

AMARANTHACEAE (C. A. Backer, Heemstede)

Herbs, rarely climbing or clambering shrubs. *Leaves* opposite or alternate, exstipulate, simple, entire or obsoletely dentate-serrate. *Flowers* ♂, unisexual, or partly difformed and neutral, in clusters, heads, racemes, spikes or panicles, solitary or clustered in the axil of persistent bracts, usually bibracteolate. *Tepals* 3–5, mostly free; bracts, bracteoles and tepals with scarious margins or entirely scarious; bracteoles falling off with the perianth or persistent; perianth usually enclosing the fruit and falling off with it, rarely persistent. Stamens as many as petals and opposed to them, rarely fewer; filaments free, or connate below, or almost entirely united in a cup or tube, with or without interposed dentiform, subulate, linear or short and broad pseudo-staminodes; anthers dorsifixed or inserted in a basal cleft, 1–2-celled (2- or 4-locellate). Ovary superior, 1-celled; ovules 1 or more, basal; funicles short or long. *Fruit* sometimes baccate or crustaceous, usually membranous, very rarely corky, circumscissile, indehiscent or bursting irregularly. Seeds 1–∞, often lenticular or subreniform, smooth or verruculose.

Distr. Worldwide, more than 60 genera and *ca* 850 *spp.*, few in the tropical forests, most developed in America and Africa, in Australia a big centre of *Ptilotus*. In *Malaysia*: mostly represented by widely distributed anthropochorous *spp.*, none endemic, several naturalized.

The floristic areas occupied by the native *spp.* can be divided into three types *viz* wides, Western and Eastern elements. The wides are those of *spp.* widely distributed in the Old World. Their native country is often unknown.

The Western element (Asiatic or/and African) is represented by: *Aerva curtisii*, *Nothosaerva brachiata* (doubtful), *Digera muricata*, *Pupalia lappacea*, and is mostly confined to the western half of *Malaysia*.

It is about as strong as the Eastern (or Australian) element which consists of: *Gomphrena canescens*, *G. tenella*, *Ptilotus conicus*, *Deeringia arborescens*, *Amaranthus leptostachyus* & *A. interruptus*. This eastern element is for the greater part confined to New Guinea, the Moluccas, and the Lesser Sunda Islands.

Ecol. Mainly annuals of open places, in *Malaysia*: mostly in anthropogenic localities, waste places, road-sides, fields, two aquatic (*Centrostachys*, *Alternanthera philoxeroides*), one occasionally so (*Alternanthera sessilis*), a few almost exclusively in forests.

Uses. Some *spp.* are used as vegetables, especially *Amaranthus*. There are some ornamentals (*Celosia*, *Alternanthera*, *Gomphrena*, *Iresine*, *Amaranthus*). Several are medicinal. *Alternanthera ficoidea* var. *bett-zickiana* is used against soil wash. Ashes of *Achyranthes aspera* are rich in alkali.

Notes. Flowers and ripe fruits are necessary for identification. The foliage, in many *spp.* is very variable and hardly offers constant characters for specific distinction. The species are, apart from the shape of the leaves, not very variable; *Amaranthus tricolor* and *A. lividus* are exceptions. *Celosia argentea* and some other species have produced varieties in breeding; these are sometimes unstable.

Figs. 2–3, 5–8 *courtesy Pasuruan Exp. Station.*

(ARTIFICIAL) KEY TO THE GENERA

1. Leaves alternate.
 2. Scandent or clambering shrubs, unarmed, green-leaved, at least 2 m tall, often very much larger. Flowers singly or clustered along the rachis of simple or paniced racemes or spikes, ♂ or unisexual, glabrous, white, yellowish or greenish, 1½–2½ mm long; filaments at their base united in a cup, without intervening pseudo-staminodes; stigmas 2–4, mostly 3, patent or recurved. Fruit an indehiscent berry falling out of the persistent perianth when ripe. 1. *Deeringia*
 2. Otherwise.
 3. Fruits all or for the greater part 2–∞-seeded. Flowers ♂ in simple or paniced (sometimes coxcomb-like) spikes, glabrous. Stamens 5; filaments at their base united in a cup. Erect, unarmed herbs or undershrubs.
 4. Style 1, rather long; stigma 1, capitate. Perianth 6–10 mm long. Fruit membranous, circumsciss; seeds 1–9. 2. *Celosia*
 4. Style very short or absent; stigmas 2–3, linear-clavate. Perianth less than 4 mm long. Fruit baccate, falling out of the persistent perianth when ripe; seeds 10 or more, usually more than 20. 1. *Deeringia*
 3. Otherwise. Fruit 1-seeded.
 5. No pseudo-staminodes.
 6. Flowers ♂. Style 2–3 mm long; stigmas 2–3. Unarmed.
 7. Flowers in short, dense head-like spikes. Lower flowers not accompanied by 2 palmatifid scales (sterile flowers). Filaments at their base connate in a cup. Stigma 1, entire or faintly 2-lobed. Fruit thin-walled.

8. Tepals distinctly dimorphous: 2 outer ones elliptic, their bases externally with a dense tuft of hairs; 3 inner ones with a narrow cuneate claw and patent ovate-oblong blade. Fruit indehiscent 12. *Ptilotus*
8. Tepals subequal. Fruit circumsciss. Seed arillate 3. *Allmania*
7. Flowers in spiciform often long racemes, the lower part of the older racemes lax. Lower flowers usually accompanied by 2 palmatifid scales (sterile flowers). Filaments free. Stigmas 2, recurved. Fruit crustaceous, indehiscent. Seed exarillate 5. *Digera*
6. Flowers unisexual, in sessile (δ) (\varnothing) or ($\delta\varnothing$) clusters; these either collected in a spike or panicle or not. Filaments free. Style very short or absent; stigmas 2-4 (often 3), linear. Unarmed or spinous. 4. *Amaranthus*
5. Filaments alternating with subulate pseudo-staminodes. Flowers \varnothing or φ , in the latter case long-pilose outside. Style very short, stigmas 1-2, minute 8. *Aerva*
1. Leaves, at least partly, opposite.
9. Lower flowers not accompanied by fascicled hooks (difformed flowers).
10. Flowers in paniced spikes, minute, in Malaysia exclusively φ . Perianth $\pm 1\frac{1}{4}$ mm long, externally at the base with a dense whorl of long white hairs, otherwise subglabrous, nerveless. Stigmas 2, ascending, subulate 16. *Iresine*
10. Otherwise.
11. Anthers 2-celled (4-locellate).
12. Filaments 5, alternating with pseudo-staminodes.
13. Pseudo-staminodes short, with a broad, truncate or subdentate apex. Flowers glabrous, united in a (finally) long spike, after anthesis widely patent or reflexed. Bracteoles, or one or more tepals, after anthesis with a very acute, often pungent tip. Stigma capitate, entire.
14. Aquatic. Bracteoles broadly ovate-orbicular, membranous, not spinous. Tepals very unequal, outermost one spine-tipped 10. *Centrostachys*
14. Terrestrial. Bracteoles consisting of a rather long spine bearing on either side of its long concave base a much shorter, membranous nerveless wing. Tepals not very unequal, after anthesis spinous or not 11. *Achyranthes*
13. Pseudo-staminodes subulate. Flowers either white-pilose or thinly beset with short hairs and then strongly nerved, not pungent 8. *Aerva*
12. No pseudo-staminodes. Style at best $\frac{1}{2}$ mm long. Leaves glabrous.
15. Stamens 1-2. Spikes usually clustered, $\frac{1}{2}$ - $1\frac{1}{2}$ cm long. Tepals nerveless, hairy outside 9. *Nothosaerva*
15. Stamens 5. Spikes solitary or sometimes paired, 1- $2\frac{1}{2}$ cm long. Tepals strongly nerved, glabrous 13. *Psilotrichum*
11. Anthers 1-celled (2-locellate), or absent and replaced by spurious ovaries.
16. Stigma 1, capitate, entire 14. *Alternanthera*
16. Stigmas 2, erect or spreading, sometimes minute 15. *Gomphrena*
9. Flowers racemed or spicate, lower ones accompanied by fascicled hooks (difformed flowers). Hooks hairy at the base, upwards glabrous. Perianth pilose outside. Style 1, stigma capitate. Fruit falling off together with the hooks, by means of these easily adhering to passers-by.
17. Filaments alternating with short, broad pseudo-staminodes. Old flowers deflexed, accompanied by sessile or subsessile fascicles of obliquely erect, $1\frac{3}{4}$ - $2\frac{1}{2}$ mm long hooks 6. *Cyathula*
17. No pseudo-staminodes. Old flowers widely patent with distinctly stalked fascicles of squarrose, 3-4 mm long hooks 7. *Pupalia*

1. DEERINGIA

R.Br. Prod. (1810) 413.

Erect herbs or scandent or clambering shrubs, unarmed. *Leaves* alternate, petioled, ovate to lanceolate, acute, entire. *Flowers* in axillary and terminal, simple or branched, frequently paniced racemes or spikes, solitary in the axil of a bract, subtended by 2 bracteoles. *Tepals* 5, rarely 4, oval-oblong, 1-nerved with scarious margins, glabrous. *Stamens* 5, rarely 4, filaments at the base united in a cup; free parts distant, filiform-subulate; no pseudo-staminodes; anthers 2-celled (4-locellate). *Ovary* sessile or shortly stalked; ovules few to many; funicles long; stigmas 2-3, rarely 4, linear or \pm clavate. *Fruit* baccate, thin-walled, indehiscent, globose, broadly ellipsoid or obovoid, falling out of persistent perianth when ripe; seeds 0 to many, on long pale funicles, circular or reniform, shining black or brownish black, very finely verruculose or almost smooth.

Distr. About 7 spp. in the palaeotropics from Madagascar to Australia.

Ecol. Unlike most Malaysian *Amaranthaceae* the species of this genus are not anthropochorous; as a rule they inhabit forests.

Uses. Only one species used by the Malaysians, mainly medicinally.

Notes. This is the only Malaysian *Amaranthaceae* genus of which the fruits (red or white berries) fall off unopened, leaving behind bracts, bracteoles and perianth.

KEY TO THE SPECIES

1. Single flowers sessile or subsessile. Single spikes consisting of 50 or fewer flowers. Flowers ♂ or (♂) (♀). Tepals appressed against the ripe living berry. Seeds distinctly verruculose.
2. Flowers ♀, in simple or very sparingly branched spikes or sometimes solitary. Perianth $2\frac{1}{4}$ – $2\frac{1}{2}$ mm long. Free parts of the filaments about as long as the staminal cup or but slightly longer.
3. Spikes rather less than 1 cm long. Flowers very few, occasionally 1. Ripe berry red. Seeds 1–4. Climber 3. *D. tetragyna*
3. Spikes 3–12 cm long. Flowers 4–50. Ripe berry white. Seeds 10–64. Erect herb or undershrub, 1–2 m high 2. *D. polysperma*
2. Flowers (♂) (♀) (male ones spuriously bisexual but ovary empty), in paniced spikes. Branches of the panicle widely patent. Perianth $1\frac{1}{4}$ –2 mm long. Free parts of the filaments in ♂ much longer than the staminal cup. Ripe berry bright red. Seeds 1–2. Very tall climber 4. *D. arborecens*
1. Single flowers on $\frac{2}{3}$ –2 mm long pedicels, ♀. Single racemes often consisting of more than 50 flowers. Free parts of the filaments several times longer than the staminal cup. Tepals under the ripe living berry patent or reflexed. Ripe berry bright red. Seeds 0–9, almost smooth 1. *D. amarathoides*

1. *Deeringia amarathoides* (LAMK) MERR. Interpr. Herb. Amb. (1917) 211; Spec. Blanc. (1918) 136; En. Philip. Fl.Pl. 2 (1923) 126.—*Achyranthes amarathoides* LAMK, Enc. 1 (1785) 548.—*Celosia baccata* RETZ, Obs. 5 (1789) 32; BLANCO, Fl. Filip. (1837) 193.—*Deeringia celosioides* R.Br. (non HASSK. 1848) Prod. (1810) 413; DECNE in Nouv. Ann. Mus. 3 (1834) 371; SPAN. in Linnaea 15 (1841) 345; BLANCO, Fl. Filip. ed. 2 (1845) 135; ed. 3, 1 (1877) 244, t. 236; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1025; Bth. Fl. Austr. 5 (1870) 209; F.v.M. Descr. Not. pt 3 (1876) 41; HOOK. f. Fl. Br. Ind. 4 (1885) 714; BAIL. Queensl. Fl. pt 4 (1901) 1218; RIDL. Fl. Mal. Pen. 3 (1924) 4; HEYNE, Nutt. Pl. (1927) 604; OCHSE & BAKH. v. d. BR. Veget. (1931) 30, fig. 19; GAGN. in Fl. Gén. I.C. 4 (1936) 1055.—*Deeringia indica* RETZ ex BL. Bijdr. (1825) 542; HASSK. Pl. Jav. Rar. (1848) 436.—*Lestibudesia philippica* WEINM. Syll. Ratisb. 1 (1828) 118.—*Celosia philippica* STEUD. Nom. ed. 2 (1841) 316, MIQ. in DC. Prod. 13, 2 (1849) 241, MERR. En. Philip. Fl.Pl. 2 (1923) 127.—*Deeringia baccata* MOQ. in DC. Prod. 13, 2 (1849) 236; FORBES, Wand. (1885) 515 and 502 (here doubtfully but wrongly as *Gouania leptostachya* DC.); KOORD. Exk. Fl. 2 (1912) 194; MERR. Fl. Man. (1912) 190; DOMIN, Beitr. Pflanzengeogr. Austr. 1, 2 (1921) 628.—*Iresine amarathoides* Moq. in DC. Prod. 13, 2 (1849) 348.—*Cladostachys baccata* O.K. Rev. 2 (1891) 541.—Fig. 1.

Scandent or clambering shrub, often with long, pendulous branches, 2–6 m (to up to 15 m ?) high; stem in the higher part obtusangular and finely appressed pubescent, at an advanced age terete and glabrous. *Leaves* ovate or ovate oblong-sublancoolate, base acute, obtuse, rounded or subtruncate, often unequal, frequently shortly contracted into the petiole, tapering towards the apex or acuminate, acute, crowned by a longish, often caducous mucro, at first on both surfaces very thinly patently pilose, glabrescent, 4–15 by 2–8 cm (floral leaves often much smaller); midrib in the living plant distinctly prominent beneath; petiole 1–6 cm. *Flowers* racemed; racemes axillary and terminal,

very often divaricately branched, 5–35 cm (0–8 cm peduncle included), rather dense or in lower part lax, often more than 50-flowered; highest racemes usually collected in a terminal panicle of 15–75 cm

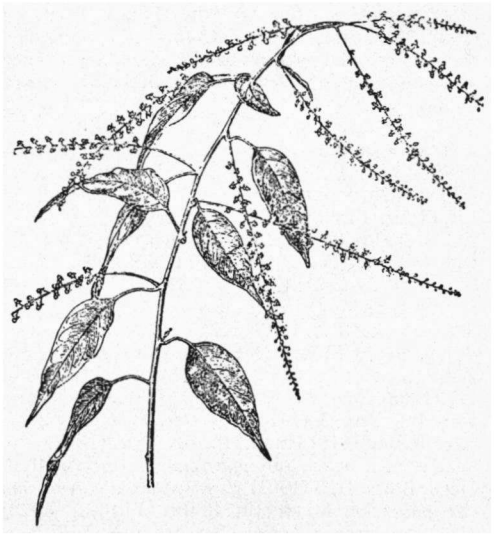


Fig. 1. *Deeringia amarathoides* (LAMK) MERR. from Java, $\times \frac{1}{5}$.

long; rachises of inflorescence finely and not very densely appressed pubescent; bracts narrowly triangular, very acute, $\pm 1\frac{1}{2}$ mm; bracteoles ovate, acute, ± 1 mm. Flowers solitary or clustered, malodorous. Pedicels $\frac{2}{3}$ –2 mm. *Tepals* during anthesis widely patent or reflexed, under the fruit reflexed as are the stamens, obtuse or rounded, concave, pale green or somewhat yellowish, white-margined, often, especially under the fruit, tinged with red, $1\frac{1}{2}$ – $2\frac{1}{2}$ mm long. Staminal cup $\frac{1}{4}$ – $\frac{1}{3}$ mm; free parts of the filaments several times longer

than the cup, for the rest variable as to length, $1\frac{1}{2}$ – $2\frac{3}{4}$ mm. Stigmas 3, greenish white, 1 – $1\frac{1}{2}$ mm, recurved on the fruit. *Berry* globose-obovoid, bright red, 4–7 mm diam. Seeds 0–9, usually no more than 5, circular with emarginate base, 1 – $1\frac{1}{3}$ mm diam., almost smooth.

Distr. From India to China, southward to Australia, in *Malaysia*: throughout, not yet reported from the Moluccas & Borneo.

Ecol. In Java, especially in the drier eastern half, 1–1500 m, in teak- and open mixed forest, forest borders, secondary forests, tall brush-wood, hedges, often, though by no means exclusively, on calcareous soil. Sometimes cultivated for its medicinal properties.

Uses. The natives press the root in diluted vinegar and add a piece of onion (Dutch: *ajuin*; BURKILL (Dict. 775) mistranslated *alum* = *aluin*). The juice so obtained is sniffed up; it loosens the mucus and cures the head-ache caused by obstruction of the nasal cavities. The leaves are applied to sores; young cooked sprouts are eaten with rice.

Vern. *Bayam besar*, *bayam pohon*, *pantjar luhur*, *tangtang angin*.

Notes. The specimens found in native hedges may have been planted. *D. amaranthoides*, *D. baccata*, and *D. celosioides* are considered specifically distinct by SUESSENGUTH (FEDDE, Rep. 44 (1938) 39). I cannot agree with this view; the differences mentioned by S. are hardly of any importance and moreover are very inconstant in Malaysian materials.

2. *Deeringia polysperma* (ROXB.) MOQ. in DC. Prod. 13, 2 (1849) 236; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1026; KOORD. Exk. Fl. 2 (1912) 194; MERR. En. Philip. Fl. Pl. 2 (1923) 126; GAGN. in Fl. Gén. I.C. 4 (1936) 1056.—*Celosia polyperma* ROXB. Fl. Ind. 2 (1824) 511.—*Lestibudesia latifolia* BL. Bijdr. (1825) 541.—*Celosia latifolia* STEUD. Nom. ed. 2 (1840) 315; MOQ. in DC. Prod. 13, 2 (1849) 244; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1027.—*Deeringia indica* ZOLL. ex Moq. in DC. Prod. 13, 2 (1849) 236; ZOLL. Syst. Verz. (1854) 110; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1026; KOORD. Minah. (1898) 565; RIDL. Fl. Mal. Pen. 3 (1924) 5.—*Deeringia celosioides* (non R. BR. 1810) HASSK. Pl. Jav. Rar. (1848) 436.—*Deeringia indica* var. *pubescens* SCHINZ in Bull. Herb. Boiss. II, 3 (1903) 3.—*Deeringia polysperma* var. *pubescens* MERR. En. Philip. Fl. Pl. 2 (1923) 126.—*Deeringia salicifolia* SCHINZ in E. & P. Nat. Pfl. Fam. ed. 2, 16c (1934) 27, *nomen*.

Erect herb or undershrub, 1–2 m. Young stems, petioles, leaves, rachises of the spikes, bracts and bracteoles frequently clothed with shortish, thickish brown hairs, glabrescent; stem in the higher part obtusangular. *Leaves* ovate-oblong-lanceolate from a cuneate or shortly contracted base, narrowed upwards or slightly acuminate, acute, herbaceous or slightly fleshy, 3–22 by $1\frac{1}{2}$ –12 cm; midrib in the living plant slightly prominent beneath; petiole $\frac{1}{2}$ –5 cm. *Flowers* spicate; spikes axillary, single or sometimes paired, erect or more or less patent, simple or sometimes sparingly branched, 3–12 cm long, rather dense or, at an

advanced age, rather lax, 4–50-flowered. Flowers quite sessile; bracts broadly ovate, obtuse or rather acute, $\pm 1\frac{1}{2}$ mm long; bracteoles ovate, 1 – $1\frac{1}{4}$ mm. *Perianth* $2\frac{1}{4}$ – $2\frac{1}{2}$ mm long. Tepals during anthesis erect or obliquely erect, afterwards appressed to the fruit, very obtuse, green, white-bordered. Staminal cup $\frac{3}{4}$ –1 mm high; free parts of the filaments about as long as the cup or slightly longer. Stigmas 2–3, recurved or on the fruit obliquely erect or patent, $\frac{1}{2}$ – $\frac{2}{3}$ mm long. *Berry* globose or broadly ellipsoid, white, ± 3 mm diam. Seeds 10–64, usually more than 20, reniform, $\pm \frac{3}{4}$ mm diam, very finely verruculose.

Distr. *Malaysia*: Mal. Peninsula, Sumatra, Java, Philippines, Celebes, Kabaena, Moluccas, and New Guinea.

Ecol. In Java, 5–800 m alt. (in the Philippines ascending to 1800 m, according to MERRILL), in thickets and shaded localities, in forests and on forest borders, much rarer than *D. amaranthoides*.

Notes. In a fruiting state conspicuous by its white berries.

3. *Deeringia tetragyna* ROXB. Fl. Ind. ed. CAREY (1832) 683; WIGHT, Ic. 2 (1843) 729; MIQ., Fl. Ind. Bat. I, 1 (1858) 1026. Climbing shrub, entirely glabrous; young shoots pendulous. *Leaves* ovate from a broad, rounded base, shortly contracted into petiole, shortly acuminate, acute, slightly undulate, 3–7 cm by 2–4 cm; petiole $\frac{3}{4}$ – $1\frac{1}{2}$ cm. *Flowers* axillary, spicate or sometimes solitary; spikes erect, shortly stalked, rather less than 1 cm long, few-flowered, dense; bracts ovate-oblong, obtuse, $\pm 1\frac{1}{2}$ mm; bracteoles much shorter than perianth, oblong, obtuse. *Tepals* 4–5, oval-oblong, obtuse, very concave, $2\frac{1}{4}$ – $2\frac{1}{2}$ mm long. Stamens about equalling perianth; staminal cup rather large; free parts of filaments linear from triangular base, about as long as cup or slightly longer. Ovary subglobose, with 3–4 longitudinal furrows, few-ovuled; styles 3–4, recurved, linear-subclavate. *Berry* (not seen) subglobose, \pm lobed, red, succulent. Seeds 1–4, mostly 1.

Distr. *Malaysia*: Moluccas (according to ROXBURGH).

Notes. This imperfectly known species of which I could examine the type specimen I find to represent a distinct species which is tolerably well figured by WIGHT. Its native country is said to be the Moluccas on the authority of ROXBURGH l.c. who states that it was accidentally introduced from there into the Botanic Gardens, Calcutta. It is strange that it has never been re-collected.

4. *Deeringia arborescens* (R. BR.) DRUCE, Rep. Bot. Exch. Club Br. Isl. 1916, 619 (1917); DOMIN, Bibl. Bot. 89 (1921) 74; Beitr. Pflanzengeogr. Austr. 1, 2 (1921) 628.—*Lestibudesia arborescens* R. BR. Prod. (1810) 414.—*Celosia arborescens* SPRENG. Syst. 1 (1825) 815; MOQ. in DC. Prod. 13, 2 (1849) 243.—*Lagrezia altissima* Moq. in DC. Prod. 13, 2 (1849) 253.—*Deeringia altissima* F.V.M. Fragm. Phyt. Austr. 2 (1861) 92, l.c. 6 (1864) 251; BTH. Fl. Austr. 5 (1870) 210; HEMSL. Rep. Bot. Chall. 1, 3 (1884) 182; F.V.M. Descr. Not.

Pap. Pl. 7 (1886) 28; BAILEY, Queensl. Fl. pt 4 (1901) 1219.—*Cladostachys altissima* O.K. Rev. 2 (1891) 541.

Woody climber, ascending to top of tallest trees (ex BTH.), glabrous or on young vegetative parts clothed with brown, \pm crisped hairs. *Leaves* oblong or lanceolate from a cuneate or contracted base, obtuse or rather acute, firmly herbaceous, 5–20 by $1\frac{1}{2}$ –10 cm; petiole $1\frac{1}{2}$ – $3\frac{1}{2}$ cm. *Flowers* (δ) (σ) (male ones pseudo-hermaphrodite), paniced; single panicles 4–15 cm long, axillary and terminal; highest often collected in a terminal, rather large panicle; branches of single panicles widely patent, spiciform, dense or rather lax, 1–3 cm long. *Flowers* sessile or subsessile, glabrous; bracts and bracteoles thinly membranous, nerveless.— σ : Bracts ovate-orbicular, rounded, \pm 1 mm long; bracteoles slightly smaller than the bract, much shorter than the perianth, \pm $\frac{3}{4}$ mm diam; perianth white. *Tepals* oblong or oblong-obovate, rounded at apex, very convex, nerveless, $1\frac{1}{2}$ –2 mm long. Adult sta-

mens slightly exceeding the perianth; filaments thin, finally much longer than the short staminal cup; anthers oblong, yellow. Ovary shortly stalked, conical, glabrous, empty; style very short; stigmas 3, linear-clavate, short, thick, recurved.— σ : Bracts and bracteoles much shorter than perianth, \pm 1 mm long; bracts ovate-triangular, bracteoles oval. Perianth greenish, $1\frac{1}{4}$ – $1\frac{1}{2}$ mm long, at last appressed against ripe fruit. *Staminodes* 5, varying from slightly shorter to slightly longer than perianth; filaments at base connate in a comparatively large and wide cup; their free parts slightly longer than cup; their anthers deformed, small, empty. Ovary subglobose, 6–15-ovuled; style short; stigmas 3, recurved, shortly linear, thick. *Berry* globose, red, with the top exerted from the perianth, 3–4 mm diam. *Seeds* 1–2, reniform, black, densely verruculose, \pm 1 mm diam.

Distr. NE. Australia, in *Malaysia*: collected in Buton Isl. (SE. Celebes), the Tanimbar Isl. (S. Moluccas), and SE. New Guinea (Saibai Island)

2. CELOSIA

LINNÉ, Sp.Pl. 1 (1753) 205.

Erect, entirely glabrous annuals. Stem angular-ribbed. *Leaves* alternate, petioled, ovate to linear, entire or subentire, often with small semilunar leaves in the axils. *Flowers* σ , in simple or branched, dense or interrupted, sometimes deformed, terminal or axillary spikes, solitary in axil of bract, subtended by 2 bracteoles. *Tepals* 5, free, during anthesis erecto-patent or spreading, before and after anthesis erect, ovate-oblong, acute, scarios, longitudinally nerved. *Stamens* 5; filaments at the base connate in a cup; free parts linear from a triangular base, often alternating with minute, triangular pseudo-staminodes; anthers oblong-linear, 2-celled (4-locellate). Ovary sessile with broad base; ovules ∞ , on short funicles; style 1, filiform, persistent; stigma capitate, faintly 2–3-lobed. *Utricle* thin-walled, circumsciss in or about the middle. *Seeds* 1– ∞ , lenticular, shining black.

Distr. About 60 spp. mainly in the subtropics and temperate regions of Africa and America, in *Malaysia*: no indigenous species.

In *Malaysia* one wild species, and several more or less deviating forms which are cultivated for ornamental purposes.

1. *Celosia argentea* LINNÉ, Sp.Pl. (1753) 205; BL. Bijdr. (1825) 543; DECNE in Nouv. Ann. 3 (1834) 372; BLANCO, Fl. Filip. (1837) 192; ed. 2 (1845) 135; ed. 3, 1 (1877) 243; SPAN. in Linnaea 15 (1841) 345; MOQ. in DC. Prod. 13, 2 (1849) 242; HASSK. in Pl. Jungh. (1852) 128; MIQ., Fl. Ind. Bat. I, 1 (1858) 1028; HOOK. f. Fl. Br. Ind. 4 (1885) 714; BAILEY, Queensl. Fl. pt 4 (1901) 1218; LAUT. & SCHUM. Fl. D. Schutzg. (1901) 303; PULLE in Nov. Guin. 8 (1910) 351; KOORD. Exk. Fl. 2 (1912) 194; MERR. Fl. Man. (1912) 190; ASCH. & GR. Syn. 5, 1 (1913) 222; MERR. Interpr. Herb. Amb. (1917) 212; EN. Born. Pl. (1921) 245; EN. Philip. Fl.Pl. 2 (1923) 127; RIDL. Fl. Mal. Pen. 3 (1924) 5; HEYNE, Nutt. Pl. (1927) 604; BACKER, Onkr. Suiker. (1930) 216, Atl. t. 226; OCHSE & BAKH. v. D. B. Veget. (1931) 27, fig. 17, 28, fig. 18; GAGN. in Fl. Gén. I.C. 4 (1936) 1056.—*Celosia cristata* LINNÉ Sp.Pl. (1753) 205, BLANCO, Fl. Filip. (1837) 191, &c.; KOORD.

Exk. Fl. 2 (1912) 195; HEYNE, Nutt. Pl. (1927) 605.—*Celosia coccinea* LINNÉ, Sp.Pl. ed. 2 (1762) 297; BLANCO Fl. Filip. ed. 2 (1845) 134; *op cit.* ed. 3, 1 (1877) 241, t. 64, &c.—*Celosia pyramidalis* BURM. f. Fl. Ind. (1768) 65, t. 25, fig. 1.—*Celosia huttonii* MAST. in Gard. Chron. 1872, 215; ASCH. & GRAEBN. Syn. 5, 1 (1913) 222.

Forma spontanea: Annual, 0.4– $1\frac{1}{2}$ m; stem erect, green or red, strongly ribbed, often much branched. *Leaves* on petioles of $\frac{1}{4}$ – $1\frac{3}{4}$ cm or highest almost sessile, oblong-lanceolate or lanceolate-linear, rarely ovate-oblong, acute at both ends, herbaceous, often tinged with red, 4–18 by $\frac{3}{4}$ – $6\frac{1}{2}$ cm; highest often very small; leaf axils often provided with \pm falcate small leaves. *Spikes* solitary or sometimes paired, erect, stalked or partly subsessile, often much lengthening during anthesis, at length cylindrical with a conical apex, very dense, throughout their length (when pure-

bred) with ♂ flowers, usually simple, sometimes bifid or trifid at apex, 2–22 by 1–1³/₄ cm; their stalk ribbed-furrowed, often lengthening during anthesis, finally 1¹/₂–21 cm. *Flowers* solitary, sessile, obliquely patent; bracts and bracteoles persistent after fall of the perianth, ovate-oblong, pellucid, 1-nerved, mucronate, 3–7 mm long. Perianth 6–10 mm, at first shining white with a pink tip or almost entirely pink, withering white. Adult staminal cup 1¹/₂–2 mm high; free part of filaments 2¹/₂–3 mm; pseudo-staminodes minute, triangular. Style violet, 3¹/₄–5 mm. *Utricle* included by the perianth, obovoid with rounded apex, ± 3¹/₂ mm long. Seeds 1–9, 1¹/₄–1¹/₂ mm diam.

Distr. Ubiquitous, in *Malaysia*: wild but not native, introduced here perhaps very long ago (from trop. Africa?), thoroughly established in the settled areas throughout the Archipelago.

Ecol. In Java, 1–700 m alt., a rather common weed of open dry localities, field, gardens, waste places, locally often numerous.

Uses. Seeds used by the Chinese for poultices and for adorning cakes. The leaves furnish an inferior vegetable.

Vern. *Borojjo*, S.

Notes. *Forms cultivated* for ornamental purposes are found throughout *Malaysia*; not unfrequently such forms are met with as garden escapes. These latter may breed true but often also they display to a great and variable degree a regression to the wild form, possibly due to intercrossing with it. One branch of a plant may bear the marks of cultivation (in the shape of sterile flowers) whilst another is quite alike the wild form.

In cultivated forms the higher flowers of the inflorescence are sterile, the rest fertile; the fertile flowers being usually somewhat smaller than those

of the wild form; the entire inflorescence is usually red, violet, yellow or orange. It may have the shape of an almost sessile cock's comb with a thick sinuous crest; this form usually goes under the name of *C. cristata* L. This is a very common ornamental plant in *Malaysia* where it reaches a height of 0.4–1¹/₂ m; the inflorescence is usually bright red; the ovate leaves often bear a large bright red blotch. In another series of cultivated forms (*forma plumosa* (Voss.) BACK.) the inflorescence is loosely branched; the branches are cylindrical and have a much constricted tail-like sterile upper part. The two forms may be found on a single plant; the terminal inflorescence being more or less cock's-comb-like, the lower ones cylindrical, tail-ended.

Excluded

Celosia nana BLANCO, Fl. Filip. (1837) 192 = *Alternanthera celosioides* MOQ. in DC. Prod. 13, 2 (1849) 360 are according to MERRILL (En. Philip. Fl.Pl. 3 (1923) 135) = *Ammannia baccifera* L. (*Lythr.*)

Doubtful

Celosia cernua JUSS.; F.-VILL. Noviss. Append. (1880) 168.

Celosia phytolaccaefolia JUSS.; F.-VILL. Noviss. Append. l.c.

Celosia bicolor BLANCO, Fl. Filip. (1837) 191; MERR. Spec. Blanc. (1918) 383.—*Celosia glauca* (non ROTTL.) BLANCO, *op. cit.* ed. 2 (1845) 135, ed. 3, 1 (1877) 242. The form BLANCO described was according to MERRILL (Enum. Philip. Fl.Pl. 2 (1923) 127) certainly no amaranthaceous plant, and may possibly have been a species of *Ammannia* (*Lythrac.*)

3. ALLMANIA

R.Br. *ex* WIGHT, in HOOK. J. Bot. (1834) 226, t. 128.

Erect or ascending annual. *Leaves* alternate, varying from linear to obovate, entire. *Flowers* ♀, in terminal or (by development of an axillary branch) leaf-opposed heads; heads stalked or subsessile, composed of crowded, 3–7-flowered cymes; flowers solitary in the axil of a bract, subtended by 2 bracteoles which partly act as bracts to branches of a cyme. Tepals free or nearly so, erect or erecto-patent, subequal, ovate-lanceolate, pellucid with green or purple midrib. Stamens 5; filaments at base connate in a short cup; anthers 2-celled (4-locellate); no pseudo-staminodes. Ovary ovate, compressed, narrowed into style; ovule 1, erect on short, broad funicle; style filiform, stigma capitate, faintly 2-lobed. *Utricle* enclosed by the perianth, ovoid, compressed, thin-walled, circumsciss below the middle. Seed erect, lenticular, at base with a cupular, 2-lobed, thin aril.

Distr. Monotypic, trop. Asia and *Malaysia*.

Notes. There is only one variable species, described under several names. All forms pass gradually into each other.

1. *Allmania nodiflora* (L.) R.Br. in WALL. Cat. (1832) 6890, *nomen*; HOOK. f. Fl. Br. Ind. 4 (1885) 716; KOORD. Exk. Fl. 2 (1912) 195; RIDL. Fl. Mal. Pen. 3 (1924) 5; BACKER, Onkr. Suiker. (1930) 217,

Atlas t. 227; GAGN. in Fl. Gén. I.C. 4 (1936) 1059. —*Celosia nodiflora* LINNÉ, Sp.Pl. (1753) 205; BURM. f. Fl. Ind. (1768) 66.—*Allmania albida* R. Br. in WALL. Cat. 6981 (1832), *nomen*; HOOK. f.

Fl. Br. Ind. 4 (1885) 717; MERR. En. Philip. Fl. Pl. 2 (1923) 127; GAGN. in Fl. Gén. I.C. 4 (1936) 1059. —*Allmania esculenta* R.Br. in WALL. l.c. 6892. —*Chamissoa brownei* STEUD. Nom. ed. 2 (1841) 344. —*Chamissoa javanica* HASSK. Fl. Jav. Rar. (1848) 434; MOQ. in DC. Prod. 13, 2 (1849) 249. —*Chamissoa albida* MOQ. in DC. Prod. 13, 2 (1849) 248. —*Chamissoa esculenta* MOQ. l.c. 249. —*Chamissoa nodiflora* MART. ex MOQ. l.c.; HASSK. in Pl. Jungh. (1852) 129; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1029; Suppl. (1860) 149. —*Chamissoa pyramidalis* MOQ.¹ l.c. 248. —*Allmania pyramidalis* KOORD. Exk. Fl. 2 (1912) 195.

Erect or ascending annual 0.1–0.8 m long; taproot long; stem branched from the base or nearly so, solid with thickened nodes, glabrous or obscurely thinly pubescent. *Leaves* linear, spatulate, oblong or obovate, narrowed into petiole, acute, obtuse, rounded or abruptly shortly acuminate, mucronate, glabrous or on undersurface thinly pubescent, rather fleshy, $1\frac{1}{2}$ – $6\frac{1}{2}$ by $\frac{1}{3}$ – $2\frac{1}{2}$ cm; petiole 2–10 mm. Heads terminal or leaf-opposed, at first subglobose, afterwards somewhat lengthened, $\frac{3}{4}$ –2 cm long; their stalk 2–35 mm, rather robust, scantily hairy or glabrous; single cymes sessile, 3–7-flowered; bracts and bracteoles ovate-lanceolate, long acuminate, keeled, 3–5 mm long; midrib green or purple; margins shining

white; keel scaberulous outside. *Tepals* before and after anthesis erect, during anthesis obliquely spreading, with strong, green or purple midrib and pellucid white, shining margins, glabrous or scaberulous on back, 4–5 mm long. Stamens shorter than perianth. Ovary and style glabrous; style during anthesis \pm 2 mm, on fruit (conical base included) \pm 3 mm; stigma about as high as anthers. *Utricle* glabrous, \pm $3\frac{1}{2}$ mm; seed shining black, \pm $2\frac{1}{2}$ mm diam.; aril enclosing base of seed, pale pink or pale brown.

Distr. Tropical Asia; in *Malaysia*: Singapore, Sumatra, Java, Madura, Sumba, Wetar & the Philippines.

Ecol. In Java from the plains up to \pm 100 m alt. (very rarely higher), locally often a rather common weed on light especially sandy soils, sandy shores, fields, roadsides and dunes.

Uses. Long ago reported to be eaten at Singapore.

Notes. Often split into 2 species: *A. nodiflora* with sessile heads and *A. pyramidalis* with peduncled ones. This difference exists only on paper, not in nature where the two forms pass into each other. I never saw a form with *quite sessile* heads. SCHINZ (in E. & P. Nat. Pfl. Fam. ed. 2, 16c, p. 33) figures *A. nodiflora* with clearly peduncled heads but he described them as sessile.

4. AMARANTHUS

LINNÉ, Sp. Pl. 1 (1753) 989.

Annuals, erect or wholly or partly decumbent, unarmed or spinous. *Leaves* alternate, entire. *Flowers* (δ η) in sessile, small, dense clusters, clusters axillary or collected in axillary and terminal, solitary or paniced spikes. Flowers solitary in the axil of a bract, sustained by 2 bracteoles; bracts and bracteoles small, scarious. *Tepals* 3 or 5, rarely 4, erect or obliquely patent, free, subequal, membranous, green, purple, or pellucid with a green or purple median band, after anthesis sometimes indurate at base. Stamens as many as tepals; filaments free, filiform, no pseudo-staminodes; anthers 2-celled (4-locellate). Ovary ovate or oblong, ovule 1, sessile, erect; style short or none; stigmas 2–4, often 3, erect or spreading-recurved, linear. *Utricle* laterally compressed, membranous; circumsciss when ripe or bursting irregularly or falling off unopened together with the perianth; seed erect, lenticular, shining black or brown.

Distr. About 40 spp. all over the world, specially developed outside the tropics, several elsewhere introduced. Most of the Malaysian species are ubiquitous; of some the native country is unknown. Of the 7 wild Malaysian species one is frequently also cultivated; the two others are almost exclusively cultivated but occasionally met with as strays from gardens.

Ecol. Weeds of waste places, roadsides, fields and gardens, locally sometimes gregarious.

Uses. Some species serve as vegetables; some are used medicinally or for ornamental purposes.

Vern. In the Malay language all species are called *bayam* (with various additions).

Notes. Probably several of the Malaysian species have been introduced.

KEY TO THE SPECIES

1. *Utricles*,² also when adult and quite ripe, indehiscent or at last bursting irregularly, falling off together with the perianth. *Tepals* very shortly mucronate. Stigmas *very* short ($\frac{1}{4}$ – $\frac{2}{3}$ mm), erect or suberect. Bracts and bracteoles shorter than the perianth. Unarmed.

(1) Not *Celosia pyramidalis* BURM. f. which is *Celosia argentea* L.

(2) See footnote next page.

2. Tepals in all flowers 3, exceptionally 4.
3. Ripe utricle very strongly corrugated, seed-containing part entirely included by the perianth, from which only the seedless conical beak emerges 1. *A. gracilis*
3. Ripe utricle smooth or faintly rugulose, top of the seed-containing part slightly emerging from the perianth 2. *A. lividus*
2. Tepals 5. Ripe utricles in a dried state faintly longitudinally ribbed and \pm rugulose 3. *A. interruptus*
1. Adult *quite ripe* utricles¹ circumscess a little below the middle. Perianth and cup-shaped base of the utricle persisting till after the fall of the lid and the seed. Stigmas $3/4-2 1/2$ mm, often recurved when long.
4. Tepals in all or most flowers 5, less often 4, rarely (only in a few flowers) 3, *shortly mucronate*.
5. Flower clusters for a great part solitary in the higher leaf axils, for the rest collected in spikes or panicles which terminate the main stem and its branches. Bracts not longer than the perianth.
6. Axillary flower-clusters exclusively \varnothing ; those of the spikes and panicles for the greater part or almost entirely σ . Midrib of the tepals not much broadened upwards.
7. Style $1 1/4-1 1/2$ mm long. \varnothing clusters usually armed with 2 very sharp spines, rarely with 1 spine only or unarmed. Midrib of the tepals green or purple 5. *A. spinosus*
7. Style $1/4-1/2$ mm long. Flower-clusters unarmed. Midrib of the tepals green. Small plant 6. *A. leptostachyus*
6. Terminal spike of the main stem almost entirely \varnothing , other spikes entirely σ , or at their base σ , higher up \varnothing . Midrib of the tepals green, in the lower half very thin, in the upper half (up to quite near the apex) much thickened. Unarmed 7. *A. dubius*
5. Flower clusters *all* collected in terminal and axillary panicles of spikes. Bracts often longer than the perianth.
8. Tepals of \varnothing flowers not or hardly overlapping, $1/3-1/2$ mm wide. Panicles erect, or nodding only in their upper half. Cultivated and occasionally met with as an escape from gardens 8. *A. hybridus*
8. Tepals of \varnothing flowers distinctly overlapping for the greater part of their length, $2/3-3/4$ mm wide. Panicles (in Malaysian specimens) drooping almost from the very base. Possibly exclusively cultivated. 9. *A. caudatus*
4. Tepals in all flowers 3, *provided with a long apical awn* 4. *A. tricolor*

1. *Amaranthus gracilis* DESF. Tabl. Ec. Bot. (1804) 43; THELLUNG in ASCH. & GR. Syn. 5, 1 (1914) 335; DOMIN. Beitr. Pflanzengeogr. Austr. 1, 2 (1929) 634; HEYNE, Nutt. Pl. (1927) 605; BACKER, Onkr. Suiker. (1930) 222, Atl. t. 232; OCHSE & BAKH. v. D. BR. Veget. (1931) 18.—*Amaranthus viridis* LINNÉ, Sp.Pl. ed. 2, 2 (1763) 1405, *ex parte*; BTH. Fl. Austr. 5 (1870) 215; HOOK. f. Fl. Br. Ind. 4 (1885) 720; BAILEY, Queensl. Fl. pt. 4 (1901) 122; PULLE, Nova Guinea 8 (1910) 351; KOORD. Exk. Fl. 2 (1912) 197; MERR. Interpr. Herb. Amb. (1917) 212; En. Born. (1921) 246; En. Philip. Fl.Pl. 2 (1923) 128; GAGN. in Fl. Gén. I.C. 4 (1936) 1064.—*Cenopodium caudatum* JACQ. Coll. 2 (1788) 235 (*non Amaranthus caudatus* L.).—*Amaranthus polystachyus* WILLD. Sp.Pl. 4 (1805) 385; BLUME, Bijdr. (1825) 538; KOORD. Exk. Fl. 2 (1912) 197.—*Euxolus caudatus* MOQ. in DC. Prod. 13, 2 (1849) 274; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1036.—*Euxolus polystachyus* MIQ. Fl. Ind. Bat. 1, 1 (1858) 1036.

Annual, erect, ascending or rarely prostrate, 10–75 cm long, often much branched, unarmed; stem terete-obtusangular, glabrous or thinly pubescent. Leaves (larger ones at least) rather long-petioled, ovate-rhomboid-oblong from obtuse or cuneate, often decurrent base, acute, obtuse, rounded or retuse, glabrous or on stronger nerves spar-

ingly pubescent, green; larger ones 3–9 by 2–6 1/2 cm. Flowers green; lower clusters axillary; upper ones in terminal, rather dense, continuous or interrupted ($\sigma\varnothing$) spikes or panicles; bracts and bracteoles ovate, minutely mucronate, shorter than adult perianth; tepals 3 (exceptionally 4), very shortly mucronate with transparent white margins and green median band, glabrous, very convex, in σ oblong-linear, $\pm 1 1/2$ mm long, in \varnothing narrowly oblong-spathulate, during anthesis $2/3-1$ mm, when fruiting $1 1/4-1 3/4$ mm long; σ flowers often with rudimentary filiform ovary; ovary in \varnothing oblong; stigmas 2–3 on conical top of ovary, erect or suberect, $1/4-1/3$ mm. Utricle falling off together with the perianth, about as long as this, only the subconical short beak emerging, very strongly corrugated, $\pm 1 1/2$ mm long, indehiscent or at last bursting irregularly. Seed with a blunt margin, shining brown or black, 1–1 1/4 mm diam.

Distr. Tropical ubiquitous, in *Malaysia*: throughout the Archipelago.

Ecol. In the lower regions, especially below 600 m alt., a very common weed of cultivated areas, also in waste places, locally often abundant. To my knowledge never cultivated in *Malaysia*.

Uses. In the Moluccas used as a food.

Vern. Besides the general name *bayam* many local names.

(1) Herbarium specimens have not rarely been collected before the utricles were quite ripe, sometimes when they were still very young. In such cases a normally circumscess utricle often *seems* to burst irregularly (by pressure).

2. *Amaranthus lividus* LINNÉ, Sp.Pl. 1 (1753) 990; THELLUNG in ASCH. & GR. Syn. 5, 1 (1914) 319; HEYNE, Nutt. Pl. (1927) 605; BACKER & SLOOT, Theeonkr. (1924) 107, t. 107; BACKER, Onkr. Suiker. (1930) 220, Atl. t. 231.—*Amaranthus viridis* LINNÉ, Sp.Pl. ed. 2, 2 (1763) 1405, *ex parte*.—*Amaranthus blitum* (non L.) MIQ. Fl. Ind. Bat. 1 (1858) 1033; BTH. Fl. Austr. 5 (1870) 213; HOOK. f. Fl. Br. Ind. 4 (1885) 721; OCHSE & BAKH. v. D. BR. Veget. (1931) 17, fig. 11.—*Euxolus lividus* MOQ. l.c. 273.

Annual, erect of prostrate, 5–80 cm long, often much branched (frequently from very base), unarmed; stem terete-obtusangular, quite glabrous. *Leaves* (larger ones at least) rather long petioled, obovate or ± rhomboid, rarely oblong, from cuneate base, with broadish, usually deeply emarginate mucronate apex, green or more or less suffused or blotched with purple or entirely purple; larger ones 3–6 by 2–4 cm. Lower flower-clusters axillary, higher ones on older vigorous plants always collected in terminal and axillary spikes or panicles; bracts and bracteoles ovate, acute, much shorter than adult perianth. Tepals 3, very shortly mucronate, with transparent margins and green or purple median band, very concave, in ♂ oblong, ± 1¼ mm long, in ♀ oblong-spathulate, slightly accrescent with age, 1¼–1¼ mm. Filaments equaling the perianth or slightly shorter. Rudimentary ovary in ♂ often present, filiform; ovary in ♀ oblong; stigmas 2–3, erect or suberect, 1/3–2/3 mm long; adult utricle broadly ellipsoid, acute, laterally compressed, slightly exceeding perianth, smooth or faintly rugulose when ripe, 1½–2 mm long, falling off together with perianth, indehiscent or at last bursting irregularly; seed with a rather blunt margin, shining black or blackish brown, 1–1¼ mm diam.

Distr. In *Malaysia*: Sumatra, Java, Celebes & Philippines, probably also elsewhere.

Ecol. In Java from the lowlands up to ± 2000 m, a very common weed in cultivated and waste places.

Uses. Used by the Indonesians as a food.

Vern. *Bayam*. Moreover, many local names.

Notes. This is a very variable species.

3. *Amaranthus interruptus* R. BR. Prod. (1810) 414; BTH. Fl. Austr. 5 (1870) 215; BAILEY, Queensl. Fl. pt 4 (1901) 1221.—*Amaranthus spiratus* ZIPP. *ex SPAN*, in *Linnaea* 15 (1841) 345, *nomen*.—*Euxolus interruptus* MOQ. in DC. Prod. 13, 2 (1849) 275; F.V.M. Descr. Not. pt 5 (1878) 87.

Annual, erect or ascending, 40–60 cm long, almost simple or in higher part with (sometimes many) obliquely erect branches, unarmed; stem straight or slightly flexuous, obtusangular, glabrous or very thinly clothed with minute patent hairs. *Leaves* (larger ones at least) rather long petioled, oblong from long-cuneate base, much narrowed in upper half, obtuse or slightly emarginate, shortly mucronate, with oblique prominent primary lateral nerves; glabrous; larger leaves 3–6 by 1¼–2½ cm. *Flower-clusters* dense; lower ones axillary; higher ones collected in continuous or more or less inter-

rupted spike; terminal spike simple or branched; flowers in upper part of panicle-branches often exclusively ♂, lower down largely or exclusively ♀; bracts and bracteoles shorter than perianth, mucronate on broadly oval transparent base. *Flowers* green, all of them (in the Timor-specimen) 5-merous. Tepals of ♂ oblong, acute or minutely mucronate, 1½–1½ mm long; tepals of ♀ narrowly spathulate, very shortly mucronate, slightly accrescent with age, 1¼–1¼ mm long. Styles 2–3, erect 1/3–1/2 mm. *Utricle* falling off together with the perianth, broadly ellipsoid, rather thick, in a dried state faintly longitudinally ribbed and rugulose, tipped above the seed with a sharply delimited, broad, obtuse cone (bearing the unaltered styles), indehiscent or in dried materials bursting irregularly. Seed thick, with an obtuse margin, shining brownish black, ± 1 mm diam.

Distr. Eastern Australia, in *Malaysia*: Timor (SPANOGHE) and SE. New Guinea (LAWES; Port Moresby, CHALMERS, TURNER; Rigo distr. MACGREGOR).

Notes. Sometimes confused with unarmed forms of *Amaranthus spinosus* L. which may at once be recognized by the much longer (1¼–1½ mm) styles. It has also been confused with *Amaranthus leptostachyus* BTH. which differs by the *circumscissis* smooth utricles.

4. *Amaranthus tricolor* LINNÉ (*sens. ampl.*) Sp.Pl. (1753) 989; THELLUNG in ASCH. & GR. Syn. 5, 1 (1914) 272; MERR. Interpr. Herb. Amb. (1917) 213; En. Philip. Fl.Pl. 2 (1923) 128; HEYNE, Nutt. Pl. (1927) 606; BACKER, Onkr. Suiker. (1930) 220, Atl. t. 230; OCHSE & BAKH. v. D. BR. Veget. (1931) 25.—*Amaranthus melancholicus* LINNÉ, Sp.Pl. (1753) 989; MOQ. in DC. Prod. 13, 2 (1849) 262; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1032.—*Amaranthus mangostanus* LINNÉ, Cent. Pl. 1 (1755) 32; MOQ. in DC. Prod. 13, 2 (1849) 261; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1032; HOOK. f. Fl. Br. Ind. 4 (1885) 720; MERR. Interpr. Herb. Amb. (1917) 213; En. Born. (1921) 245; RIDL. Fl. Mal. Pen. 3 (1924) 6; GAGN. in Fl. Gén. I.C. 4 (1936) 1062.—*Amaranthus polygamus* LINNÉ, Cent. Pl. 1 (1755) t. 32.—*Amaranthus gangeticus* LINNÉ, Syst. ed. 10, 2 (1759) 1268; MOQ. in DC. Prod. 13, 2 (1849) 261; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1032; HOOK. f. Fl. Br. Ind. 4 (1885) 719; KOORD. Exk. Fl. 2 (1912) 196; RIDL. Fl. Mal. Pen. 3 (1924) 6; GAGN. in Fl. Gén. I. C. 4 (1936) 1063.—*Amaranthus oleraceus* (non LINNÉ) BURM. f. Fl. Ind. (1768) 198 (*sphalm.* 298); BLUME, Bijdr. (1825) 539; DECNE in Nouv. Ann. Mus. 3 (1834) 371; SPAN. in *Linnaea* 15 (1841) 345; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1033; Suppl. (1860) 149.—*Amaranthus salicifolius* HORT. VEITCH *ex Gard.* Chron. (1871) 1550, fig. 331; MERR. En. Philip. Fl.Pl. 2 (1923) 129.—Fig. 2.

Annual; stem under cultivation erect and often very robust, up to 1½–2½ m high, in a wild state usually much smaller, erect or ascending, angular, glabrous or in higher part thinly pubescent. *Leaves* (larger ones at least) long-petioled, rhomboid-ovate-oblong-lanceolate from a cuneate or acute, often decurrent base, narrowed in upper part, acute,

obtuse, rounded, retuse or emarginate, glabrous or on larger nerves thinly pubescent, in wild specimens entirely green, in cultivated (for orna-



Fig. 2. *Amaranthus tricolor* L. from Java,
× 1/6.

ment) forms often tinged or blotched with purple or entirely purple, sometimes bright red with yellow; larger leaves 10–25 by 3–12 cm. *Flower-clusters* dense; lower ones axillary, higher ones often collected in rather thick spike; ♂ and ♀ flowers intermixed; bracts and bracteoles long-awned from broad base, as long as adult perianth or shorter. Tepals 3, long-awned from broad base, with broad transparent margins and green or purple median band, in ♂ 3½–6 mm long, in ♀ at first 2–3 mm, under the ripe fruit 3–5 mm. Filaments about as long as perianth or shorter, often much shorter; ovary cylindrical or obconical; styles 3, 2–2½ mm long. *Utricle* flask-shaped, circumsciss somewhat below middle; lid with thickened base and suddenly contracted, conical, obtuse apex. Seed with a rather obtuse margin, shining blackish brown or brown, 1–1¼ mm diam.

Distr. Ubiquist, possibly native in trop. Asia, in *Malaysia*: throughout the Archipelago.

Ecol. Very frequently cultivated as a pot-herb, often run wild in waste places, in fields, along roadsides, locally often abundant, 1–700 m.

Uses. Cultivated green-leaved forms very frequently eaten by Europeans and non-Europeans as a substitute for spinach. Variegated-leaved forms sometimes kept in gardens as ornamentals.

Vern. *Bayam*. Moreover, local names.

5. *Amaranthus spinosus* LINNÉ, Sp.Pl. (1753) 991; BURM. f. Fl. Ind. (1768) 200 (*sphalm.* 300); BLUME, Bijdr. (1825) 540; DECNE, Nouv. Ann. Mus. 3 (1834) 371; BLANCO, Fl. Filip. (1837) 710; ed. 2 (1845) 491; ed. 3, 3 (1879) 113; SPAN. in *Linnaea* 15 (1841) 345; HASSK. Pl. Jav. Rar. (1848) 432; MOQ. in DC. Prod. 13, 2 (1849) 260; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1031; HOOK. f. Fl. Br. Ind. 4 (1885) 718; KOORD. Minah. (1898) 564; BAILEY, Queensl. Fl. pt 4 (1901) 1220; KOORD. Exk. Fl. 2 (1912) 195; THELLUNG in ASCH. & Gr. Syn. 5, 1 (1914) 267; MERR. Interpr. Herb. Amb. (1917) 213; En. Born. (1921) 245; En. Philip. Fl.Pl. 2 (1923) 128; DOMIN, Beitr. Pflanzengeogr. Austr. 1, 2 (1929) 629; RIDL. Fl. Mal. Pen. 3 (1924) 6; HEYNE, Nutt. Pl. (1927) 606; BACKER, Onkr. Suiker. (1930) 220, Atl. t. 229; OCHSE & BAKH. v. D. BR. Veget. (1931) 23; GAGN. in Fl. Gén. I.C. 4 (1936) 1062.

Annual, erect, often much branched, 15–100 cm high; stem terete or obtusangular, green or more or less suffused with purple, glabrous or slightly pubescent. *Leaves* (larger ones at least) rather long petioled, ovate-oblong-lanceolate, from acute, often slightly decurrent base, in their upper part gradually narrowed, obtuse, rounded or slightly retuse, often shortly mucronate, glabrous or, when young, slightly pubescent on the nerves; larger ones 3½–11 by 1¼–4½ cm. *Flower-clusters* dense; lower ones axillary; higher ones often collected in axillary and terminal spikes; spikes often branched in their lower part; terminal spike above base usually wholly ♂, with weak spines or quite unarmed, finally often with a drooping apex; axillary clusters and those on the base of the spike (rarely also the higher ones) usually armed with 2, or sometimes more, obliquely erect or patent, straight, thin, very

sharp, $\frac{1}{2}$ –2 cm long spines (metamorphosed bracts), sometimes with one spine only, rarely (*var. inermis* SCHINZ) unarmed; bracts and bracteoles mucronate from a broad base, shorter than the adult perianth or at best as long. *Tepals* 5, shortly mucronate, very convex, with transparent margins and green or purple median band, in ♂ ovate-oblong, 2–2½ mm long, in ♀ oblong-spathulate, at first 1¼–1½ mm, under the ripe fruit 1¾–2¾ mm long. Filaments about equalling perianth or slightly longer or shorter. Ovary oblong; styles mostly 3, sometimes 2, when adult recurved and 1¼–1½ mm long. *Utricle* oblong, with a 3-lobed apex, circumsciss a little below the middle. Seed with a thin margin, shining black or brownish black, ± 1 mm diam. or slightly larger.

Distr. Ubiquitous, in *Malaysia*: throughout the Archipelago.

Ecol. At present throughout Java, from the lowlands up to ± 1400 m, a very common weed of waste places, railway-yards, waysides, fields and gardens, often gregarious.

Uses. Used as a diuretic, an emmenagogue and a lactagogue, further for poultices and against gonorrhoea.

Vern. *Bayam duri* (i.e. spinous bayam). More-over many local names.

Notes. Possibly an introduced species. In Malaysian specimens ripe adult utricles always open circumsciss a little below the middle.

6. *Amaranthus leptostachyus* BTH. *Fl. Austr.* 5 (1870) 214; BAILEY, *Queensl. Fl. part 4* (1901) 1220; DOMIN, *Beitr. Pflanzengeogr. Austr.* 1, 2 (1921) 630.

Annual, not or sparingly branched, 7½–25 mm high; stem obtusangular, glabrous or very sparingly beset with patent minute hairs. *Leaves* (larger ones at least) long petioled, ovate-oblong from a cuneate base, in their upper part gradually narrowed to an obtuse or acute, minutely mucronate apex, glabrous or beneath on the nerves with few scattered, very minute, patent hairs, 1–6 by ½–2½ cm; primary nerves in dried specimens distinctly prominent beneath; petiole ¼–6 cm. *Flower-clusters* rather dense; lower ones axillary, consisting almost or entirely of ♀ flowers; higher clusters collected in axillary and terminal spikes, often forming together a terminal panicle, consisting mainly of ♂ flowers, in the lower part often intermixed with ♀ ones; bracts and bracteoles mucronate, shorter than the perianth. *Tepals* usually 4–5, sometimes 3, erect or obliquely patent, oblong-spathulate with a distinct mucro, scarious with a conspicuous but rather thin green midrib, 1½–1½ mm long, ½–½ mm wide. *Stamens* in ♂ 4–5, not rarely 3. *Styles* in ♀ 2–3, erecto-patent or recurved, ½–½ mm long. *Utricle* tipped by a thick conical beak, crowned by the styles, not rugulose, circumsciss; upper part falling away, leaving the much shorter cup-shaped persistent base in the perianth. Seed erect, lenticular, shining blackish brown, somewhat less than 1 mm diam.

Distr. N. Australia, in *Malaysia*: SE. New Guinea (Lorne Range, CHALMERS; Jimari, FITZGERALD).

Notes. Sometimes confused with *A. interruptus* R.Br. which may be easily recognized by the indehiscent, in a dry state slightly rugulose utricles and constantly 5-merous flowers. From unarmed forms of *A. spinosus* L. easily distinguishable by the much shorter styles (in *A. spinosus* 1¼–1½ mm).

7. *Amaranthus dubius* MART. *Hort. Erl.* (1814) 197; THELL. in ASCH. & GR. *Syn.* 5, 1 (1914) 265.

Annual, erect, ½–1 m high, in its upper part often with many obliquely erect branches, unarmed; stem obtusangular, green, glabrous or very thinly beset with minute patent hairs. *Leaves* (larger ones at least) long-petioled, ovate-oblong or ovate-rhomboid from broadly cuneate base, much narrowed in the upper part, slightly emarginate, minutely mucronate, glabrous; larger leaves 6–20 by 4–10 cm. *Flowers-clusters* dense, green, lowest axillary; higher ones collected in dense spikes; spikes (especially the terminal ones which frequently reach 10–25 cm in length) in their lower part frequently with few or many obliquely patent branches, often sinuous, either almost entirely ♂ or at base ♂, higher up ♀; terminal spike often entirely ♀; larger bracts broad, thinly membranous, oval with a long mucro, totalling ± 2 mm. *Perianth* 1½–2½ mm long; that of the ♀ flowers somewhat increasing with age; *tepals* 4–5, rarely 3, oval-oblong; their midrib in lower half very thin, in upper half (up to quite near apex) much thickened, produced into a short (often very short) mucro. Filaments short. Ovary shortly 3-lobed; styles 3, 1–1¼ mm long, often recurved. *Utricle* ellipsoid, when fully ripe circumsciss in or slightly below middle. Seed with a rather thin margin, brownish black, shining ± 1½ mm diam.

Distr. Native of tropical America, of rather recent introduction in Java; collected for the first time in 1922 and repeatedly afterwards at Buitenzorg, later also at Bandoeng. Not yet found in any other part of Malaysia.

Ecol. Weed of gardens, road-sides and waste places, abundantly fruiting, may be expected to spread rapidly.

8. *Amaranthus hybridus* LINNÉ *subsp. cruentus* (L.) THELL. *var. paniculatus* (L.) THELLUNG in ASCH. & GR. *Syn.* 5, 1 (1914) 247; HEYNE, *Nutt. Pl.* (1927) 605; BACKER, *Onkr. Suiker.* (1930) 219, *Atl. t.* 228.—*Amaranthus hybridus* L. *Sp.Pl.* (1753) 990.—*Amaranthus cruentus* LINNÉ, *Syst. Pl. ed.* 10, 2 (1759) 1269, *non* WILLD. *ex* ROXB. *quod est A. caudatus* L.—*Amaranthus paniculatus* LINNÉ, *Sp.Pl. ed.* 2 (1763) 1406; MOQ. in DC. *Prod.* 13, 2 (1849) 257; MIQ. *Fl. Ind. Bat.* 1, 1 (1858) 1030; BTH. *Fl. Austr.* 5 (1870) 213; HOOK. *f. Fl. Br. Ind.* 4 (1885) 718; BAILEY, *Queensl. Fl. pt 4* (1901) 1220; KOORD. *Exk. Fl.* 2 (1912) 196; MERR. *En. Philip. Fl.Pl.* 2 (1923) 128; GAGN. in *Fl. Gén. I.C.* 4 (1936) 106.—*Amaranthus speciosus* SIMS, *Bot. Mag.* (1821) t. 2227.

Annual, erect, in higher part often much branched, 0.15–3 m, unarmed; stem obtusangular, strongly suffused with purple; younger parts more or less

densely clothed with short hairs or almost glabrous. *Leaves* (larger ones at least) long-petioled, ovate-oblong-lanceolate from an acute often short-decurrent base, in their upper half gradually narrowed, obtuse, shortly mucronate, often with wavy margins, dark green above, strongly tinged with purple beneath; larger ones 10–30 by 3–12 cm; nerves beneath or on both sides more or less densely hairy. *Flower-clusters* crowded, paniculate or in feeble specimens spicate: panicles (spikes) terminal and frequently also in the higher leaf axils, erect or at the top more or less drooping, puberulous, (♂♀); terminal panicle in well-developed specimens 15–40 cm long. *Flowers* dark purple, 5-merous; bracts and bracteoles long-pointed distinctly longer than perianth. Tepals oblong, not or hardly overlapping, with a short or very short mucro, $1/3$ – $1/2$ mm wide, in ♂ $1\frac{3}{4}$ –2 mm long, in ♀ during anthesis (mucro excluded) $1\frac{1}{3}$ – $1\frac{1}{2}$ mm long, afterwards up to 2 mm. Filaments white, equalling perianth or slightly longer. Ovary in ♂ rudimentary, hardly perceptible, in ♀ oblong; styles 3, less often 2, ± recurved, ± $3/4$ mm long; *utricle* exceeding perianth, ± urceolate, in the lower half pale, in the upper half purple, circumsciss between the pale and the purple parts. Seed dark brown, shining, 1– $1\frac{1}{4}$ mm diam.

Distr. Native country unknown, introduced into *Malaysia* very long ago: Sumatra, Java, Lesser Sunda Islands.

Ecol. In Java from the lowlands up to ± 1300 m cultivated for ornamental purposes and sometimes met with as a stray from gardens, but nowhere firmly established, not truly naturalized.

Uses. in *Malaysia* unknown.

Vern. *Bayam kéjong*, J, and a few local names.

9. *Amaranthus caudatus* LINNÉ, Sp.Pl. (1753) 990; MOQ. in DC. Prod. 13, 2 (1849) 255; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1030; HOOK. f. Fl. Br. Ind. 4 (1885) 719; BAILEY, Queensl. Fl. pt 4 (1901) 1220; KOORD. Exk. Fl. 2 (1912) 196; THELLUNG in ASCH. & GR. Syn. 5, 1 (1914) 231; RIDL. Fl. Mal. Pen. 3 (1924) 6; GAGN. in Fl. Gén. I.C. 4 (1936) 1061.

Annual, erect, not or sparingly branched, 0.3– $1\frac{1}{2}$ m, unarmed; stem obtusangular, usually suffused with purple, thinly beset with patent short hairs. *Leaves* (larger ones at least) long petioled, rhomboid-ovate-lanceolate from cuneate base, in their upper half gradually narrowed, obtuse, mucronate, green, often bordered with purple; dimensions?; nerves beneath usually pale. *Flower-clusters* very densely spicate; lower paniced; panicle in *Malaysian* specimens borne by a flaccid peduncle, drooping from the very base; terminal spike frequently much longer than the others; bracts and bracteoles broad, with a long apical point; many slightly exceeding the flowers. Perianth 5-merous. *Tepals* in ♂ ovate-oblong, shortly mucronate, in ♀ oblong-obovate-subspathulate, with at least partly overlapping margins, 2– $2\frac{1}{2}$ mm (including the often rather long mucro) by $2/3$ – $3/4$ mm, purple. Styles 3, ± $3/4$ mm long. *Utricle* slightly exceeding perianth, lageniform, circumsciss. Seed 1– $1\frac{1}{4}$ mm diam; dark brown, shining.

Distr. Ornamental plant of old, native country not known with certainty, in *Malaysia* but rarely cultivated.

Notes. The only *Malaysian* specimen I have seen had been collected in NE. Sumatra above Sibolangit, ± 1350 m; it may have been taken from a cultivated plant.

5. DIGERA

FORSK. Fl. Aeg.–Arab. (1775) 65.

Annual. *Leaves* alternate, petioled, entire or subentire. *Flowers* in axillary peduncled spiciform racemes; lower part of raceme in each axil of persistent bracts with 3 flowers on very short common stalk; central flower of triad perfect, ♀, 2-bracteolate; tepals 5, almost free; 2 outer ones larger than the 3 other ones and together embracing them. Stamens 5; filaments free, filiform; no pseudo-staminodes; anthers oblong, 2-celled (4-locellate). Ovary obovoid, truncate; ovule 1, erect; style filiform, rather long; stigmas 2, recurved, linear, short. Lateral flowers in the axil of bracteoles of the fertile flower, reduced to a stalked palmatifid scale; scales towards the apex of the raceme gradually smaller, in the highest flowers absent. *Utricle* falling off together with the enclosing perianth, bracteoles and scales, rugulose-tuberculate, with keeled sides ending at the top in a small hornlet, crustaceous, indehiscent. Seed erect, exarillate.

Distr. Monotypic; northern Africa through the Orient and S. Asia to *Malaysia*.

Notes. In feeble specimens the sterile lateral flowers are sometimes absent.

1. *Digera muricata* (L.) MART. Beitr. Amar. (1825) 77, no 2.—*Achyranthes muricata* LINNÉ, Sp.Pl. ed. 2 (1762) 295.—*Achyranthes alternifolia* LINNÉ, Mant. (1767) 50; ROXB. Fl. Ind. ed. CAREY 1 (1832) 674.—*Digera arvensis* FORSK. Fl. Aeg.–Arab. (1775)

65; MOQ. in DC. Prod. 13, 2 (1849) 324; HASSK. in Pl. Jungh. (1852) 132; ZOLL. Syst. Verz. (1854) 109; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1044; HOOK. f. Fl. Br. Ind. 4 (1885) 717; KOORD. Exk. Fl. 2 (1912) 197.—*Cladostachys frutescens* D. DON, Prod.

(1825) 76; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1025.—*Digera forskali* BL. Bijdr. (1825) 542; HASSK. Pl. Jav. Rar. (1848) 425; MOR. Syst. Verz. (1845/6) 73; ZOLL. Syst. Verz. (1854) 109.—*Desmochaeta muri-*

cata WIGHT, Icon. (1843) t. 732.—*Cladostachys muricata* MOQ. in DC. Prod. 13, 2 (1849) 235.—*D. alternifolia* ASCH. in SCHWEINF. Beitr. Fl. Aeth. (1867) 180; ASCH. & GR. Syn. 5, 1 (1914) 357; BACKER, Onkr. Suiker. (1930) 223; Atl. t. 233.—Fig. 3.

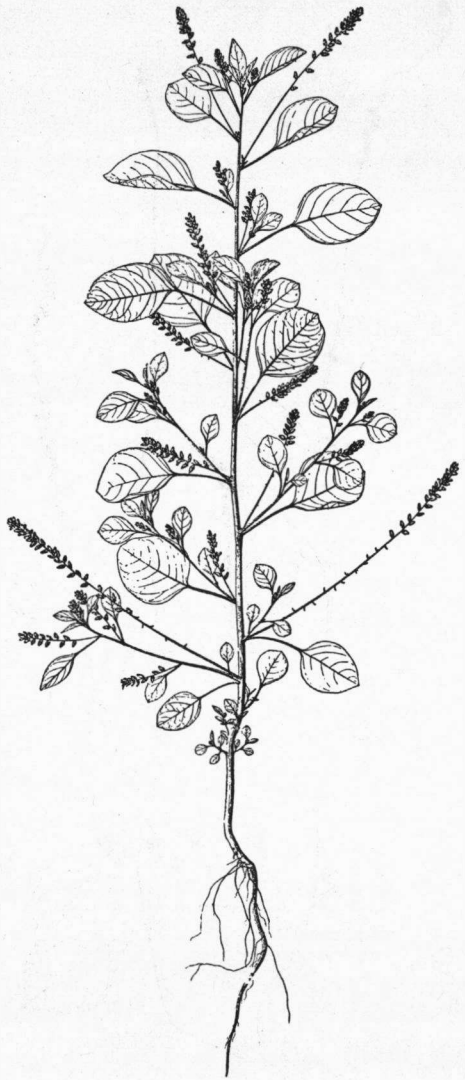


Fig. 3. *Digera muricata* (L.) MART. from Java, $\times 1/4$.

Annual, often branched from base; small specimens erect; larger ones prostrate-ascending or with widely patent, prostrate-ascending, often long branches, 0.15–1.6 m long; stem often flexuous, glabrous or slightly pubescent. *Leaves* ovate or ovate-oblong from a cuneate, obtuse, rounded or subcordate base, with an acute, obtuse or rounded apex, entire or obsoletely crenulate, herbaceous, glabrous, $1\frac{1}{2}$ – $7\frac{1}{2}$ by $\frac{3}{4}$ – $5\frac{1}{2}$ cm; petiole $\frac{3}{4}$ –5 cm. *Racemes* solitary, widely patent-ascending, in upper part dense, lower down rather lax, 1–30 cm long ($\frac{1}{4}$ – $7\frac{1}{2}$ cm of peduncle included), glabrous or subglabrous; lowest fruits often falling off before expansion of the highest flowers; bracts widely patent, ovate-lanceolate, concave with a strong midrib and broad scarious margins, glabrous (as are pedicels, bracteoles, scales and perianth), $2\frac{1}{2}$ –3 mm long, persistent; pedicels very short; bracteoles appressed against sterile flowers or in the absence of these against the perianth, oblong with scarious margins, 2– $2\frac{1}{2}$ mm long. Sterile flowers appressed against the fertile flower, flat, much dilated from a stalk-like base, palmatifid, towards the apex of the raceme gradually smaller, in the highest flowers absent. *Tepals* during anthesis more or less patent, afterwards erect; 2 outer ones $3\frac{1}{2}$ – $4\frac{1}{4}$ mm long, concave, 5–7-nerved, green with whitish or pink borders; 3 inner ones shorter, much narrower, thinner, obtuse, pink, 1–2-nerved. Adult filaments much longer than anthers. Style (short stigmas excluded) 2– $2\frac{1}{2}$ mm; perianth after anthesis not or hardly accrescent. *Fruit* compressed-globose, between the apical hornlets slightly depressed, bearing a persistent style-base, 2– $2\frac{1}{4}$ mm diam.

Distr. N. Africa through the Orient to southern Asia, in *Malaysia*: Java, Madura, Kangean Arch., Celebes, Moluccas, Sumba and Sumbawa.

Ecol. Obviously preferring the drier areas, 1–250 m, in fields (especially when sandy), along road-sides, railway-embankments, waste places, usually in scattered specimens.

Vern. *Bayam sidit*, J.

Notes. The specimen preserved in BURMAN's collection (Herb. DELESSERT, Geneva) named *Achyranthes muricata* and mentioned in BURM. f. Fl. Ind. (1768) 63 is *Amaranthus gracilis* DESF. The true *Digera muricata* lies in Herb. BURMAN as '*Blitum, malaice Baian clatek*' (*bajam glatik*).

6. CYATHULA

BLUME, Bijdr. 11 (1825) 548, *nom. conserv.*, non LOUR.

Perennial herbs or undershrubs. *Leaves* opposite, entire. *Flowers* clustered; clusters either singly along the rachis of a long raceme on short, jointed stalks, deflexed after anthesis, or (not in Malaysia) in dense globose heads; perfect flowers in each cluster 1–3, ♀, at least partly accompanied by imperfect sterile ones (reduced to

fascicled hooks. *Tepals* of perfect flowers 5, oblong, shortly acuminate, with scarios margins, longitudinally nerved. Stamens 5; filaments at the base connate into a short cup; free parts alternating with shorter, dentate or lacerate pseudo-staminodes; anthers 2-celled (4-locellate). Ovary obovoid; ovule 1, pendulous from a long funicle; style filiform; stigma capitellate. *Utricle* ellipsoid, thin-walled, indehiscent, by means of the hooks easily adhering to passers-by.

Distr. Pantropic, probably two dozen species, centering in Africa, in *Malaysia* only one widely distributed species and an endemic variety.

KEY TO THE SPECIES

1. Leaves rhomboid-obovate or rhomboid-oblong; larger ones less than twice as long as broad.

1. *C. prostrata*

1. Leaves lanceolate or linear-lanceolate; larger ones more than 2½ times as long as broad.

1. *C. prostrata* var. *lanceifolia*

1. *Cyathula prostrata* (L.) BLUME, Bijdr. (1825) 549; MOQ. in DC. Prod. 13, 2 (1849) 326; HASSK. in Pl. Jungh. 2 (1852) 133; HOOK. f. Fl. Br. Ind. 4 (1885) 723; BAILEY, Queensl. Fl. 4 (1901) 1230; KOORD. Exk. Fl. 2 (1912) 197; MERR. Fl. Man. (1912) 194; Interpr. Herb. Amb. (1917) 214; En. Born. (1921) 246; DOMIN, Beitr. Pflanzengeogr. Austr. 1, 2 (1929) 639; BACKER, Trop. Natuur 11 (1922) 81, *cum ic.*; MERR. En. Philip. Fl. Pl. 2 (1923) 129; RIDL. Fl. Mal. Pen. 3 (1924) 7; HEYNE, Nutt. Pl. (1927) 606; BACKER, Onkr. Suiker. (1930) 224, Atl. t. 234; GAGN. in Fl. Gén. I.C. 4 (1936) 1070.—*Achyranthes prostrata* LINNÉ, Sp. Pl. ed. 2 (1762) 296; BURM. Fl. Ind. (1768) 64.—*Pupalia prostrata* MART. Beitr. Amar. (1825) 113; HASSK. Pl. Jav. Rar. (1848) 427.—*Cyathula geniculata* (non LOUR.) MIQ. Fl. Ind. Bat. 1, 1 (1858) 1045; KOORD. Minah. (1898) 565.—Fig. 4.

Perennial herb, ascending or erect from a rooting base, 30–50 cm high; stem obtusely quadrangular, thickened above the nodes, often tinged with red, rather densely clothed with fine hairs. *Leaves* rhomboid-obovate or rhomboid-oblong from a contracted or narrowed, rounded, obtuse or acute base and a mostly triangular, acute or rather obtuse apex, entire, ciliate, bordered with red, otherwise green or, especially in a young state, more or less tinged with red, herbaceous, on both surfaces more or less densely patently hairy, 1¼–15 by ¾–6½ cm; petiole 1–12 mm. *Flowers* racemed; racemes terminal and often also in the highest leaf-axils, erect, straight or ± sinuous, 19–45 cm (including 1–12 cm peduncle); rachis rather densely pubescent; bracts ovate, acuminate very acute, reflexed after anthesis; clusters shortly stalked, in the lower part of the inflorescence more or less distant, in the higher part crowded, at first erect, afterwards patent, at last reflexed; lower clusters composed of 2–3 perfect ♂ flowers and several imperfect sterile ones; imperfect flowers towards the

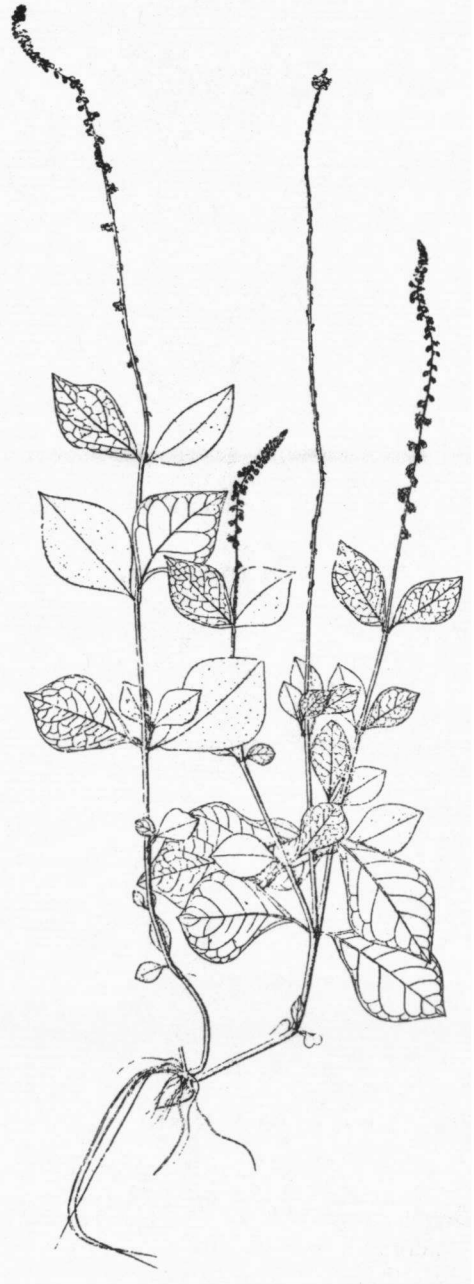


Fig. 4. *Cyathula prostrata* (L.) BL. from Java, × 1/3.

apex of inflorescence gradually fewer; apex of inflorescence bearing solitary perfect flowers without imperfect ones; stalks of clusters joined just above the base; ripe clusters falling off as a whole. *Tepals* of ♂ ovate-oblong, strongly mucronate, 2¼–3 mm long, dull pale green, glabrous within, externally clothed with appressed or patent, rather long, white hairs; outer ones 5-, inner ones 3–4 nerved. Free parts of the filaments ± 1 mm; anthers minute; pseudo-staminodes rectangular-cuneate with a truncate, shortly dentate apex. Ovary with a broad, flat top; style ± 2/3 mm. Utricle glabrous ± 1½ mm; seed shining brown. Imperfect flowers 1¾–2½ mm long, sessile or almost so; hooks obliquely patent, above the hairy base glabrous and usually red.

Distr. Africa to China and Australia, prob. introduced in Central America, in *Malaysia*: throughout the Archipelago.

Ecol. In the settled areas, 1–1650 m, common in shaded localities, along roadsides, teak-forests, forest-borders, secondary forests, often gregarious.

Uses. Used for some medicinal purposes, against cough, dysentery, cholera and intestinal worms.

Vern. *Rumput djarang-djarang*, *M*, *ranggitan*, *J*, and several local names.

Notes. The type specimen of *Cyathula geniculata* LOUR. is *Achyranthes aspera* L.

var. *lancifolia* (MERR.) comb. nov.—*Cyathula lancifolia* MERR. in Philip. J.Sc. 11 (1916) Bot. 179; En. Philip. Fl.Pl. 2 (1923) 129.—*C. lancifolia* var. *stenophylla* MERR. in Philip. J.Sc. 29 (1926) 478.

Leaves lanceolate or linear-lanceolate from a narrowed, acute base, towards the apex tapering or slightly acuminate, acute or rather obtuse, apiculate, entire, ciliate, herbaceous, on both surfaces rather thinly clothed with appressed long thin hairs or, barring the nerves, subglabrous beneath, 1½–7 by ½–2½ cm; petiole ¼–½ cm.

Distr. *Malaysia*: Philippines (Luzon, Samar, Bohol, Mindanao).

Ecol. Damp forests at low and medium altitudes.

Notes. Except the narrow leaves I can find no differences with the species; there are no transitions. MERRILL's var. *stenophylla* is apparently a dwarf, characterized by a much slender habit and short racemes 5–10 cm long incl. the peduncle.

7. PUPALIA

JUSS. in Ann. Mus. 2 (1803) 132, *nomen conserv.*, MOQ. in DC. Prod. 13, 2 (1849) 331.

Herbs, sometimes woody at the base. *Leaves* opposite, entire. Flowers spicate or racemed; spikes (racemes) terminal and axillary; lower part of spike (raceme) in axils of persistent bracts with a flower-cluster consisting of 2–3 bibracteolate ♀ flowers accompanied by some rudimentary ones; highest flowers often solitary and ♂, without rudimentary flowers. *Tepals* 5, free, with scarious margins, 3–5-nerved, not indurate at base. Stamens 5, at the base connate in a very short cup; no pseudo-staminodes; anthers oblong, 2-celled (4-locellate). Ovule 1, pendulous from a long funicle; style filiform; stigma capitate. *Utricle* oblong-obovoid, subcompressed; pericarp thin with a sharply delimited somewhat thicker apex, which finally falls off letting out the seed; rudimentary flowers consisting of fascicled squarrose hooks; clusters falling off (with the bracteoles) as a whole, by means of the hooks, readily and firmly adhering to passers-by.

Distr. Few spp., from Africa to India and Malaysia.

1. *Pupalia lappacea* (L.) Juss. in Ann. Mus. 2 (1803) 132; MOQ. in DC. Prod. 13, 2 (1849) 331; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1046; HOOK. f. Fl. Br. Ind. 4 (1885) 724; FORB. Wand. (1885) 515. KOORD. Exk. Fl. 2 (1912) 198; MERR. in Philip. J. Sc. 11 (1916) Bot. 269; En. Phil. Fl.Pl. 2 (1923) 129.—*Achyranthes lappacea* LINNÉ. Sp.Pl. (1753) 204; ROXB. Fl. Ind. ed. CAREY (1832) 673.—*Achyranthes atropurpurea* LAMK. Enc. 1 (1785) 346.—*Pupalia atropurpurea* MOQ. l.c. 331; ZOLL. Syst. Verz. (1854) 109; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1046; HOOK. f. Fl. Br. Ind. 4 (1885) 723; FORB. Wand. (1885) 515; KOORD. l.c. 198.—*Desmochaeta atropurpurea* DC. and *D. flavescens* DC. ex Cat.

Hort. Monsp. (1813); DECNE in Nouv. Ann. Mus. 3 (1834) 372; SPAN. in Linnaea 15 (1841) 345.

Perennial herb, erect or clambering, often much branched, ½–2 m high; stem obtusely quadrangular or subterete, thickened above the nodes, finely pubescent. *Leaves* ovate-oblong from a rounded, obtuse or acute base, contracted into the petiole, acutely acuminate, on both surfaces glabrous or more or less densely clothed with shorter or longer, appressed or obliquely patent, white hairs, 2–12 by 1¼–7 cm; petiole 2–25 mm, finely pubescent. *Spikes* (racemes) terminal and in the highest leaf axils, erect or obliquely erect,

6-35 cm long (1-10 cm peduncle included), finely and more or less densely patently pilose. *Flower-clusters* sessile or very shortly stalked, lower remote, higher ones crowded, all clusters at first erect, afterwards patent, consisting of 2-3 ♂ flowers and several rudimentary ones; highest ♂ flowers solitary without accompanying rudimentary flowers; bracts and bracteoles ovate-oblong, acute, pilose; bracts 2½-5 mm long, soon widely patent or reflexed; bracteoles 2½-4 mm. *Tepals* oblong or ovate-oblong, with a short acicular apical point, 4-5 mm long, dull pale green, albido-pilose outside, inside glabrous. *Staminal cup* ½-½ mm high, slightly fleshy; free parts of the filaments ± 2 mm, often pink; anthers ± ½ mm. *Ovary* with a narrow base and a clearly delimited broadly

rounded apex; style 1½-1¾ mm. *Utricle* 2-2½ mm long; seed shining dark brown; rudimentary flowers at first subsessile and small, afterwards borne on a distinct, villous pedicel and much accrescent; hooks finally 3-4 mm long, pale green or purple, glabrous above the villous base.

Distr. Africa to India, in *Malaysia*: eastern part of Java, Madu. a, Bali, Kangean Arch., Philippines, Celebes, Saleier, Lombok, Sumba, Sumbawa & New Guinea.

Ecol. Distinctly preferring the periodically dry areas, 3-300 m, in sunny or slightly shaded localities, grassy wilds, jungles, hedges, teak-forests, in many regions rather common but usually as scattered specimens.

Vern. Djembrengan, J, tjakt, J.

8. AERVA (*Aerua* AUCTT.)

FORSK. Fl. Aeg.-Arab. (1775) 170, *nomen conserv.*

Herbs or undershrubs, erect, straggling or clambering. *Leaves* alternate or opposite, quite entire. *Flowers* in axillary and terminal spikes, small ♀ or (♀) (♀), solitary in the axil of a persistent bract, sustained by 2 bracteoles: the latter either falling off with the perianth or not; rachis of the spike remaining whole after fruiting, or breaking up. *Tepals* 5, free, thin and tender or rather firm, hairy, 1- or more-nerved. *Stamens* 5; filaments at base connate in a short cup; free parts subulate, alternating with shorter, subulate, pseudo-staminodes; anthers 2-celled (4-locellate). *Ovary* compressed, glabrous; ovule 1, pendent from apex of long funicle; style very short, stigmas 1-2. *Utricle* falling off with the perianth, much compressed, bursting irregularly. *Seed* vertical, reniform, shining black.

Distr. About 10 spp. in the Old World, centering in Africa.

Notes. *Aerva javanica* (BURM. f.) JUSS. does not occur in Java, nor for that matter elsewhere in Malaysia. It is reduced to the African-Asian *Aerva persica* (BURM. f.) MERR.

KEY TO THE SPECIES

- 1. Spikes very dense. *Tepals* very thin, 1-nerved, externally clothed with many long white hairs, often densely woolly. *Bracteoles* not falling off together with the fruiting perianth.
- 2. Stigmas 2, very distinct, shortly linear, obliquely spreading. Spikes for the greater part ½-2½ cm long, with a usually rounded apex, mostly 2-4 together in the axils of normal leaves, never forming a loosely branched panicle. *Tepals* 1¼-1½ mm. *Leaves* ½-5 by ¼-3 cm. Erect herb, 10-110 cm high.
 - 1. *Ae. lanata*
- 2. Stigma 1, entire or very obscurely 2-lobed with broadly rounded lobes. Spikes ¾-5 cm long, usually with a conical apex, partly in the axils of ordinary leaves, partly in the axils of bracts, often forming a ± paniculate inflorescence. *Tepals* 2-2½ mm. *Leaves* 1½-7½ cm. Erect or more or less clambering, ¾-2 m high
 - 2. *Ae. sanguinolenta*
- 1. Spikes not very dense. *Tepals* rather firm, 3-5-nerved, externally thinly beset with very short hairs. *Bracteoles* falling off together with the fruiting perianth. *Bract-bearing rachis* remaining whole for a long time after the fall of the flowers
 - 3. *Ae. curtisif*

1. *Aerva lanata* (L.) JUSS. in Ann. Mus. Paris 11 (1808) 131; BLUME, Bijdr. (1825) 547; HASSK. Pl. Jav. Rar. (1848) 423; MOQ. in DC. Prod. 13, 2 (1849) 303; HASSK. in Pl. Jungh. (1852) 132; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1039, Suppl. (1860) 149, 365; HOOK. f. Fl. Br. Ind. 4 (1884) 728; PULLE in Nova Guinea 8 (1910) 352; KOORD. Exk. Fl. 2 (1912) 198; MERR. En. Philip. Fl. Pl. 2 (1923) 130; HEYNE, Nutt. Pl. (1927) 607; BACKER, Onkr. Suiker. (1930) 225, Atl. t. 235.—*Achyranthes lanata* LINNÉ, Sp. Pl. (1735) 204.—Fig. 5.

Perennial erect herb, 10-110 cm long, often di-

vided from near the base into ascending or erect branches; main branches and upper part of the stem often unbranched for a considerable length, leafy and flowering almost throughout; stems terete, hard, densely clothed with appressed and patent white hairs; internodes usually shorter than 2 cm. *Leaves* alternate, oval-elliptic-ovate from a cuneate or contracted base, acute or rather obtuse, with a very short mucro, on both surfaces (especially so beneath) rather densely appressed white-pubescent, 6-50 by 3-30 mm; highest leaves often very small; petiole 2-15 mm. *Spikes* mostly

2-4 together, patent or obliquely erect, cylindrical with a usually rounded apex, pure white, $\frac{1}{2}$ - $1\frac{1}{2}$ cm, sometimes up to $2\frac{1}{2}$ cm long; highest often collected into a dense leafless inflorescence, but never forming a loosely branched panicle. *Flowers* softly membranous; all ♂; bracts and bracteoles ovate-oval, mucronate, white, externally hairy, $\frac{3}{4}$ -1 mm long. *Tepals* $1\frac{1}{3}$ - $1\frac{1}{2}$ mm, densely white-woolly outside, oval-oblong, rounded or very obtuse; 2 outer ones with minute mucro, entirely white, 3 others with green midrib. *Stamens* \pm half as long as perianth; style totalling $\frac{1}{4}$ - $\frac{1}{3}$ mm, bifid

nearly halfway down; arms very distinct, obliquely spreading, shortly linear. *Utricle* \pm 1 mm diam. Seed $\frac{2}{3}$ - $\frac{3}{4}$ m. Fruiting spike easily breaking up (in a dried state). Graceful plant!

Distr. Africa to Asia, in *Malaysia*: Sumatra, Banka, Java, Madura, Philippines, Aru Isl., Timor, and New Guinea.

Ecol. Especially in periodically dry areas, in Java $\frac{1}{2}$ -100 m, in dry localities, along roadsides, on neglected premises, waste places, locally often frequent.

Uses. Leaves steeped in hot water used as a remedy against sudden swellings.

Vern. *Katumpangan ayer*, M.

Notes. The sheet conserved under the name *Achyranthes lanata* in Herb. BURMAN at Geneva is *Ae. sanguinolenta* (L.) BL. A second specimen of *Ae. sanguinolenta* in the Herb. BURMAN bears the wrong name of *Celosia lanata* L. (= *Aerva javanica* JUSS.).

2. *Aerva sanguinolenta* (L.) BL. *Bijdr.* (1825) 547; DECNE in *Nouv. Ann. Mus.* 3 (1834) 371; SPAN. in *Linnaea* 15 (1841) 345; MOQ. in *DC. Prod.* 13, 2 (1849) 300; HASSK. in *Pl. Jungh.* (1851) 132; MIQ. *Fl. Ind. Bat.* 1, 1 (1858) 1038; KOORD. *Exk. Fl.* 2 (1912) 198; MERR. *Interpr. Herb. Amb.* (1917) 214; HEYNE, *Nutt. Pl.* (1927) 607; BACKER, *Onkr. Suiker.* (1930) 226, atl. t. 236.—*Achyranthes sanguinolenta* LINNÉ, *Sp.Pl.* ed. 2 (1762) 294; BURM. *f. Fl. Ind.* (1768) 63.—*Achyranthes scandens* ROXB. *Fl. Ind.* 2 (1824) 509.—*Aerva scandens* WALL. *Cat.* (1829) 6911, *nomen*; MOQ. *l.c.* 302; MIQ. *l.c.* 1039; HOOK. *f. Fl. Br. Ind.* 4 (1884) 727; KOORD. *l.c.* 198; MERR. *En. Philip. Fl.Pl.* 2 (1923) 130; GAGN. in *Fl. Gén. I.C.* 4 (1936) 1034.—*Aerva timorensis* MOQ. *l.c.* 301; MIQ. *l.c.* 1039.

Perennial herb, often more or less woody at base, $\frac{3}{4}$ -2 m high, erect or \pm clambering, branched or not; stem terete, its upper part densely clothed with appressed or patent soft white hairs, gradually glabrescent downward; internodes often longer than 3 cm. *Leaves* opposite or alternate (often on a single specimen), ovate-elliptic, oblong or lanceolate from a cuneate or contracted base, usually acute, mucronate, on both surfaces (especially so beneath) rather densely clothed with appressed white hairs, more or less tinged with purple (type) or green, 15-75 by 6-45 mm; petiole 3-10 mm. *Spikes* solitary or fascicled, partly in axils of ordinary leaves, partly in those of bracts and then often collected into a lax terminal spike or raceme with a well-developed terminal spike, cylindrical, usually with a conical apex, $\frac{3}{4}$ -5 cm long, more or less tinged with purple or sordidly white, rarely pure white. *Flowers* softly membranous, (♂) (♀); bracts and bracteoles ovate, mucronate, externally pilose but not very densely so, rarely glabrous, acute 1- $1\frac{1}{2}$ mm long. *Tepals* oblong, acute, externally pilose but not very densely so, 2- $2\frac{1}{2}$ mm long; 2 outer ones minutely mucronate. *Stamens* slightly more than half as long as perianth. *Style* totalling \pm $\frac{1}{2}$ mm; stigma entire or very slightly 2-lobed with rounded lobes. *Fruiting spike* very dense and rather thick, not easily

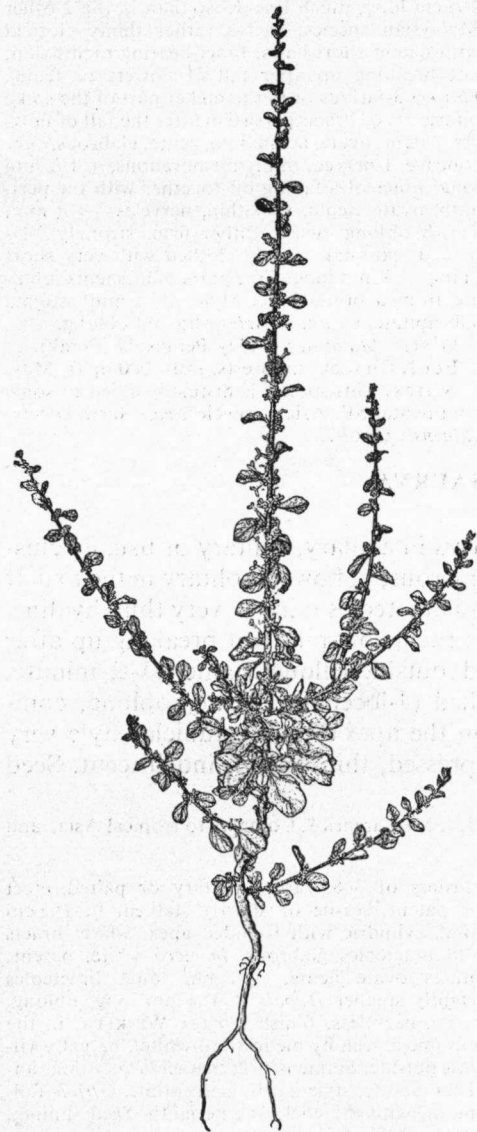


Fig. 5. *Aerva lanata* (L.) JUSS. from Java, $\times \frac{1}{5}$.

breaking up. *Utricle* fully 1 mm diam. Seed $\frac{3}{4}$ -1 mm diam., shining brownish black.

Distr. India to China, in *Malaysia*: Java (incl. Madura & Kangean), Celebes (incl. Saleier & Muna), Philippines, Moluccas, (Ambon, Tanimbar), Lesser Sunda Isl. (Lombok, Sumbawa, Flores, Timor).

Ecol. Especially in periodically dry areas, in Java 5-200 m, in sunny or moderately shaded dry localities, brushwood, hedges, neglected premises, locally often numerous. The purple-tinged typical form is sometimes cultivated for medicinal purpose.

Uses. The red-leaved form used internally against haematuria and irregular or painful menstruation (doctrine of the signature).

Vern. *Ki sambang, sambang tjalak.*

Notes. In the Kew-herbarium I found 2 abnormal specimens collected in 1884 by J. G. FR. RIEDEL in Timor Laut (=Tanimbar Archipelago; 131-132° E, 7-8° S), where also normal plants have been gathered. These abnormal specimens had paniculate short spikes of *deformed* hairy flowers; most of these were asexual and consisted of insufficiently differentiated bracts, bracteoles and tepals. But several flowers were pseudo-bisexual; stamens 5, at the base connate in a short cup; filaments alternating with short subulate pseudo-staminodes; anthers 2-celled (4-locellate); ovary much compressed, glabrous, empty; stigma capitate, entire. Leaves on both surfaces pubescent; inflorescence pubescent. They had been reported to represent *Nothosaerva brachiata* by HEMSLEY (Rep. Bot. Chall. Exp. 1, 3 (1884) 183).

3. *Aerva curtisii* OLIV. in HOOK. f. Ic. Pl. 23 (1892), t. 2201; RIDL. Fl. Mal. Pen. 3 (1924) 8; BURK. & HEND. in Gard. Bull. 3 (1925) 409.

Straggling herb, sometimes slightly woody at base, 30 cm of usually much more; stem rather robust, rather thinly pilose. *Leaves* opposite, oblong-lanceolate or lanceolate from a gradually narrowed acute base, very acute, herbaceous, on both sides (especially beneath) thinly clothed with patent, rather long thin hairs, 5-15 by 2-4 cm; petiole $\frac{3}{4}$ -2 cm. *Spikes* terminal or in higher forks of stem, racemed, umbellate or subpaniculate on a 1-2½ cm common peduncle, erect or patent, 1-4½ cm long, much less dense than in the 2 other Malaysian species; rachis rather thinly clothed with patent short hairs; bract-bearing rachis thin, not breaking up after fall of flowers or fruits. *Flowers* 3-farious or in the higher part of the spike bifarious, ♂, bracts persistent after the fall of flowers, patent, ovate, acuminate, acute, glabrous, very concave, 1-nerved, thinly membranous, $\pm 1\frac{1}{2}$ mm long; bracteoles falling off together with the perianth, ovate, acute, very thin, nerveless, ± 1 mm. *Tepals* oblong, acute, rather firm, strongly 3-5-nerved, externally thinly clothed with very short hairs, ± 3 mm long. Free parts of filaments subulate from a broad base. Style $\pm \frac{1}{2}$ mm; stigma subcapitate, entire. *Utricles* obovoid-oblong.

Distr. *Malaysia*: Malay Peninsula (Perak).

Ecol. On rocks in forests, 150-1000 m, fr. May.

Notes. This species is distinctly allied to some continental SE. Asiatic species, e.g. *Aerva cochinchinensis* GAGN.

9. NOTHOSAERVA

WIGHT, Icon. 6 (1853) 1.

Erect annual herb. *Leaves* opposite. *Flowers* in axillary, solitary or usually clustered, very dense, short spikes, minute, 3-5-merous, ♀; flowers solitary in the axil of a bract, subtended by 2 bracteoles; bracts and bracteoles minute, very thin, hyaline, persistent till after fall of fruiting perianth; rachis of spike not breaking up after fruiting. *Tepals* free acute, hyaline, 1-nerved, outside villous. Stamens 1-2, minute, free; no pseudo-staminodes; anthers 2-celled (4-locellate). Ovary oblong, compressed, glabrous; ovule 1, pendulous from the apex of a long funicle; style very short, stigma capitate, entire. *Utricle* compressed, thin-walled, indehiscent. Seed lenticular.

Distr. Monotypic, distributed through tropical Africa, Mascarenes & Comores to tropical Asia, and possibly *Malaysia*.

1. *Nothosaerva brachiata* (L.) WIGHT, Icon. 6 (1853) 1; HOOK. f. Fl.Br. Ind. 4 (1885) 726; HUB. WINKL. in Bot. Jahrb. 49 (1913) 366; MERR. En. Born. (1921) 246.—*Illecebrum brachiatum* LINNÉ, Mant. (1767) 23.—*Aerva brachiata* MART. Beitr. Amar. (1825) 83, no 3; MOQ. in DC. Prod. 13, 2 (1849) 304; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1040.

Stem usually much branched, often so from near the base, 0.10-0.60, glabrous. *Leaves* elliptic or ovate-elliptic from an acute base, obtuse or acute, minutely mucronate, thinly herbaceous, green, quite glabrous, 2-5 by $\frac{1}{2}$ -2 cm; petiole 4-8 mm. *Spikes* very numerous, for the greater part in

clusters of 3-8, rarely solitary or paired, erect or patent, sessile or shortly stalked, $\frac{1}{2}$ -1½ cm long, cylindrical with rounded apex, white; bracts and bracteoles glabrous, *in sicco* white, patent; bracts ovate acute, ± 1 mm long; bracteoles slightly smaller. *Tepals* $\pm 1\frac{1}{4}$ mm long, oblong, acute, nerveless, bluish red (*ex* WINKLER; in the specimens seen by me *in sicco* white), patently villous outside. Stamens 1-2; filaments very thin, anthers minute, style hardly perceptible. *Utricle* falling off with the enclosing perianth. Seed shining, brownish black, $\pm \frac{3}{4}$ mm diam.

Distr. Trop. Africa & Mascarenes to SE. Asia,

in *Malaysia*: SE. Borneo (between Kuma and Salingahu, fls bluish rosa, HUB. WINKLER 2950, fl. July).

Notes. I have not seen WINKLER's number which is the sole record in *Malaysia*. Neither have I seen a specimen with hairy stems or leaves. This species is sometimes confused with *Aerva lanata* (L.) JUSS. which may be easily distinguished by the

distinct hairiness of the stem and leaves and the manifestly bifid, longer style.

The specimens cited by HEMSLEY (Rep. Bot. Chall. 1, 3 (1884) 183) are abnormal plants and have proved to belong to *Aerva sanguinolenta* (L.) BL.

10. CENTROSTACHYS

WALL. in ROXB. Fl. Ind. 2 (1824) 497.

Aquatic herb. *Leaves* opposite, petioled, entire, herbaceous. *Flowers* ♂, spicate; spikes terminal, erect many-flowered, at last elongate; only few flowers open at the same time. Flowers solitary in the axil of a thin bract, subtended by 2 membranous bracteoles, after anthesis deflexed. *Tepals* 5, spreading during anthesis; before and after anthesis erect, firmly membranous, after anthesis hardened at base; outermost one rigid, pungent, 1-nerved; others distinctly shorter, plurinerved. Stamens 5, much shorter than perianth, at the base connate in a short cup, alternating with short, cuneate pseudo-staminodes; these dorsally, just below the truncate or subdentate top, with a fimbriate scale much surpassing them. Anthers oblong, 2-celled (4-locellate). Ovary glabrous; ovule 1, pendent from a long funicle; stylefiliform, short, persistent; stigma capitate. *Utricle* ovoid, thin-walled, indehiscent; seed erect.

Distr. Monotypic, from trop. Africa to SE. Asia, Java and Norfolk Island ($\pm 168^\circ$ E, 29° S).

1. *Centrostachys aquatica* (R.Br.) WALL. Cat. (1829) 6932, *nomen*; MOQ, in DC. Prod. XIII, 2 (1849) 321; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1043.—*Achyranthes aquatica* R.Br. Prod. (1810) 417; ROXB. Fl. Ind. ed. CAREY (1832) 673; HOOK. f. Fl. Br. Ind. 4 (1885) 730; KOORD. Exk. Fl. 2 (1912) 149; GAGN. in Fl. Gén. I. C. 4 (1936) 1073.

Stem floating or ascending, rooting, terete, thick, striate-ribbed, densely appressed pubescent, medullate, 0.75–1.50 m long. *Leaves* oblong-lanceolate from an acute base, acuminate, acute, $7\frac{1}{2}$ –15 by 2–3 cm, on both surfaces clothed with appressed long, white hairs; indumentum of young leaves very dense, growing thinner with age; petiole 1–3 cm. *Spikes* erect, $7\frac{1}{2}$ –45 cm; rachis rather densely appressed pilose; bracts, bracteoles and flow-

ers glabrous; flowers at first crowded, afterwards remote; bracts soon reflexed, ovate, acuminate, 3–4 mm; bracteoles embracing together the foot of the perianth, broadly ovate-orbicular, very concave, 3– $3\frac{1}{2}$ mm diam. Outermost tepal with very narrow transparent margins and a firm, slightly recurved, subulate tip, 6–8 mm long; other ones with broader transparent margin 5–7 mm long. Filaments (staminal cup included) 2–3 mm long; anthers $1\frac{1}{4}$ – $1\frac{1}{2}$ mm. Style $1\frac{3}{4}$ – $2\frac{1}{2}$ mm. *Utricle* (not seen) rather acute, ± 4 mm long.

Distr. Trop. Africa to SE. Asia, in *Malaysia*: E. & Central Java.

Ecol. In Central Java at 450, in E. Java at 20 m, in swampy or inundated localities, locally abundant but, on the whole, very rare.

11. ACHYRANTHES

LINNÉ, Sp.Pl. 1 (1753) 20.

Erect or ascending terrestrial herbs. *Leaves* opposite, petioled, entire, herbaceous. *Flowers* ♀ spicate. Spikes terminal or axillary, erect, many-flowered, at last elongate; only few flowers open at the same time; flowers solitary in the axil of an acuminate, acute, membranous, persistent bract, subtended by 2 bracteoles, after anthesis deflexed; bracteoles consisting of a rather long spine bearing on either side of its thick concave base a much shorter, membranous nerveless wing. *Tepals* 5, spreading during anthesis, before and after anthesis erect, membranous or herbaceous-coriaceous, 1- or more-nerved, very acute, in fruit pungent or not. Stamens 5, much shorter than the perianth; filaments at the base connate in a short cup, alternating with short broad pseudo-staminodes; anthers oblong, 2-celled (4-locellate). Ovary glabrous; ovule 1, pendent from a long funicle; style filiform, short, persistent; stigma capitate. *Utricle* falling off together with perianth and bracteoles,

by means of bracteoles or tepals easily adhering to passers-by, ellipsoid with truncate or depressed apex, thin-walled, indehiscent. Seed erect.

Distr. Few spp., mostly in the Old World, often introduced.

Notes. In Malaysia transitions between the 2 species described below have not yet been found.

KEY TO THE SPECIES

1. Back of the pseudo-staminodes just below the apex with a long-fringed scale much surpassing the pseudo-staminode itself. Basal wings of the bracteoles (*when not damaged*) adnate throughout their length to the spine, 1 $\frac{1}{4}$ –2 mm long 1. *A. aspera*
1. Back of the pseudostaminodes without a scale. Basal wings of the bracteoles inserted on the thick base of the spine, otherwise free from it, $\frac{1}{2}$ –1 $\frac{1}{4}$ mm long 2. *A. bidentata*

1. *Achyranthes aspera* LINNÉ, Sp.Pl. (1753) 204; BLANCO, Fl. Filip. (1837) 188, ed. 2 (1845) 133; ed. 3, 1 (1877) 239; MOQ. in DC. Prod. 13, 2 (1849) 314; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1042; Suppl. (1860) 365; BTH. Fl. Austr. 5 (1870) 240; HOOK. f. Fl. Br. Ind. 4 (1885) 730; BOERL. Ned. Kruid. Arch. II, 5 (1891) 421; KOORD. Minah. (1898) 563; BAILEY, Queensl. Fl. pt 4 (1901) 231; KOORD. Exk. Fl. 2 (1912) 199; MERR. Interpr. Herb. Amb. (1917) 214; EN. BORN. (1921) 246; EN. PHILIP. Fl.Pl. 2 (1923) 31; DOMIN, Beitr. Pflanzengeogr. Austr. (1929) 638; RIDL. Fl. Mal. Pen. 3 (1924) 8; HEYNE, Nutt. Pl. (1927) 607; BACKER, Onkr. Suiker. (1930) 228, Atl. t. 238; OCHSE & BAKH. v. D. BR. Veget. (1931) 40, fig. 7; GAGN. in Fl. I.C. 4. (1936) 1071.—*Achyranthes canescens* R.BR. Prod. (1810) 417; MOQ. l.c. 315; HASSK. Pl. Jav. Rar. (1848) 412.—*Achyranthes argentea* DECNE in Nouv. Ann. Mus. 3 (1834) 372; SPAN. in Linnaea 15 (1841) 345.—*Achyranthes grandifolia* MOQ. l.c. 313; MIQ. l.c. 1042.

Erect rather stiff herb $\frac{1}{4}$ –1 $\frac{1}{4}$ m high, usually branched from near the base; branches obliquely erect or ascending; stem angular-ribbed, thickened above the nodes, hard, more or less densely hairy. Leaves oval-obovate or elliptic-oblong, from an acute or obtuse base, acuminate or not, acute, obtuse or rounded, entire, flat or more or less wavy, more or less densely hairy or, barring the nerves, glabrous or subglabrous, $\frac{1}{2}$ –10 cm by $\frac{3}{4}$ –5 $\frac{1}{4}$ cm; petiole $\frac{1}{2}$ –1 $\frac{1}{2}$ cm. Spikes terminal, erect, 10–75 ($\frac{1}{2}$ –15 cm peduncle included); rachis rather robust, stiff, angular-ribbed, more or less densely clothed with appressed or more or less patent, rather long white hairs; bracts long-acuminate, not pungent, 2–3 $\frac{1}{2}$ mm long, before anthesis erect, afterwards spreading, at last quite reflexed as often is the fruiting perianth also, \pm silvery; bracteoles appressed against base of perianth. Spines 2 $\frac{3}{4}$ –4 $\frac{1}{2}$ mm, shining, often tinged with purple, sharp; basal wings almost throughout their length adnate to spine but most easily separating from it, 1 $\frac{1}{4}$ –2 mm long. Tepals ovate-lanceolate, very acute, green with pale margins, with 3 or more rather strong nerves, during anthesis 3 $\frac{1}{2}$ –5 $\frac{1}{2}$ mm long, afterwards up to 4 $\frac{1}{2}$ –6 $\frac{1}{2}$ mm, hardening and becoming pungent. Filaments (staminal cup included) 2 $\frac{1}{4}$ –3 $\frac{1}{2}$ mm; pseudo-staminodes truncate or crenulate, just below the apex with a dorsal long-fringed scale far exceeding the top of the pseudo-staminode itself; ovary turbinate; style 1–2 mm. Utricle rounded at the base, 2 $\frac{1}{2}$ –2 $\frac{3}{4}$ mm long.

Distr. Ubiquitous, in Malaysia: throughout the

Archipelago, possibly not truly indigenous in Malaysia.

Ecol. Sunny dry localities especially in regions with a well-marked dry monsoon: road-sides, waste places, a typical ruderal, 1–2300 m.

Uses. Rubbed on the body of young children against convulsions.

Vern. *Djarong*, *njarong*, etc.

Notes. In Journ. Ind. Bot. Soc. 11 (1932) 335 A. C. JOSHI describes and figures a case of dedoublement of stamens in this species.

2. *Achyranthes bidentata* BL. Bijdr. (1825) 545; MOQ. in DC. Prod. 13, 2 (1849) 312; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1040; BOERL. in Ned. Kruid. Arch. II, 5 (1891) 427; KOORD. Minah. (1898) 564; SCHUM. & LAUT. Fl. Deut. Sch. Geb. (1901) 306; KOORD. Exk. Fl. 2 (1912) 199; PULLE in Nova Guinea 8 (1912) 627; MERR. En. Philip. Fl.Pl. 2 (1923) 545; HEYNE, Nutt. Pl. (1927) 607; GAGN. in Fl. Gén. I.C. 4 (1936) 1072.—*Achyranthes javanica* MOQ. l.c. 312; MIQ. l.c. 1041.

Erect or ascending, rather flaccid herb, $\frac{3}{4}$ –1 $\frac{1}{2}$ m long; stem \pm quadrangular with longitudinally furrowed sides, often purple in higher part, thinly or moderately densely clothed with appressed or patent long, fine, white hairs. Leaves elliptic-oblong-lanceolate or ovate-lanceolate from an acute or obtuse base, long acuminate, on both surfaces thinly or moderately densely clothed with appressed or patent longish hairs, 5–20 by 1–8 cm; petiole $\frac{1}{2}$ –3 $\frac{1}{2}$ cm. Spikes terminal and in the higher leaf axils, 4–45 cm long (including 1–15 cm peduncle); rachis rather thin and flaccid, often somewhat tortuous, rather densely clothed with appressed or more or less patent long white hairs; bracts long-acuminate, not pungent, 3–3 $\frac{1}{2}$ mm long, before anthesis erect, afterwards patent or reflexed; bracteoles appressed against base of perianth, often slightly recurved at the apex, very variable in length, 2 $\frac{1}{2}$ –5 $\frac{1}{2}$ mm, basal wings inserted on the thick base of a spine, otherwise free, erect or more or less patent, $\frac{1}{2}$ –1 $\frac{1}{4}$ mm long. Tepals (midrib excepted) thinly membranous and nerveless, very acute, during anthesis often violet, often distinctly unequal, variable as to length, 4 $\frac{1}{2}$ –7 mm, not becoming pungent. Filaments (staminal cup included) 2–2 $\frac{1}{2}$ mm long; pseudo-staminodes truncate, entire or mostly irregularly dentate, without dorsal scale. Style $\frac{1}{2}$ –2 mm. Utricle subtruncate, 2–2 $\frac{1}{2}$ mm long.

Distr. Tropical Africa and Asia, in Malaysia:

Sumatra, Java, Celebes, Philippines, Moluccas, Lombok and New Guinea.

Ecol. Throughout Java, 350–2500 m, in forests and well-shaded localities, often abundant along trails under everwet conditions.

Uses. Internally used as an anthelmintic; masti-

cated against malignant ulcers of the cavity of the mouth.

Notes. It is remarkable that this species has not yet been collected in the Mal. Peninsula, Borneo and most of the Lesser Sunda Islands. Unlike *A. aspera* it is certainly indigenous in Malaysia.

Excluded

Achyranthes linearifolia Sw. in WIKSTRÖM, Vet. Akad. Handl. Stockholm för 1825 (1826) 428 (not: 48) is quoted by Ind. Kew. as described from the Moluccas. It came from St Barthélemy, E of Porto Rico, in the West Indies, as I was kindly informed by Dr FLORIN.

Achyranthes spiciflora BURM. f. Ind. Alt. Herb. Amb. (1769) 5; non *ibid.* 203; PENNANT, Outl. of

the Globe 4 (1800) 257 is based on *Cauda felis agrestis* RUMPH. Herb. Amb. 4, p. 84. According to MERRILL (J. Arn. Arb. 29 (1948) 188) this is *Acalypha amentacea* ROXB. (*Euph.*).

Achyranthes hispida PENNANT, l.c. is according to MERRILL, l.c., *Acalypha hispida* BURM. f. Fl. Ind. (1768) 303, pl. 61, f. 1 (*Euph.*).

12. PTILOTUS

R. BR. Prod. (1810) 415.

Annual herbs. *Leaves* alternate, entire, often narrow. *Flowers* ♂, terminal, in globular conical or cylindrical dense heads or short spikes, solitary in the axil of a bract, subtended by 2 bracteoles; bracts and bracteoles scarious; *tepals* free or at the base shortly connate, usually dimorphous, after anthesis indurated at the base or not, glabrous or clothed on the back with denticulate, often long hairs, inside glabrous or woolly. Stamens 5; filaments free or connate in short cup, with or without interposed, small, translucent pseudo-staminodes, all perfect or 1–2 sterile. Anthers 2-celled (4-locellate). Ovary sessile or shortly stalked, glabrous or hairy; ovule 1, pendent from basal erect long funicle; style central or slightly excentric, long, thin; stigma capitate. *Utricle* enclosed by perianth, indehiscent. Seed vertical, sometimes arillate.

Distr. If united with *Trichinium*, which is now almost universally done, this large genus is practically confined to Australia and Tasmania, in *Malaysia*: one Australian species.

Ecol. Mainly confined to semi-arid regions.

1. *Ptilotus conicus* R. BR. Prod. (1810) 415; MOQ. in DC. Prod. 13, 2 (1849) 282; BTH. Fl. Austr. 5 (1870) 242; BAILEY, Queensl. Fl. pt 4 (1901) 1222.—*Ptilotus corymbosus* (non R. BR.), BLUME, Bijdr. (1825) 543; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1036.—*Ptilotus amabilis* SPAN. in Linnaea 15 (1841) 345, ic. ined. 59 in *Herb. Lugd. Bat.*—*Ptilotus conicus* var. *timorensis* ENGL. Bot. Jahrb. 7 (1885) 454.

Stem erect, 40–60 cm high, slender, glabrous, often already quite near the base divided into ascending main-branches, in higher part with erecto-patent branchlets. *Leaves* rather distant, narrowly linear, acute, with (*in sicco*) recurved margins, glabrous, 2–5 cm by 1/2–2 1/2 mm. *Heads* in higher portion of plant loosely panicleate-corymbose, at first globular, ± 3/4 cm diam., growing more cylindrical with age, finally up to 1 1/2 cm long; bracts and bracteoles with short acicular tips, 1-nerved, 2 1/2–3 1/2 mm long, persistent after the fall of perianth; flower-axis articulated above the bracteoles. *Tepals* shortly united at the base, purple, ± 4 1/2 mm long; 2 outer ones elliptic,

outside at base with dense tuft of erecto-patent long hairs, otherwise glabrous, 3–3 1/2 mm long; 3 inner ones with an erect, narrowly cuneate, 3-nerved claw and a slightly longer and (at the base) broader, ovate-oblong, 1-nerved, patent blade; claw along either margin densely clothed with intricate, long, thin, dentate hairs. Perfect stamens 5, glabrous, ± 4 1/2 mm, filaments narrowly ligular, at base connate into a short cup; free parts tapering upwards but at 3/4–1 mm below top abruptly broadened into a subcircular disk, above this dilatation much contracted, filiform; anthers short; no pseudo-staminodes. Style glabrous, ± 2 1/2 mm. *Utricle* narrowly ovate compressed, ± 2 1/2 mm.

Distr. N. Australia (Gulf of Carpentaria), in *Malaysia*: Lesser Sunda Islands (Flores, Roti, Timor, Wetar), and S. Moluccas (Tanimbar, Key); a distinct Australian element in the Malaysian flora.

Ecol. Apparently confined to open country in periodically dry regions, at low alt., in Timor on calcareous hills.

13. PSILOTRICHUM

BLUME, Bijdr. (1825) 544.

Dwarf shrubs or herbs. *Leaves* opposite, entire. *Flowers* ♀, in terminal or axillary

heads or narrow spikes, solitary in the axil of a bract, subtended by 2 bracteoles. *Tepals* 5, free, narrow, strongly longitudinally plurinerved, membranous, after anthesis indurate or not. Stamens 5, filaments \pm unequal, at the base connate in a short cup; anthers small, 2-celled (4-locellate); no pseudo-staminodes. Ovary ellipsoid or globose; ovule 1, pendulous from a long erect funicle; style thin; stigma capitate. *Fruit* enclosed by the perianth, thin-walled, indehiscent; seed erect, lenticular.

Distr. About 14 *spp.* in Africa, SE. Asia and Malaysia, centering in Africa.

1. *Psilotrichum ferrugineum* (ROXB.) MOQ. in DC. Prod. 13, 2 (1849) 279; HOOK. *f.* Fl. Br. Ind. 4 (1885) 725.—*Achyranthes ferruginea* ROXB. Fl. Ind. ed. WALL. 2 (1824) 502.—*Psilotrichum trichotomum* BLUME, Bijdr. (1825) 545; MOR. Syst. Verz. (1845/6) 73; HASSK. Pl. Jav. Rar. (1848) 419; MOQ. l.c. 280; HASSK. in Pl. Jungh. (1852) 130 (*sphalm. tricholonum*); ZOLL. Syst. Verz. (1854) 109; HOOK. *f.* Fl. Br. Ind. 4 (1885) 725; KOORD. Exk. Fl. 2 (1912) 199; MERR. En. Born. (1921) 246; En. Philip. 2 (1923) 131; RIDL. Fl. Mal. Pen. 3 (1924) 8; BACKER, Onkr. Suiker. (1930) 227, Atl. t. 237; GAGN. in Fl. Gén. I.C. 4 (1936) 1066.—*Leiospermum ferrugineum* WIGHT, l.c. (1843) 721.—*Ptilotus trichotomus* MIQ. Fl. Ind. Bat. 1, 1 (1858) 1037.—Fig. 6.

Annual, erect or ascending, often much branched from near the base, 5–50 cm long, in sunny localities often strongly tinged with purple; stems thin, in the leaf axils and on the young nodes often \pm hairy, otherwise glabrous; pairs of leaves often distant. *Leaves* patent, variable in shape, lanceolate, oblong, elliptic or obovate, minutely mucronate, rather fleshy in a living state, glabrous, $\frac{3}{4}$ – $7\frac{1}{2}$ by $\frac{1}{2}$ –2 cm; petiole 3–10 mm. *Spikes* usually terminal or in forkings of stem, sometimes also axillary, solitary or rarely paired, sessile or on thin and often rather long peduncles, at first shortly conical, afterwards lengthened, rather acute, dense, 1– $2\frac{1}{2}$ cm long; rachis pilose; lowest fruits often falling off before expansion of the highest flowers; bracts and bracteoles thinly membranous; bracts widely patent or subreflexed, ovate-lanceolate, concave, very acute, $1\frac{1}{4}$ – $1\frac{1}{2}$ mm long, persistent; bracteoles ovate-triangular, nerveless, $\frac{1}{2}$ – $\frac{3}{4}$ mm long, falling off together with the perianth and the fruit. *Perianth* much longer than the bract and the bracteoles. *Tepals* lanceolate, very acute, throughout their width with 3–5 strong longitudinal nerves, glabrous, 2– $2\frac{1}{2}$ mm long, not or hardly indurate after anthesis. Filaments very thin, $\frac{1}{2}$ – $\frac{3}{4}$ mm long (cup included). Style $\frac{1}{2}$ – $\frac{2}{5}$ mm, persistent. *Utricle* ellipsoid, compressed-pellucid but opaque at the apex, 1– $1\frac{1}{2}$ mm long. Seed vertical, shining black or blackish brown, \pm 1 mm long or slightly longer.

Distr. SE. Asia, in *Malaysia*: throughout the Archipelago, not yet reported from the Lesser Sunda Islands and the Moluccas.

Ecol. Humid clayey fields, along ditches and trenches, locally often numerous, 5–1200 m, on the whole not a very common species.

Notes. The shape of the leaves is very variable.

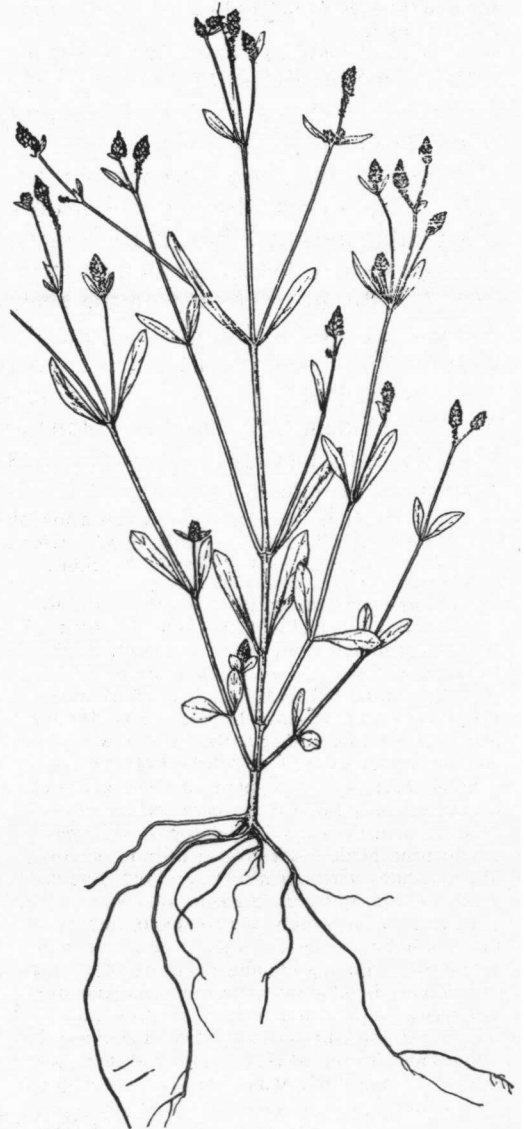


Fig. 6. *Psilotrichum ferrugineum* (ROXB.) MOQ. from Java, $\times \frac{1}{3}$.

14. ALTERNANTHERA

FORSK. Fl. Aeg.-Arab. (1775) 28.

Annual or perennial, erect, ascending, trailing, creeping, floating or clambering herbs, often hairy; hairs dentate or smooth. *Leaves* opposite, entire. *Flowers* ♂ or by malformation ♀, in axillary or rarely terminal, sessile or peduncled heads or short spikes, solitary in axil of bract, subtended by 2 bracteoles; bracts and bracteoles scarious. *Perianth* often dorsally compressed. *Tepals* 5, free, equal or unequal, glabrous or hairy. *Stamens* normally 2-5, sometimes partly anantherous; filaments at the base united in a tube or a short cup; free part short, usually alternating with (sometimes very minute) pseudo-staminodes; anthers small, 1-celled (2-locellate); pseudo-staminodes entire, dentate or lacinate. *Ovary* compressed or not; ovule 1, pendulous from a long funicle; style short; stigma capitate. *Utricle* indehiscent, sometimes corky, falling off with the perianth and with or without the bracteoles. Seed vertical.

Distr. Large genus, centering in America, some species in other parts of the World, in *Malaysia*: 6 species, of which 1 indigenous (one variety endemic); the 5 others introduced from trop. America. Three of these are naturalized and, often on a large scale, locally firmly established. The other two are cultivated.

Uses. The gregarious matted growth of some species is sometimes used for protecting soils from rain-wash. Others are cultivated for ornamental purposes.

Notes. In some species the hairs are, under the microscope, smooth, in others they are minutely but distinctly dentate. This neglected character is of importance for specific delimitation; it proved constant in the Malaysian species treated here.

KEY TO THE SPECIES

1. Heads all sessile (after the fall of the lower flowers often *seemingly* stalked, but in this case the spurious peduncle is at once recognized as the rachis of the head by the presence of bracts). Perianth sessile between the bracteoles. Filaments at the base united in a *very short* cup.
2. Bracts and tepals not spinescent.
3. All tepals 1-nerved, or only at the very base obscurely 3-nerved, not with indurate bases. Bracts not or shortly acuminate. Anthers 3, oval or oblong. Pseudo-staminodes minute, entire, perhaps sometimes wanting. *Leaves* green. *Hairs* smooth.
4. Leaves variable as to shape but *not* narrowly linear-filiform, $\frac{3}{4}$ -15 by $\frac{1}{4}$ -3 cm 2. *A. sessilis*
4. Leaves *very* narrowly linear-filiform, 2-6 cm by $\frac{1}{2}$ -2 mm 2. *A. sessilis* var. *tenuissima*
3. Three outer tepals in their lower $\frac{1}{3}$ - $\frac{1}{2}$ distinctly 3-nerved, their bases at last indurate. Bracts rather long-acuminate. Anthers 5, linear, 1-2 of them sometimes shorter than the others. *Leaves* often coloured. *Hairs* dentate 3. *A. ficoides*
2. Bracts and 2 outer tepals with *spinescent* tips. Entire head conspicuously prickly. Stems trailing or creeping. *Hairs* dentate 1. *A. repens*
1. Heads usually borne on a distinct bractless peduncle (if sessile then the perianth is 5-7 mm long!). Filaments united at the base into a *distinct tube*. Pseudo-staminodes distinct, divided into narrow apical straps.
5. Stems solid, their young parts hairy all round; hairs minutely dentate. Bracts, bracteoles and perianth hairy. *Leaves*, when not too old, densely appressed-hairy all over the lower surface. Not aquatic.
6. Perianth yellowish-white, placed between the bracteoles on a short but distinct stalk, falling off together with this stalk. Top of the bracteoles with a distinct dorsal hairy crest. Bracts with a rather long mucro. Robust plant 5. *A. brasiliana*
6. Perianth red, sessile between the bracteoles. Bracteoles not crested. Bracts with a very short mucro or without one 6. *A. porrigens*
5. Stems in their lower part fistulose. Leaf axils with white smooth hairs, on two opposite sides with a longitudinal hairy groove, otherwise glabrous. Plant of very humid localities, often growing in shallow water 4. *A. philoxeroides*

1. *Alternanthera repens* (L.) STEUD, Nomencl. ed. 2, 1 (1840) 65; O.K. Rev. Gen. 2 (1891) 540; ASCH. & GR. Syn. 5, 1 (1914) 362; BACKER, Onkr. Suiker. (1930) 229, atl. t. 239.—*Achyranthes repens* LINNÉ, Sp.Pl. (1753) 205.—*Illecebrum achyrantha* LINNÉ, Sp.Pl. ed. 2. (1762) 299.—*Alternanthera achyrantha* R.BR. Prod. (1810) 417; MOQ. in DC.

Prod. 13, 2 (1849) 358; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1049; BACKER, Bull. J.B.B. II, 12 (1913) 7.

Prostrate herb, often rooting; taproot robust; stem terete, hard, on the younger parts densely clothed with appressed, minutely dentate, white hairs, 10-50 cm long. *Leaves* elliptic-obovate, narrowed into the petiole, with an obtuse or rounded

top, on the upper surface glabrous or thinly appressed-pilose, on the lower surface glabrous or on the nerves appressed-pilose, $1\frac{1}{4}$ – $4\frac{1}{2}$ by $\frac{1}{3}$ – 2 cm, in a single pair often of very unequal size; petiole 2–10 mm. Heads 1–3 in the leaf-axils, sessile, globose or oblong, white, $\frac{1}{2}$ – $1\frac{1}{2}$ cm long; bracts spine-tipped, ± 4 mm (including spine); bracteoles acuminate, very acute but not spinous, 3–4 mm long. *Tepals* very unequal: 2 abaxial ones much larger than the others, convex, spine-tipped, ± 5 mm long, above base right and left with hair-tuft, in the lower half with 3 upwards confluent nerves, hardening after anthesis; adaxial tepal rather flat, oblong, dentate near tip, mucronate, not spiny, at base right and left with hair-tuft, $\pm 3\frac{1}{2}$ mm long, two inner tepals much smaller than the others, their lower halves very concave, embracing the ovary and afterwards the fruit, on the middle of their back with a patent hair-tuft. Stamens 5, all perfect; filaments (basal cup included) $\frac{1}{2}$ – $\frac{3}{4}$ mm; anthers oblong, minute; pseudo-staminodes much shorter than filaments, broad, entire, emarginate or irregularly dentate. Style very short. *Fruit* falling off with perianth and bracteoles, broadly oval, much compressed, truncate or retuse, brown $\pm 1\frac{1}{2}$ mm long.

Distr.—Native of trop. America, introduced in Java, collected there for the first time in 1912, now established in some waste places on and near the northern coast, at low altitude, locally abundant, but on the whole still rare.

Notes. The specimen mentioned by BURMAN *f.* in his *Fl. Ind.* (1768) 66 as *Illecebrum achyranthes*, and conserved at Geneva in Herb. DELESSERT, is *Alternanthera sessilis*.

2. *Alternanthera sessilis* (L.) R.Br. *ex R.* & S. *Syst.* 5 (1819) 554; MOQ. in DC. *Prod.* 13, 2 (1849) 357; MIQ. *Fl. Ind. Bat.* 1, 1 (1858) 1048; HOOK. *f.* *Fl. Br. Ind.* 4 (1885) 731; O.K. *Rev. Gen.* 2 (1891) 540; KOORD. *Exk. Fl.* 2 (1912) 200; ASCH. & GR. *Syn.* 5, 1 (1914) 361; MERR. *Interpr. Herb. Amb.* (1917) 215; EN. *Born.* (1921) 246; EN. *Philip.* 2 (1923) 132; RIDL. *Fl. Mal. Pen.* 3 (1924) 10; BACK. & SLOOT. *Handb. Thee.* (1924) 109, t. 109; HEYNE, *Nutt. Pl.* (1927) 608; BACKER, *Onkr. Suiker.* (1930) 230, *Atl.* t. 241; GAGN. in *Fl. Gén. I.C.* 4 (1936) 1077.—*Gomphrena sessilis* LINNÉ, *Sp. Pl.* (1753) 225.—*Illecebrum sessile* BURM. *f.* *Fl. Ind.* (1768) 166.—*Illecebrum indicum* HOUTT. *Nat. Hist.* 2, 7 (1777) 713, t. 43, f. 3.—*Alternanthera triandra* LAMK. *Encycl.* 1 (1783) 95; BURK. *Dict.* 1 (1935) 116.—*Alternanthera denticulata* R.Br. *Prod.* (1810) 417; BLUME, *Bijdr.* (1825) 546; MIQ. *l.c.* 1048; BTH. *Fl. Austr.* 5 (1870) 249; HOOK. *f.* *l.c.* 731; BAILEY, *Queensl. Fl.* pt 4 (1901) 1233, *DOMIN.* *Beitr. Pflanzengeogr. Austr.* 1, 2 (1929) 639.—*A. nodiflora* R.Br. *Prod.* (1810) 417; MIQ. *l.c.* 1047; BTH. *l.c.* 249; BAILEY, *l.c.* 1233; KOORD. *Exk. Fl.* 2 (1912) 200; DOMIN, *l.c.* 639.—*Achyranthes villosa* (non FORSK.) BLANCO, *Fl. Filip.* (1837) 189; ed. 2 (1845) 134; ed. 3, 1 (1877) 240.—*Adenogramma oppositifolia* HASSK. in *Flora* 31 (1851) 754.—*Fig. 7.*

Herb, perennial or under unfavourable circum-

stances short-lived, often pluricaulous, 10–100 cm long; taproot robust; stem either erect, ascending or creeping and solid, (or, in inundated localities, floating and in the lower part fistular), green or more or less tinged with purple, on 2 opposite sides with a longitudinal row of hairs, across the nodes



Fig. 7. Alternanthera sessilis (L.) R.Br. from Java, $\times 1/s$.

with a transverse row of hairs, otherwise glabrous; hairs articulate, smooth. *Leaves* variable as to shape and size, varying from linear-lanceolate via oblong to oval or obovate, acute at the base, acute, obtuse or rounded at the apex, green, glabrous or thinly and finely pilose, $\frac{3}{4}$ – $1\frac{1}{2}$ cm by $\frac{1}{4}$ – 3 cm, in wet localities comparatively large, in dry localities much smaller; petiole 1–5 mm. *Heads* 1–4 in the axil of present or fallen leaves, sessile but by the fall of lower flowers often spuriously peduncled, at first globose, growing more cylindrical with age, $\frac{1}{2}$ – $1\frac{1}{2}$ cm long; rachis densely white-hairy; bracts and bracteoles not or shortly acuminate, glabrous, white, persistent after the fall of the flowers; bracts $\frac{2}{3}$ – 1 mm; bracteoles 1 – $1\frac{1}{2}$ mm. *Tepals* shortly acuminate or not, glabrous or on the back with few or several hairs, white or purplish, shining (in a living state), 1-nerved or only at the very base obscurely 3-nerved, after anthesis not hardening in the lower part, $2\frac{1}{2}$ – 3 mm long. Filaments 5 of which only 3 antheriferous, $\pm \frac{3}{4}$ mm long (basal cup included); anthers oval-oblong, $\frac{1}{6}$ – $\frac{1}{4}$ mm; pseudo-staminodes subulate-filiform, entire, very minute, not exceeding filaments, often shorter. Style during anthesis very short, afterwards slightly

lengthened. *Fruit* falling off with the perianth, obreniform, deeply emarginate, *corky*, dark brown, glabrous, 2-2 $\frac{1}{4}$ by 2 $\frac{1}{2}$ -3 mm; lobes finally longer than the interposed style.

Distr. Throughout the Old World, in *Malaysia*: throughout the Archipelago.

Ecol. A common plant, $\frac{1}{2}$ -1250 m, in constant or periodically humid or even inundated, open localities: fallow rice-fields, road-sides, gardens, shallow ditches, swamps, tea-plantations. Fruits often floating in great quantities upon the water.

Uses. An infusion of the entire plant is used as a remedy against intestinal cramps and as a cooling hair-wash.

Vern. Dawn tolod, M, kremak, J.

Notes. The habit of the species varies exceedingly with the habitat.

var. tenuissima (Suess.) *comb. nov.*—*Alternanthera tenuissima* SUESSENGUTH in Bot. Arch. 39 (1939) 382.

Leaves from a narrowed base very narrowly linear or almost filiform, acute, shortly mucronate, with a strongish midrib, when very young sparsely beset with longish white hairs, soon becoming glabrous, 2-6 cm by $\frac{1}{2}$ -2 mm. Pseudo-staminodes not found.

Distr. Malaysia: NE. New Guinea (Morobe distr., CLEMENS 6339).

Ecol. The only collection known was made in a garden, as a weed, at c. 1800 m alt.

Notes. In contrast to SUESSENGUTH who says that it is not closely allied to any Malaysian species, I find this aberrant form in all *essential* characters agreeing with *A. sessilis* from which it differs only by the peculiar shape and width of the leaves. It might be an etiolated or depauperated form.

A specimen closely resembling this variety was figured by DOMIN (*l.c.*) under the name of *A. nodiflora* R.Br. from Queensland.

3. *Alternanthera ficoides* (L.) R.Br. *ex R. & S. Syst.* 5 (1819) 555; MERR. *En. Philip. Fl. Pl.* 2 (1923) 131.—*Gomphrena ficoidea* LINNÉ, *Sp. Pl.* (1753) 235.—*Gomphrena polygonoides* LINNÉ, *Sp. Pl.* (1753) 225, *ex parte.*—*Alternanthera polygonoides* R.Br. *Prod.* (1810) 416; ASCH. & GR. 5, 1 (1914) 364.—*Teleianthera manillensis* WALP. in *Nov. Act. Ac. Nat. Cur.* 19 (1843) Suppl. 1, 404.—*Telanthera polygonoides* Moq. in *DC. Prod.* 13, 2 (1849) 363.

var. betzickiana (NICH.) *comb. nov.*—*Alternanthera betzickiana* NICH. *Gard. Dict. ed.* 1 (1884) 59; ASCH. & GR. *Syn.* 5, 1 (1914) 365.—*Alternanthera amoena* (non Voss.?) BACK. & SLOOT. *Handb. Thee.* (1924) 108, t. 108; HEYNE, *Nutt. Pl.* (1927) 608.

Perennial herb, 20-50 cm high; stem erect or at the base for a greater or smaller part decumbent and rooting, often much branched and forming dense tufts, terete in the lower part, quadrangular upwards, on 2 opposite sides with a longitudinal furrow, appressed-pilose at the top and on the nodes. *Leaves* oblong, oblong-obovate or spatulate from an acute base, acute or obtuse, finely mucronate, often \pm crisp, not rarely entirely

green, but mostly in different ways variegated with brownish red, bright red, pink or yellow, when young clothed with fine dentate hairs, glabrescent, 1-6 by $\frac{1}{2}$ -2 cm; petioles 1-4 cm, \pm hairy. *Heads* terminal and axillary, often in dense clusters of 2-5, globular or oblong, $\frac{1}{2}$ -1 cm long; hairs of bracts, bracteoles and floral parts, when present, minutely dentate; rachis hairy; bracts and bracteoles rather long-acuminate, very acute, glabrous or on the back with long hairs; bracts 1 $\frac{3}{4}$ -3 mm; bracteoles 2-2 $\frac{3}{4}$ mm. *Perianth* often \pm difform and then consisting of more than 5 tepals; normal tepals white or yellowish, shiny; 3 outer ones in their lower $\frac{1}{3}$ - $\frac{1}{2}$ with 3 close-set strong, upwards convergent nerves; their bases finally indurate; 2 abaxial tepals ovate-oblong, 3-4 mm long, concave, in their lower halves rather densely patently pilose on the back; their upper halves acutely acuminate, glabrous; adaxial tepal ovate-oblong, faintly concave or almost flat, sparingly hairy or glabrous, 2 $\frac{3}{4}$ -3 $\frac{1}{2}$ mm long; 2 inner tepals very concave, narrower and shorter than the others, sparingly hairy or glabrous. Stamens (basal cup included) 1 $\frac{1}{4}$ -2 $\frac{1}{4}$ mm long; anthers 5, linear; 1-2 often somewhat shorter than the others and sterile; fertile ones $\frac{3}{4}$ -1 mm; pseudo-staminodes strap-shaped, reaching up to the middle or the top of the anthers, at the apex cleft into 3-5 very narrow strips. Ovary glabrous; style subconical rather thick \pm $\frac{1}{2}$ mm. *Utricle* in Java not developing (in typical *A. ficoides* faintly notched).

Distr. Native of Brazil, already long ago introduced into Java, in *Malaysia* (at least in Sumatra and Java) frequently cultivated as an ornamental plant, or in tea-plantations along the borders of terraces as a protector from rain-wash, for which purpose it is, by its densely tufted growth, eminently adapted, 1-2000 m.

Ecol. In *Malaysia* fruits are never produced.

Uses. See above.

Vern. Djoekoet selon (Ceylon-grass), ketjijtag abang, J.

Notes. A form of *A. ficoides* with entire, subulate pseudo-staminodes and shorter petioles has been collected in Banka, probably also in a cultivated state: *var. versicolor* (REGEL) BACK.

4. *Alternanthera philoxeroides* (MART.) GRISEB. in GOETT. *Abh.* 24 (1879) 36; O.K. *Rev. Gen.* 2 (1891) 540; KOORD. *Exk. Fl.* 2 (1912) 200; BACKER, *Onkr. Suiker.* (1930) 230, *Atl. t.* 240; OCHSE & BAKH. *v. d. Br. Veget.* (1931) 15, *f.* 10.—*Bucholzia philoxeroides* MART. *Beitr. Amar.* (1825) 107.—*Telanthera philoxeroides* Moq. in *DC. Prod.* 13, 2 (1849) 362; BACKER in *Ann. J.B.B. II, Suppl.* 3 (1909) 417.

Perennial herb, ascending from a creeping or floating, rooting base, often much branched and forming dense masses, $\frac{1}{2}$ -1 m long; stem fistular, in the leaf-axils with a transverse row of white, smooth hairs, on 2 opposite sides with a longitudinal hairy groove. *Leaves* oblong or oblong-obovate from a tapering base, acute or rather obtuse, submucronate, glabrous or ciliate, 2 $\frac{1}{4}$ -8" by $\frac{3}{4}$ -2 $\frac{1}{2}$ cm; petiole 3-6 mm. *Heads* terminal and ses-

sile, or usually axillary and then mostly peduncled, solitary, ovoid-globular-ellipsoid, $3/4-1\frac{1}{2}$ cm long; peduncle usually $1-4\frac{1}{2}$ cm, not rarely shorter, seldom almost wanting, on the adaxial side with a longitudinal hairy groove, otherwise glabrous; bracts and bracteoles 1-nerved, glabrous, white, persistent after fall of perianth; bracts ovate-triangular, $2-2\frac{3}{4}$ mm; bracteoles ovate, acuminate, very acute, $2\frac{1}{4}-2\frac{1}{2}$ mm. Perianth almost sessile above the bracteoles, dorsally compressed, shining white, glabrous, $5-7$ mm long. *Tepals* oblong, acute or rather obtuse, 1-nerved. Stamens in normal flowers (see beneath) 5; filaments $3\frac{1}{2}-4$ mm (including short staminal cup); anthers linear, $1-1\frac{1}{4}$ mm; pseudo-staminodes about as long as stamens, oblong-linear; their tips divided into a few narrow strips. Ovary shortly stalked, broadly obovate-cuneate, dorsally compressed, rounded at the apex; style short, thick. *Fruit* in Malaysia never produced.

Distr. Native of Brazil, introduced long ago in Java, in *Malaysia* found for the first time in 1875 near Batavia by O. KUNTZE, at present quite naturalized in many localities in W. Java, not yet recorded from elsewhere in Malaysia.

Ecol. In stagnant or slow-moving shallow water, pools, ditches, often gregarious. In Malaysia fruits are unknown.

Notes. In Java the stamens are very often replaced by as many sterile spurious ovaries surrounding the true ovary. This malformation was pictured and described by COSTERUS in Ann. Jard. Bot. Btzg 23 (1910) 12, t. III.

5. *Alternanthera brasiliana* (L.) O.K. Rev. Gen. 2 (1891) 537.—*Gomphrena brasiliana* LINNÉ, Moen. 4 (1759) 310.—*Alternanthera strigosa* HASSK. in Tijdschr. Nat. Gesch. & Phys. 5 (1838/9) 259; in Flora (1842) II lit. p. 19; Plant. Jav. Rar. (1848) 420.—*Telanthera strigosa* MOQ. in DC. Prod. 13, 2 (1849) 370; KOORD. Exk. Fl. 2 (1912) 201.—*Mogiphanes jacquinii* (non SCHRAD.) BOERL. Hand. Genees- & Nat. Congr. Leiden (1889) 148.—*Telanthera praelonga* (an MOQ. ?) BACKER in Ann. J.B.B. Suppl. 3 (1909) 416.

Perennial herb, decumbent at the base, higher up ascending-erect or clambering among and over other plants, often widely branched, $1\frac{1}{2}-3$ m high; all hairs minutely dentate; stem obtusangular or subterete, thickened and articulate above the nodes, on the younger parts densely clothed with appressed acroscopic long white hairs, gradually glabrescent. Pairs of leaves rather distant, blade ovate-lanceolate from a cuneate or contracted base, acuminate, acute, at first densely appressed pilose on both surfaces, slowly glabrescent, $3\frac{1}{2}-10$ by $3/4-4$ cm; petiole $1/2-1\frac{1}{4}$ cm. *Heads* terminal, often in bifurcations of the stem, solitary or rarely 2-3 together, stalked, at first hemispheric-ovoid and 6-8 mm diam., afterwards increasing in size, ovoid-oblong, 12-16 by 10-12 mm; stalks at first short, lengthening with age, finally 6-16 cm, more or less densely clothed with appressed acroscopic long white hairs; rachis densely hairy; bracts and bracteoles long-ovate, acuminate, acute, yellowish

white, 1-nerved; bracts $2\frac{1}{2}-3\frac{1}{4}$ mm, at first densely clothed with appressed long, white, for the greater part deciduous hairs; bracteoles considerably shorter than perianth, $3-3\frac{1}{2}$ mm, on back long-hairy; persistent. *Perianth* distinctly stalked between bracteoles, falling off with the stalk; stalk $1/2-3/4$ mm long, at base with a whorl of patent longish hairs, thick, with 5 longitudinal ribs; ribs strong, at the base thickened and shining (not glandular). *Tepals* oblong-lanceolate, acute, strongly 3-nerved, yellowish white, at first on back appressed long-hairy, gradually losing most hairs, 4-5 mm long. Filaments (staminal cup included) $2-2\frac{1}{2}$ mm; anthers linear, $1\frac{1}{2}-1\frac{1}{2}$ mm; pseudo-staminodes narrow, slightly longer than stamens, shortly dentate at apex. Ovary obovoid; style $1/3-1\frac{1}{2}$ mm. *Utricle* ellipsoid, its top on both sides of the style with an obtuse knob, $\pm 2\frac{1}{4}$ mm long.

Distr. Native of trop. America, introduced into Java more than a century ago, in *Malaysia*: at present naturalized in a wide circle around Buitenzorg, and also collected in Central Java, as yet not found in other islands.

Ecol. Moist, shaded localities, 200-600 m, steep ravine slopes, stream banks, locally often gregarious.

6. *Alternanthera porrigens* (JACQ.) O.K. Rev. Gen. 2 (1891) 538; ASCH. & GR. Syn. 5, 1 (1914) 366.—*Achyranthes porrigens* JACQ. Hort. Schoenbr. 3 (1798) 54, t. 350.—*Telanthera porrigens* MOQ. in DC. Prod. 13, 2 (1849) 377.

Erect or ascending with erecto-patent branches, $1/2-1\frac{1}{4}$ m high; all hairs minutely dentate; stems thin, firm; young parts densely clothed with appressed acroscopic rather long hairs. *Leaves* elliptic-oblong from an acute or contracted base, acute, mucronate, $1\frac{1}{2}-6\frac{1}{4}$ by $1/3-3\frac{1}{4}$ cm, at first on both surfaces densely clothed with appressed long hairs; hairs subsistent or those of upper surface gradually disappearing; petiole 2-10 mm. *Heads* terminal and near the tops of the branches also axillary, not very numerous, highest often in lax umbelliform inflorescences, often 2-3 together on a common peduncle and then 1-2 sessile; rest shortly peduncled; peduncle thin, firm, up to 10 cm long but often much shorter; axes of inflorescence and stalks of heads densely clothed with appressed acroscopic hairs; heads at first ovoid, afterwards more cylindrical, 6-15 by 4-6 mm; lowest flowers already fallen before expansion of highest; axis of head densely hairy; bracts acute or very shortly mucronate, ± 2 mm long, bracteoles very acute, densely hairy on back, $\pm 2\frac{1}{4}$ mm. *Perianth* sessile between the bracteoles, red, $3-3\frac{1}{2}$ mm long. *Tepals* oblong or ovate-oblong, 1-nerved, in lower half rather densely hairy on the back. Filaments (staminal cup included) $1\frac{1}{4}-2$ mm; anthers linear, $3/4-1$ mm; pseudo-staminodes strap-shaped, about as long as stamens, at top divided into a few narrow strips. Style $1/4-1\frac{1}{2}$ mm. *Fruit* broadly oblong, dorsally compressed, $1-1\frac{1}{4}$ mm long.

Distr. A native of Peru, in *Malaysia*: once found in West Java as an introduced ornamental, and already met with as a garden-escape, probably not fit for naturalization.

15. GOMPHRENA

LINNÉ, Sp.Pl. 1 (1753) 224.

Annual, or less often perennial herbs. *Leaves* opposite, sessile or on short petioles. *Flowers* ♀, in terminal, solitary, sessile or subsessile heads or short spikes; receptacle cylindrical or swollen. Flowers solitary in the axil of a persistent bract, subtended by 2 bracteoles; bracts and bracteoles scarious, glabrous; bracteoles erect, navicular, acute, often coloured, with or without dorsal crest, glabrous, falling off with perianth. Tepals 5, erect, free or nearly so, on back long-woolly. Stamens monadelphous; staminal tube long or short, shortly 5-lobed; free parts of filaments with or without intervening pseudo-staminodes, entire, retuse or distinctly 2-lobed; anthers introrse, 1-celled (2-locellate). Ovary compressed, glabrous; ovule pendulous from long erect funicle; style short or long; stigmas 2, erect or spreading, short, sometimes almost inconspicuous. *Utricle* compressed, indehiscent.

Distr. Large genus, centering in trop. America, some *spp.* native in Australia and SE. Malaysia, one an introduced ubiquist.

Of the species collected in Malaysia 3 are natives of America and have been introduced. The 2 other species are native both in Australia and in SE. Malaysia, and represent a distinct Australian element in the Malaysian flora.

Notes. The flowers are in this genus ♂, at least in the Malaysian *spp.* In those of an Australian specimen of *G. brownii* MOQ. I could find no trace of an ovary. SCHINZ in ENGL. & PR. Nat. Pfl. 2e Aufl. 16c (1934) 26 describes this genus as lacking pseudo-staminodes. But on p. 79 of the same volume he figures 2 species with very distinct pseudo-staminodes.

KEY TO THE SPECIES

1. Bracteoles with a (sometimes very narrow) dorsal crest.
 2. Dorsal crest of the bracteoles well-developed, very distinct, dentate-serrate on the back.
 3. Head globose or depressed-globose, $1\frac{3}{4}$ – $2\frac{1}{4}$ cm long when adult. Bracteoles deep purple, pink or white, 2– $3\frac{1}{4}$ mm broad (crest included). Lobes of the staminal tube at least partly obtuse or rounded, not or hardly longer than the unwithered anthers. 1. *G. globosa*
 3. Heads at first ovoid, afterwards more spiciform, cylindrical, $2\frac{1}{2}$ –5 cm long when adult. Bracteoles orange or reddish, 4–5 mm broad (crest included). Lobes of the staminal tube very acute, much longer than the unwithered anthers. Exclusively cultivated 3. *G. haageana*
 2. Dorsal crest of the bracteoles very narrow, dorsally entire, not reaching up to the apex of the bracteole. Flowers white 2. *G. celosioides*
1. Bracteoles without a dorsal crest.
 4. Adult heads 3–4 cm diam. Perianth much compressed, 12–14 mm long, much longer than the bracteoles. Tepals acute. Staminal tube with long filiform pseudo-staminodes between the filaments, free parts of the latter 5–6 mm long. Style 8–9 mm (spreading stigmas included), exceeding the stamens. Robust herb 4. *G. canescens*
 4. Adult heads $\frac{3}{4}$ –1 cm diam. Perianth not or hardly compressed, $3\frac{1}{2}$ –4 mm long, about equalling the bracteoles or slightly longer. Tepals rather obtuse. Staminal tube without pseudo-staminodes between the filaments, free parts of the latter $\pm \frac{1}{2}$ mm long. Style $\pm \frac{1}{2}$ mm (the erect minute stigmas included), not exceeding the stamens. Small herb 5. *G. tenella*

1. *Gomphrena globosa* LINNÉ, Sp.Pl. (1753) 224; BURM. Fl. Ind. (1768) 72; BL., Bijdr. (1825) 548; BLANCO, Fl. Filip. (1837) 198; ed. 2 (1845) 139; ed. 3 (1877) 251, t. 78; DECNE in Nouv. Ann. Mus. 3 (1834) 372; SPAN. in Linnaea 15 (1841) 346; MOQ. in DC. Prodr. 13, 2 (1849) 409; MIQ. Fl. Ind. Bat. 1, 1 (1858) 1050; Suppl. (1860) 150; HOOK. f. Fl. Br. Ind. 4 (1885) 732; BAILEY, Queensl. Fl. pt 4 (1910) 1235; PULLE in Nova Guinea 8 (1910) 352; KOORD. Exk. Fl. 2 (1912) 201; STUCHLIK in FEDDE, Rep. XII (1913) 337 *seq.*; ASCH. & GR. Syn. 5, 1 (1914) 367; MERR. Interpr. Herb. Amb. (1917) 215; EN. Born. (1921) 246; EN. Philip. Fl.Pl. 2 (1923) 132; RIDL. Fl. Mal. Pen. 3 (1924) 10; HEYNE, Nutt. Pl. (1927) 609; BACKER, Onkr. Suiker. (1930) 231, Atl. t. 242; GAGN. in Fl. gén. I. C. 4 (1936) 1067.—

Flos globosus RUMPH. Herb. Amb. 5, 289, t. 100, fig. 2.—Fig. 8.

Annual, erect or at base decumbent and rooting, 15–60 cm high; stem thickened at base of internodes, often tinged with red, on young parts appressed pilose. *Leaves* oblong or oblong-obovate from an acute base, obtuse, often \pm undulate, thinly pilose on both surfaces, 5–15 by 2–6 cm; petiole 1– $1\frac{1}{2}$ cm; 2 topmost leaves sessile or nearly so. *Heads* sessile or subsessile above the topmost pair of leaves, solitary or sometimes in clusters of 2–4, globose or depressed globose, $1\frac{3}{4}$ – $2\frac{1}{4}$ cm diam.; bracts ovate-triangular, acuminate, acute, 3–6 mm; bracteoles with very distinct dentate-serrate dorsal crest, much surpassing the bract, 7–12 mm by 2– $3\frac{1}{4}$ mm (crest included), deep purple,

pink or white. *Perianth* shorter than the bracteoles, yellowish green, white-woolly outside, 6–6½ mm long. Staminal tube about equalling the perianth; its lobes at least partly obtuse or rounded, not or hardly longer than unwithered anthers. Style much shorter than staminal tube, bifid. *Fruit* ovoid, ± 2½ mm; seed reniform, swollen.

Distr. Native of trop. America; long ago introduced into *Malaysia*; found throughout the Archipelago either cultivated or semi-naturalized.

Ecol. In settled areas in waste places not rarely found as a stray from gardens but nowhere firmly established, and not truly naturalized, 1–± 1300 m. *Fl. fr.* throughout the year.

Uses. Cultivated in gardens as an ornamental. Cooked leaves may be eaten.

Vern. *Bunga knop*, M.

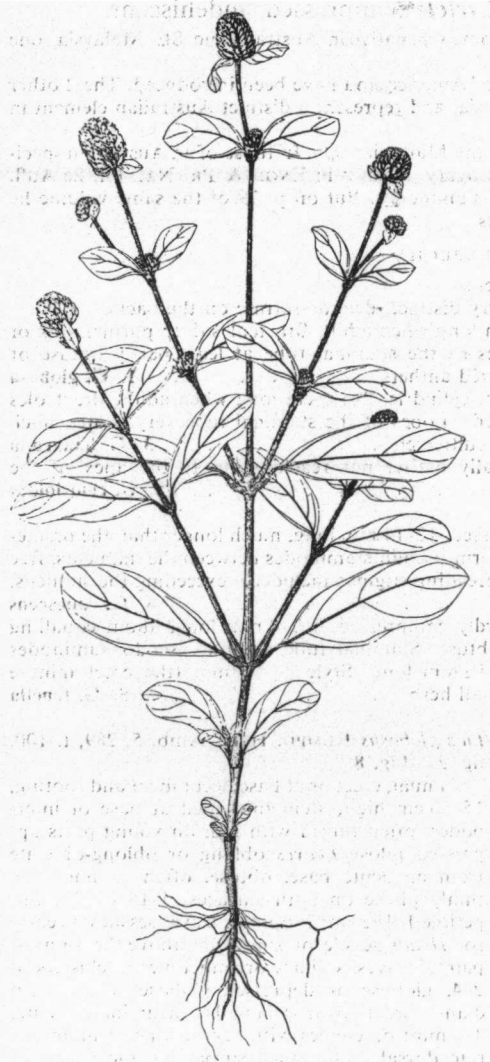


Fig. 8. *Gomphrena globosa* L. from Java, × ¼.

2. *G. celosioides* MART. Beitr. Amar. (1825) 93; MOQ. in DC. Prod. 13, 2 (1849) 410; SEUBERT in MART. Fl. Bras. 5, 1 (1875) 218; SANDW. in Kew Bull. (1946) 29; STEEN. in Bull. J.B.B. III, 17 (1948) 402.

Annual, erect or ascending, 10–25 cm long, often branched from the base; stem finely appressed-white-pilose; internode immediately beneath 2 top-most leaves often long. *Leaves* shortly petioled or subsessile, spatulate or oblong-lanceolate from an acute base, acute or rather obtuse, ending in a short rather hard point, glabrous or sparingly appressed pilose above, thinly or rather densely appressed pilose beneath, 2–4½ by ½–1¼ cm; 2 top-most leaves subsessile. *Heads* sessile above highest pair of leaves; at first subglobose, ± 1 cm diam., gradually lengthening into a spike, finally up to 4 cm long; receptacle long-white-woolly; bracts ovate, acuminate, very acute, 3–4 mm; bracteoles long-ovate, very acute, white, ± 6 mm, in the higher part with a dorsal crest; crest narrow, abruptly ending below top of the bracteole and there sparingly shortly, irregularly dentate, otherwise entire. *Perianth* inserted on a minute knob, pure white, somewhat shorter than the bracteoles, 4½–5½ mm. *Tepals* narrowly lanceolate, acute, in lower half externally densely clothed with long fine white hairs. *Stamens* slightly shorter than perianth; filaments nearly entirely connate; apical teeth of the staminal tube varying from rather obtuse to rather acute, not or shortly exceeding unwithered anthers, ± ⅔ mm. *Style* much shorter than the staminal tube, bifid somewhat deeper than halfway down, totalling ⅓–1 mm. *Ripe fruit* not seen.

Distr. Native of trop. America, introduced in trop. and S. Africa, India and Australia, in *Malaysia*: in Batavia, Manila (COERT no 1400, a. 3.6.36), and Singapore, well on its way to spread over the Old World. The statement of SANDWICH *l.c.* that the plant has run wild all over the Botanic Gardens at Buitenzorg was due to misinformation.

Ecol. Roadside weed, between grass, locally gregarious, tufted in mats (Singapore, harbouryard, 1926; Batavia, 1946), well adapted to hot, dry, dusty situations at low elevations.

3. *Gomphrena haageana* KLOTZSCH, in OTTO & DIETR. Allg. Gartenz. 21 (1853) 297.

For differentiating characters see the key to the species.

Distr. Native of Mexico, in *Malaysia*; exclusively and occasionally cultivated.

4. *Gomphrena canescens* (POIR.) R.BR. Prod. (1810) 416; MOQ. in DC. Prod. 13, 2 (1849) 398; BTH. Fl. Austr. 5, (1870) 253; HEMSL. Rep. Bot. Chall. 1, 3 (1884) 184; BAILEY, Queensl. Fl. pt 4 (1901) 1235; STUCHLIK in FEDDE, Rep. XII (1913) 345; DOMIN, Beitr. Pflanzengeogr. Austr. 1, 2 (1929) 644.—*Philoxerus canescens* POIR. in LAMK. Tabl. Enc. Bot. Suppl. 4 (1816) 393.—*Gomphrena lanuginosa* SPAN. in Linnæa 15 (1841) 346, *ic. ined.* 51 (*non vidi*); MIQ. Fl. Ind. Bat. 1, 1 (1858) 1051.

Erect annual, 60–90 cm high, not or sparingly branched, stem hard, densely clothed with erect appressed long white hairs. *Leaves* sessile, linear

or narrowly linear-lanceolate, acute, firmly herbaceous with a strong midrib, on both surfaces densely clothed with appressed long white hairs, $2\frac{1}{2}$ –5 cm by 2–5 mm. *Heads* subtended by an involucre of 5–9 patent cauline leaves, depressed globose, 3–4 cm diam.; involucre leaves narrowly linear, tapering to a very acute apex, 1-nerved, at the base long-ciliate, on both surfaces densely clothed with appressed long white hairs, 2–3 by 4–6 mm; receptacle densely long-white-woolly; bracts and bracteoles tapering from a broad base, bracts 6–7 mm long; bracteoles very acute \pm 8 mm. *Flowers* between the bracteoles on a very short thick pedicel; perianth strongly compressed, purple, greatly surpassing the bracteoles 12–14 mm long. *Tepals* nearly free, lanceolate, acute, 1-nerved, in the lowest $\frac{1}{3}$ – $\frac{1}{2}$ of the back (especially at the base) clothed with long hairs. *Stamens* 7–9 mm long, at the base for a length of 2–4 mm connate into a tube; free parts of filaments flat, glabrous 5–6 mm, alternating with shorter subulate acute anatherous pseudo-staminodes. *Ovary* glabrous; style glabrous, 8–9 mm, longer than the stamens, shortly bifid; arms spreading. *Fruit?*

Distr. N. Australia, in *Malaysia*: Lesser Sunda Isl. (Timor, SPANOGHE), Moluccas (Tanimbar, RIEDEL).

Ecol. Probably in sunny dry localities, in Timor on calcareous rocks, apparently rare, only twice collected.

5. *Gomphrena tenella* (MOQ.) BTH. Fl. Austr. 5 (1870) 256.—*Iresine tenella* MOQ. in DC. Prod. 13, 2 (1849) 343.

Erect annual, Malaysian specimens only $2\frac{1}{2}$ –6 cm high, unbranched; stem thin, hard, in higher

part densely woolly. *Leaves* in 2–4 distant pairs, narrowly linear, glabrous, above, thinly patently pilose beneath, $\frac{1}{2}$ – $\frac{3}{4}$ cm long. *Heads* sessile above the topmost pair of leaves, globose, $\frac{3}{4}$ –1 cm diam.; receptacle very densely clothed with longish white hairs; bracts ovate, shortly apiculate, \pm $2\frac{1}{2}$ mm long, much shorter than the bracteoles; axis of flower densely woolly; bracteoles ovate, acute, \pm $3\frac{1}{2}$ mm long. *Tepals* nearly free, oblong, rather obtuse, $3\frac{1}{2}$ –4 mm long, in the lower half with an oblong herbaceous central field; this field on the back densely clothed with long, entangled, in dried specimens brownish hairs. Filaments connate up to near apex; staminal tube not shorter than ovary and style together; free parts of filaments \pm $\frac{1}{2}$ mm long, broad, slightly narrowed upwards, without intervening pseudo-staminodes. Style minute; stigmas 2, erect, subulate; style and stigmas together \pm $\frac{1}{2}$ mm long. *Fruit?*

Distr. N. Australia, in *Malaysia*: Moluccas or the Lesser Sunda Islands. The only specimen on which this record is based was collected by REINWARDT in 1821, and is preserved in the Rijksherbarium, Leyden. According to an accompanying note by BLUME it was collected somewhere in the Moluccas, but it may have been gathered in Flores Island.

Notes. I am not wholly satisfied that my identification of the specimen described above is correct. The dimensions of its vegetative parts are very much smaller than those given by MOQUIN and BENTHAM for Australian specimens. However, it is possible that REINWARDT collected the plant in a very sterile or arid locality. I have not examined any other specimen of this species.

16. IRESINE

P. BROWNE, Hist. Jamaica (1756) 358.

Erect, ascending or scandent herbs or undershrubs. *Leaves* opposite, petioled, entire or subentire. *Flowers* (δ) (\varnothing) or \varnothing , paniculate; panicles terminal, often also in the highest leaf axils, many-flowered; their ultimate branches spiciform, bearing solitary or clustered, minute flowers; flowers solitary in axil of bract, subtended by 2 bracteoles, membranous, usually shining, subglabrous or woolly. *Tepals* 5, oblong or ovate-oblong, acute; stamens (in \varnothing reduced to very minute staminodes) 5; filaments at the base connate in shallow cup, filiform, with or without interposed pseudo-staminodes; these usually short, broadly triangular, rarely long; anthers oblong, 1-celled (2-locellate); ovary (wanting in δ) compressed, ovule 1, pendulous from an erect funicle; style very short; stigmas 2, subulate, erect-ascending, short; utricle compressed, orbicular, thin-walled, indehiscent; seed lenticular or reniform, shining.

Distr. Large genus, centering in America, also in the Galapagos Isl., in *Malaysia*: one Brazilian species cultivated and locally naturalized.

1. *Iresine herbstii* HOOK. f. in Gard. Chron. (1864) 654, 1206; Bot. Mag. (1865) t. 5409; ASCH. & GR. Syn. 5, 1 (1914) 369; MERR. En. Philip. 2. (1923) 132; HEYNE, Nutt. Pl. (1917) 609; BAILEY, Stand. Cycl. 2 (1935) 1662; BACKER, Bekn. Fl. Java

(emerg. ed.) IV A, fam. 63 (1942) 12.—*Iresine celosoides* (non LINNÉ!) BOERL. in Verh. 2e Geenes- en Nat. Congr. Leiden (1889) 148; BACKER, Ann. J. B. B. Suppl. 3 (1909) 405; KOORD. Exk. Fl. 2 (1912) 201.

Perennial herb, erect or ascending, often much branched, slightly fleshy; nodes thickened; base of the internodes in dried specimens strongly constricted; young stems pubescent, especially on and near nodes. *Leaves* broadly ovate-orbicular, broadly oval or broadly obovate, at the frequently slightly unequal base very obtuse, rounded or truncate but shortly contracted into the petiole, with a usually more or less deeply emarginate but sometimes rounded or shortly acuminate and then very acute apex, entire or subentire, concave, thinly fleshy, either shining dark red with lighter coloured bands along the main-nerve or (*var. aureo-reticulata* NICH.) green with golden yellow bands, on both surfaces very thinly clothed with shining brown or yellowish, partly bifid and appressed hairs, 2½–8 cm long and wide; petioles 1–5 cm; those of a single pair connected at the base by a transverse row of longish, thickish, harticulate hairs. *Panicles* terminal and often also in axils of the highest and then small leaves, 5–50 cm long, united in a terminal, erect, 8–60 cm long, often much branched and rich-flowered panicle; primary branches of the panicle erecto-patent, branched from base or nearly so; ultimate branchlets spiciform, rather dense-flowered, 1–4 cm long; rachises of the panicle thin, red, at first rather densely clothed with longish shining hairs; glabrescent. *Flowers*

not concealing the rachis, *in Malaysia exclusively* ♀; bracts, bracteoles and perianth greenish white or yellowish white; bracts and bracteoles persistent after fall of the perianth, ovate, rather acute, concave, nerveless, glabrous; bracts ± 1 mm long; bracteoles slightly wider, ± 1¼ mm long. *Perianth* ± 1¼ mm long, at the base externally with a dense whorl of long, very thin, white hairs; tepals dorsally with a few short hairs, otherwise glabrous, oblong, rather acute, nerveless; pseudo-staminodes minute. Ovary suborbicular, much compressed, glabrous; stigmas obliquely patent-ascending, ± ½ mm. *Fruit* never produced in Malaysia.

Distr. Native of Brazil, *in Malaysia*: exclusively cultivated for ornamental purposes (already before 1894) and locally naturalized in *e.g.* Java, Celebes, and Ceram.

Ecol. Naturalized in forest borders and along forest paths, 500–1500 m, locally abundant.

Uses. The leaves are squeezed in water in order to obtain a red dye used for colouring agar agar jellies.

Vern. *Bayam merah*, M.

Notes. In Malaysia exclusively ♀ flowers are found. In none of the many specimens I examined, I have found ♂ flowers nor have I traced any description of them. Fruit is never produced in Malaysia.

Excluded

Nevrollis fuscata RAFINESQUE, *Autikon Bot.* (1840) 150. This new genus was based by RAFINESQUE on *Celosia virgata* HORT. (*non* JACQ.). Its native origin was cited as: 'Borneo or Moluccas?' I cannot identify this with certainty. It is possible that MERRILL

(Rafin. p. 119) is right in reducing it to *Celosia*. RAFINESQUE might have had a specimen belonging to a garden form of JACQUIN's species which is native in South America.