Revision of *Xyris* L. (Xyridaceae) in Thailand

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ABSTRACT. Xyridaceae (with only one genus, *Xyris* L.) was treated for the Flora of Thailand by Hansen in 1987 with 11 species. Through extended collection, with observations in the field and new methodologies in particular in specimens from north-eastern Thailand, at present 17 indigenous species have been recognized, including four new species and two new records for Thailand. An updated key to the species is provided. Lectotypes have been designated for all names as necessary. All species are described and illustrated.

KEY WORDS: *Xyris*, Xyridaceae, Thailand, new species, new records.

INTRODUCTION

Xyridaceae, with five genera globally, but only one genus, *Xyris* L. in Asia, was published in the Flora of Thailand in 1987 with 11 species (Hansen, 1987). For other Asian countries, three species have been reported in Bhutan (Noltie, 1994), seven in India (Hooker, 1894), three in Sri Lanka (Wijesundara, 2000), six in China (Wu & Kral, 2000), one in Taiwan (Yang, 2000), 11 in Cambodia, Laos, and Vietnam (Hansen, 1983), 16 in the Malesian region (Van Royen, 1954b) and three in Java (Backer & Bakhuizen van den Brink, 1968).

For the present new account herbarium specimens of the genus were consulted at the following herbaria: AAU, BK, BKF, BM, E, HN, K, KEP, KKU, L, P, PSU, QBG, SING and TCD. Recent field collections, including observations on morphology, ecological and phenological information, and locality conditions were made mostly in Thailand, with voucher specimens deposited mainly at BK, BKF, KKU and L. Five lectotypes were selected, based on the quality of the syntype specimens and the degree to which they matched the original descriptions.

The present account comprises 17 species for Thailand, six more than the 1987 treatment. Four of them were described recently (Phonsena, Chantaranothai & Meesawat, 2012a), *X. bituberosa*, *X. buengkanensis*, *X. emarginata* and *X. thailandica*; and two noted as new records: *X. borneensis* Rendle and *X. linifolia* P.Royen (Phonsena, Chantaranothai & Meesawat, 2012b). All taxa belong to subgenus *Xyris* (Dahlgren et al., 1985).

Important characters to be used in species delimitation (and key) comprise, for example, the presence or absence of a swollen underground stem (Fig. 1), the shape of the spike (Fig. 2), the shape of the fertile bract (Fig. 3), the shape of the stomatal field (Fig. 3), the shape and margin of petal limbs (Figs. 4A–D), and whether the ligule is present or absent (Figs. 4E–F).

All cited specimens have been seen by the first author.

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XYRIS

Herbs, perennial or annual, forming bulb, corm, stoloniferous rhizome or in dense tufts. Leaves alternate, equitant, distichous, ensiform, linear, subterete or terete, with or without a ligule; blade flat, subterete or terete, smooth, rough, papillate or with minute transverse ridges; margin entire, finely serrate; fertile bracts at apex emarginate; montane plant (1180–1280 m altitude) 11. Fertile bracts at apex not emarginate; lowland plant (180 m altitude) 12. Margin of fertile bracts lacerate

Each fertile bract subtending one flower. Sepals 3, brown or hyaline; the 2 lateral sepals keeled, persistent; the median sepal hood-like, ovate, thin, membranous, covering the flower in bud, falling off at anthesis. Petals 3, yellow; limbs obovate, ovate or elliptic, claw long and narrow. Stamens 3, inserted on the petals; filaments flattened; anthers lanceolate-oblong, basified, 2-loculed, bifid distally and sagittate proximally, dehiscing by vertical slits. Staminodes 3 or absent, bifractuate, branches with elongate-penicillate hairs. Ovary (in Thai species) superior, sessile, 1-locular with 3 parietal placentas. Style filiform, trifid; stigma horseshoe-shaped. Fruit a loculicidal capsule, obovoid or ellipsoid. Seeds numerous, brown, ellipsoid to ovoid or subglobose.

About 280 species, mainly in North and South America, with few species in Africa, Asia and Australia; 18 species in SE Asia, 17 species in Thailand.

KEY TO THE SPECIES OF XYRIS IN THAILAND

1. Plant with bulbous or cormous underground stem
2. Underground stem forming a bulb
3. Leaves subterete to terete, margin entire
4. Leaf margin papillose or finely serrate; fertile bracts at apex entire; montane plant (1180–1280 m altitude) 15. X. thailandica
5. Leaf margin entire; fertile bracts at apex emarginate; lowland plant (180 m altitude)
6. Margin of scape papillate
7. Scape with 6–15 longitudinal ridges; leaves with transverse ribs
8. Bracts imbricate and arranged in 5 rows
9. X. indica
10. Stomatal field of fertile bracts 3–10 times longer than wide
11. Fertile bracts at apex amarginate
12. Margin of fertile bracts lacerate
13. Leaf blade basally smooth
14. Inflorescence depressed hemispherical, wider than long, rarely ellipsoid or ovoid; staminodes absent
15. Leaf blade rough, often tuberculate
16. Leaf blade smooth
17. X. wallichii
18. X. grandi
19. X. borneensis
20. X. capensis
21. X. thailandica
22. X. emarginata
23. X. tuberosa
24. X. bituberosa
25. X. linifolia
26. X. complanata
27. X. indica
28. X. buengkanensis
29. X. lobbii
30. X. bancana
31. X. borneensis
32. X. intersea
33. X. pauciflora
34. X. grandis
35. X. kradungensis
36. X. pauciflora
37. X. intersea
38. X. borneensis
39. X. buengkanensis
40. X. lobbii
41. X. bancana
42. X. borneensis
43. X. intersea
44. X. pauciflora
45. X. grandis
46. X. kradungensis
Figure 1. Habit of SE Asian *Xyris*: A. solitary annual herb; B. caespitose perennial herb; C. solitary perennial herb with stoloniferous rhizome; D. solitary perennial with abruptly dilated underground stem forming globose depressed corm; E. solitary perennial herb with abruptly dilated underground stem forming 2-lobed corm; F. solitary perennial herb with dilated underground stem forming bulb. (scale bar = 2 mm)
Figure 2. Spike of SE Asian Xyris: A. ellipsoid spike with imbricate bracts; B. ovoid spike with imbricate bracts; C. cylindrical spike with imbricate bracts; D. depressed hemispherical spike with imbricate bracts; E. globular spike with imbricate bracts; F. ellipsoid spike with 5-ranked bracts. (scale bar = 2 mm)
Figure 3. Fertile bract and stomate field of SE Asian *Xyris*: A. fertile bract without stomate field; B. fertile bract with entire margin and ovate stomate field; C. fertile bract with emarginate apex; D. & E. fertile bract with lacerate apex; F. fertile bract with oblong-triangular stomate field. (scale bar = 1 mm)
Figure 4. Petal limb and ligule of SE Asian *Xyris*: A. elliptic petal limb with entire margin; B. obovate petal limb with crenulate margin; C. obovate petal limb with fimbriate margin; D. obovate petal limb with lacerate margin; E. leaf with a ligule; F. leaf without a ligule. (scale bar = 1 mm)

Caespitose perennial herb, 50–90(–100) cm tall. Leaves 5–15(–200) per plant, linear or subterete, with sheaths, dark brownish-black, twisted, 30–70 by 0.4–0.9 cm, with or without a ligule; blade smooth, margin entire, not thickened but sometimes distinctly sharp-edged; apex blunt to acute, slightly oblique. *Scape* terete, subterete or compressed below the spike with 1(–2) low ridges, twisted, (25–)50–90(–100) cm by 2–3 mm, surface smooth, margin entire. *Spike* ellipsoid to cylindrical, 0.5–1.1 by 0.5–0.7 mm. *Sterile bracts* (6–)8–12, imbricate, greenish-brown to reddish-brown, elliptic to ovate, 4–6 by 2–3 mm. *Fertile bracts* imbricate, greenish-brown to reddish-brown, ovate to elliptic, 6–8 by 4–6 mm, margin lacerate above near apex; stomatal field triangular-elliptic, 1.5–2.5 by 1–2 mm. *Lateral sepals* pale brown, 5–6.5(–8) by 1–1.5 mm, with ciliate crest. *Petal limbs* yellow, obovate or spatulate, 6–9 by 5–7 mm, margin entire or slightly lacerate. *Anthers* 2–2.5 mm long, shallowly bifid, deeply sagittate; filaments 1–1.5 mm long. *Staminodes* 3, branches 3.5–4 mm long. *Style* 3–4 mm long, distally 3-branched, branches ca 3 mm long. *Capsule* dark brown, obovoid, 5–6 by 2.5–3 mm. *Seeds* dark brown, translucent, obovoid, to ellipsoid, ribbed, ca 0.6 mm long, 0.3–0.4 mm diam., with 16–18 longitudinal ridges and 5–9 transverse ridges.

Figure 5. *Xyris bancana*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.

Distribution.— Cambodia, Vietnam, Hong Kong, Malesia (Banka, type).

Ecology.— Wet places with sandy soil; from sea level to 1470 m altitude.

Phenology.— Flowering: August to September. The flowers usually open about 11.30 a.m. and persist until mid-afternoon (2.00 p.m.), rarely until 3.30 p.m.

Vernacular.— Krathin thung (กระถินท雍) (General).

Conservation status.— The wide distribution of this species means a conservation status of Least Concern (LC, rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.

Notes.— This species is recognized by the median bracts being lacerate on their upper margin as in X. complanata, but it differs from the latter by its terete scape and leaf margin being not tuberculate.

Highland plants in sandstone plateau from NE Thailand (e.g. Phu Kradueng National Park and Phu Luang Wildlife Sanctuary) are usually very densely caespitose, with up to 200 leaves per plant (Fig. 16A). All plants have linear leaves, and the leaf size is wider than the plants from lower altitude.

Two collections, Bodinier 1468 and Bodinier s.n. (26 April 1894), are mentioned in the original description of X. chinensis. Bodinier 1468 at E is chosen as lectotype because it is the best of the four sheets examined, and is a good match for Malme’s original description.


Solitary perennial herb, 40–50(–75) cm tall with abruptly dilated underground stem, forming a 2-lobed corm. C orn lobes yellowish-brown, subglobose, (0.8–)1–1.5 by (1.2–)1.5–2.3 cm, containing starch grains. Leaves (2 or) 3 or 4 per plant, linear or subterete, twisted, (12–)25–37 cm by 2–2.3 mm, with a ligule; blade smooth, margin entire, apex bluntly oblique to acute. S cape terete, subterete below the spike, twisted, 40–50(–75) cm by 1–1.5 mm, surface smooth, margin entire. Spike ellipsoid to ovoid, (0.8–)1.2–1.8 by 0.5–0.9 cm. Sterile bracts 6–12, imbricate, pale brown to reddish-brown, ovate to obovate, 4–7 by 3–5 mm, margin entire, apex lacerate. Fertile bracts imbricate, pale brown to reddish-brown, ovate to obovate, 6–8 by 5–7 mm, margin entire, apex lacerate; stomatal field triangular, 1.8–2.1 by 1.5–2.5 mm. Lateral sepals hyaline or pale brown, 5–6 by 1–1.5 mm, without or with a minute crest. Petal limbs yellow, obovate, 10–12 by 8–10 mm, margin distally lacerate. Anthers 2–3 mm long, shallowly bifid, deeply sagittate; filaments 1–1.5 mm long. Staminodes 3, branches ca 4 mm long. Style 5–6 mm long, distally 3-branched, branches ca 3 mm long. Capsule dark brown, obovoid, 3–3.4 by 2–2.2 mm. Seeds reddish-brown, translucent, ellipsoid, ca 0.6 mm long, 0.2–0.3 mm diam., with 13–15 longitudinal ridges and 1–3 transverse ridges.


Distribution.— Endemic to north-eastern Thailand.

Ecology.— On open, sandy soil in wet places in dry dipterocarp forest at 180–450 m altitude.

Phenology.— Flowering: September to November, between the late rainy season and the beginning of dry season. The flowers open in the late morning at 11.30 a.m. and persist until 4.30 p.m.

Vernacular.— Krathin phu wua (กระถินผ้วว้า).

Conservation status.— This species is endemic to Thailand, recorded from three localities, two within the protected areas, and the other from disturbed dry dipterocarp forest near villages. The habitat outside the sanctuary has been disturbed by farming activities which appear to cause the rapid decline of the species there, but the populations within the protected areas are well protected. A rating of Endangered (EN, IUCN 2001) is merited.

Notes.— Xyris bituberosa resembles X. tuberosa Ridl. and also possesses a tuber (underground corm-shaped stem). It is distributed in north-eastern, eastern and peninsular Thailand. The latter species, however, differs in having simple (sometimes aggregated) and smaller tubers, and ensiform leaves.

Uses.— None recorded.


Caespitose perennial herb, 20–40(–75) cm tall. Leaves 5–15 per plant, subterete or linear, wiry, twisted, 6–30(–40) cm by 0.4–1.2 mm, forming a ligule 0.5–1 mm long; blade basally rugulose with short transverse ridges, margin entire, apex bluntingly-oblique. Scape terete or subterete with 7–8 low ridges below the spike, twisted, 20–40(–75) cm by 0.5–1 mm, surface smooth, margin entire. Spike ellipsoid, 5–9 by 3–5 mm. Sterile bracts 4–8, imbricate, greenish- to reddish-brown, elliptic to ovate, 4–6 by 2–3 mm, margin entire, lacerate at apex. Fertile bracts imbricate, greenish- to reddish-brown, ovate to elliptic, 6–8 by 4–6 mm, margin lacerate near apex; stomatal field ovate to elliptic, 3–6 by 2.5–5 mm, with papillose epidermis. Lateral sepals pale brown, 3–4 by 0.7–1 mm, crest ciliate at least in the upper half. Petal limbs ob-ovate, yellow, 6–8 by 3–5 mm, margin distally entire. Anthers 1.2–1.5 mm long, shallowly bifid, deeply sagittate; filaments ca 1 mm long. Stamnodes 3, branches ca 1.5 mm long. Style 3–3.5 mm long, distally 3-branched, branches ca 2 mm long. Capsule dark brown, ellipsoid to ob-ovoid, 5–6 by 2.5–3 mm. Seeds brown, translucent, obovoid to ellipsoid, 0.4–0.5 mm long, 0.2–0.3 mm diam., with 14–16 longitudinal ridges and 6–9 transverse ridges.


Distribution.— Peninsular Malaysia, Singapore, Banka, Billiton, Borneo (Sabah, type).

Ecology.— On open, sandy soil, in wet places, sometimes in strand vegetation, from sea level to 150 m altitude.

Phenology.— Flowering: August to September. The flowers usually open about mid-morning (10.00 a.m.) and persist until mid-afternoon (2.00 p.m.).

Vernacular.— Krathin sai (กระถินใส).

Conservation status.— Although this species is found in strand vegetation, which is under threat from human disturbances, its wide distribution means a conservation status of Least Concern (LC,
rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.

Notes.— *Xyris borneensis* was placed by Hansen (1979a) in the synonymy of *X. bancana* Miq. along with *X. ridleyi* Rendle, *X. glauccella* Malme, *X. chinensis* Malme and *X. subcomplanata* Malme. Hansen reported that *X. borneensis*, from Borneo, has subterete leaves but that it is otherwise similar. Many specimens were misidentified as *X. bancana*. However, Phonsena et al. (2012a) hold a distinct view: for example, the stomatal field of *X. borneensis* is covered with papillae (versus non-papillose in *X. bancana*), and the leaf of *X. borneensis* has six compound vascular bundles and two single vascular bundles (versus 11 compound vascular bundles and three single vascular bundles in *X. bancana*). Therefore, we regard *X. borneensis* as a distinct species.

Doust & Conn (1994) described *Xyris cheumatophila* Dust & B.J.Conn from Australia (Northern Territory and Queensland), mentioning in a note that it has often been confused with *X. juncea*, *X. pauciflora* and *X. complanata*. However, this species may be identical with *X. borneensis*, as both species are similar in all characters, including seed-characters. *Xyris borneensis* is known from peninsular Thailand to Borneo. So it is quite possible that this species occurs in Northern Australia. More material needs to be examined to determine if *X. borneensis* and *X. cheumatophila* are the same species.


Distribution.— Endemic to Bueng Kan (Phu Wua Wildlife Sanctuary and Si Wilai). It is likely to occur also in nearby areas within the Mekong basin of Laos and Thailand.

Ecology.— On open, sandy soil in wet places in dry dipterocarp forest at 180–450 m altitude.

Phenology.— Flowering: September to November, between the late rainy season and the beginning of dry season. The flowers open about 10.30 a.m. and persist until 4.30 p.m.

Vernacular.— Krathin bueng kan (กระดินบึงแคน).

Conservation status.— This species is endemic to Thailand, and is so far known from only one locality. Its extent of occurrence is estimated as to be less than 100 km². Its habitat has been disturbed by farming activities and its occurrence is declining. A rating of Critically endangered (CR, IUCN 2001) is merited.

Uses.— None recorded.
Notes.— The bracts of this species are imbricate and arranged in five rows but in other SE Asian Xyris they are imbricately arranged and not in rows. The margin of the bract is hyaline, thin, entire in living plants but mostly fimbriate when dry. The fertile bracts of this species are similar to X. wallichii but the staminal field of the fertile bract in this species is 2–3 times longer than wide, whereas 3–10 times longer than wide in X. wallichii. Xyris buanganensis differs also in its fimbriate margin of the petals (entire in X. wallichii).


Caespitose aquatic annual herb, 40–55(–65) cm tall. Leaves more than 5 per plant, basally reddish, ensiform, straight, 10–25(–35) cm by 2–4 mm, with or without a ligule; blade smooth, margin slightly thickened or entire; apex bluntly-oblique, rarely acute. Spike terete with 1 or 2-ridges, straight, (15–)30–50(–65) cm by 1–1.5 mm, surface smooth, margin entire. Spike globular to hemispherical, 0.6–1.2 by 0.6–1.3 cm. Sterile bracts 5–6, imbricate, blackish-brown to brown, ovate, thin, 3–4 by 2–3 mm, margin entire. Fertile bracts imbricate, blackish-brown to brown, ovate, thin, 4–6 by 3–4 mm, margin entire; staminal field absent. Lateral sepals brown, ovate, 6–7 by 1.5–2 mm, with smooth entire crest. Petal limbs yellow, obovate, 6–10 by 6–8 mm with claw up to 7 mm long, margin distally lacerate. Anthers ca 2 mm long, shallowly bifid, deeply sagittate; filaments 1.5–2 mm long. Staminal 3, branches 3–4 mm long. Style 4–5 mm long, distally 3-branched, branches 2.5–3 mm long. Capsule dark brown, opaque, ovoid to obovoid, 4–5 by 3–4 mm. Seeds dark brown, ovoid to ellipsoid, ribbed, 0.5–0.6 mm long, ca 0.3 mm diam., with 17–18 longitudinal ridges and 7–9 transverse ridges.


Distribution.— India, Sri Lanka, Indo-China, China, Malesia, South Africa (type), South America.

Ecology.— In open, wet places and bogs with
Figure 6. *Xyris capensis*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.
shallow water in lower montane oak forest, 900–2400 m altitude.

Phenology.— Flowering: October to December. The flowers usually open from mid-morning (10.00 a.m.) until late afternoon (4.00 p.m.).

Vernacular.— Ya hua khot (Ya hua khot) (Loei).

Conservation status.— The wide distribution of this species means a conservation status of Least Concern (LC, rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.

Notes.— This species is recognized by its bracts lacking a stomatal groove.

Two collections, *Junghuhn 401 and Junghuhn 403*, are mentioned in the original description of *X. melanocephala*. *Junghuhn 403* (L0367238) at L is chosen as lectotype because it is the best preserved.


Caespitose perennial herb, 50–90(–100) cm tall. Leaves 7–20(–70) per plant, linear, twisted, 20–60(–70) cm by 2–4 mm, with a ligule; blade smooth; margin papillate due to numerous retrorsely oriented, coalescent rows of cells, the distal cell in each row forming a small tubercle; apex acute, oblique. *Scape* compressed with 1 or 2 ridges, twisted, (30–)60–80(–100) by 1.5–3 mm, surface smooth, margin papillate. *Spike* ellipsoid to cylindrical, 0.9–2.6(–4) by 0.5–0.9 cm. *Sterile bracts* 4–8, imbricate, greenish-brown to brown, ovate, 5–6 by 3–5 mm. *Fertile bracts* imbricate, greenish-brown to brown, darkening with age, obovate to orbicular, 6–8 by 5–7 mm; margin entire basally, entire to lacerate distally; apex slightly emarginate; stomatal field elliptic-rombic, 2.5–3.1 by 2.2–2.5 mm. *Lateral sepals* brownish, 5–6 by 1.5–2 mm, with ciliate crest. *Petal limbs* yellow, broadly obovate, 6–8 by 7–9 mm, margin distally serrate to lacerate. *Anthers* 2.5–2.5 mm long, shallowly bifid, deeply sagittate; filaments 1.5–2 mm long. *Staminodes* 3, branches 3–4 mm long. *Style* 3–5 mm long, distally 3-branched, branches 2–3 mm long. *Capsule* dark brown, obvoid, 5–6 by 2.5–3 mm. *Seeds* reddish-brown, translucent, ovoid, ribbed, ca 0.6 mm long, 0.3–0.4 mm diam., 14–15 dark brown longitudinal ridges and 2–4 transverse ridges.

Figure 7. Xyris complanata: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.

Distribution.— India, Sri Lanka, Indo-China, China (Hainan), Malesia, Australia (type).

Ecology.— Open, wet places in dry dipterocarp forest, lower montane oak forest and lower montane oak-pine forest, from sea level to 1600 m altitude.

Phenology.— Flowering all year round, preferably October to December. The flowers usually open from mid-morning (10.00 a.m.) and persist until late afternoon (4.00 p.m.). Old flowers may persist for another day after anthesis.

Vernacular.— Tan (ทาน) (Nakhon Si Thammarat); ya tan (หญาทาน) (Narathiwat); ya krathiam (หญากระถิ) (Prachin Buri); ya krathin (หญากระอิน) (Trat).

Conservation status.— The wide distribution of this species means a conservation status of Least Concern (LC, rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.

Notes.— Xyris complanata is recognized by its flattened scapes, conspicuously rough leaf edges and by its fertile bracts which are lacerate on the upper margin.

The first author has only seen a photograph of the type of X. anceps described as originating from Madagascar. Vahl (1805), and subsequent authors apparently erroneously indicated Malabar as its place of occurrence. Hansen (1982) cited the name as “X. anceps auct. non Lam.: Vahl”.

Caespitose or solitary perennial herb, 30–45 cm tall, base dilated, bulbous. Bulb ovoid, 0.6–1 by 0.4–0.6 cm. Leaves 2–4 per plant, basally reddish, linear, twisted, 10–20 cm by 1.5–2.2 mm, with a ligule; blade smooth, margin entire, apex bluntly oblique to acute. Scape terete, slightly twisted, 20–45 cm by 1–1.5 mm, surface smooth, margin entire. Spike ellipsoid, 0.8–1.5 by 0.5–1 cm. Sterile bracts 8–12, imbricate, reddish-brown to brown, obovate, 3–6 by 2–4 mm, margin entire. Fertile bracts imbricate, reddish-brown to brown, ovate, 7–8 by 4–5.5 mm, margin entire, apex emarginate; staminal field ovate, 2.5–3 by 1.2–2 mm. Lateral sepals pale brown, 7–8 by 1.5–2 mm, with coarsely and distantly serrate crest. Petal limbs bright yellow, obovate, 8–10 by 7–8 mm, margin fimbriate. Anthers ca 3 mm long, shallowly bifid, deeply sagittate; filaments 1–1.5 mm long. Staminodes 3, branches 3–3.5 mm long. Style 7–8.5 mm long, distally 3-branched, branches 3–3.5 mm long. Capsule dark brown, obovoid, 3–5 by 2–3 mm. Seeds brown to dark brown, translucent, narrowly ellipsoid to oblong, 0.5–0.8 mm long, 0.2–0.3 mm diam., with 13–15 longitudinal ridges and 0–4 transverse ridges.


Distribution.— Endemic to north-eastern Thailand. It may be assumed that it has a wider distribution in nearby areas along the Mekong basin of Laos & Thailand.

Ecology.— On open, sandy soil in wet places in dry dipterocarp forest at ca 180 m altitude.

Phenology.— Flowering and fruiting: October to December, between the late rainy season and the beginning of dry season. The flowers open in the morning at 08.30 a.m. and persist until 12.30 p.m.

Vernacular.— Krathin khok (กิ่งก.contract).

Conservation status.— This species is known from a restricted area which is under pressure from agricultural and urban development. The extent of occurrence is estimated as to be less than 100 km². A rating of Critically endangered (CR, IUCN 2001) is merited.

Uses.— None recorded.

Notes.— The fertile bracts of X. emarginata resemble those of X. lobbii Rendle in its emarginate apex, but differ in its lacerate margin (entire in X. lobbii). The margin of the fertile bracts also resembles those found in X. complanata, but X. emarginata differs from the latter in the leaf margin and the scape being smooth, not rough with tubercles.


Solitary, rarely caespitose perennial herb, (10–)30–50(–60) cm tall with stoloniferous rhizome. Leaves (4–)10–30 per plant, basally reddish, ensiform, straight, (7–)25–50(–60) cm by (3–)6–20 mm, without a ligule, blade smooth, margin distinct and slightly thickened, entire, apex bluntly-oblique to acute. Scape subterete, compressed below the spike with 2–7 ridges, straight, (10–)25–40(–60) cm by 2–3 mm, surface smooth, margin entire. Spike depressed-hemispherical or globular to ellipsoid, (0.6–)1–1.5 by (0.5–)2–2.5 cm. Sterile bracts 4–6, imbricate, greenish-brown to brown, narrowly triangular, 3–6 by 2–4 mm. Fertile bracts imbricate, greenish-brown to brown, almost triangular, (0.6–)0.8–1.1 by 0.3–0.6 cm, margin entire; staminal field narrowly-oblong, (3–)6–7 by 0.4–0.7 mm. Lateral sepals conuate below, brown, 7–9 by 2–2.5 mm, with smooth, upwards greenish crest. Petal limbs yellow, ovate, (0.5–)1.2–(0.8–)1.5 by (0.3–)0.6–(0.5–)1.2 cm, margin entire. Anthers 2–3 mm long, shallowly bifid, deeply sagittate;
Figure 8. *Xyris grandis*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. style; H. seed. Drawn by O. Phueakkhai.
filaments 1.5–2 mm long. Staminodes absent. Style 5–7 mm long, distally 3-branched, branches 3–3.5 mm long. Capsule dark brown, obovoid, 5–6 by 3–5 mm. Seeds dark brown, opaque, ovoid, broadly ellipsoid or subglobose, 0.6–0.7 mm long, ca 0.4 mm diam., with striate or Anastomosing longitudinal ridges and several weaker transverse ridges.


Distribution.—Laos, Cambodia, Vietnam, Peninsular Malaysia (type), Sumatra.

Ecology.—Among mosses on open sandstone plateaus in lower montane rain forest, dry evergreen forest, (400–850–1600 m altitude.

Phenology.—Flowering: July to November, in March (Indo-China). The flowers usually open from mid-morning (10.00 a.m.) and persist until 3.00 pm, rarely until 4.00 p.m.

Vernacular.—Ya bua yai (ไทย) (North-eastern).

Conservation status.—This species is known from four restricted localities in Thailand. Its extent of occurrence is estimated to be less than 50 km², but it has a wide distribution in Indo-China, Peninsular Malaysia and Sumatra. A conservation status of Vulnerable (VU, rating in IUCN, 2001) is most appropriate.

Uses.—None recorded.

Notes.—The Thai specimens are smaller of stature than the Indo-Chinese and the Malesian specimens. The shape of the inflorescences is very variable from depressed hemispherical to ellipsoid but shape and surface of the seeds match those of the type specimen, and also the absence of staminodes link them to X. grandis. Specimens from countries outside Thailand are commonly labeled as occurring in moist rain forest.

Hansen (1979a) said that only one specimen of X. grandis (Larsen, Smitinand & Wancke 1005 (AAU)) has been recorded from Thailand, and stated that it was a juvenile. It was in fact a mature plant, the small size of the specimen misleading Hansen.

Previous publications have failed to note that X. grandis has a stoloniferous rhizome. Rhizomes were lacking from herbarium sheets, being easily separated from the rest of the plant during collection.

Solitary or caespitose annual herb, 30–80–110 cm tall. Leaves 5–20–(30) per plant, narrowly ensiform, spongy, straight, (10–)30–60–(70) cm by (3–)4–6–(8) mm, without a ligule; blade flat with conspicuous, short transverse ribs connecting the longitudinal nerves, margin entire, apex bluntly oblique to acute. Scape terete with 6–15 longitudinal ridges, straight, (18–)30–70–(110) cm by 2–3–(4.5) mm, surface smooth, margin entire. Spike ovoid to cylindrical, (0.7–)1–2–(3.5) by 0.7–1.4 cm. Sterile bracts 4–6, imbricate, greenish-brown, ovate, 4–6 by 3–5 mm. Fertile bracts imbricate, greenish-brown, ovate to obovate, 5–8 by 4–6 mm, margin entire; staminal field triangular-rhombic, 1.4–1.5 by 1.8–2 mm. Lateral sepals pale brownish to almost hyaline, 10–12 by 2–2.5 mm, with coarsely serrate crest. Petal limbs yellow, ovate, 1.2–1.5 by 1.4–1.8 cm, margin distally lacerate. Anthers ca 4 mm long, shallowly bifid, deeply sagittate; filaments 2.5–3 mm long. Stamnodes 3, branches 3–3.5 mm long. Style 6.5–7 mm long, distally 3-branched, branches ca 5 mm long. Capsule brown, obovoid, 5–7 by 3–5 mm. Seeds pale brown, translucent, ovoid, ribbed, 0.6–0.7 mm long, ca 0.3 mm diam., 14–19 longitudinal ridges and 1–3 transverse ridges.


Distribution.—India (type), Sri Lanka, Myanmar, Indo-China, China (Hainan), Malesia, Australia.

Ecology.—Open, swampy places adjacent to rice fields. A lowland species, to 300 m altitude.

Phenology.—Flowering: (August to) October to January (to February). The flowers usually open during late morning (10.30 a.m.) and persist until mid-afternoon (2.30 p.m.).

Vernacular.—Krathin thung (กrokขี้กลาก) (Trat); krathin na (กrokน้ำ) (Chanthaburi); ya krathiam (หญกขี้กลาก) (Central, North-eastern); krachap daeng (สำขี้แดง) (Narathiwat); tall yellow-eyed grass.

Conservation status.—The wide distribution of this species means a conservation status of Least Concern (LC, rating in IUCN, 2001) as most appropriate.

Uses.—This plant has been used in traditional medicine as a cure for ringworm, itch and leprosy (Burkill, 1966). Dry inflorescences are used for decoration.

Notes.—Of the two collections, Pierre 1056 and Pierre 1086 from Vietnam, are mentioned in the original description of X. capito, both of them are suitable lectotypification, and Pierre 1036 at BM is selected.
Figure 9. *Xyris indica*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.

Solitary, rarely caespitose annual herb, 7–40(–50) cm tall. Leaves 5–10(15) per plant, basally reddish, ensiform, straight, (7–)10–25(–38) cm by (3.5–)4–6(–7.5) mm, without a ligule; blade smooth, margin conspicuously widened but hardly thickened, entire, apex bluntly-oblique. **Scape** terete, usually subterete below the spike, straight, (6–)10–35(–50) cm by (0.7–)1.2–1.7(–2) mm, surface smooth, margin entire. **Spike** ovoid-spherical, (0.6–)0.7–1.1(–1.5) by (0.5–)0.7–1.1 cm. **Sterile bracts** 5–7, imbricate, greenish-brown to reddish-brown, obovate to orbicular, 4–5 by 3–4 mm. **Fertile bracts** imbricate, pale brown, obovate to broadly elliptic, 6–7 by 4–5 mm, entire on very finely dentate near apex, sometimes torn at apex and apparently emarginate, pale brown below. **Lateral sepals** (1–1.5 by 0.8–1.5 mm. **Lateral sepals** pale brownish to hyaline, thin, 10–12 by 2–2.5 mm, with entire crest. **Petal limbs** yellow, obovate, 9–11 by 6–8 mm, margin distally erose. **Anthers** ca 2 mm long, shallowly bifid, deeply sagittate; filaments 1.5–2 mm long. **Staminodes** 3, branches 3–3.5 mm long. **Style** 5–6 mm long, distally 3-branched, branches ca 3 mm long. **Capsule** dark brown, obovoid, 4–6 by 3–4 mm. **Seeds** reddish-brown, translucent, ellipsoid, ribbed, 0.5–0.6 mm long, 0.2–0.3 mm diam., with 13–15 longitudinal ridges and 2–7 transverse ridges. **Distribution.**— Myanmar, Cambodia, Laos, Vietnam (type).

Ecology.— On moist, sandy soil among grasses, from sea level to 1300 m altitude.

Phenology.— Flowering: (July to) November to December. The flowers usually open during late morning (10.30 a.m.) and persist until mid-afternoon (2.00 p.m.).

Vernacular.— Krathin thung yai (กระดินห้วยใหญ่) (General).

Conservation status.— The wide distribution of this species means a conservation status of Least Concern (LC, rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.
Figure 10. *Xyris intersita*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.
Notes.— Three collections from Australia, *Hartley 13731 (L)*, Clarkson 4893 (L) and Henshall 1615 (BM) most likely belong to this species, but further study on their identity is needed.


Caespitose perennial herb, (10–)15–40(–60) cm tall. Leaves 5–10 per plant, basally reddish, ensiform, twisted, (10–)15–25(–40) cm by 2–4(–4.5) mm, with a conspicuous 0.5–1.5 mm long ligule; blade smooth, margin widened, flattened and quite sharply edged but not rough, apex bluntly oblique. *Scape* suberet to compressed with 1 or 2 ridges, twisted, (15–)20–40(–60) cm by 1–2 mm, surface smooth, margin entire. *Spike* ellipsoid to cylindrical, 0.7–1(–2.2) by 0.3–0.8 cm. *Sterile bracts* 4–5, imbricate, reddish-brown, elliptic to ovate, 3–5 by 2–3 mm. *Fertile bracts* imbricate, reddish-brown to dark brown, elliptic to ovate, 4–7 by 3–4 mm, margin entire or with a few teeth near apex; staminal field triangular, 2–2.1 by 1.1–1.4 mm. *Lateral sepals* dark brown, narrowly lanceolate to obovoid, 5–7 by 1–1.5 mm, with entire to shortly dentate crest. *Petal limbs* yellow, obovate, 6–9 by 5–7 mm, margin fimbriate. *Anthers* ca 2 mm long, slowly bifid, deeply sagittate; filaments 2–2.5 mm long. *Staminodes* 3, branches 3.5–4 mm long. *Style* 5–6 mm long, distally 3-branched, branches ca 4 mm long. *Capsule* dark brown, obovoid, 4–5 by 1–1.5 mm. *Seeds* dark brown, translucent, ellipsoid, ribbed, 0.5–0.6 mm long, ca 0.3 mm diam., with 13–18 longitudinal ridges and 1 or 2 transverse ridges.


Distribution.— Endemic to north-eastern Thailand.

Ecology.— In open, dry dipterocarp forest and lower montane pine-oak forest at 400–1300 m altitude.

Phenology.— Flowering: August to November. The flowers usually open during early morning (8.30 a.m.) and persist until 1.00 p.m.

Vernacular.— Ya bua bae (ญบัวบ้าบ) (North-eastern).

Conservation status.— This species is endemic to north-eastern Thailand, recorded only from Phu Kradueng National Park and Phu Luang and Phu Wua Wildlife Sanctuaries. The populations in these areas are well protected. A conservation status of Vulnerable (VU, rating in IUCN, 2001) seems most appropriate.

Uses.— None recorded.

Notes.— Hansen (1979) described *X. kradungensis*, and mistakenly cited two specimens of *X. bancana* as *X. kradungensis* (Larsen et al. 4737 and Sorensen, Larsen & Hansen 6167).
Figure 11. *Xyris kradungensis*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.

Solitary perennial herb, 25–55(–65) cm tall, base abruptly dilated and bulbous. Bulb ovoid, 1.5–3 by 0.8–1.4 cm. Leaves 1 (or 2) per plant, subterete to terete, twisted, 20–40 cm by 0.8–1.5 mm, without a ligule; blade smooth, margin entire, apex bluntly oblique to acute. Spike terete, twisted, 25–55(–65) cm by 0.7–1.5 mm, surface smooth, margin entire. Spike elliptoid to ovoid, 0.9–1.4 by 0.5–1.1 cm. Sterile bracts 4–8, imbricate, reddish- or dark brown, elliptic to ovate, 4–6 by 3–5 mm, margin entire, lacerate at apex. Fertile bracts imbricate, reddish- or dark brown, ovate, 5–7 by 4–5 mm, margin entire; staminal field ovate to elliptic, 1.8–2 by 1–1.2 mm. Lateral sepals hyaline, 5.5–7 by 1–1.5 mm, crest entire or coarsely serrate. Petal limbs yellow, obovate, 7–10 by 5–8 mm, margin distally lacerate. Anthers ca 2 mm long, shallowly bifid, deeply sagittate; filaments 2–2.5 mm long. Staminaodes 3, branches 3–3.5 mm long. Style 4–5 mm long, distally 3-branched, branches ca 4 mm long. Capsule brown, obovoid to ellipsoid, 4–6 by 3–4 mm. Seeds yellowish-brown or brown, translucent, ellipsoid, 0.5–0.9 mm long, 0.2–0.3 mm diam., with 9–11 dark brown longitudinal ridges and 1 or 2 transverse ridges.


Distribution.—Laos (type).

Ecology.—Open, grassy places on sandy soil in dry dipterocarp forest at 180–200 m altitude.

Phenology.—Flowering: June to October. The flowers open during late morning (at ca 10.30 a.m.) and persist until mid-afternoon (2.00 p.m.).

Vernacular name.—Krathin nam khong ( الكرستن نام كونغ).

Conservation status.—This species is found in a small area in dry dipterocarp forest of the Mekong basin of Laos and Thailand. Only three localities in Thailand are known, each consisting of a small population. Its habitat was disturbed by logging activities and land use, and is changing rapidly. An Endangered (EN, rating in IUCN, 2001) is merited.

Uses.—None recorded.

Notes.—Van Royen (1954a) in his original description of *X. linifolia*, indicated that the single known collection was made by Smiles in 1893 at the foothill of Mt Kau, Siam. Hansen (1983) argued that Mt Kau should be Mt Kan, not in Siam (Thailand) but in Laos, where Smiles travelled along the Mekong River at the time. However, Hansen (1987) included this species in his key for the treatment in the Flora of Thailand, without a description, assuming that it was likely to occur in Thailand also.

This species closely resembles *X. thailandica* in habit by its underground stem, but it differs from the latter by its terete leaves with smooth margins, not papillate as in *X. thailandica*.


Solitary perennial herb, 30–50(–90) cm tall with stoloniferous rhizome. Leaves 6–10 per plant,
Figure 12. *Xyris lobbii*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.
basally reddish, linear to subfalcate, straight, (10–)20–60 cm by 3–7 mm, without a ligule, blade smooth, margin not thickened, equitant, entire, apex bluntly oblique to acute. **Scape** terete, straight, (35–)40–60(–90) cm long, surface smooth, margin entire. **Spike** subspherical, ovoid to ellipsoid, 0.8–2.1 by 0.6–1.3 cm. **Sterile bracts** 7–9, imbricate, greenish-brown to reddish-brown, ovate to obovate, 4–5 by 3–4 mm. **Fertile bracts** imbricate, greenish-brown to reddish-brown, obovate to elliptic, 6–10 by 4–6 mm, margin entire, apex emarginate; staminal field triangular, 2.8–3.1 by 1.4–1.6 mm. **Lateral sepals** brown, firm, widening upwards, 8–10 by 2–2.5 mm, with entire or finely dentate to serrate crest. **Petal limbs** yellow, oval, 7–10 by 6–8 mm, crenulate at margin. **Anthers** 3–3.5 mm long, shallowly bifid, deeply sagittate; filaments 3–3.5 mm long. **Staminodes** 3, branches 3.5–4 mm long. **Style** 5–6.5 mm long, distally 3-branched, branches ca 4 mm long. **Capsule** dark brown, ellipsoid, 5–7 by 2–3 mm. **Seeds** pale brown, translucent, narrowly ellipsoid, 0.9–1 mm long, 0.2–0.3 mm diam., with 18–22 waving longitudinal ridges and 1 or 2 transverse ridges.


**Distribution.**—**Myanmar** (type), Vietnam.

**Ecology.**—Open grassy forest at 1000–2150 m altitude.

**Phenology.**—**Flowering:** September to November (to March). The flowers usually open between 11.00 a.m. (rarely before) and late afternoon (4.00 p.m.).

**Vernacular.**—Dao nuea (Dao nuea) (Northern).

**Conservation status.**—This species has a wide distribution in northern and north-eastern Thailand, and is recorded also in Myanmar and Vietnam. A conservation status of Least Concern (LC, rating in IUCN, 2001) seems most appropriate.

**Uses.**—None recorded.

Note.—Previous publications have failed to note that *X. lobii* has a stoloniferous rhizome. Rhizome were lacking from herbarium sheets being easily separated from the rest of the plant during collection.


Solitary, rarely caespitose annual herb, 5–40–(50) cm tall. *Leaves* 5–10(–15) per plant, basally reddish, linear-ensiform, (3–)5–25(–30) cm by (0.5–)1–3(–4) mm, with or without a ligule; blade rough with epidermis often tuberculate, margin tuberculate (use microscope or hand lens), apex bluntly-oblique to acute. *Scape* terete, with or without ridges, (8–)10–30(–50) cm by 0.3–1.5(–1.8) mm; surface smooth, margin entire. *Spikes* ellipsoid to ovoid, 0.4–1(–1.4) by 0.2–0.7(–1.2) cm. *Sterile bracts* 4, imbricate, reddish-brown, elliptic to ovate, 3–4 by 2–3 mm. *Fertile bracts* imbricate, pale or reddish-brown, rarely blackish-brown, obovate to orbicular, 4–6 by 4–5 mm, margin entire; stomatal field triangular, 1–2.2 by 0.4–1.2 mm. *Lateral sepals* hyaline to brown, 5–7 by 1.5–2 mm, with coarsely serrate or tuberculate or quite entire crest. *Petal limbs* yellow, obovate, 6–10 by 4–7 mm, margin distally lacerate, claw 4–5 mm long. *Anthers* 1–1.5 mm long, shallowly bifid, deeply sagittate; filaments 1–1.5 mm long. *Staminodes* 3, branches 3.5–4.5 mm long. *Style* 3.5–4.5 mm long, distally 3-branched, branches 2 mm long. *Capsule* dark brown, ovoid, 2–4 by 1.5–2 mm. *Seeds* reddish-brown, translucent, ellipsoid, ribbed, 0.5–0.6 mm long, ca 0.3 mm diam., with 12–14 longitudinal ridges and 1–3 transverse ridges.

Thailand.— All over the country.

Distribution.— India (type), Sri Lanka, Myanmar, Indochina, China, Malesia, Australia.

Ecology.— In open, wet places among grasses, from sea level to 1300 m altitude.

Phenology.— Flowering: August to December. The flowers usually open between mid-morning (9.00 a.m.) and mid-day (1.30 p.m.).

Vernacular.— Kung (>F) (Songkhla); ya khon kai (มณฑปที่) (North-eastern); ya bua (บัวบาน) (Ubon Ratchathani).

Conservation status.— The wide distribution of this species means a conservation status of Least Concern (LC, rating in IUCN, 2001) is most appropriate.

Uses.— It is believed by people in the north-eastern of Thailand that a tonic of this plant relieves back and waist pains.

Notes.— This species is similar to *X. intersita* in habit. It is easily recognized by the rough epidermis of the leaves.

Two collections, *Hohenacker* 369 and *Zollinger* 3286, are mentioned in the original description of *X. oryzetorum*. *Hohenacker* 369 at C is chosen as lectotype because the specimen is in good condition, and is a good match for the original description.


Solitary perennial herb, 25–50(–70) cm tall, base abruptly dilated and bulbous. *Bulb* ovoid, 1.6–2.5 by 0.9–1.8 cm. *Leaves* (2 or) 3 per plant, linear, flattened, twisted, 20–50 cm by 1.5–2.2 mm, without a ligule; blade smooth, margin papillose or finely serrate, apex bluntly oblique to acute. *Scape* terete, twisted, 40–50(–70) cm by 1.6–2 mm surface smooth, margin entire. *Spikes* ovoid to ellipsoid, 1.1–1.6 by 0.7–1 cm. *Sterile bracts* 4–7, imbricate, reddish- to blackish-brown, obovate to circular, 4–6 by 3–6 mm, margin entire, apex lacerate or entire. *Fertile bracts* imbricate, reddish- to blackish-brown, ovate, 5–6 by 4–5 mm, margin entire, apex lacerate or entire; stomatal field triangular, 1.4–1.6 by 0.9–1.2 mm. *Lateral sepals* hyaline or brown, 5–7 by ca 1 mm, with entire crest. *Petal limbs* yellow,
Figure 13. *Xyris pauciflora*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.
oovate, 9–13 by 7–9 mm, margin distally lacerate. 

**Anthers** ca 2.5 mm long, shallowly bifid, deeply sagittate; filaments 1.5–2 mm long. **Staminodes** 3, branches 3.5–4 mm long. **Style** 6.5–7 mm long, distally 3-branched, branches ca 3 mm long. **Capsule** brown, obovoid, 4–5 by 2–3 mm. **Seeds** reddish-brown, translucent, narrowly ellipsoid, 0.9–1.1 mm long, 0.3–0.4 mm diam., with 14–15 longitudinal ridges and 1–4 transverse ridges.


**Distribution.**— Endemic to north-eastern Thailand, known only from a restricted area in Phu Kradueng and Phu Ruea National Parks.

**Ecology.**— Open places, among grasses in lower montane pine-oak forest, at 1180–1280 m altitude.

**Phenology.**— Flowering: September to November, between the late rainy season and the beginning of dry season. The flowers open in the afternoon between 2.00 p.m. and persist until 5.00 p.m.

**Vernacular.**— Krathin phu (กะทิน).

**Conservation status.**— This species is endemic to Thailand, recorded only from Phu Kradueng and Phu Ruea National Parks. Its extent of occurrence is estimated to be less than 50 km², but the populations in these national parks are well protected. A rating of Endangered (EN, IUCN 2001) is merited.

**Uses.**— None recorded.

**Notes.**— *Xyris thailandica* is similar to *X. linifolia* through having a bulbous underground stem, but differs in its flat, linear leaves (terete in *X. linifolia*) and in its papillose margin of the leaves (entire in *X. linifolia*). *Xyris thailandica* is a montane species, occurring above 1000 m altitude whereas *X. linifolia* occurs in the lowland between 180 and 200 m altitude.


Solitary perennial herb, plants usually aggregated together, 40–50 cm tall, with abruptly dilated underground stem, forming a corm. Corm depressed globose, rarely 2-lobed, 1–1.8 by 2.5–4 cm, containing starch grains. **Leaves** 4–10 per plant, basally reddish, ensiform, straight, 25–40(–45) cm by 6–9 mm, with a small ligule or ligule absent; blade smooth, margin distinctly thickened, entire, apex bluntly-oblique to acute. **Scape** terete, subterete below the spike, straight, 15–40 cm by 1–2 mm surface smooth, margin entire. **Spike** ovoid to ellipsoid, rarely globose, 0.8–2.1 by 0.7–1.4 cm. **Sterile bracts** 4–6, imbricate, brown to dark brown, ovoid to ovate, margin lacerate, 4–6 by 3–4 mm. **Fertile bracts** imbricate, brown to dark brown, suborbicular to ovate, 6–8 by 6–7 mm, margin lacerate; stomatal field triangular, 1.8–2.6 by 1.4–2.4 mm. **Lateral sepals** hyaline, very thin, 5–7 by 1–1.5 mm, crest distantly serrate or entire. **Petal limbs** yellow, obovate, 1.5–1.8 by 1.4–1.6 cm with claw up to 5 mm long. **Anthers** ca 2 mm long, shallowly bifid, deeply sagittate; filaments 3–4 mm long. **Staminodes** 3, branches 3.5–4 mm long. **Style** 5–6 mm long, distally 3-branched, branches 3–4 mm long. **Capsule** brown, obovoid, 4–5 by 2–3 mm. **Seeds** reddish-brown to brown, translucent, ellipsoid, ribbed, 0.6–0.7 mm long, ca 0.3 mm diam., with 14–16 longitudinal ridges and 1 or 2 transverse ridges.

**Thailand.**— **NORTH-EASTERN:** Loei [Phu Kradueng National Park, 12 July 1948, Bunpheng 82 (**BKF**); 11 July 1959, Floto 7482 (**K**); 29 Oct. 2009, Phonsena 6450 (**BK, BKF, KKU, L**); 14
Figure 14. *Xyris tuberosa*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.

Distribution.— Cambodia, Laos.

Ecology.— On open, sandy soil among grasses, lower montane pine-oak forest, from sea level to 1300 m altitude.

Phenology.— Flowering: (July to) October to December (to February). The flowers usually open about late morning (11.00 a.m.) and persist until mid-afternoon (3.00 p.m.).

Vernacular.— Ya dok lueang (ญ้ดดอกเหลือง) (Loei).

Conservation status.— This species is known from four widely scattered localities in Thailand, and few collections from Laos and Cambodia. A conservation status of Vulnerable (VU, rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.

Notes.— See the notes of X. bituberosa.


Solitary, rarely caespitose perennial herb, 20–40 cm tall. Leaves 4–10 per plant, ensiform, straight, sheath with margin + ciliate below, 5–30 cm by 1.5–2 mm, without a ligule; blade rough, margin entire, apex bluntly-oblique to acute. Scape terete without ridge to slightly compressed above with 1 or 2 shallow ridges, straight, 5–40 cm by 0.5–1.4 mm, surface smooth, margin entire. Spike ellipsoid, 0.4–1.1 cm by 0.2–0.6 cm. Sterile bracts 4, imbricate, reddish-brown, narrowly elliptic, 3–4 by 1–2 mm. Fertile bracts imbricate, reddish-brown, narrowly elliptic to elliptic, 5–7 by 2–4 mm, with margin entire; staminal field oblong-triangular, 2.7–3.2 by 0.6–0.8 mm. Lateral sepals pale brown, not hyaline, 10–11 by 2–2.5 mm, crest entire. Petal limbs yellow, elliptic to obovate, 6–10 by 3–5 mm, margin distally entire. Anthers 1–1.5 mm long, shallowly bifid, deeply sagittate; filaments 1.5–2 mm long. Staminodes 3, branches 3–3.5 mm long. Style 3–4 mm long, distally 3-branched, branches ca 3 mm long. Capsule brown dark, obvoid, 4–6 by 2.5–3 mm. Seeds reddish-brown, translucent, narrowly ellipsoid, 0.4–0.6 mm long, ca 0.2 mm diam., with 23–26 undulate longitudinal ridges and 2–4 transverse ridges.

Figure 15. *Xyris wallichii*: A. habit; B. leaf lamina and leaf apex; C. spike; D. fertile bract; E. lateral sepal; F. petal limb and stamen; G. staminode; H. style; I. seed. Drawn by O. Phueakkhai.
Figure 16. *Xyris bancana*: A. habit, B. inflorescence; *X. complanata*: C. habit, D. inflorescence; *X. grandis*: E. habit, F. inflorescence.
Figure 17. *Xyris kradungensis*: A. habit, B. inflorescence; *X. tuberosa*: C. habit, D. inflorescence; *X. wallichii*: E. habit, F. inflorescence.

Distribution.— India, Myanmar, Laos, Vietnam, Peninsular Malaysia.

Ecology.— In wet places on sandstone rocks, lower montane oak–pine forest, upper montane rain forest, at 1000–1400 m altitude.

Phenology.— Flowering: August to December. The flowers usually open about 11.30 a.m. and persist until late afternoon (4.00 p.m.).

Vernacular.— Ya bua chuen (หญาบัวชื) (General).

Conservation status.— This species is known from only four scattered, restricted localities in Thailand, and recorded also from neighbouring countries. A conservation status of Vulnerable (VU, rating in IUCN, 2001) is most appropriate.

Uses.— None recorded.

Notes.— This species is similar to X. pauciflora in its leaf shape. Xyris wallichii is easily recognized by its narrow stomatal field on the fertile bracts (triangular in X. pauciflora). It occurs only at altitudes above 1000 m. (X. pauciflora is found from sea level to 1300 m).

There are two sheets of Ridley’s type of X. oreophila (Robinson & Klass 6138) at K and L, and a specimen at K is chosen as the lectotype as it is a much better specimen, and matches Ridley’s original description.

Dried out plants were found epiphytic on mossy tree trunks at Mae Hong Son, Mae Ngao National Park (Doi Pui Noi, 1300 m altitude, 17° 52′ N, 98° 03′ E, 14 Nov. 2011, Phonsena, Duyfjes & De Wilde 6859 (BKF, KKU, L) & Sukasathan, Duyfjes & De Wilde 5348 (L, QBG)). The seeds, bracts and stomatal field below apex of fertile bracts all match those of X. wallichii, but that species (and in fact all known Xyris species) has never been recorded as epiphytic. Living plants will be collected in the wet season to confirm their identity.

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