

XYRIDACEAE (P. van Royen, Leyden)

XYRIS

LINNÉ, Sp. Pl. (1753) 42; Gen. Pl. ed. 5 (1762) no 64; NILSSON, Kongl. Svenska Vet.-Akad. Handl. 24, 14 (1892) 1-75, pl. 1-6; MALME, Svensk Bot. Tidskr. 21 (1927) 381-396; MALME, Bull. Jard. Bot. Btzg III, 10 (1929) 385-392; MALME, in ENGLER & PRANTL, Nat. Pfl. Fam. ed. 2, 15a (1930) 35-38.

Mostly perennial, paludose, grass-like *herbs* with fibrous roots; stembase very rarely thickened, often profusely producing shoots. *Leaves* basal, distichous on each shoot, ensiform, linear or filiform, sometimes twisted; sheaths with a membranous margin (in *Mal. spp.*) producing mucilage (?always), with or without a short ligule; limb glabrous or with numerous, small hard papillae, sometimes with a stout nerve in either margin. *Flowers* ♂, in terminal, few- to many-flowered heads, 3-merous, yellow to white, ephemeral, each in the axil of a conspicuous bract; bracts conchate, imbricate, spirally arranged, lower ones sterile; one to few flowers simultaneously in anthesis. Peduncles scape-like, terete to compressed, sometimes winged or ribbed, glabrous or with numerous hard papillae, at the base with some sheaths provided with a short limb. *Bracts* entire, ciliate, fimbriate or lacerate, with one complete main nerve and some complete or incomplete longitudinal secondary (descending) nerves, in the apical part mostly with a small minutely-papillose field. *Calyx* zygomorphic; lateral sepals navicular, with entire, dentate or ciliate crest, wings membranous, entire, glabrous or ciliate; median sepal membranous, spathe-like or cap-shaped, enveloping the corolla, mostly obovate, 1-3(-5)-nerved, pushed out by the corolla in anthesis (?always). *Corolla* actinomorphic, ephemeral; petals with an orbicular to obovate limb and a long, narrow claw, free, cohering mutually or by the staminodes. *Stamens* mostly 3 fertile epipetalous inserted on the petals and 3 alternating staminodes, staminodes rarely absent, or all stamens fertile; filaments short; anthers basifix, dehiscing lengthwise extrorsely. *Ovary* superior, sessile to stipitate (in Australian *spp.* sometimes with 3 hard swellings at the top), 1- or 3-celled, or incompletely 3-celled. Placentas parietal, central, or basal, with ~ ovules; styles filiform, apex 3-fid, stigmas mostly capitate. *Fruit* shape similar to that of the ovary but larger, loculicidally 3-valved. Seeds ellipsoid to obovoid, often ribbed, with a long funicle.

Distr. *Xyridaceae* are confined to the tropics throughout the world including the southern parts of North America; east of *Malaysia* and Australia hitherto only recorded from the Palau group (Korrör) and New Caledonia.

Xyridaceae contain only two genera, *Xyris* and *Abolboda*; the latter genus possesses blue flowers and is restricted to South America.

Some *spp.* of *Xyris* are spread over large areas, e.g. *X. capensis*, *X. complanata*, and *X. indica*. On the whole, however, the species occupy limited areas.

Ecol. Restricted to marshy habitats, often on sandy, acid soils together with *Cyperaceae*, *Eriocaulon*, *Drosera*, *Juncus*, etc., and on borders of shallow swamps; locally they are often very common or even subgregarious. Single species are common in wet rice-fields, e.g. *X. indica*, which seems to be almost restricted to this anthropogenic habitat.

Fig. 1. A. *X. complanata*, B. *X. tuberosa*, C. *X. bancana* var. *lacerata*, D. *X. borneensis*, E. *X. malmei*, F. *X. ridleyi* var. *ridleyi*, Fa. *X. ridleyi* var. *penicillata*, G. *X. papuana*, H. *X. pauciflora*, I. *X. lobbii* var. *lobbii*, J. *X. oreophila*, K. *X. dajacensis*, L. *X. grandis*, M. *X. chlorocephala*, N. *X. indica* var. *indica*, O. *X. capensis* var. *schoenoides*.

The figures show from left to right: basal bract, median bract, lateral sepal(s), with or without ovary, stamen, staminode. In O the basal and median bracts are of the same shape. In G two types of basal bracts are given. In B stamens and staminodes are unknown. In L (*X. grandis*) staminodes do not occur.

The figures are not drawn on the same scale.

Most *spp.* occur in the lowland, but several are bound to mountain marshes, e.g. *X. flabellata*, *X. grandis*, and *X. oreophila*.

According to BEUMÉE (Trop. Natuur 6, 1917, 158) the sheaths of *X. indica* are filled with mucilage which originates from the disintegrating parenchymatic tissue between the vessels of the membranous marginal parts of the sheaths. This phenomenon may, possibly, occur in other species.

BEUMÉE also observed an undescribed particularity of the anthesis, namely that in the early morning the expanding corolla pushes (and detaches) the cap-shaped median sepal from its insertion and presses it outside the bracts of the head, where it, subsequently, is blown away by the air. This explains why, in herbarium specimens, it is never found in open flowers, and has been termed caducous. In *X. lobbii* it is, for this reason, as yet unknown.

Notes. The term 'descending nerves' used in this revision indicates that the side-nerves running downwards from the midrib of the bracts are incomplete and do not reach the base of the bract: this character has proved to be useful in specific delimitation.

With the length of the staminodes is meant the length of the free part, not including the length over which they are coherent with the claw of the petals.

All Malaysian species belong to § *Euxyris*.

KEY TO THE SPECIES

1. Peduncle terete or subterete in the upper part, neither winged nor ribbed when dry.
2. Dried leaves with numerous short, transverse, prominent ribs connecting the longitudinal veins, 5-6 cm by 3-10 mm; top falcate. Sheath 8-30 cm long. Midrib of the bracts with 4-6 descending nerves. Fig. 1 N 14. *X. indica*
2. Leaves without transverse ribs.
3. Stem-base provided with subglobose tubers between the roots. Bracts with ca 4 complete nerves besides the midrib. Incompletely known species. Fig. 1 B 2. *X. tuberosa*
3. Stem-base without tubers.
4. Lateral sepals ciliate or serrate in the upper half.
5. Leaves linear, twisted, without thickened marginal ribs. Anther-cells produced above the connective, each with 2 acute teeth. Fig. 1 D 4. *X. borneensis*
5. Leaves ensiform, not or slightly twisted, with distinct thickened marginal ribs.
6. Anther-cells acute. Papillae on median bracts in a narrow quadrangular field in the apical half. Midrib of median bracts provided with ca 14 subcomplete descending nerves. Fig. 1 I. 9. *X. lobbii*
6. Anther-cells obtusely 2-tipped. Papillae on median bracts in a triangle in the upper third part. Midrib of median bracts provided with 4 partly complete, partly incomplete descending nerves. Fig. 1 H 8. *X. pauciflora*
4. Lateral sepals entire.
7. Leaves acuminate. Midrib of bracts with 5-10 complete nerves. Anther-cells produced above the connective, acute. Fig. 1 J 10. *X. oreophila*
7. Leaves obtuse. Bracts with ca 6 complete and ca 2 descending nerves. Anther-cells produced above the connective, 2-tipped. Fig. 1 E 5. *X. malmei*
1. Peduncle compressed or subterete, with one or more wings or ribs when dry.
8. Dried leaves with numerous short, transversal, prominent ribs connecting the longitudinal veins. Fig. 1 N 14. *X. indica*
8. Dried leaves without such ribs.
9. Staminodes absent. Upper part of bracts with a small triangular field of small papillae. Head brownish. Fig. 1 L 12. *X. grandis*
9. Staminodes present.
10. Bracts without a papillate field.
11. Head greenish. Midrib of median bract with 2 descending forked nerves. Leaves 6-18 mm wide. Fig. 1 M 13. *X. chlorocephala*
11. Head blackish or brown. Midrib of median bract with 6-9 partly complete and partly incomplete nerves. Leaves 2-4 mm wide. Fig. 1 O 15. *X. capensis var. schoenoides*
10. Bracts with a papillate field.
12. Bracts with a subapical, dorsal, hollow minutely papillate tooth. Fig. 1 K 11. *X. dajacensis*
12. Bracts without such a tooth, sometimes keeled.
13. Leaves with thickened, in section sometimes hollow tubular margins.
14. Bracts orbicular to 1½ times as long as broad. Crest of lateral sepals lacerate-fimbriate in the upper part. Upper half of anther-cells free. Leaves 10-50 cm long, spread. Fig. 1 A. 1. *X. complanata*
14. Bracts twice as long as broad. Crest of lateral sepals entire. Anther-cells connate to the apex. Leaves 2½-9½ cm long, equitant. Fig. 10 16. *X. flabellata*
13. Leaves without thickened margins.
15. Crest of lateral sepals ciliate to serrate or tuberculate.
16. Median bracts lacerate or ciliate at the top.
17. Crest of lateral sepals densely ciliate-tuberculate.

- 18. Leaf flattened in section, as is the central tissue.
- 19. Staminodes penicillate. Median bracts with numerous (25-35) nerves.
- 20. Peduncle with a few ribs. Median bracts with a narrow-elliptic papillate field. Base of anther-cells not free, emarginate. Fig. 1 C 3. *X. bancana* var. *lacerata*
- 20. Peduncle with 2 wings. Median bracts with a broad quadrangular papillate field. Base of anther-cells free, not emarginate. Fig. 1 Fa 6. *X. ridleyi* var. *penicillata*
- 19. Staminodes sparsely short-ciliate. Median bracts with ca 11 nerves. Fig. 1 F 6. *X. ridleyi* var. *ridleyi*
- 18. Leaf terete or subterete in section, as is the central tissue. Sheath 2-5 cm, blade 8-25 cm. Fig. 1 D 4. *X. borneensis*
- 17. Crest of lateral sepals sparsely tuberculate. Fig. 1 G 7. *X. papuana*
- 16. Median bracts entire and glabrous at the top.
- 21. Lateral sepals coarsely serrate. Fig. 1 H 8. *X. pauciflora*
- 21. Lateral sepals finely ciliate-tuberculate. 3. *X. bancana* var. *bancana*
- 15. Crest of lateral sepals entire. Anther-cells acute. Fig. 1 J 10. *X. oreophila*

1. *Xyris complanata* R. BROWN, Prodr. 1 (1810) 256; NILSSON, l.c. 29; MALME, l.c. (1927) 389; l.c. (1929) 387.—*X. anceps* (non LAMK) VAHL, En. Pl. 1 (1805) 205.—*X. elongata* RUDGE, Trans. Linn. Soc. 10 (1811) 289, t. 15, f. 1.—*X. walkeri* KUNTH, En. Pl. 4 (1843) 19; MIQUEL, Fl. Ind. Bat., Suppl. (1861) 608.—*X. malaccensis* STEUDEL, Syn. Pl. Glum. 2 (1855) 287.—Fig. 1 A, 2.

Perennial. Leaves rigid, linear, 10-50 cm by 1½-3½ mm, acute, often falcate, twisted, widened at the base, striate when dry, with a stout nerve in either margin, which is scabrous but for the basal part. Sheaths narrow, 3-7 cm, slightly crested. Peduncle 10-60 cm by 2-2½ mm, distinctly compressed, twisted, with a stout, scabrous rib in either margin. Head oblong-ovoid to cylindrical, 5-25 by 4-7 mm. Basal bracts elliptic, 2-4 by 2-3 mm, with ca 7 descending nerves; median bracts elliptic to orbicular, 5-6 by 4-6 mm, sometimes with a prominent keel, central part subspinulose at the top, papillate in a triangular field in the upper half, entire or emarginate at the top, with ca 15 descending nerves. Lateral sepals 4-5 by 1-1½ mm, obtuse, top sometimes scarious, crest lacerate-fimbriate in the upper half, sometimes exceeding the top; median sepal cap-shaped, 3-3½ mm long, with 1 or 3 nerves. Petals 5-6 mm long, limb obtriangular to obovate, ca 3 mm by 3-4 mm, apical margin lacerate, claw 2½-3 by ca ½ mm. Stamens 2-2½ mm, filament ca 1 mm; anthers 1-1½ mm, deeply incised at the top, cells with 2 acute tips, base mucronulate or with 2 acute tips. Staminodes bifid, penicillate, ca 1 mm long. Ovary obovoid, 3-sided, ca 2 by 1 mm. Styles 3-fid, 3-5 mm, arms ca 1 mm, infundibuliform at the top, with lacerate margins. Fruit 3-3½ by 2½-3 mm.

Distr. Ceylon, India, China, Hainan to Australia, throughout Malaysia, not yet collected in the Moluccas, Java, the Lesser Sunda Islands, only once collected in Sumatra (Palembang), and only once in Celebes (Makale).

Ecol. Mainly in the coastal areas in damp sandy places, in open dune hollows (Pahang), in peaty swamps (Palembang), in damp situations in savannahs (East New Guinea), in West Malaysia mostly on open sandy padang soils, at low altitude below 150 m, except in Central Celebes (Makale) at 1500 m and West New Guinea at 1600 m (Balim), fl. April-Jan..

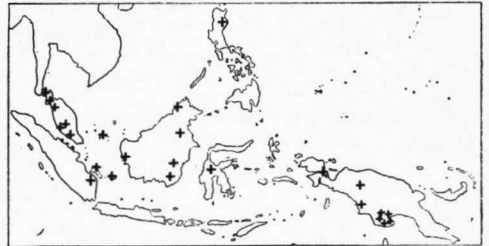


Fig. 2. Distribution of *Xyris complanata* R. Br. in Malaysia.

Vern. *Chelagi, berudang*, Mal. Pen., *djangot tutu*, Billiton, *purum bili bili*, Kutai, *gumi-gumi*, Tagalog. Notes. Rather variable in shape and size of peduncle, head and leaves, but is recognizable by the stout nerves in the margins of the leaf.

2. *Xyris tuberosa* RIDLEY, J. Fed. Mal. St. Mus. 10 (1920) 122; MALME, l.c. (1927) 390; l.c. (1929) 385.—Fig. 1 B.

Stembase with globose, pubescent or glabrous tubers up to 8 mm diam.. Leaves ensiform, 20-25 cm by 1½-2½ mm, falcate, acute, widened at the base, papillate. Sheaths 6-7 cm. Peduncle 30-40 cm, terete, with numerous black papillae. Head ovoid to globose, 8-10 by 8-10 mm. Bracts elliptic, 6-7 by 3-4 mm, obtuse to truncate, papillate in the upper fourth, with 4-8 complete nerves (incomplete in the basal bracts). Lateral sepals narrow, 4-5 by ca 1 mm, obtuse, crest tapering towards the base. Ovary urceolate, shortly stipitate, 3-sided, 2-3 by ca 2 mm.

Distr. Malaysia: Malay Peninsula, 'mainland shores'.

Notes. Differing from all other spp. by stembase tubers. The material is too scarce to judge whether these are a normal feature. In North America *X. torta* SMITH is bulbous, but in this species the stembase itself is thickened and no separate tubers are found between the roots.

3. *Xyris bancana* MIQUEL, Fl. Ind. Bat., Suppl. (1861) 608; NILSSON, l.c. 37; MALME, l.c. (1927) 390; l.c. (1929) 388. var. *bancana*.

Tufted. *Leaves* acerose-ensiform, 2–7 cm by *ca* 1 mm, acute, falcate; sheath 1–1½ cm; basal leaves with a distinct, finely ciliate crest and small, reduced limb; apical leaves similar to the basal ones, with one or two sheaths. Peduncle 10–30 cm by 1 mm or less, terete to subterete, with a few prominulous ribs in the upper part, glabrous. Head ellipsoid to subglobose, 2–4 by 1–5 mm. *Bracts* boat-shaped, elliptic to obovate, 4–5 by 1½–2½ mm, emarginate, central part with numerous papillae over the whole length and slightly crested, with numerous descending nerves; margins membranous. Lateral *sepals* 3–4 mm long, obtuse, with a ciliate inconspicuous crest; median sepal cap-shaped, minutely tuberculate at the top. *Petals* 4–5 mm long, limb obovate, *ca* 2½ mm diam., claw 2–3 mm. *Stamens* 3 or 6, ½–2 mm long; anthers 1–1½ mm long, apex deeply incised; cells with 2 acute tips, base obtuse, emarginate. *Staminodes* bifid, penicillate, *ca* 1½ mm long, or absent. Ovary ellipsoid to obovoid, obtuse, 3-sided, 3-celled, *ca* 2 mm by 1 mm. Styles 3-fid, 1–1½ mm, stigmas capitate. Fruit 3–3½ mm long.

Distr. *Malaysia*: Banka & Billiton.

Ecol. On sandy, open *padang* soils in the lowland, fl. Oct. (once noted).

var. lacerata MALME (Bull. Jard. Bot. Btzg III, 10, 1929, 388, descr.) *var. nov.*—Fig. 1 C.

Differs from the type-variety in the narrower leaves (½–¾ mm wide), the flexuose or spirally twisted peduncle, and the lacerate apical margin of the bracts.

Distr. *Malaysia*: Malay Peninsula.

4. *Xyris borneensis* RENDLE, J. Bot. 37 (1899) 506, pl. 403, f. 11; MALME, l.c. (1927) 390; l.c. (1929) 387.—Fig. 1 D.

Leaves wiry, 8–25 cm by ½–1¼ mm, twisted, acute, glabrous to scabrous, striate when dry; sheath 2–5 cm, widened at the base up to 6 mm. Peduncle 13–40 cm by *ca* 1 mm, terete or subterete, with 0 to 3 wings, twisted, scabrous. Head ovoid to ellipsoid, 3–7 by 2–6 mm. Basal *bracts* triangular, acute, margin membranous, the central part papillate from top to base, 3–3½ by *ca* 1½ mm. Median bracts conchate, obovate, 4½–5½ mm by *ca* 2½ mm with numerous complete nerves, papillate in a quadrangular region in the upper half, apical margin lacerate. Lateral *sepals* narrow, *ca* 5 by ½ mm, emarginate at the top, crest ciliate at least in the upper half, wings ciliate in the apical part. Median sepal spatheiform, membranous, 2½–3 by *ca* 1 mm, papillate at the top, with one distinct nerve. *Petals* 7–8 mm long, limb narrowly obovate-elliptic, *ca* 3 by 2½ mm, claw 4–5 mm long, ⅓ mm wide or less. *Stamens* *ca* 1½ mm long; anthers *ca* 1 mm long, top and base deeply incised, top of the cells with 2 acute teeth, base subobtusate. *Staminodes* bifid, penicillate, *ca* 1 mm long. Ovary obovoid, 3-sided, 3-celled, 2–3 by ½–2 mm. Styles 3-fid, up to 3 mm, 3-sided, branches 1–1½ mm, 3-sided, capitate at the top.

Distr. *Malaysia*: Borneo, Banka, and Billiton.

Ecol. On open sandy *padang* soils in the lowland, fl. Aug.–Jan. (once noted).

5. *Xyris malmei* VAN ROYEN, Blumea 7 (1953) 307.—Fig. 1 E.

Leaves ensiform, 7–30 cm by 1–2 mm, striate when dry, subfalcate, obtuse, widened at the base and the margins there sometimes with brown hairs, papillate; sheath 4–7 cm long. Peduncle 20–45 cm by *ca* 1 mm, terete, but subterete immediately below the head, papillate. Head subglobose to ellipsoid, 7–12 by 3–10 mm. Basal *bracts* ovate, 4–5 by 2½–3 mm, obtuse, retuse, with 4 descending nerves, papillate in a narrow region in the upper half. Median bracts ellipsoid, 8–9 by 3–4 mm, with *ca* 6 complete and *ca* 2 incomplete descending nerves, papillate in a narrow region in the upper third. Lateral *sepals* 8–9 by *ca* 1½ mm, obtuse, emarginate, crest narrow, entire. Median sepal cap-shaped, 6½–8 by *ca* 2 mm, 1-nerved. *Petals* 15–17 mm long, limb obovate, 8–9 by 5–6 mm, claw 7–8 mm. *Stamens* 3–4½ mm, anthers 2–2½ mm, deeply incised at the top; cells with 2 acute tips, base obtuse, emarginate. *Staminodes* 2–3 mm, bifid, penicillate. Ovary obovoid, 3-sided, *ca* 3 by 1 mm, stipitate. Styles 11–12 mm, 3-fid, 3-sided, branches 3–3½ mm, capitate at the top.

Distr. *Malaysia*: Malay Peninsula (Kedah Peak), 850–1300 m.

Notes. This species has characters in common with *X. bancana*, *X. oreophila* and *X. lobbilii*. From *X. lobbilii* it differs in the obtuse leaves without thickened margins, in the terete to subterete peduncle without ribs, in the narrow entire crest of the lateral sepals and in the top of the thecae. From *X. oreophila* it differs in the divided top and base of the thecae and the narrow papillate field in the apical third of the bracts. It differs from *X. bancana* in the non-ribbed peduncle, in the entire crest of the lateral sepals, and in the relatively longer sheath of the leaf.

6. *Xyris ridleyi* RENDLE, J. Bot. 38 (1899) 505, t. 409, f. 12–16; RIDLEY, Fl. Mal. Pen. 4 (1924) 349; MALME, l.c. (1927) 390; l.c. (1929) 385, 389.—*X. glauccella* MALME, l.c. (1929) 388.—Fig. 1 F, *var. ridleyi*.

Leaves linear to ensiform, 3–20 cm by *ca* 1 mm, acute, sometimes shortly spinulose, falcate, twisted, densely papillate; sheath 1–3 cm. Peduncle subterete to compressed, with 2 wings, 10–45 cm by *ca* 1 mm, twisted, subsabrous or glabrous. Head globose to obovoid, 3–10 by 6–8 mm. *Bracts* elliptic, 2–3 by *ca* 1½ mm, obtuse, emarginate, with *ca* 11 descending or complete nerves, but 3–5 branched descending nerves in the basal ones, sometimes keeled in the upper third, papillate in the upper half, apical margin minutely fimbriate, the most apical bracts with longly fimbriate apical margin. Lateral *sepals* 3½–6 by *ca* 1 mm, obtuse, emarginate, crest papillate, wings fimbriate along the margin in the upper half. Median sepal spatheiform, 3–4 mm long, with one distinct nerve, papillate at the top. *Petals* 3–6 mm long, limb orbicular, 2–3 mm long, claw *ca* 3 mm. *Stamens* 1½–2½ mm, filaments *ca* 1 mm, anthers *ca* 1 mm, deeply emarginate at the top, broadly emarginate at the base; cells with 2 acute tips, base obtuse, emarginate, the

inner lobes shorter than the outer ones. *Staminodes* 2-fid, $1\frac{1}{2}$ –1 mm, each arm spatulate, shortly fimbriate along the margin. Ovary obovoid, truncate, 3-sided, 1-celled, $3\text{--}3\frac{1}{2}$ by 1–2 mm. Styles 3–4 mm long, 3-fid, arms *ca* 1 mm, their top infundibuliform with an irregularly fimbriate margin.

Distr. *Malaysia*: Malay Peninsula (G. Tahan).
Ecol. 1700–2300 m, fl. June, Sept..

Notes. By the shape of their staminodes this variety is relatively easy to recognize.

var. penicillata VAN ROYEN, *Blumea* 7 (1953) 309.—Fig. 1 Fa.

Staminodes penicillate.

Distr. Cambodia & Siam.

Note. It is possible that this variety will be found in the Malay Peninsula.

7. *Xyris papuana* VAN ROYEN, *Blumea* 7 (1953) 307.—Fig. 1 G.

Leaves linear-ensiform, twisted, obtuse, 20–45 cm by *ca* $\frac{1}{2}$ mm, striate when dry, minutely tuberculate; sheath 1–2 cm long; ligule short, obtuse, $\frac{1}{2}$ – $2\frac{1}{2}$ mm long. Peduncle 20–55 cm, $\frac{1}{2}$ – $\frac{3}{4}$ mm wide, subterete, twisted, with one or more prominent ribs when dry. Head ovoid, 3–8 by 3–6 mm. Basal *bracts* ovate, 2–3 by $1\frac{1}{2}$ –2 mm, with a few descending nerves, apical margin lacerate. Median bracts obovate, 4–5 by $3\text{--}3\frac{1}{2}$ mm, with 14 descending branched nerves, minutely papillate in the apical third, apical margin ciliate. Lateral *sepals* narrow, $4\frac{1}{2}$ –5 by *ca* $\frac{3}{4}$ mm, obtuse, emarginate, ciliate at the top, crest narrow, with small teeth or entire, wings in the apical part ciliate. Median sepal cap-shaped, *ca* 3 mm long, with 3 nerves of which 2 are sometimes incomplete. *Petals* 7–9 mm long, limb cuneate, margin crenulate, *ca* 3 mm diam., claw 5–6 mm. *Stamens* $1\frac{1}{2}$ –2 mm, anthers *ca* 1 mm, top deeply incised; top of the thecae with 1–2 acute teeth, base subobtusely to mucronate. *Staminodes* 6–7 mm, twice forked, penicillate. Ovary obovoid, $1\frac{1}{2}$ – $2\frac{1}{2}$ by *ca* $\frac{4}{5}$ mm, truncate, 3-sided, 3-celled. Style 4– $4\frac{1}{2}$ mm, 3-sided, 3-fid, each branch $1\frac{1}{2}$ –2 mm, 3-sided, capitate at the top.

Distr. *Malaysia*: Moluccas (Misool, and Trangan in Aru Islands) and N. New Guinea (Mt Cyclops).

Ecol. Alang-fields at low alt. (Misool) and mountain summits (Mt Cyclops) at *ca* 1900 m, fl. July, Oct..

Notes. This species is closely related to *X. ban-cana*, *X. lobbii*, *X. ridleyi*, and *X. borneensis*, but its short sheath in relation to the long leaves, the lacerate apical margin of the median bracts, and the numerous descending nerves in these bracts are good distinctive characters.

8. *Xyris pauciflora* WILLD. *Phytogr.* 1 (1794) 2, t. 1, f. 1; NILSSON, *l.c.* 36; MALME, *l.c.* (1927) 391; *l.c.* (1929) 389.—*X. pauciflora* WILLD. *var. oryzetorum* MIQUEL, *Fl. Ind. Bat.* 3 (1855) 529.— Fig. 1 H, 3.

Leaves narrowly linear, 3–25 cm by 1–2 mm, acute to acuminate, striate when dry, sparsely papillate at either side, sometimes restricted to the margin only in mature leaves; sheath $1\frac{1}{2}$ –7 cm

long with a scabrous keel. Peduncle subterete, compressed and sometimes with 2 narrow wings, twisted, 4–40 cm by 1– $1\frac{1}{2}$ mm. Head ovoid to globose, 3–9 by 2–8 mm. Basal *bracts* elliptic, 2–4 by 2–3 mm, obtuse, emarginate, papillate along the midrib, with 2 descending nerves; median bracts elliptic to orbicular or obovate, 3–6 by 4–5 mm, obtuse, with 4 partly complete or incomplete descending nerves and a narrow papillate triangle in the upper third, spinulose at the top, margins mem-

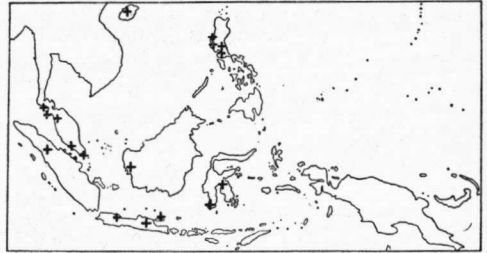


Fig. 3. Distribution of *Xyris pauciflora* WILLD. in Malaysia.

branous. Lateral *sepals* curved, 3–5 by $1\frac{1}{2}$ mm, subacute, crest narrow, coarsely serrate, wings unequal, tapering towards the base. Median sepal spatheiform, *ca* 3 mm long. *Petals* 6–9 mm long, limb obovate, 2– $3\frac{1}{2}$ mm, claw 4–5 mm. *Stamens* 1– $1\frac{1}{2}$ mm, anthers $\frac{1}{2}$ – $\frac{3}{4}$ by *ca* $\frac{1}{2}$ mm; inner loculi of the thecae shorter than the outer ones, obtuse, connective membranously widened. *Staminodes* 2-forked, penicillate, *ca* 1 mm long. Ovary obovoid, 3-sided, 2–3 by 1 mm. Style 3-fid, 2 mm long, branches *ca* $\frac{1}{2}$ mm, capitate.

Distr. Ceylon, India, SE. China, Hainan, Hongkong, and Formosa to N. Australia and Queensland, in *Malaysia*: Malay Peninsula, N. Sumatra (Toba), West Borneo, Java, and Madura, Celebes (Makassar and Tinampu), Philippines (Luzon).

Ecol. In damp, sandy places, in alang-fields, and on sandy padang soils, in Java decidedly in regions subject to a pronounced dry monsoon, in the lowland below 300 m, only on the Toba Plateau at 900 m, fl. April–Oct., Jan..

9. *Xyris lobbii* RENDLE, *J. Bot.* 37 (1899) 506, t. 403, f. 17–24; MALME, *l.c.* (1927) 390; *l.c.* (1929) 389.— Fig. 1 I.

Leaves ensiform, 12–40 cm by 3–6 mm, acute, sometimes subfalcate, papillate, with thickened margins; sheath 7–10 cm, slightly widened at the base. Peduncle 40–65 by *ca* 1 mm, terete, papillate. Head ellipsoid to globose, 9–12 by 7–12 mm. Basal *bracts* ovate, 4– $4\frac{1}{2}$ by $2\frac{1}{2}$ –3 mm, obtuse to subtruncate, thickened and minutely papillate in a narrow triangle, 1-nerved. Median bracts obovate to elliptic, 6–8 by 4–5 mm, thickened in a narrow triangle from top to base, papillate in a narrow quadrangular field in the apical half, with *ca* 14 complete nerves. Lateral *sepals* 6– $6\frac{1}{2}$ mm by $1\frac{1}{2}$ –2 mm in the upper part, tapering towards the base, obtuse, emarginate, crest fimbriate in the upper half. Median sepal unknown. *Petals* 10–12 mm

long, limb cuneate, $2\frac{1}{2}$ –5 by $3\frac{1}{2}$ –6 mm, margin crenulate, claw 8–9 mm long. *Stamens* 4– $4\frac{1}{2}$ mm, anthers 2– $2\frac{1}{2}$ mm, obtusely incised at the top; top and base of thecae subacute. *Staminodes* twice forked, 9–10 mm, penicillate. Ovary obovoid, 3-sided, 3-celled, ca $2\frac{1}{2}$ by 1 mm, truncate, stipitate. Style 3-fid, 5–6 mm, branches ca 3 mm, capitate at the top.

Distr. Siam & S. Burma (var. *burmana*) and Malaysia: Malay Peninsula.

Notes. Var. *burmana* MALME is found in S. Burma and Siam and may be found in Malaysia. It differs from the type-variety in the shorter leaves, the relatively longer sheath, and the larger number of nerves in the bracts.

10. *Xyris oreophila* RIDLEY, J. Fed. Mal. St. Mus. 7 (1916) 121; Fl. Mal. Pen. 4 (1924) 349, f. 202; MALME, l.c. (1927) 391; l.c. (1929) 385.—Fig. 1 J.

Medium sized. *Leaves* ensiform, 7–36 cm by 1–3 mm, acuminate, papillate, mature leaves sometimes glabrous; sheath 3–7 cm long. Peduncle 20–55 cm by ca 1 mm, terete to subterete, with or without one or two ribs, densely papillate. Head ellipsoid to obovoid, 6–14 by 5–12 mm. Basal bracts obovate, 3–7 by 1–3 mm, emarginate, slightly keeled, papillate in a narrow elliptic field along the midrib, with 4 descending nerves. Median bracts spatulate to obovate, 5–8 by 2–4 mm, subnavicular, obtuse, emarginate, with 5–10 complete nerves, slightly thickened in a narrow, minutely papillated triangle in the apical part. Lateral sepals 6–7 by 1–2 mm, obtuse, emarginate, crest entire. Median sepal cap-shaped, 5 by 1–2 mm, 1-nerved. *Petals* 13–15 mm long, limb obovate, 6–7 by ca 3 mm, claw 7–8 by $\frac{1}{2}$ mm. *Stamens* 11–12 mm, anthers 2–3 by $\frac{1}{2}$ mm, emarginate; top and base of thecae acute, attached to the filament. *Staminodes* forked, penicillate, 1–2 mm. Ovary obovoid to fusiform, 3-sided, 3-celled, ca $4\frac{1}{2}$ by 1 mm. Style ca 4 mm, 3-fid, branches 4–5 mm; stigma infundibuliform, papillate along the margin.

Distr. Malaysia: Malay Peninsula (Kedah Peak), 900–1300 m, fl. Dec.

Note. The bases of the anther-cells are attached to the filament and not free as is depicted by RIDLEY.

11. *Xyris dajacensis* VAN ROYEN, Blumea 7 (1953) 308.—Fig. 1 K.

Leaves linear, 5–16 cm by 1–2 mm, acute, often twisted, papillate, sometimes along the margins only; sheath 1–11 cm long, sometimes with a short ligule. Peduncle up to 60 cm by 1– $1\frac{1}{2}$ mm, distinctly compressed but sometimes terete in the basal part, twisted, subscabrous in the upper part, glabrous in the lower part, provided with a few prominent ribs in the upper part. Head ovoid to ellipsoid, 3–10 by 2–7 mm. Basal bracts suborbicular, 1–3 by 2–4 mm, papillate at the top only, with 2 complete and 4 incomplete nerves. Median bracts broadly obovate to orbicular, 3–5 by $4\frac{1}{2}$ – $5\frac{1}{2}$ mm, apex with a hollow papillate prominulous tooth, entire or emarginate, margins entire to scarious, with 4–6, sometimes branched, complete nerves. Lateral sepals 3–4 by 1–2 mm, acute, with a few

teeth in the apical part of the crest. Median sepal ca 3 mm long, spatheiform. Petals 3–4 mm long, limb obovate-cuneate, 2– $2\frac{1}{2}$ by $1\frac{1}{2}$ –2 mm, margin crenulate, claw ca 2 mm long. *Stamens* ca $2\frac{2}{3}$ mm, filaments ca $\frac{1}{5}$ mm, abruptly narrowed at the top, anther ca $\frac{2}{3}$ mm, deeply incised at either end, top and base of the cells obtuse. *Staminodes* penicillate, ca $\frac{1}{2}$ mm. Ovary obovoid, 3-sulcate, 3-celled, 2–3 by $1\frac{1}{2}$ mm. Style 3-fid, $2\frac{1}{2}$ –3 mm, with 2 broad membranes and a narrow wing decurrent along the ovary; stigmas leaf-like widened, united in a 3-sided infundibulum.

Distr. Malaysia: Br. N. Borneo (Sandakan, Labuan).

Notes. This species resembles *X. complanata* but differs from it by the obtuse ends of the anther-cells, the spinulose bracts, and the ribless margins of the leaf. It closely resembles *X. pauciflora* but has a larger region with minute papillae on the bracts, different anthers and leaves with thickened cells in the margins.

12. *Xyris grandis* RIDLEY, J. Linn. Soc. 38 (1906) 332; J. Fed. Mal. St. Mus. 2 (1911) 138; Fl. Mal. Pen. 4 (1924) 347; MALME, l.c. (1929) 392.—Fig. 1 L.

Leaves ensiform, acuminate, 50–90 by 1–2 cm, sometimes falcate, distinctly nerved, glabrous; sheath 20–30 cm long, widened and reddish brown or dark brownish at the base. Peduncle 25–60 cm by 3–4 mm, 3-sided in the upper part, subterete in the basal part. Head brown, ovoid to subglobose, 1– $1\frac{3}{4}$ by ca $1\frac{1}{2}$ cm. Basal bracts navicular, 10–22 by $2\frac{1}{2}$ – $3\frac{1}{2}$ mm, obtuse, crested. Median bracts ovate-oblong, 8–13 by 3–4 mm, obtuse or emarginate, minutely spinulose, with 4 descending nerves. Lateral sepals 8–9 by ca 2 mm, obtuse, crested, entire. Median sepal spatheiform, 1-nerved, up to 5 by 4 mm. *Petals* up to 15 mm long, limb suborbicular, up to 7 by 3–4 mm, outer margin lacerate, claw 7–8 mm. *Stamens* 3– $3\frac{1}{2}$ mm, anthers brown, 2– $2\frac{1}{2}$ mm; thecae close to each other, each with 2 acute tips and obtuse base. *Staminodes* absent. Ovary ellipsoid, 2–3 by 1– $1\frac{1}{2}$ mm, attenuate at the base. 3-sided, 3-celled. Styles 3-fid, $6\frac{1}{2}$ –7 mm, branches linear, 3– $4\frac{1}{2}$ mm.

Distr. Malaysia: Malay Peninsula (Main Range).

Ecol. In forests, swampy places and screes, 900–2200 m, fl. March–Oct.

Notes. This clearly marked species belongs with *X. chlorocephala* to the most robust representatives in Malaysia.

13. *Xyris chlorocephala* VAN ROYEN, Blumea 7 (1953) 308.—Fig. 1 M.

Leaves ensiform, acuminate, 35–65 by $2\frac{2}{3}$ – $1\frac{1}{4}$ cm, sometimes falcate, distinctly nerved, glabrous; sheath 10–20 cm long, widened and reddish brown or dark brownish at the base. Peduncle 25–65 cm by 3–4 mm, flattened immediately below the head, subterete in the lower part. Head green, 1– $1\frac{1}{2}$ by ca $1\frac{1}{2}$ cm. Basal bracts navicular, 7–9 by 2– $3\frac{1}{2}$ mm, obtuse, crested. Median bracts ovate to squamate, 8–13 by 3–4 mm, obtuse or emarginate, minutely spinulose, with 2 twice forked descending nerves. Lateral sepals 8–9 by ca 2 mm, obtuse,

crest abruptly narrowing near the top. Median sepal spatheform, up to 5 by 4 mm. *Petals* up to 15 mm long, limb suborbicular, up to 7 by 3-4 mm, outer margins lacerate, claw 7-8 mm long. *Stamens* 3-3½ mm, anthers 2-2½ mm, yellow, connective widened, membranous; thecae with 2 acute tips, mucronate at the base, inner cells shorter than the outer ones. *Staminodes* forked, penicillate, 2-2½ mm long, with a short mucro in the fork. Ovary ellipsoid, 2-3 by 1-1½ mm, attenuate at the base, 3-sided, 3-celled. Styles 3-fid, 6½-7 mm, branches linear, 3-4½ mm.

Distr. Malaysia: Central Sumatra (Westcoast, Serasah Bunta near Pajakumbu and Harau Cleft).

Ecol. In the spray of waterfalls and on steep damp walls with seepage water, often rooting in moss, 500 m, fl. March, Aug.

Note. Closely resembling *X. grandis* but differing in the smaller leaves, the green head, the peduncle which is flattened below the head, the absence of a minutely papillate field on the bracts, the crest of the lateral sepals which abruptly narrows at the top, the presence of penicillate staminodes, in the shorter inner loculi of the yellow anther, and the mucronate base of the anther-cells.

14. *Xyris indica* LINNÉ, Sp. Pl. 1 (1753) 42, *pro stirp. ind. orient., emend.* J. E. SMITH, in REES, Cy-



Fig. 4. *Xyris indica* L. var. *indica* in a rice-field in Krawang (West Java).

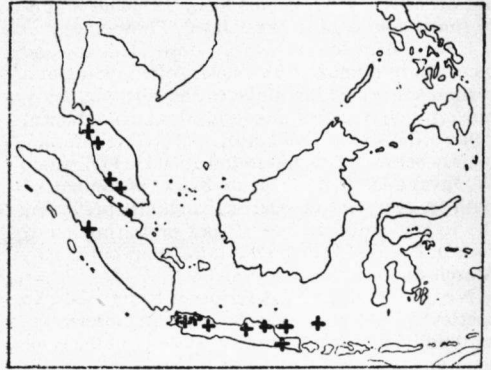


Fig. 5. Distribution of *Xyris indica* L. var. *indica* in Malaysia.

clop. 30 (1819) no 11, non sensu PURSH. Fl. Am. Sept. (1814) 33 *quae est X. tortu* J. E. SMITH, l.c.: NILSSON, l.c. 38; RENDLE, J. Bot. 37 (1899) 497; WEINZIEHER, Flora 106 (1914) 393-432, t. 6 & 7: Festschr. Inst. Allg. Bot. Univ. Zürich (1914) 43-82, t. 1 & 2; BEUMÉE, Trop. Natuur 6 (1917) 155-159, f. 1-10; BACKER, Handb. Fl. Java 3 (1924) 4; Onkruid. Suiker. (1928) 176; RIDLEY, Fl. Mal. Pen. 4 (1924) 348; MALME, l.c. (1929) 390.—*X. calcephala* MIQ. Fl. Ind. Bat. 3 (1855) 527.—*X. robusta* MART. in WALL. Cat. (1828) no 6087; in WALL. Pl. As. rar. 3 (1832) 30.—*X. capito* HANCE, J. Bot. 14 (1876) 262.—*X. paludosa* R. BR. Prod. 1 (1810) 256.—Fig. 1 N, 4-5.

var. indica.
Robust perennial. *Leaves* linear-ensiform, 5-60 by 1/3-1 cm, top falcate and curved in the mature ones, straight in the juvenile ones, acute to obtuse, glabrous, indistinctly nerved when dry, with numerous short, prominent transverse ribs connecting the nerves; sheath 8-30 cm long. Peduncle 20-80 cm by 1½-3 mm, twisted, compressed to terete, with prominent nerves. Head ovoid to subglobose or ellipsoid, ½-3½ by ½-1½ cm. *Bracts* papyraceous, conchate, slightly 5-angled to obovate, 5-8 by 5-7 mm, obtuse to truncate, entire or emarginate, with membranous gold-coloured margins, with ca 4-6 descending nerves, minutely papillate in the upper third. *Lateral sepals* 5-7 by ca 1 mm, obtuse; crest dentate, sometimes entire, in the apical flowers shorter than the wings and then the apex of the sepals acute. Median sepal cap-shaped, up to 4 by 2½ mm. *Petals* yellowish to yellow, 8-10½ mm long, cuneate, limb obovate or ovate, 3½-5 by 3-4 mm, margin serrulate, claw 5-6 by ½ mm. *Stamens* ca 4 mm long; anthers 4-sided. 1½-2 by ½ mm, top broadly incised, with a short mucro in the incision; thecae acute or mucronate at both sides, connective membranous *Staminodes* penicillate, 2-3 mm long. Ovary obovoid, 3-sided, 2½-3 by 1½-2 mm, 1-celled. Style 3-fid, 2-3 mm long. Fruit 3-4 mm high.

Distr. Ceylon, India, Cochin-China, China and Hainan to Australia, in *Malaysia:* Sumatra (once

at Fort de Kock, Westcoast Res.), Java and Madura (most abundant in West Java), Philippines.

Ecol. Almost exclusively restricted to and common in inundated rice-fields, often giving at a certain stage a yellow tinge to the ripening fields, but erratically distributed and absent in adjacent fields (BACKER, Krakatao, 1929, 7, footnote), mainly below 250 m, but found at 600 m (Tjibadak, W. Java) and 900 m (Fort de Kock, W. Sumatra), both in everwet and seasonal regions, preferring the lighter soils, acc. to COERT preferring sandy soils in E. Java, *fl.* throughout the year, but mostly March-June.

Notes. As LINNÉ's description comprised two species, J. E. SMITH emended the circumscription by typifying it with the Indian element, at the same time giving a new name and a description of the American element (RENDLE, *l.c.*). A variety occurs in Indo-China.

Vern. *Djadjaruman, djukut pëntolan, latun, babawangan beureum, S, atjuk-atjuk, J, bunga dari kandang, rumpot bagau, jérangau padang, Mal. Pen., pérangon padang, Penang.*



Fig. 6. *Xyris capensis* THUNB. var. *schoenoides* (MART.) NILSS. in a swamp on Mt Patuha (West Java). Below: leaves and heads of *Eriocaulon blumei* KOERN. (DE VOOGD, 1939).

15. *Xyris capensis* THUNB. var. *schoenoides* (MART.) NILSSON, Kongl. Vet. Akad. Förh. (1891) 3, p. 154-155; NILSSON, *l.c.* (1892) 41.—*X. schoenoides* MART. in WALL. Cat. (1828) no 6083; in WALL. Plant. As. rar. 3 (1832) 30.—*X. macrocephala* (non VAHL) JUNGH. Java, ed. 2, neerl. 1 (1853) 543.—



Fig. 7. *Xyris capensis* THUNB. var. *schoenoides* (MART.) NILSS. Tuft on swinging moor of Mt Diëng (Central Java) (POLAK, 1930).

X. melanocephala MIQUEL, Fl. Ind. Bat. 3 (1855) 528; NILSSON, *l.c.* (1892) 42; MALME, *l.c.* (1927) 392; MALME, *l.c.* (1929) 391.—*X. sumatrana* MALME, *l.c.* (1929) 391-392.—*X. semifuscata* BOJER ex BAKER, J. Linn. Soc. 20 (1884) 277.—*X. novoguineensis* HATUSIMA, Tokyo Bot. Mag. 56 (1942) 422.—Fig. 1 O, 6-9.

Leaves rigid, ensiform, 10-50 cm by 2-4 mm, top falcate, curved, obtuse; sheath 6-16 cm long, crested, ligule 2-25 mm long. Peduncle 20-96 cm by 1½-3 mm, subcompressed, ribbed, with one distinct wing, but with 2 in the upper part, twisted, basal part subvillose and sometimes shining brown.



Fig. 8. *Xyris capensis* THUNB. var. *schoenoides* (MART.) NILSS. Gregarious in the marsh Tegal Bungbrung, Mt Papandajan (W. Java), ca 2350 m alt. (DOCTERS VAN LEEUWEN, May 1930).

Head subglobose to obovoid, up to 1 cm diam. Basal bracts orbicular; median bracts narrowly elliptic and shortly spinulose, sometimes broadly boat-shaped. Bracts in either case provided with 6-9 mainly complete, sometimes incomplete nerves, 4-9 by 3-6 mm. Lateral sepals boat-shaped, 6-7 by 1-1½ mm, obtuse to acute, entire, with a narrow crest. Median sepals cap-shaped, 3-4 by ca 2 mm, obtuse. Petals yellow or yellowish, limb obovate, 4-5½ mm long, claw 6-7 mm. Stamens ca 2 mm long, filaments ca ½ mm, anthers ca 1½ by ca ½ mm, obtusely incised at the top, apex of thecae with 2 teeth, base obtuse to mucronate, connective membranously widened. *Staminodes* bifid, penicillate, 1½-2½ mm. Ovary 3-sided, 1-celled with 3 parietal placentas, obovoid, 4-6 by ca 2 mm. Style 3-fid, 2½-3½ mm, branches 1½-2 mm, stigmas infundibuliform, papillate.

Distr. SE. Asia and throughout *Malaysia*: Su-

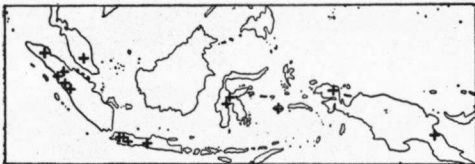


Fig. 9. Distribution of *Xyris capensis* THUNB. var. *schoenoides* (MART.) NILSS. in *Malaysia*.

matra (N. half), Malay Peninsula (Cameron's Highlands), Java (W.-Central), Central Celebes (Lake Posso and Limbung near Masamba), Moluccas (Buru), and New Guinea (Arfak Mts and Morobe Distr.), the species *s.l.* distributed from Central Africa to Australia.

Ecol. Mountain swamps, stream and lake banks, swinging moors, sometimes rather close to solfatara (Diëng, Gajolands), mostly associated with sedges and *Juncus*, locally often subdominant by densely set tufts, (600)-900-2500 m, fl. Jan.-Dec..

Notes. In Java on the Diëng-plateau it is sometimes used as an inferior substitute for *Fimbristylis* in the construction of mats (HEYNE, Nutt. Pl. 1927, 427).

Vern. *Mëndongan*, *J, aga mantjii*, Alahan Pandjang, *sinar uluh uluh*, Toba.

16. *Xyris flabellata* VAN ROYEN, *Blumea* 7 (1953) 308.—Fig. 10.

Small, not tufted. *Leaves* ensiform, 2½-9½ cm by 1½-2½ mm, equitant, acute, falcate, with a stout hollow nerve in either margin, minutely papillate; sheath 1½-7½ cm long; leaves enveloping the peduncle provided with an obtuse, 5-10 mm long acumen, but without a limb. Peduncle 8-28 cm by 1-1½ mm, subterete, provided with one stout rib, papillate. Head obovoid to ovoid, 5-7 by 3-5½ mm, few-flowered. Basal bracts black,

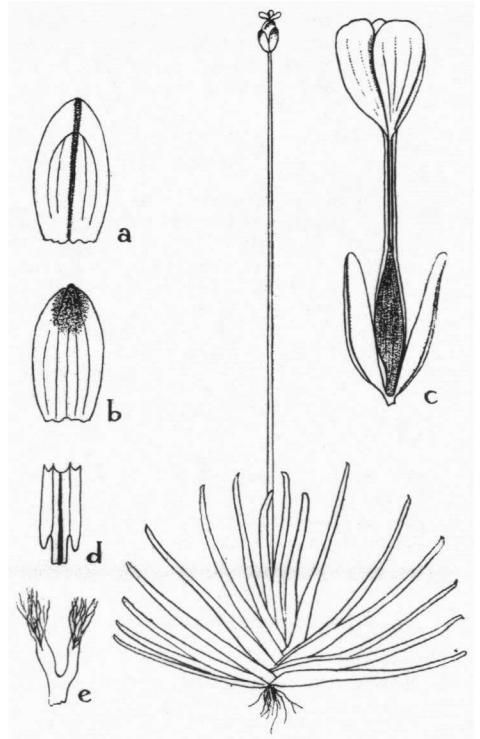
ovate, 5–6 by $3\frac{1}{2}$ –4 mm, obtuse, distinctly crested, with 4 descending nerves. Median bracts obovate, 6–7 by $2\frac{1}{2}$ –4 mm, crested, black and papillate in the apical part, with 5–6 complete nerves. Lateral sepals obtuse, 5 – $5\frac{1}{2}$ by ca $1\frac{1}{2}$ mm, with an entire, narrow crest. Median sepal cap-shaped, 1-nerved, ca 4 mm long. Petals 8–10 mm long, limb elliptic to orbicular, $3\frac{1}{2}$ – $4\frac{1}{2}$ mm long, claw $4\frac{1}{2}$ – $5\frac{1}{2}$ mm. Stamens ca 2 mm, filament ca 1 mm long; anthers 1 – $1\frac{1}{2}$ mm, top retuse, top of the thecae with 2 acute teeth, base mucronate, connective membranously widened. *Staminodes* bifid, penicillate, 1–2 mm. Ovary fusiform to obovoid, 3-sided, 3-celled, 3–4 by $\frac{3}{4}$ – $1\frac{1}{2}$ mm. Style 4–5 mm, 3-fid, branches ca 2 mm long, capitate.

Distr. *Malaysia*: North Sumatra (Gajo Lands).

Ecol. In marshy, low, open vegetation of mountain heaths, typified by *Cyperaceae*, *Eriocaulon*, and *Patersonia*, 2350–3300 m.

Notes. The leaves are typically equitant, forming in the field characteristic 'combs'. They are rather fleshy and have a yellowish-green colour.

Fig. 10. *Xyris flabellata* VAN ROYEN. Habit, $\times \frac{3}{4}$, a. basal bract, b. median bract, c. lateral sepals and flower, d. stamen, e. staminode (after VAN STEENIS 8430).



Excluded

Xyris operculata 'LABILL.'; NAVES, Nov. App. (1880) 268. According to MERRILL (En. Philip. I, 1922, 192) this is a wrong record of this Australian species for the Philippines.