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THE GENUS LERCHEA (RUBIACEAE)

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SUMMARY

Lerchea Linn., a genus from Sumatra and Java, is revised. Eight species are recognized. Two new species, *L. corymbosa* and *L. parviflora*, are described. One variety has been raised to species, *L. beccariana*. A key, descriptions, illustrations, and distribution maps for all species are provided. Raphides are shown to be present in *Lerchea* and the two closely related genera *Xanthophytum* and *Pomazota*. Hence these three genera are transferred from Pomazotoideae-Pomazoteae to Rubioideae-Hedyotideae. Two cladograms are given, one of *Lerchea*, the other showing the relationship between *Lerchea*, *Xanthophytum*, and *Pomazota*.

INTRODUCTION

This treatise presents a revision of the genus *Lerchea*. The genus was described by Linnaeus in 1771. The type seems then to have been temporarily lost, and the genus on the point of being expunged from literature. According to Bennett (1838), Robert Brown re-found the type among an unfiled part of the Linnaean collection, and the genus was thus recovered. Some more species were later described, mostly from Sumatra, but the genus is very poorly known.

Lerchea consists of small shrublets up to 1 m high, with small inconspicuous flowers. This latter fact could be one explanation why there is so little collected material, but the main cause must be a factual rareness. Despite a rather extensive excursion in the mountains of western Sumatra, I found only one species. It grew rather abundantly on a steep slope in undisturbed, shady rainforest. Since Sumatra nowadays is mainly a farming country with vast rice fields, the future for the genus seems hazardous.

Eight species are recognized; two of them are newly described here.

MATERIAL AND METHODS

This revision is based on studies of material from the herbaria B, BM, BO, C, FI (photos only), G, K, L, P, SING, and UC. I have seen all types and examined all collections cited. All lectotypes were chosen here.

The descriptions are sometimes more or less incomplete, due to lack of material. The variation presented is thus to be regarded as preliminary. The drawings are made by myself. Since the mature flowers seem to drop easily, floral parts often come from buds of different maturity. Minor differences in length and width should therefore not be used in identification of the species. Seeds investigated in SEM were boiled, critical-point-dried and gold-coated.

To present an interpretation of the character distribution and to form a hypothesis on the phylogeny of the genus, a cladistic analysis with outgroup comparison was performed. The cladograms were constructed by hand. The data matrix for the *Lerchea* cladogram was also run in a computerized parsimony analysis (PAUP), written by D.L. Swafford and available at the Swedish Museum of Natural History. The PAUP run yielded three equally parsimonious cladograms discussed later in this study.

MORPHOLOGICAL COMMENTS

Raphides – Raphides are reported absent in *Lerchea* and allied genera (Bremekamp, 1966), but 'small rod-like crystals of a very similar type' are said to be present (Verdcourt, 1958). I have found bundles of needle-shaped crystals abundant in both leaf and floral tissue, and I see no reason why these should not be called raphides.

Hairs – The sparse hairs on the leaves, and those which sometimes occur on the outside of the corolla, are, what Verdcourt (1958) calls, completely septate hairs, i.e., hairs made up of distinct cells. The hairs on the inside of the corolla are of two seemingly different types: a dense ring of ascending stiff hairs near the brim of the corolla and below that, a more sparse and soft indumentum. However, these two types are morphologically identical. They are both striate, thin-walled and with a few thin septae.

Leaves – The leaves in *Lerchea* are, like in all Rubiaceae, opposite. However, sometimes one of the leaves at the node is less developed and earlier dropping, thus making the remainding leaves pseudo-alternate. The outline of the leaves is lanceolate to oblong or obovate, and varies considerably in size. On the upper side of the leaves the veins are distinct. On the underside, which often is considerably brighter in colour, the veins are prominent. Two slightly different types of venation occur, one with sparse, smoothly curved nerves leaving the midrib at an angle of 40–65°, the other with more densely placed, almost parallel nerves leaving the midrib at an angle of 50–90°. In most of the specimens the upper epidermis consists of very big cells. In two species, *L. bracteata* and *L. beccariana*, this layer is always double. Of *L. interrupta* some specimens have double, others single cells and in *L. corymbosa* the layer is single but some of the cells are periclinally split. In many specimens it was impossible to observe the true nature of the epidermis, due to shrivelled cells. Since the way the specimens are treated before mounting them on sheets certainly affects the condition of the epidermis, further studies should be done on preferably fresh, or at least diligently dried material.

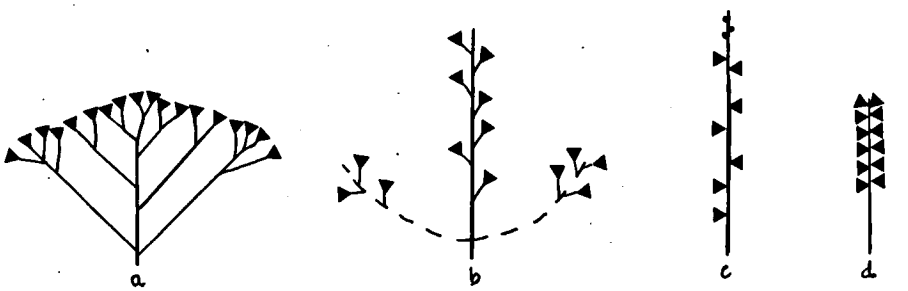


Fig. 1. Types of inflorescences in *Lerchea* described in the text. a. Corymbiform; b. tail-like, with peduncled cymes or fascicles; c. tail-like, with sessile or subsessile cymes or fascicles; d. spike- to head-like.

Stipules – Two kinds of stipules occur in *Lerchea*. One type is rather small and triangular, uniting the petioles, with a subulate, sometimes bifid apex and often reflexed margins. The other is more or less foliaceous, not uniting the petioles, sometimes dropping easily, and always with distinct venation. The shape varies from lanceolate to broadly obovate, the apex from acuminate to obtuse.

Inflorescence – The inflorescence in *Lerchea* is mostly terminal, but sometimes pseudo-axillary. It consists of more or less condensed cymes or fascicles in a raceme with a more or less elongated main axis (fig. 1). A spike-like inflorescence with an elongated main axis has been used as a diagnostic character of the genus and up to now all species have showed this feature. However, one of the new species, *L. corymbosa*, has a short main axis with several stout side branches (fig. 1a). A next step in a presumed series is that the main axis is longer and the side branches have disappeared. Very rarely one or two may remain at the bottom of the inflorescence. The fascicles are peduncled, the peduncles are reflexed or not (fig. 1b). The next type of inflorescence has reduced peduncles and the fascicles may be reduced to solitary flowers in the upper part of the inflorescence (fig. 1c). Both these types (fig. 1b, c) I call tail-like. Another type is where the main axis is secondarily reduced, giving the inflorescence a spike- to head-like appearance (fig. 1d).

Fruits – The fruit is bilocular, each loculus with a very hard endocarp. It seems to be indehiscent, not even splitting in the two loculi. Probably they are opened late by decay, but the fact that the seeds are very small and could contain but little endosperm seems to contradict this. The placentas are fleshy, peltate and inserted at, or just below, the middle of the septum. The seeds are attached to the surface of the placenta and not embedded in it, like in *Hedyotis*.

Seeds – The seeds are numerous, square in outline and a bit compressed in one end but not truly wedge-shaped (fig. 2a). They are minute, c. 0.2 mm long. The morphology of the testa structure has been considered especially by Bremekamp, and used for taxonomical delimitation within the family Rubiaceae (Bremekamp, 1952, 1966). The testa cells in *Lerchea* are very small, c. 40 μm, irregular pentagons or

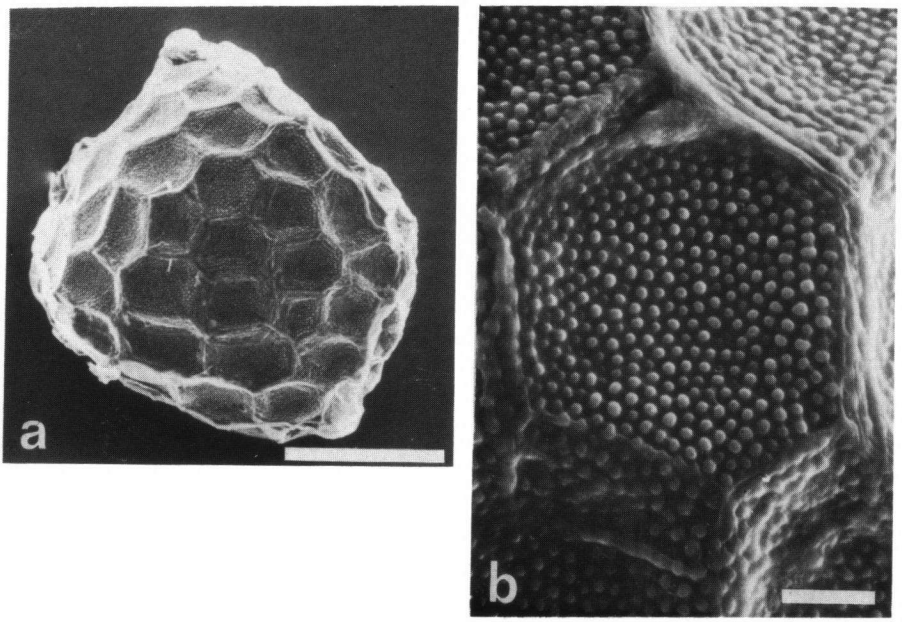


Fig. 2. *Lerchea bracteata* Valeton. a. Seed; b. testa structure (a, b *Axelius 343*). Bar scale: a: 0.1 mm; b: 10 μm.

hexagons. The outer wall is thin and smooth while the inner five walls are thicker and tuberculate. Apparently the testa cell collapses during maturation, and the outer wall falls down to cover the tubercles like a skin (fig. 2b). This, a collapsing outer wall covering the differently sculptured lower walls, is probably a common feature in Rubiaceae. Bremer (1984) reports a similar testa structure in *Steenisia*, although the outer wall is said to be 'deciduous'.

LERCHEA

Lerchea Linn., Mant. Pl. 2 (1771) 155. – Type species: *L. longicauda* Linn.
Polycycliska Ridley, Kew Bull. (1926) 67. – Type species: *P. cylindrica* Ridley.

Erect one-stemmed shrublets, up to 1 m high, not or few-branched. Upper part of stem and branchlets often shortly scabrous. Raphides present. *Leaves* often only at upper nodes, opposite, petiolate, entire, herbaceous, lanceolate to oblong or obovate, cuneate to attenuate at base, acute to acuminate at apex, glabrous above, glabrous or minutely pubescent on the veins below; midrib and lateral veins distinct, prominent below, with or without distinct transverse veinlets; stipules interpetiolar, triangular to more or less foliaceous, entire or bifid at the apex, often with colleters adaxial at the

base. *Inflorescences* single or a few, terminal though sometimes pseudo-axillary, either branched, more or less corymbiform, or with a elongated main axis, tail-, spike- or head-like. Both types consisting of more or less condensed and reduced cymes or fascicles, with or without peduncles. Bracts minute to broadly foliaceous. *Flowers* pentamerous, hermaphrodite, protandrous and, with one exception, heterostylous. *Calyx* green or purple, glabrous or pubescent, with or without a tube; lobes triangular to rounded, persistent in fruit. Colleters alternate, at the base of the calyx lobes or near the base of the calyx tube. *Corolla* white to pinkish, tubiform to infundibuliform, aestivation valvate; outside glabrous or occasionally sparsely pilose; inside softly pubescent and with a dense ring of more stiff ascending hairs, either near the brim of the corolla or at about one third down the tube; lobes thickened to cucullate in bud, later more or less recurved, acute. *Stamens* exserted or not, inserted above or just below the middle of the tube, i.e., the main part of the filaments adnate to the corolla, or in the not heterostylous species at the base of the tube; free part of filaments slightly shorter to slightly longer than the anthers; anthers situated either above the ring of stiff hairs on the corolla or below, narrowly elliptical, at either end with or without a tuft of hairs, introrse, opening by slits. *Ovary* bilocular; ovules numerous on peltate placentas inserted at about the middle of the septum. Disc fleshy at anthesis, glabrous, persistent. Style filiform, glabrous, exserted or not; stigma bifid, papillose. *Fruit* a subglobose, bilocular nut; each loculus with a hard endocarp. *Seeds* brown, numerous, angular, minute, c. 0.2 mm; testa cells c. 40 μm, with a thin outer wall and tuberculate inner walls.

KEY TO THE SPECIES

1a. Inflorescence more or less corymbiform, with several side branches (fig. 1a) **1. L. corymbosa**
b. Inflorescence tail- to head-like (fig. 1b–d) 2
2a. Inflorescence spike- to head-like (fig. 1d) 3
b. Inflorescence tail-like (fig. 1b, c) 4
3a. Anthers with small tufts of hairs. Stipules small, narrowly triangular **8. L. capitata**
b. Anthers glabrous. Stipules large, broadly lanceolate . . . . . **3. L. bracteata**
4a. Flowers in reflexed, peduncled cymes or fascicles 5
b. Flowers solitary or in sessile or subsessile cymes or fascicles 6
5a. Flowers heterostylous, corolla tube c. 3 mm long . . . . . **4. L. beccariana**
b. Flowers homostylous, corolla tube c. 1.5 mm long . . . . . **5. L. paniculata**
6a. Inflorescence with broad bracts . . . . . **2. L. interrupta**
b. Inflorescence with none or very narrow bracts 7
7a. Anthers with small tufts of hairs. Corolla tube c. 4 mm long . . **7. L. longicauda**
b. Anthers glabrous. Corolla tube less than 3 mm long . . . . . **6. L. parviflora**

Fig. 3. *Lerchea corymbosa* Axelius. a. Habit, × 0.4; b. macrostylous flower, × 12.5 (a, b *de Wilde & de Wilde-Duyfjes 18832*).

1. Lerchea corymbosa Axelius, *spec. nov.* – Fig. 3, 5a.

Suffrutex 40 cm altus, in partibus superis glaber. Folia oblonga vel obovata, 14–27 × 3–7 cm, basi cuneata vel attenuata et in petiolum ad 2,5 cm longum angustata, apice acuta vel acuminata, supra glabra, subtus pubinervia; nervi primarii 20–25 paribus; stipulae foliaceae, lanceolatae, 0,7–2 × 0,2–0.4 cm, acutae. Inflorescentia corymbiformis; ramis numerosus, longis; bracteae lineares, acutae, ad 20 mm longae. Calyx glaber, lobis triangularibus, basi loborum colletibus. Corolla alabastris modo cognita, tubiformis, c. 4 mm longa; lobi in alabastro leviter incrassati. Antherae glabrae, c. 0,8 mm longae. Stylus (longior) in alabastro c. 3,4 mm. Fructus indehiscens, subglobosus, bilocularis, c. 2 mm latus. – Typus: *de Wilde & de Wilde-Duyfjes 18832*, 17 July 1979, Gunung Leuser, Atjeh, Sumatra (L, holo; BO, iso).

Erect shrublet c. 40 cm high, glabrous in upper parts. *Leaves* oblong to obovate, 14–27 by 3–7 cm, cuneate to attenuate at base, narrowing into an up to 2.5 cm long petiole, acute to acuminate at apex, glabrous above, slightly pubescent on the veins below; lateral veins 20–25 pairs; stipules foliaceous, lanceolate, 0.7–2 by 0.2–0.4 cm, acute. *Inflorescence* corymbiform, consisting of peduncled cymes or fascicles, and with several long, stout side branches; bracts linear, up to 20 mm. *Flowers* probably heterostylous, but only longistyled form seen. *Calyx* glabrous; no tube; lobes triangular; colleters at the base of the calyx lobes. *Corolla* (known only from bud) tubiform, c. 4 mm; lobes just slightly thickened in bud. Anthers glabrous, c. 0.8 mm. Shorter style not known, longer style in bud 3.4 mm. *Fruit* indehiscent, subglobose, bilocular, c. 2 mm broad, crowned with the dry disc and calyx lobes.

Note. This is the only species which has an inflorescence without the elongated main axis. The collectors of the type specimen proposed that it should be placed in *Xanthophytum*, but there is nothing to support that suggestion. The terminal inflorescence, the high inserted stamens, i.e., the main part of the filaments are adnate to the corolla, the bifid stigma and the structure of the leaves show that it must be placed in *Lerchea*. Since there are only three collections, it is not yet possible to state that the species is heterostylous. The flower, however, looks exactly like the long-styled flowers of the other heterostylous species, i.e., with the stamens inserted below the middle of the tube and the anthers situated below the ring of stiff hairs of the corolla. The style is long and projects the stigma clearly above the ring of stiff hairs.

Collections. Sumatra: Atjeh, Gunung Leuser Reserve, Alas R. valley near the mouth of the Bengkong R., c. 50 km S. of Kutacane, de Wilde & de Wilde-Duyfjes 18832 (type, BO, L); Sibolangit Nat. Res., Lörzing 4480, 5101 (BO).

2. Lerchea interrupta Korth. – Fig. 4, 5a.

L. interrupta Korth., Ned. Kruidk. Arch. 2 (1851) 164. – Type: *Korthals s.n.*, Sumatra (L, lecto).

Shrublet, sometimes thinly scabrous in upper parts. *Leaves* oblong to obovate, 13–30 by 4–6.5 cm, cuneate to attenuate at base and narrowing into an up to 3 cm long petiole, acute to acuminate at apex, glabrous; lateral veins 16–25 pairs; stipules

Fig. 4. *Lerchea interrupta* Korth. a. Habit, × 0.4; b. microstylous flower, × 12.5; c. macrostylous flower, × 12.5 (a, c *Korthals s. n.*; b *van Borssum Waalkes 1547*).

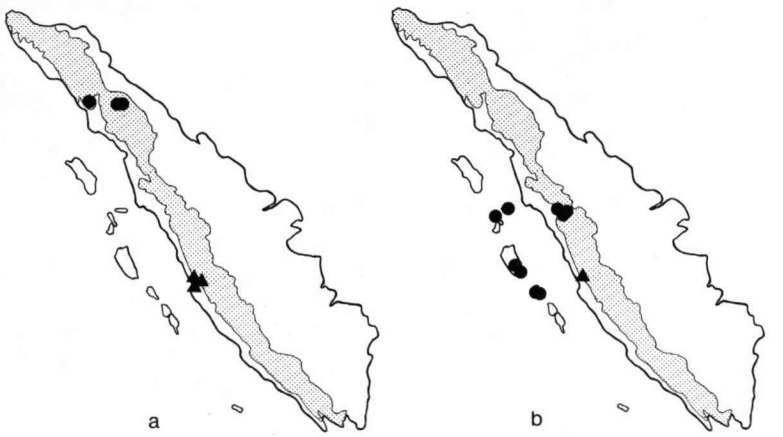


Fig. 5a. Known distribution of *Lerchea corymbosa* Axelius (●) and *L. interrupta* Korth. (▲). – Fig. 5b. Known distribution of *L. bracteata* Valeton (●) and *L. beccariana* (Bakh. f.) Axelius (▲).

foliaceous, lanceolate, 1–1.7 by 0.2–0.6 cm, acute, sometimes bifid. *Inflorescence* tail-like, up to 20 cm, very rarely with a pair of branches at the base. *Flowers* in scattered stalked or subsessile cymes, surrounded by broad bracts, c. 7 by 7 mm. *Calyx* glabrous; tube very short; lobes ovate, with obtuse apex; raphides abundant and prominent; colleters at the base of the calyx lobes or wanting. *Corolla* tubiform; tube c. 3 mm; lobes thickened in bud. Anthers glabrous, c. 0.9 mm. Style 4 mm or 2.5 mm long. *Fruit* subglobose, c. 2 mm broad, crowned with the dry disc and calyx.

Note. *Lerchea interrupta* is collected in but a few specimens, mainly by Korthals. Most of the Korthals specimens have inflorescences with elongated main axis, and, rarely, a pair of branches near the base. The main axis is nevertheless sturdier and much more developed, but the arrangement shows the connection with the branched inflorescence in *L. corymbosa* The only rather new collection of the species, *van Borssum Waalkes 1547*, looks slightly different, with a longer non-branched inflorescence and more regular and closely placed cymes. The leaves also have more dense lateral veins.

Collections. Sumatra: Lubu-Kilangan, Padang, Korthals s.n. (L); West Coast, above Telung Kabung, Mt Watas, van Borssum Waalkes 1547 (L); Ayer Mancur, Prov. Padang, Beccari s.n., 678 (FI).

3. Lerchea bracteata Valeton – Fig. 5b, 6.

L. bracteata Valeton, Icon. Bogor. 4 (1914) pl. 382. – Type: *Raap 55*, 5 Sept. 1896, Batoe I., Sumatra (BO, lecto).

Polycycliska cylindrica Ridley, Kew Bull. (1926) 67. – Type: *Boden Kloss 11439*, 9 Sept. 1924, Siberut, Mentawi I. (SING, holo).

Fig. 6. *Lerchea bracteata* Valeton. a. Habit, × 0.4; b. microstylous flower, × 12.5; c. macrostylous flower, × 12.5 (a, b *Iboet 97*; c *Raap 55*).

Shrublet sometimes branched, thinly scabrous in upper parts. *Leaves* oblong to obovate, 12–30 by 3.5–7.5 cm, cuneate to attenuate at base and narrowing into an up to 4 cm long petiole, acute to acuminate at apex, glabrous above, slightly pubescent on the veins below; lateral veins 13–20 pairs; stipules foliaceous, broadly lanceolate to obovate, large, 1–2.5 by 0.6–1.3 cm, acute or rounded at apex; veins prominent. *Inflorescence* spike- to head-like, 2–7 by 1–1.7 cm, with the subsessile to shortly stalked fascicles densely together; peduncle 0–3 cm; bracts ovate, c. 8 by 4 mm. *Calyx* green to purple; tube c. 0.5 mm, glabrous; lobes triangular, small, often with short hairs along the margin; colleters at the base of the calyx lobes. *Corolla* narrowly infundibuliform; tube c. 3 mm; lobes thickened in bud. Anthers glabrous, c. 0.9 mm. Style 4 mm or 2.5 mm long. *Fruit* subglobose, c. 2 mm broad, usually crowned with the dry disc and calyx, sometimes bare.

Note. The Sumatran mainland form of *L. bracteata* is a sturdier plant than the island form. The leaves are larger and the stipules much broader and rounded at the apex. The inflorescence has often a very short peduncle and is more strongly condensed, generally followed by a loss of bracts. The bracts that nevertheless occur are foliaceous with distinct venation, never linear. Both living and dried, the mainland form has a calyx that is distinctly purple-coloured. The population from Siberut I. shows a somewhat intermediate appearance. The habit is of the common island form but the inflorescence is of the larger mainland form.

Collections. Mentawai Islands: vicinity of Siberut, Iboet 97 (BO, L); Siberut, Boden Kloss SF 11439 (BO); Sipora, vicinity of Sioban, Iboet 406 (BO, L); Sipora, Boden Kloss SF 14684 (BO). – Batu Islands: Pulau Telo, Raap 55 (BO); Pulau Pini, Raap 720 (BO). – Sumatra: Batang Palupuh, Kleinhoonte 631 (BO); ibid., just outside the Nature Reserve, Axelius 343 (S); W. slope of Gunung Talamau (= Ophir), Bünnemeijer 546 (BO).

4. Lerchea beccariana (Bakh. f.) Axelius, *stat. nov.* – Fig. 5b, 7.

L. paniculata Bakh. f. var. *beccariana* Bakh. f., Blumea 7 (1953) 335. – Type: *Beccari 926*, Sept. 1878, Sungei Bulu, Sumatra (L, holo; BM, FI, K, iso).

Erect shrublet, scabrous in upper parts. *Leaves* oblong to obovate, 10–26 by 3.5–8 cm, cuneate to attenuate at base and narrowing into an up to 4.5 cm long petiole, acute to acuminate at apex, glabrous above, slightly pubescent on the veins below; lateral veins 15–32 pairs; stipules foliaceous, lanceolate to ovate, 1–1.5 by 0.3–0.5 cm, acute. *Inflorescence* tail-like, up to 32 cm; flowers in scattered, peduncled, reflexed cymes; bracts linear, up to 10 mm long. *Calyx* glabrous or with a few hairs; no tube; lobes triangular with prominent raphides; colleters at the base of the calyx lobes. *Corolla* tubiform; tube c. 3 mm; lobes thickened in bud. Filaments in microstylous flowers long, c. 1.3 mm; anthers glabrous, c. 0.8 mm long. Style c. 3.5 mm or c. 2 mm long. *Fruit* subglobose, c. 2 mm broad, crowned with the dry disc and calyx.

Note. This species is only known from two collections. It was described as a variety of *L. paniculata*, but though it resembles that species in the inflorescence, i.e., the reflexed, peduncled cymes, it does not agree in either flower or leaf characters.

Collections. Sumatra: Korthals s.n. (L); Sungei Bulu, Padang, Beccari 926 (BM, FI, K, L).

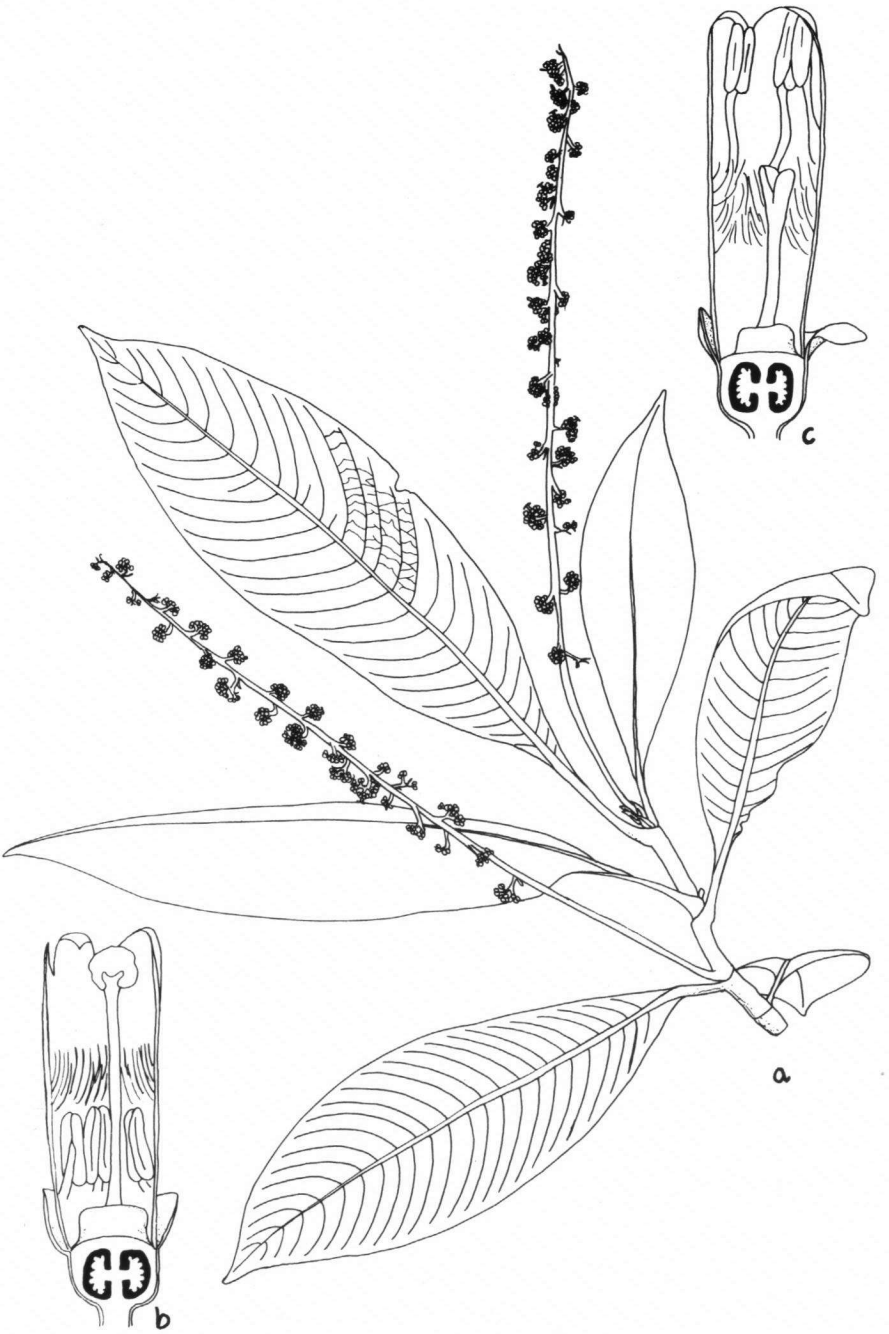


Fig. 7. *Lerchea beccariana* (Bakh. f.) Axelius. a. Habit, × 0.4; b. macrostylous flower, × 12.5; c microstylous flower, × 12.5 (a, b *Korthals s. n.*; c *Beccari 926*).

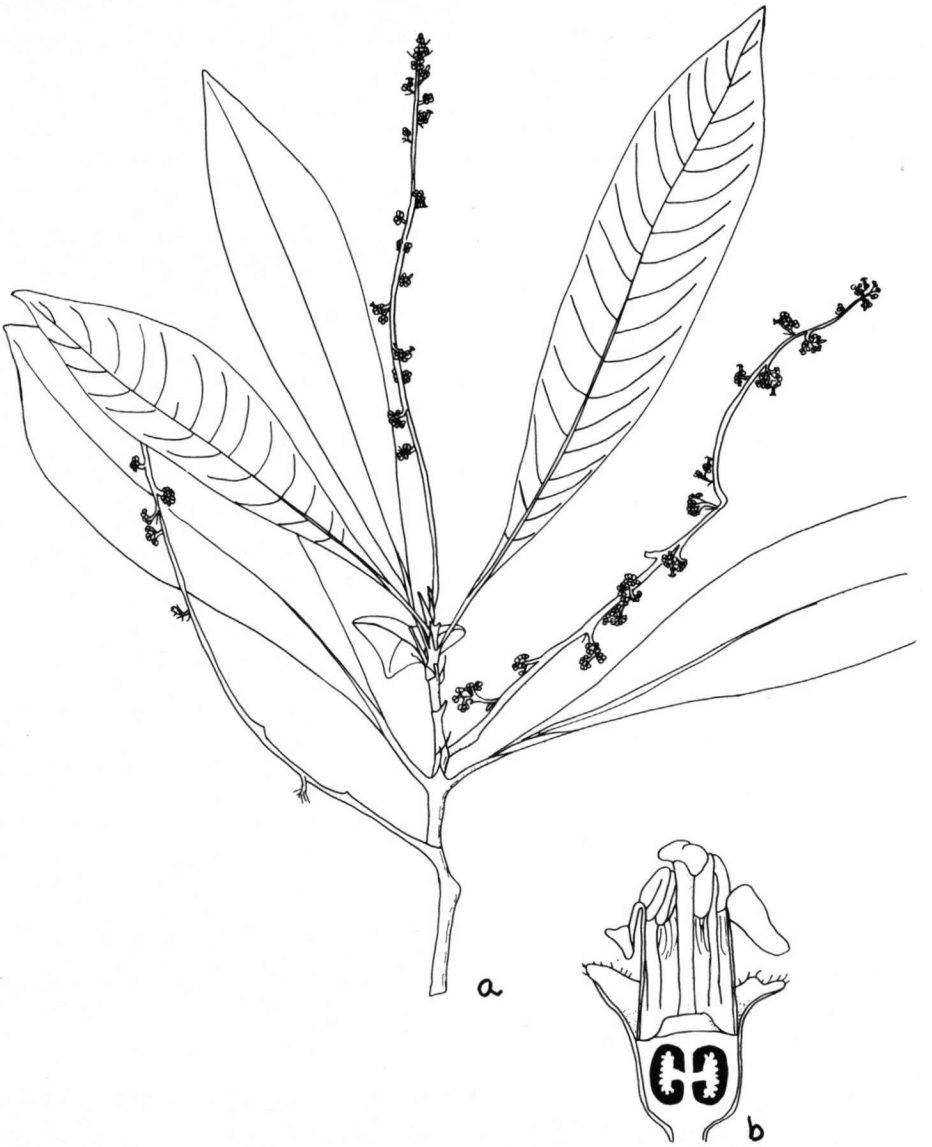


Fig. 8. *Lerchea paniculata* Bakh. f. a. Habit, ×0.4; b. flower, ×12.5 (a *Robinson & Kloss 166*; b *Bakhuizen van den Brink 243*).

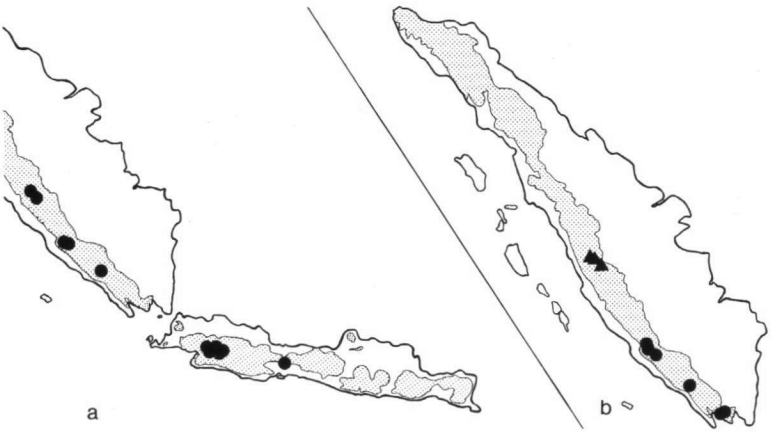


Fig. 9a. Known distribution of *Lerchea paniculata* Bakh. f. (●). – Fig. 9b. Known distribution of *L. capitata* Moore (●) and *L. parviflora* Axelius (▲).

5. Lerchea paniculata Bakh. f. – Fig. 8, 9a.

L. paniculata Bakh. f., Blumea 7 (1953) 334. – Type: *Winckel 1725b*, 20 Oct. 1923, Gunung Buleud, Java (L, holo).

Erect shrublet up to 1 m, glabrous in upper parts. *Leaves* lanceolate to oblong, 9.5–23 by 3.5–5 cm, cuneate to attenuate at base and narrowing into an up to 4 cm long petiole, acute to acuminate at apex, glabrous; lateral veins rather sparse, 11–24 pairs, stipules triangular, c. 1 cm, revolute, subulate. *Inflorescence* tail-like, up to 21 cm; flowers homostylous, in scattered peduncled cymes, the peduncles curved and reflexed; bracts linear, up to 5 mm long. *Calyx* tube very short, glabrous; lobes oblong to ovate, more or less pubescent outside and along the margins, acute to obtuse at apex; colleters abundant, often a few together, at the base of the calyx lobes. *Corolla* tubiform; tube short, c. 1.5 mm; lobes cucullate with a few stout hairs at least in bud. *Stamens* nearly free, inserted at the base of the corolla tube and as long as the tube; anthers glabrous, c. 0.6 mm long, situated above the ring of stiff hairs. Style slightly longer than the corolla tube; stigma shallowly bifid. *Fruit* subglobose, c. 2 mm broad, crowned with the dry disc and recurved calyx lobes.

Note. The specimens from the two localities in central Sumatra show some slightly divergent features. They differ from the Javanese specimens in the densely pubescent calyx lobes and the distinctly purple-coloured inflorescences. Since they in other important characters fully agree with the Javanese population, I find no reason to keep them apart.

Collections. Sumatra: Siolak Dras, Robinson & Kloss s.n. (BM, K, L); Sandaran Agong, Korinchi, Robinson & Kloss 166 (BM); Palembang, Pau, Bukit Tinggi, Forbes 2202 (BM); Pasumah, Forbes 2200 (L); Benkulu, Gunung Pakiwang, van der Pijl 372 (BO). – Java: Gunung Gedeh, de Voogd s.n. (BO); Chi Reunghas, Backer 14916 (BO); Chidadap, Chibeber, Chadas-Malang,

Backer 22760 (BO); Gunung Beser, Bakhuizen van den Brink 243 (L); Winckel 257b, 1977b (BO); Gunung Buleud, Winckel 1725b (L); Cilongok, Joss 123 (BO).

6. Lerchea parviflora Axelius, *spec. nov.* – Fig. 9b, 10.

Suffrutex in partibus superis scaber. Folia lanceolata vel oblonga, 15–30 by 2,5–5 cm, basi cuneata vel attenuata et in petiolum ad 5 cm longum gradatim angustata, apice acuta vel acuminata, supra glabra, subtus pubinervia; nervi primarii sparsi, 13–20 paribus; stipulae leviter foliaceae, triangulares vel ovatae, ad 2 cm longae, subulatae, interdum bifidae. Inflorescentia caudoides, ad 35 cm longa; flores sessiles vel subsessiles in fasciculo sessili vel subsessili, interdum singulares; bracteae lineares, minutae, rarae. Calyx plusminusve pilosus, lobis late triangularibus, parvis, basi loborum colletibus. Corolla alabastris modo cognita, tubiformis, saepe sparse pilosa, c. 2,6 mm longa; lobi in alabastro incrassati, saepe pilis paucis. Antherae glabrae, c. 0,6 mm longae; stylus (longior) in alabastro c. 2,4 mm. Fructus subglobosus, bilocularis, c. 2 mm latus. – Typus: *Meijer 4980*, 5 May 1956, Mt Sago near Pajakumbuh, ravine of Bt Pinago, Central Sumatra (L, holo).

Erect shrublet, scabrous in upper parts. *Leaves* lanceolate to oblong, 15–30 by 2.5–5 cm, cuneate to attenuate at base and gradually narrowing into an up to 5 cm long petiole, acute to acuminate at apex, glabrous above, pubescent on the veins below; lateral veins rather sparse, 13–20 pairs; stipules slightly foliaceous, triangular to ovate, up to 2 cm, subulate, sometimes bifid. *Inflorescence* tail-like, up to 35 cm; flowers probably heterostylous, if so, only longistyled form seen, sessile or subsessile, in sessile or subsessile fascicles, or sometimes solitary; bracts linear, minute, very sparse. *Calyx* and ovary more or less pilose; no tube; lobes broadly triangular, small; colleters at the base of the calyx lobes. *Corolla* known only from buds, tubiform, often sparsely pilose, c. 2.6 cm long; lobes thickened in bud, often with a few hairs. Anthers glabrous, c. 0.6 mm long. Shorter style, not known; longer (?) style in mature buds c. 2.4 mm long. *Fruit* subglobose, c. 2 mm broad, crowned with the dry disc and calyx.

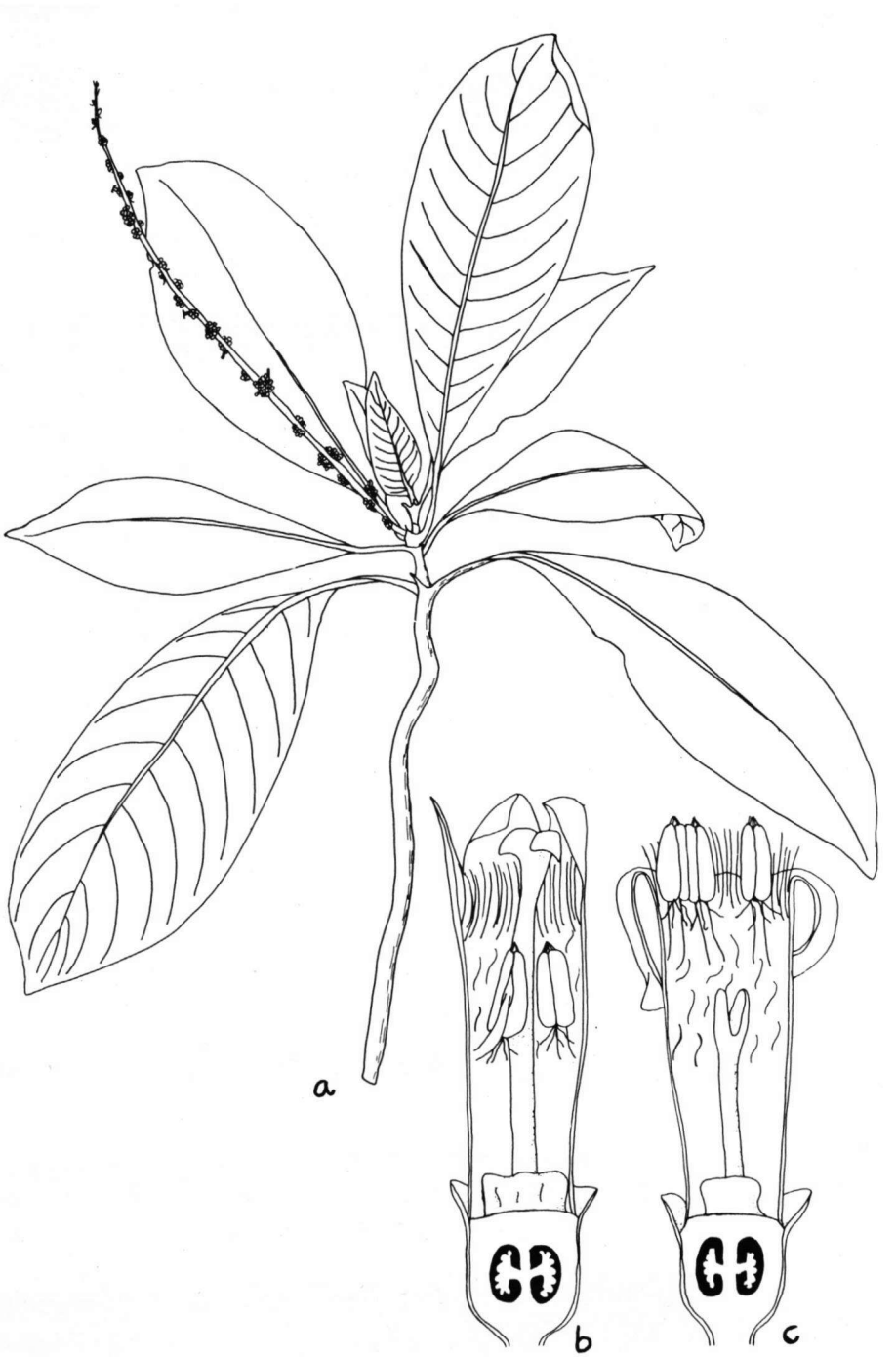
Note. All specimens belonging to this new species have formerly been identified as *L. longicauda*. They are superficially very similar to that species but when studying the flowers the differences are immediately apparent. Since *L. longicauda* is the best known species, with a considerable amount of collected material, the variation range for flower size is fairly well known. This new species has distinctly smaller flowers. It also differs in smaller anthers which are completely glabrous, a pilose ovary and calyx, and more foliaceous stipules.

All specimens have flowers with a long style well above the ring of hairs, which in this species is thinner than usually found. The stamens are inserted unusually far down the corolla tube but not as near the base of the tube to be described as nearly free, as they are in *L. paniculata*. The anthers are situated not under but in the lower part of the ring of stiff hairs. I believe this species will turn out to be heterostylous. Though, the small flowers and the short distance between the stigma and the anthers may show some connection to *L. paniculata*.

Collections. Sumatra: Mt Sago near Pajakumbuh, ravine of Bukit Pinago, Meijer 4980 (L); West Coast, Gunung Malintang, Bünnemeijer 4309 (K); limestone rocks near Si Aur, 6 km N. of Langsat Sijunjung, Meijer 4409 (L).

Fig. 10. *Lerchea parviflora* Axelius. a. Habit, ×0.4; b. macrostylous flower, ×12.5 (a *Bünnemeijer 4309*; b *Meijer 4409*).

Fig. 11. *Lerchea longicauda* L. a. Habit, ×0.4; b. microstylous flower, ×12.5; c. macrostylous flower, ×12.5 (a *Backer 10025*; b *Kostermans 19352*; c. *Horsfield s. n.*).


a
b
c

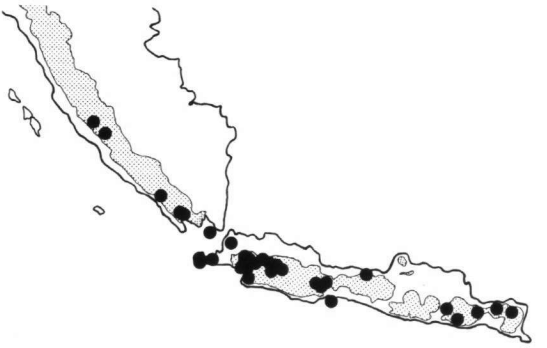


Fig. 12. Known distribution of *Lerchea longicauda* L. (●).

7. Lerchea longicauda Linn. – Fig. 11, 12.

L. longicauda Linn., Mant. Pl. 2 (1771) 155. – Type: *Hb. Linné 851a, ex. 1* (LINN, lecto).
Chiococca spicata Blume, Bijdr. Fl. Ned. Ind. (1826) 958. – *Xanthophytum spicatum* (Blume) DC., Prod. 4 (1830) 413. – *L. spicata* (Blume) Koord., Exk. Fl. Java 3 (1912) 238. – Type: *Blume s.n.*, Java (L, lecto).

Erect shrublet up to 80 cm, scabrous in upper parts. *Leaves* lanceolate to oblong to obovate, 12–30 by 3.5–7.5 cm, cuneate to attenuate at base and narrowing into an up to 5 cm long petiole, acute to acuminate at apex, glabrous above, slightly pubescent on the veins below; lateral veins sparse, 10–15 pairs; stipules triangular, c. 0.5 cm, subulate, sometimes bifid. *Inflorescence* tail-like, up to 50 cm long with flowers in sessile or subsessile fascicles or, in upper parts, solitary; bracts linear, minute. *Calyx* sparsely pubescent, occasionally glabrous; no tube; lobes broadly triangular, small; colleters at the base of the calyx lobes. *Corolla* tubiform, in bud often pear-shaped as galls (host for a larva); tube c. 4 mm; lobes thickened in bud, often with a few hairs. Anthers c. 0.8 mm long with a small tuft of hairs at the lower end and a minute tuft of hairs at the upper. Style either c. 4 mm or c. 2.5 mm long. *Fruit* subglobose, c. 2 mm broad, crowned with the dry disc and calyx.

Collections. Sumatra: Lebong Tandai, Benkulu, Brooks 6678, 7611 (K); Rimbupengadang, Ajoeb 191, 217 (BO); N. slope, Gunung Pakiwang, van Steenis 3808 (BO, L); Gunung Pakiwang, de Voogd 453 (BO); Agung Ulu Beluh, Cramer 162 (BO); Kota Agung, Jacobs 8413 (L); Pulau Sembesi, van Leeuwen-Reijnvaan 5305 (BO). – Java: Ujungkulon Res., Peujung I., near Tanjung Karangchopong, Unesco (Kostermans) 39 (BO, L); ibid., near lighthouse, Kostermans 21833 (K, L); slope of Mt Honje, Kostermans 19351A (BO, C, L); 19352 (K, L); Rawa Danau Serang, Partomihardjo 258 (BO); Gunung Agsana near Jasinga, Backer 10025 (BO, K, L); Gunung Manurah, Rumpin, Raimoendt s.n. (UC, L); Gunung Jambu, west of Leuwiliang, Bakhuizen van den Brink 6010 (BO); Gunung Sodong near Leuwiliang, Bakhuizen van den Brink 5283 (BO, L); Gunung Chibodas near Champea, Bogor, Backer 22106, 32966 (BO); Bakhuizen van den Brink 1095, 5147 (BO); Bakhuizen van den Brink f. 1804 (BO); Burck & de Monchy s.n. (BO, L); Buwalda 8104 (BO); Bijhouwer 270 (BO); Danser 6251 (P); Docters van Leeuwen 351 (BO); Hallier

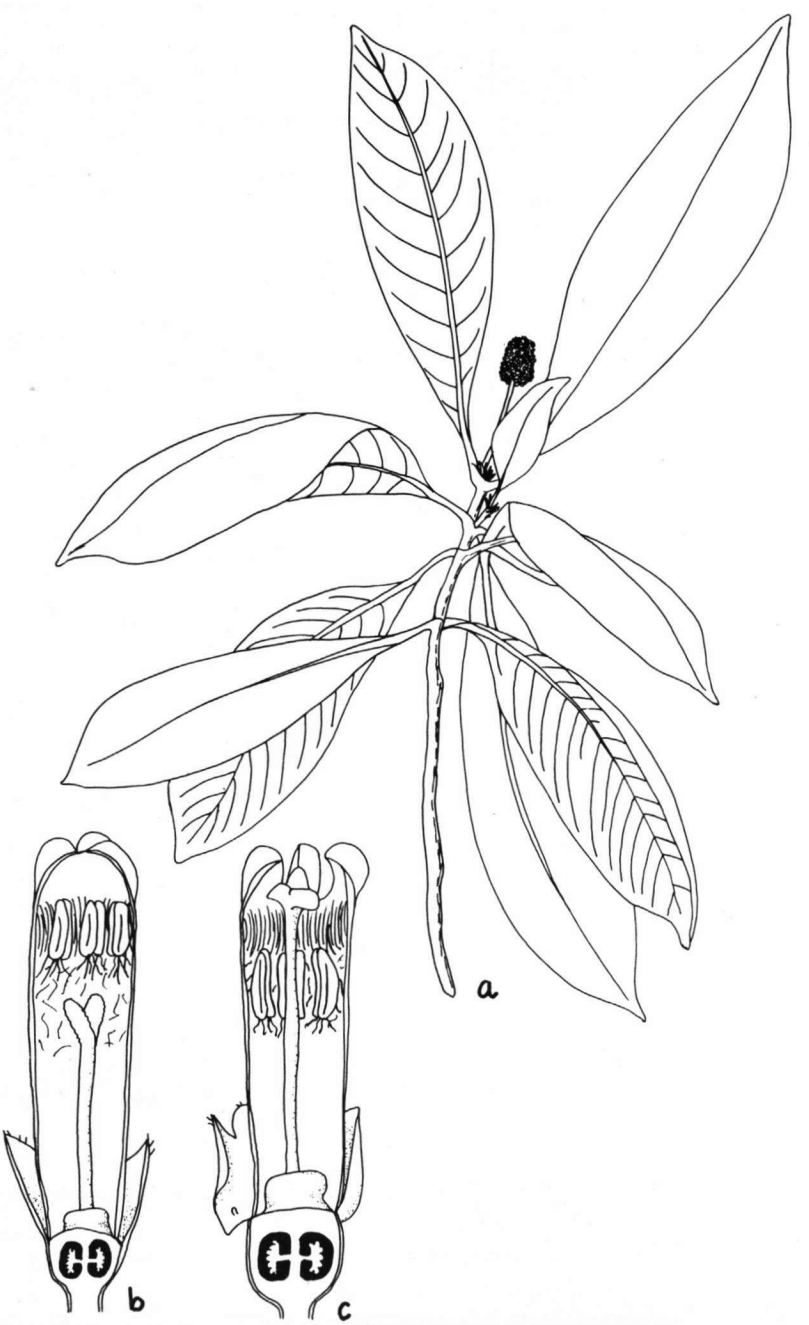


Fig. 13. *Lerchea capitata* Moore. a. Habit, × 0.4; b. microstylous flower, × 12.5; c. macrostylous flower, × 12.5 (a, b *de Voogd 1370*; b *de Voogd 1296*).

21 (BO, L), 93 (BO, K, L, P), 460 (BO); Hochreutiner 1885 (G, L); Lam 461 (BO); Valeton s.n., 67653–67658 (BO); Yates 3082 (UC); near Palabuhratu, Koorders 3894 (BO); Ploen s.n. (BO); Sanggrawa, Backer 2180 (BO); Klappa Nunggal, Backer 5866, 5932, 23372 (BO); Gunung Sangabuwana, Backer 23916 (BO); Gunung Gambir, near Kiara Pajung, Backer 23683 (BO); Chidadap, Chibeber, Muara Chitpaerug, Chisokan, Bakhuizen van den Brink f. 2980 (BO); Gunung Tangkuboprahu, Backer 689 (BO); Gunung Babakan, N. of Banjar, Backer 4269 (BO); Banjar, Bantardawa, Backer 32894, 32912 (BO); Banyumas Pasir Salam near Majenang, Backer 18786 (BO); Nusa Kambangan, Backer 4604, 4607 (BO); ibid., Gladagan, Bruggeman 855, 862 (BO); ibid., Limus Buntu, Amdjah 61, 120 (K); Pekalongan, Subah, Koorders 517 (BO); Sripit, Kediri, Backer 11829 (BO); Pasuran, S. of Bantur, Backer 3929 (BO); Glenmore in Besuki, Rant 951 (BO); Bondowoso, Sukamade (?), Clason s.n. (BO).

8. Lerchea capitata Moore – Fig. 9b, 13.

L. capitata Moore, Journ. Bot. 62 (1924) Suppl. p. 48. – Type: *Forbes 1392a*, Sumatra (BM lecto).

Shrublet (?), scabrous in upper parts. *Leaves* lanceolate to obovate, 12–18 by 4–6 cm, cuneate to attenuate at base and narrowing into an up to 4.5 cm long petiole, acute to acuminate at apex, glabrous above, slightly pubescent on the veins below; lateral veins sparse, 10–15 pairs; stipules narrowly triangular, up to 1 cm long, bifid. *Inflorescence* spike- to head-like, 1.5–8 by 1–1.2 cm, with the sessile to subsessile fascicles densely together; peduncle 3–3.5 cm; bracts linear, small, abundant. *Calyx* tube c. 0.9 mm, often glabrous; lobes triangular, small, with short hairs dorsally; colleters nearly at the base of the calyx tube. *Corolla* tubiform, c. 4 mm; lobes cucullate with a few stout hairs at least in bud. Filaments short, in macrostylous flowers nearly nil, anthers c. 0.7 mm long with a small tuft of hairs at the lower end. Style c. 4 mm or c. 2.5 mm long. *Fruit* subglobose, c. 1.7 mm broad, crowned with the dry disc and calyx.

Collections. Sumatra: Benkulu, Kaba, de Voogd 1370 (BO, K); Benkulu, Kepahiang, Kasik 89 (BO, K); de Voogd 1296 (BO, K); Benkulu, Simpang, van der Pijl 322 (BO); Palembang, Gunung Dempu, Jacobson 483 (BO); Lampong, Gunung Trang, Forbes 1491A (BM); Lampong, Kota-jawa, Forbes 1392A (BM).

DISCUSSION

The taxonomic position of *Lerchea* was first discussed in detail by Bremekamp (1952). He placed the genus together with some other genera, e.g. *Xanthophytum* and *Pomazota* (sensu Bremekamp), in the new tribe Pomazoteae, in the also new subfamily Pomazotoideae. The genera were formerly placed in Hedyotideae, subfamily Rubioideae, but were removed because of their said absence of raphides.

As mentioned before, I have found an abundance of raphides in both leaf and floral tissue, in all these genera. Hence I propose that *Lerchea, Xanthophytum* and *Pomazota* are transferred back to Hedyotidae, subfamily Rubioideae. This reclassification is also supported by the fact that both *Lerchea* and *Xanthophytum* show complete heterostyly, which, according to Verdcourt (1958), only occurs in

Table 1. Character distribution in *Lerchea, Xanthophytum* and *Pomazota*, and the outgroup *Hedyotis*. The numbers correspond to those in the cladogram (fig. 14).

Apomorphic character state	Plesiomorphic character state	Hed	Pom	Xan	Ler
1. Erect shrublet	1. Herb	–	–	+	+
2. Ferrugineous indumentum present	2. Ferrugineous indumentum not present	–	–	+	–
3. Inflorescence terminal	3. Inflorescence axillary	–	–	–	+
4. Flowers heterostylous	4. Flowers homostylous	–	–	+	±
5. Flowers tubiform, with limb	5. Flowers funnel-shaped	–	–	+	+
6. Filaments nearly free from the corolla	6. Main part of filaments adnate to the corolla	–	+	+	–
7. Fruit a capsule opening with a lid.	7. Fruit different	–	+	–	–
8. Fruit with two loculi, each with a very hard endocarp	8. Fruit with two loculi, without hard endocarp	–	–	+	+
9. Seeds minute, c. 0.2 mm long, square in outline	9. Seeds larger, obconical	–	+	+	+
10. Testa cells small, c. 40 μm	10. Testa cells larger	–	+	+	+

Rubioideae. All three genera also have peltate placentas attached to the middle of the dissepiment as well as truly septate hairs, features characteristic of Hedyotideae and Rubioideae, respectively.

Among the Hedyotideae the three genera form a group defined by two synapomorphies, very small seeds, c. 0.2 mm long, square in outline, and minute testa cells, c. 40 μm, with tubercles (fig. 2b). I have not yet been able to study all the small, often monotypic, and poorly known genera in Pomazoteae, but most likely some of them will end up inside this group, sharing the two synapomorphies. In that case the group presented here is not a monophyletic group. Nevertheless the relationships among *Lerchea, Xanthophytum* and *Pomazota* are still of interest. The sister group is likely to be found somewhere in *Hedyotis*, but relationships within this genus are still unsolved. Since no well-defined groups exist, one species, *H. auricularia* Linn., was used for character polarization. The character distribution is presented in table 1, and the resulting cladogram is fig. 14.

The relationships within the monophyletic genus *Lerchea* were also studied. The characters used are presented in table 2. To determine the character polarization *Xanthophytum* was used as outgroup. A lot of the characters (2, 3, 7, 8, 9, 12, 13, 14, 15) exist in both their states, or in an irrelevant state in the outgroup. Hence these characters were not used in the first step of analysis. In all cladograms produced by the usable characters *L. corymbosa* is the sister species to the remainder of the genus, showing plesiomorphic character states in all but the two characters defining the genus. In a second step *L. corymbosa* was therefore used as an functional

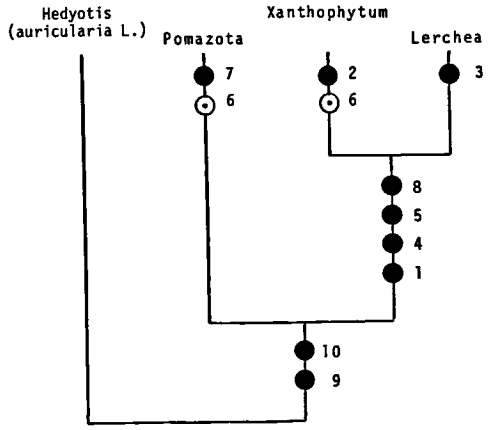


Fig. 14. Cladogram of *Lerchea, Xanthophytum* and *Pomazota*. The numbers correspond to the characters in table 1 (● = syn/aut-apomorphy, ⊙ = parallelism).

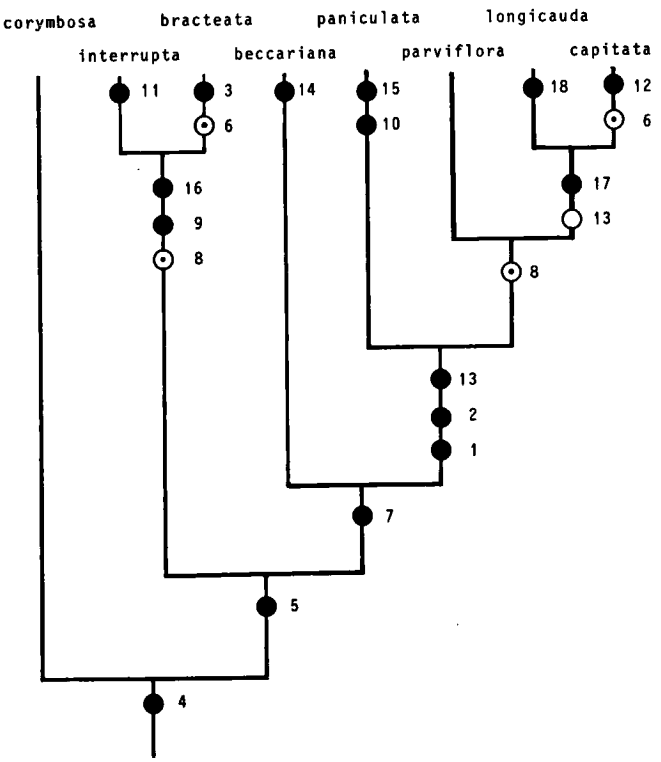


Fig. 15. Cladogram of *Lerchea*. The numbers correspond to the characters in table 2 (● = syn/aut-apomorphy, ⊙ = parallelism, ○ = reversal).

Table 2a. Character state distribution in *Lerchea* and the outgroup *Xanthophytum*.
The numbers correspond to the numbers in the matrix (table 2b) and in the cladogram (fig. 15).

Apomorphic character state	*Plesiomorphic character state*
1. Leaves with sparse primary veins.	1. Leaves with more densely placed primary veins.
2. Stipules small, triangular.	2. Stipules large, foliaceous.
3. Stipules > 0.6 mm broad.	3. Stipules ≤ 0.6 mm broad.
4. Inflorescence terminal.	4. Inflorescence axillary.
5. Main axis of inflorescence elongated.	5. Main axis of inflorescence not elongated.
6. Inflorescence spike- to head-like.	6. Inflorescence not spike- to head-like.
7. Peduncles reflexed.	7. Peduncles upright.
8. Peduncles reduced.	8. Peduncles present.
9. Bracts broad, foliaceous.	9. Bracts linear to narrowly lanceolate.
10. Flowers homostylous.	10. Flowers heterostylous.
11. Calyx lobes obtuse.	11. Calyx lobes acute.
12. Colleters near the base of the calyx tube.	12. Colleters at the base of the calyx lobes.
13. Corolla tube small, < 3 mm long.	13. Corolla tube ≥ 3 mm long.
14. Ring of stiff hairs 1/3 down corolla tube.	14. Ring of stiff hairs at brim of corolla tube.
15. Filaments nearly free from the corolla.	15. Main part of filaments adnate to the corolla.
16. Anthers large, ≥ 0.9 mm long.	16. Anthers small, ≤ 0.8 mm long.
17. Lower end of anthers with hairs.	17. Anthers glabrous.
18. Upper end of anthers with hairs.	18. Upper end of anthers glabrous.

Table 2b. Character distribution matrix in *Lerchea* and the outgroup *Xanthophytum*.
The numbers correspond to the numbers in table 2a and in the cladogram (fig. 15).
(+ = apomorphy, – = plesiomorphy, 0 = no relevant character state present)

	Xanthophytum	*Lerchea* *corymbosa*	*interrupta*	*bracteata*	*beccariana*	*paniculata*	*parviflora*	*longicauda*	*capitata*
1.	–	–	–	–	–	+	+	+	+
2.	±	–	–	–	–	+	+	+	+
3.	±	–	–	+	–	–	–	–	–
4.	–	+	+	+	+	+	+	+	+
5.	–	–	+	+	+	+	+	+	+
6.	–	–	–	+	–	–	–	–	+
7.	±	–	–	–	+	+	0	0	0
8.	±	–	+	+	–	–	+	+	+
9.	±	–	+	+	–	–	–	–	–
10.	–	–	–	–	–	+	–	–	–
11.	–	–	+	–	–	–	–	–	–
12.	0	–	–	–	–	–	–	–	+
13.	±	–	–	–	–	+	+	–	–
14.	0	–	–	–	+	–	–	–	–
15.	+	–	–	–	–	+	–	–	–
16.	–	–	+	+	–	–	–	–	–
17.	–	–	–	–	–	–	–	+	+
18.	–	–	–	–	–	–	–	+	–

outgroup, thus determinating the polarization for the rest of the characters. The computerized parsimony analysis (PAUP) resulted in three equally parsimonious cladograms of which I have chosen the one presented in figure 15.

All three cladograms have *L. corymbosa* as the sister species to the remaining 7 species. One of the rejected cladograms then has *L. beccariana* as sister species to the remaining 6 species; it involves reversals in characters 7 and 8, an interpretation which I consider hardly likely. The second rejected cladogram is similar to the one of figure 15 except that *L. paniculata* and *L. parviflora* are placed together as sister group to *L. capitata* and *L. longicauda*. This cladogram is rejected because it demands two different reversals in character 8 and because I think that the alleged synapomorphy for *L. paniculata* and *L. parviflora*, i.e., character 13, small flowers, is not a very strong one; *L. paniculata* has (open flower) a 1.5 mm long corolla tube, i.e., a very small corolla, but *L. parviflora* has in mature buds a 2.6 mm long corolla, thus being slightly larger in flower size. *Lerchea capitata* and *L. longicauda* have extra long flowers, c. 4 mm. The present interpretation (fig. 15) with a reversal in character 13, perhaps leads to the long flowers in these two species. The parallelism in character 6, a reduction of the main axis of the inflorescence, resulting in a spike- to head-like inflorescence, appears in all three cladograms. The parallelism in character 8 (fig. 15) is also a case of reduction, concerning the peduncles, and hence plausible.

Several of the groupings in the cladogram chosen (fig. 15) are based on single synapomorphies only, and hence vaguely supported. Two groups within *Lerchea* seem fairly well substantiated, however. *Lerchea interrupta* and *L. bracteata* are sister species, united by characters 8, 9 and 16 (table 2a & b). The four species *L. paniculata, L. parviflora, L. longicauda* and *L. capitata* also form a monophyletic group, with characters 1, 2 and 13. These two groups also appear in the two equally parsimonious cladograms generated by the analysis.

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