuticular flanges beaded. *Cuticle of adaxial surface* characteristically striated. *Abaxial surface* with cuticular striations radiating from the hair bases and from the water stomata.

V. grandifolia and **V. solomonensis.** — *Adaxial surface* with regular straight-walled cells, characteristically striated (see Plate 2), ridged over the anticlinal walls. *Cuticular flanges* with minute pegs at the cell corners. *Indumentum* confined to the abaxial surface: *V. grandifolia* has short broad based hairs whilst *V. solomonensis* has longer hairs with narrower bases. In other respects the two species are more or less identical in epidermal characters.

V. minor. — *Unspecialized cells* of adaxial surface with straight to slightly curved cell walls. *Cuticular flanges* conspicuously pegged at the cell corners. *Indumentum* of slender, narrow- or broad-based hairs on abaxial surface, present on the adaxial surface in *Pulle 347* but totally absent in *Pulle 348*.

V. puberula. — *Unspecialized cells* of adaxial surface with slightly curved cell walls; cuticle striated. *Cuticular flanges* conspicuously pegged at the cell corners. *Indumentum* of short broad-based hairs confined to the abaxial surface.

V. cauliflora and **V. sp.** — Cuticle of the stomatal chamber strongly developed. *Unspecialized cells* of adaxial surface with straight to slightly curved cell walls; anticlinal cuticular flanges beaded, pegged at cell corners. *Water stomata* conspicuous in both entities, surrounded by several concentric rings of unspecialized cells.

SYSTEMATIC RELATIONSHIPS

The genus has received but scant attention in recent years. From the published records it is clear that *V. cauliflora* was well known during the German period of exploration of New Guinea. The material was originally placed in the genus *Psychotria* (K. Schum. & Laut., 1900). Later K. Schumann followed Valetton and placed the genus in the tribe *Ixoreae*. Superficially in the appearance of the leaf and fruit it resembles *Randia*, and Bremekamp tentatively suggested an alliance with this group. Previously (Bremekamp, 1934, p. 9) he excluded the genus from the *Ixoreae* on account of the supposed extrorse anthers, a feature erroneously deduced from the published illustration. However, the anthers are introrse and further, the genus has salmon pink flowers, which are not common within the *Rubiaceae*. These features immediately suggest that the genus is allied to *Ixora*.

This idea is supported by the wood anatomy. *Versteegia* agrees with the *Ixoreae* (Koek-Noorman, 1972) in a great number of characteristics, viz. the nearly exclusively solitary vessels, the fibre tracheids, and the composition of the rays, but differs in the distribution of the parenchyma. In the *Ixoreae* the parenchyma occurs as diffuse strands or as short reticulate lines, whilst *Versteegia* shows short and long, mostly 2—4-seriate bands, and islands, comparable, for instance with *Alibertia* and *Duroia*, both placed in the *Gardenieae*. However, in the wood sample of *V. cauliflora*, NGF 33904, large single rod-like crystals occur in the axial parenchyma. These crystals were described for some species of *Ixora* by Janssonius, (1926, p. 200). Chang (1951) did not observe them in the wood of the species of *Ixora* studied by him, but reported the occurrence of crystals of the styloid form in the bark. As crystals of this type have not been reported for other genera (Chattaway, 1955; Koek-Noorman, unpublished data) their occurrence in *Versteegia* seems to be a strong evidence for a close affinity to *Ixora*.

Parallelocytic stomata are recorded for the genus; previously (Payne, 1970) they were only reported from *Psychotria* (*Psychotrieae*) and *Malanea* (*Guettardeae*). The occurrence in widespread subfamilies of the *Rubiaceae* suggests that this feature will be shown to be of no taxonomic significance. The most striking feature of all taxa is the striation pattern of the cuticle of the adaxial surface. Striated cuticles, so far as is known, are of rare occurrence in *Ixora* and where they occur they appear to be of a different type.

Examination of flowering material of the genus reveals an interesting situation. Flowers and fruits are rarely associated together in herbarium collections; when this is the case, the fruit is often noted as being collected from a different tree. Thus, flowering and fruiting trees occur together in the forest. It is suggested that there is a distinct possibility that the flowers are functionally either male or female. The stigma is grooved and transference of pollen has been observed; however, the style does not elongate. The stigma becomes slightly bifid at a later stage when the stigmatic surface becomes exposed and receptive. Material of the assumed functionally female plants is not common in the herbarium and it is here that functionally female flowers occur together with fruits. Other material is interpreted as functionally male, the fruits being collected from neighbouring female trees. Further collections, preferable with field observations, and spirit collections are required to substantiate this preliminary hypothesis.

In the region of W. Malesia the genus *Ixora* is well characterized by the dense terminal inflorescence. However, in Fiji and New Caledonia cauliflorous taxa of *Ixora* occur, providing a completely different facies. Ramiflorous types of inflorescence with short peduncles are also by no means uncommon in this region. Further, in New Guinea types with axillary few-flowered inflorescences borne on slender peduncles occur together with types that inter-connect with the cauliflorous taxa. From these types the relationships to the more complex inflorescences may be sought.

It is to be hoped that further collections of these taxa will be made together with spirit material so that the relationships may be worked out in more detail at a future date. Indeed, there is, theoretically, even the possibility of a unisexual or functionally unisexual '*Ixora*' existing in these regions, particularly as the fruits of *V. solomonensis* approach those of *Ixora* rather than the large fleshy fruits of the other species of *Versteegia*.

At present little is known of the range of floral and fruit types within the genus and as a consequence delimitation from some of the less well known sections of *Ixora* is difficult without flowering material. It is to be expected that further taxa may be found that can be accommodated within the genus *Versteegia*.

MASCHALODESME

K. Schum. & Laut., Fl. Schutzgeb. (1900) 561; K. Schum. in E. & P., Nat. Pfl. Fam. Nachtr. 3 (1908) 327; Val., Bot. Jahrb. 60 (1926) 80; Merr. & Perry, J. Arn. Arb. 25 (1944) 197.

Small treelets. *Stipules* interpetiolar, persistent. *Leaves* obovate to oblanceolate, petiole short. *Inflorescence* a condensed fascicle in the axils of the leaves. *Flowers* 4-merous; lobes of corolla valvate in the bud. *Stigma* bifid. *Ovary* bilocular, ovules inserted along the septum, imbricate. *Seeds* bilaterally compressed, imbricate downwards.

KEY TO THE SPECIES

1. Calyx lobes less than 2 mm long. Leaves usually more than 30 cm long, base often auriculate. Stipules over 2 cm long 1. *M. arborea*
 1. Calyx lobes over 2 mm long. Leaves less than 30 cm long, base attenuate. Stipules less than 2 cm long. 2. *M. versteegii*

1. *Maschalodesme arborea* K. Schum. & Laut., Fl. Schutzgeb. (1900) 561; Val., Bot. Jahrb. 60 (1926) 80. — *M. simplex* Merr. & Perry, J. Arn. Arb. 25 (1944) 197.

Treelet 2—4(—10) m, stem glabrous or pubescent. *Stipules* 2—2.5 by 1—1.5 cm. *Leaves* oblanceolate, (20—)25—38(—45) by (7—)8.5—11(—12.5) cm, apex obtusely apiculate, base cuneate to rotundate to auriculate, lamina pubescent to glabrous. Lateral nerves (9—)12—20. *Flowers* in bracteate clusters in the leaf axils. Major bracts linear lanceolate, 12 mm long. *Calyx* 2 mm, lobes 1.75 mm, margins ciliate. *Corolla* tube 5 mm (frequently immature in collections). *Style* exserted, 4—5 mm. *Stigma* connivent in bud, bifid in mature flowers. *Fruit* ovoid to oblong, 3.5 by 2.5 cm, red, sometimes ridged. *Seeds* flattened, c. 10 by 7 mm, in two imbricate rows.

NEW GUINEA. West. Brass 13614 (isotype of *M. simplex*; L), 13906 (L), 13997 (L); Docters van Leeuwen 9797 (BO, L), 11323 (BO, L); Kanehira & Hatusima 11779 (BO). — P a p u a. Brass 914 (BO); Schiefenhoevel 56 (L).

2. *Maschalodesme versteegii* (Val.) Ridsdale, *comb. nov.* — *Tricalysia* ? *versteegii* Val. in Lorentz, Nova Guinea 8 (1911) 471.

Treelet, 1—2 m. *Stipules* interpetiolar, persistent, 1.5—2 cm long, strongly carinate. *Leaves* obovate, 20—30 by 6—9 cm, base cuneate, tapering into the petiole, \pm glabrous. Lateral veins 12—18 on each side. *Inflorescence* a condensed fascicle, massed in leaf axils. *Calyx* 7—9 mm, pallidly pubescent in the dry state; lobes attenuate, 3—4 mm. *Corolla* (immature), tube 1.75 mm, constricted in the middle, sparsely to densely pubescent inside; lobes triangular, 2 mm. *Style* (immature) 2 mm. *Stigma* connivent. *Fruit* ovoid-oblong, c. 5 by 1.5 cm; seeds c. 5, imbricate, flattened.

NEW GUINEA. West. Von Römer 468, lectotype (BO); Versteeg 1476, syntype (BO).

Note. In the original description Valeton indicates that the flowers are functionally male or female. The male flowers having an incompletely bilocular ovary and a corolla tube internally sparsely pubescent whilst the female flowers have a completely bilocular ovary and a corolla tube internally densely pubescent. The remaining material is fragmentary; the features of the corolla are confirmed but it is no longer possible to check the observations on the ovary in the remaining material.

EPIDERMAL CHARACTERS

Generic features. — *Stomata* parallelocytic, abundant on the adaxial surface, subsidiary cells 4. *Unspecialized cells* of adaxial surface with conspicuously sinuous walls, rarely curved and slightly sinuous. *Cuticular flanges* pegged at cell corners. *Cuticle* not striated on adaxial surface. *Indumentum* present on abaxial surface, often confined to veins; hairs unicellular, bases with a conspicuously thickened poral rim, surrounded with a single ring of unspecialized cells.

M. arborea. — *Indumentum* variable, present over the whole of the abaxial surface or confined to major and minor veins; hairs short and broad-based or elongate and narrow-based.

M. versteegii. — *Indumentum* of short hairs confined to the veins.

SYSTEMATIC POSITION

The genus was erected by K. Schumann & Lauterbach to contain the single collection Lauterbach 2055. On the basis of this flowering specimen K. Schumann placed the genus in the *Mussaendeae*. By inference Valeton may also be considered to have followed such a disposition.

Large leathery to somewhat fleshy fruits with rows of imbricate flattened seeds are features not commonly found in the *Rubiaceae*. Indeed, they are characteristic of a group of genera (*Hypobathrum*, *Petunga*, *Tricalysia*, *Zuccarinia* etc.) allied to *Diplospora* Korth. These have always been placed in the *Gardenieae*.

Unfortunately, the wood anatomy can provide little further information on this group as anatomically it is difficult to separate the *Gardenieae* from the *Ixoreae* (Koek-Noorman, 1972). The presence of numerous parallelocytic stomata on the abaxial surface is worthy of note. Such a feature is absent from the species of *Randia* and *Gardenia* which have rapidly been surveyed. Stomata occur on the abaxial surface of *Zuccarinia* but their type has not been investigated in detail. All related taxa need to be investigated to evaluate the value of this character and of the other epidermal features.

Maschalodesme shows some affinity with *Zuccarinia* in the large leaves, stipules, and obovoid fruit. However, *Maschalodesme* has 4-merous flowers and one species is reported to be functionally unisexual, whilst *Zuccarinia* has 5-merous flowers which are bisexual. Further, it is a branched understorey tree, possibly with branches of limited growth, the leaves arranged aplanately along the branches.

Maschalodesme is a single-stemmed understorey treelet with the leaves massed at the apex in a pachycaul fashion. All other allies of *Diplospora* have a leptocaul habit with small petiolate leaves borne on slender branches.

No other allies of *Diplospora* occur in New Guinea, *Diplospora* only having been collected from the Aru Islands and Misool. *M. versteegii* differs from the type species in the elongate calyx lobes, a feature not at all common in *Diplospora* and its allies but widespread in other *Rubiaceae*.

Examination of materials of related genera confirms the opinion that *Maschalodesme* occupies a rather isolated position in the group. It forms an extreme end of a trend towards sessile inflorescences and verges on the cauliflorous state. It could be viewed as an isolated primitive member of the group.

Further materials of all genera are required particularly to assess the extent of occurrence of functionally male and functionally female flowers in the group.

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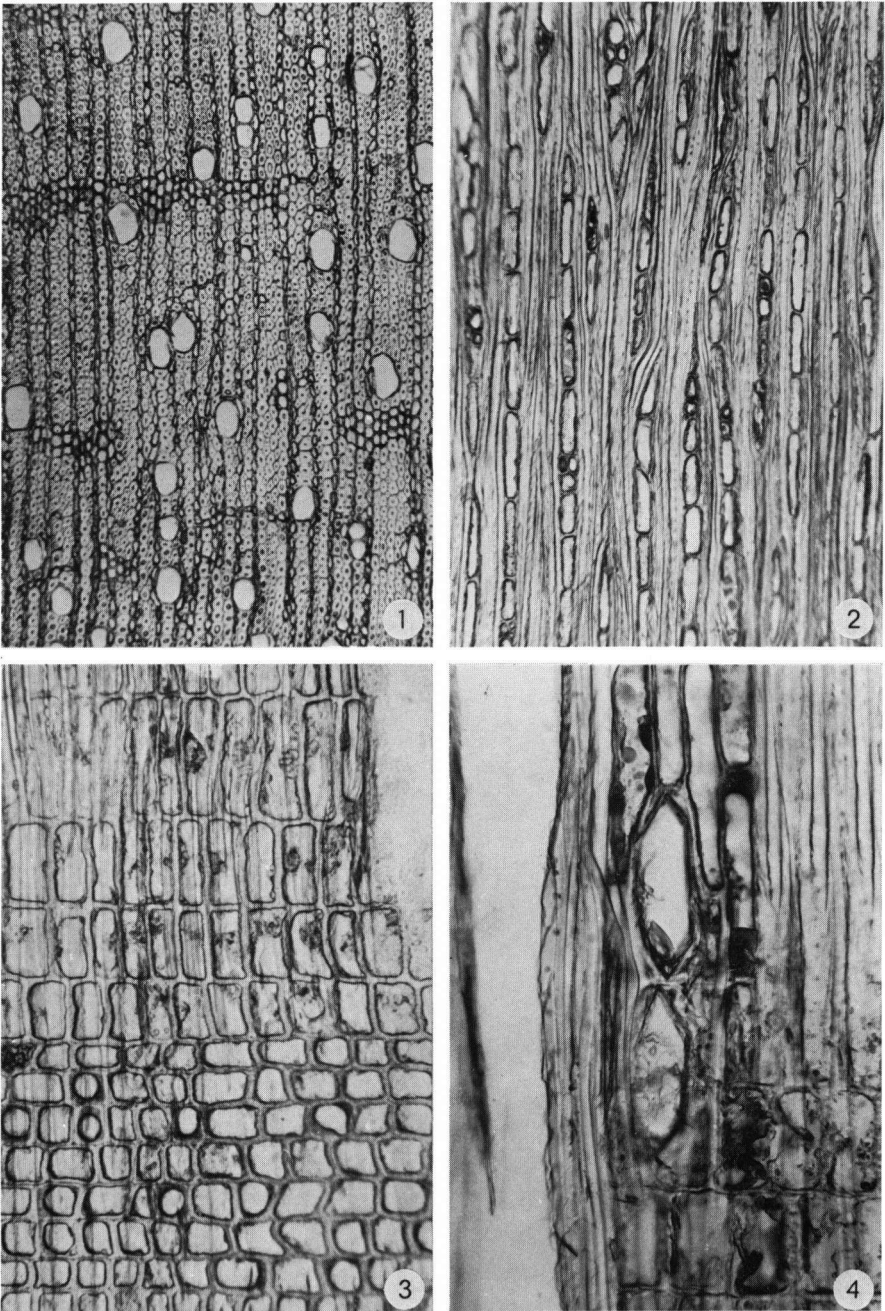


Plate I. Wood anatomy of *Versteegia cauliflora*. 1. transv. sect., $\times 55$; 2. tang. sect., $\times 110$; 3. rad. sect., $\times 110$; 4. elongated crystals in axial parenchyma, rad. sect., $\times 350$.

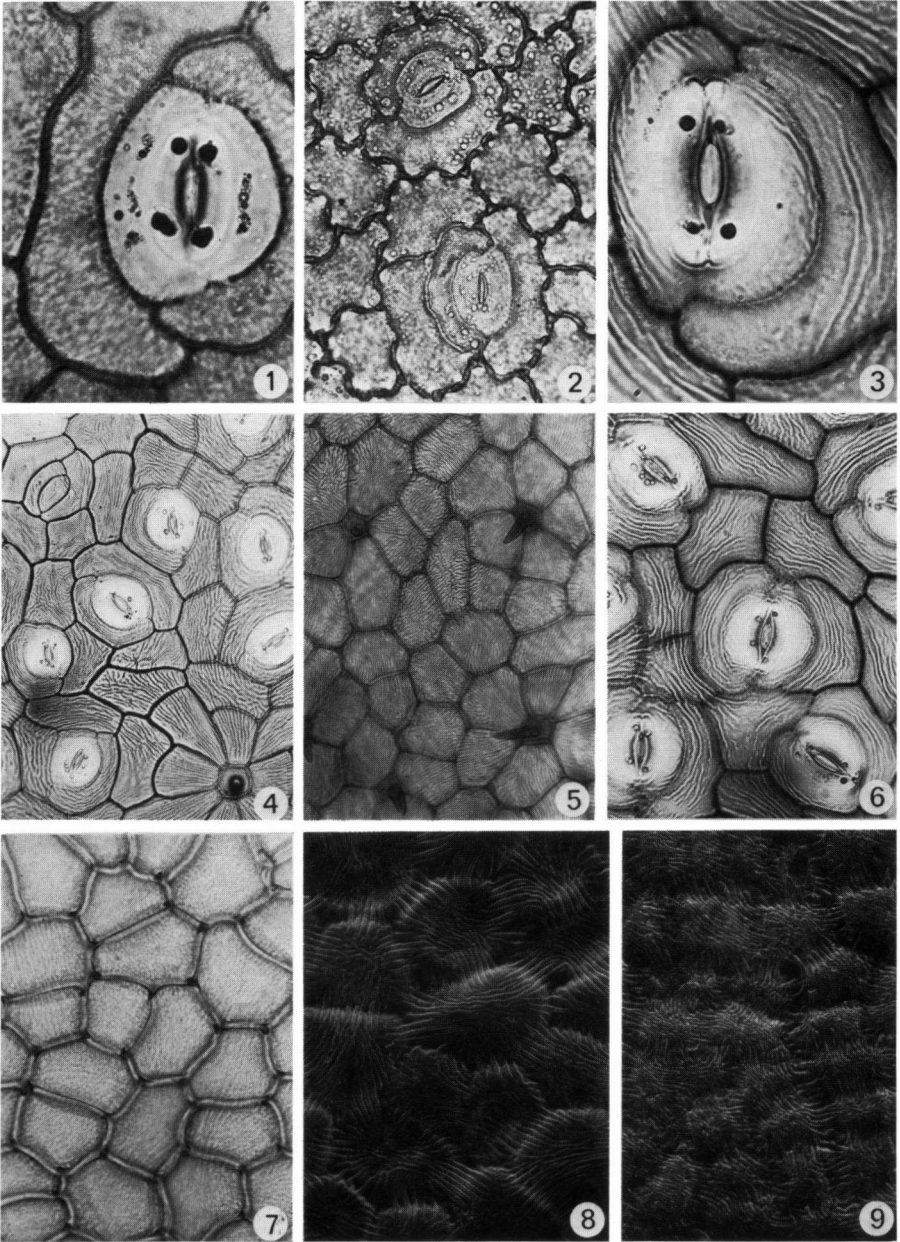


Plate 2. Epidermal features of *Maschalodesme* and *Versteegia*. — *Maschalodesme arborea*. 1. Parallelocytic stoma; 2. upper epidermis showing stomata and cuticular pegs. — *Versteegia* sp. 3. Parallelocytic stoma. — *Versteegia minor*. 4. Lower epidermis; 5. upper epidermis. — *Versteegia puberula*. 6. Lower epidermis showing beaded anticlinal flanges; 7. upper epidermis showing cuticular pegs. — Stereoscan photographs of cuticular patterns. 8. *Versteegia grandifolia*. 9. *Versteegia cauliflora*. (1 & 3 \times 625; 2, 4, 6—9 \times 250; 5 \times 150).

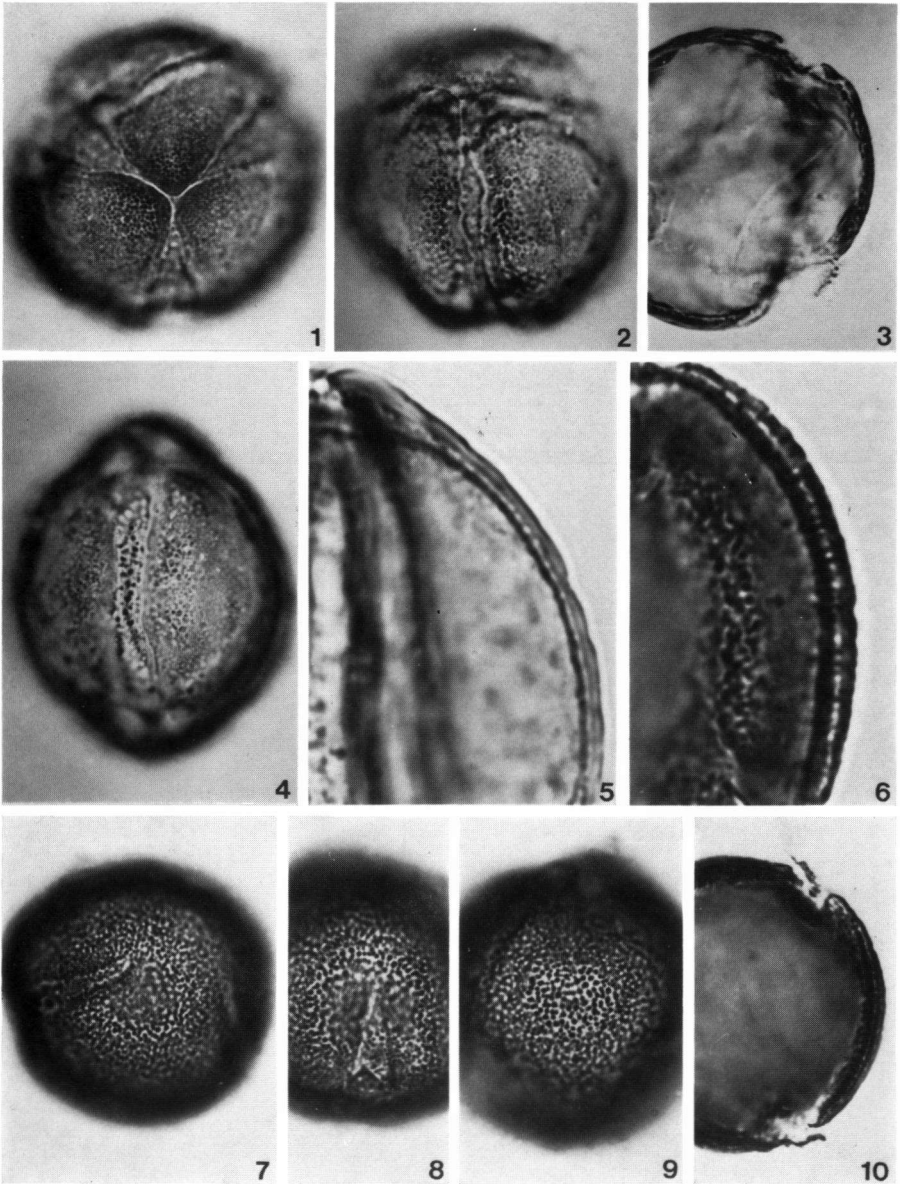


Plate I. Fig. 1: *Barringtonia neocaledonica* (McKee 5572). Polar view. — Figs. 2—5: *Barringtonia calyptrata* (NGF 4511). 2. Oblique polar view; 3. Polar view, lower focus; 4. Equatorial view; 5. Equatorial view, lower focus. — Figs. 6—10: *Crateranthus congolensis* (Karmann s.n.). 6. Equatorial view, lower focus; 7—8. Oblique polar view; 9. Polar view, upper focus; 10. Polar view, lower focus. — All 1000 ×, O.I., except 5, 6: 2000 ×, O.I.