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VOLUME 1

P.S. Short & I.D. Cowie (eds)



NYCTAGINACEAE

R.A. Kerrigan & D.J. Dixon

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NYCTAGINACEAE

R.A. Kerrigan & D.J. Dixon

Trees, shrubs, herbs or spiny climbers, stems frequently swollen at the nodes; indumentum absent or of simple, glandular hairs. *Leaves* simple, alternate, opposite or whorled; stipules absent. *Inflorescences* terminal or axillary, cymose, often umbellate, paniculate, glomerulose, verticillate or thyrsoid; bracts, sometimes small and caducous or forming an enlarged and petaloid involucre. *Flowers* bisexual or unisexual. *Perianth* with 3–10 tepals, usually 5-merous, connate into a tube often separated into a lower part restricted to above ovary and an upper petaloid part. *Stamens* 1–40, free or connate at base, unequal; anthers tetrasporangiate and dithecal, opening by longitudinal slits, dorsifixed. *Gynoecium* a 1-carpellate superior ovary with a slender style and 1 basal ovule. *Fruit* usually an anthocarp, consisting of an achene enclosed in the persistent basal portion of the perianth. *Seed* 1.

A family with about 27 genera and 350 species, mostly in the tropics and extending into temperate regions of the world. In Australia five genera and 14 native species. Most commonly known in Australia by the exotic ornamental *Bougainvillea*.

Taxonomic references: Cronquist (1981); Meikle & Hewson (1984); Bittrich & Kühn (1993); Whitehouse (1996); Daly & Roberts (2004); Mabberley (2008).

1	Herbs	Boerhavia
1:	Climber or shrub	Pisonia

BOERHAVIA L.

Annual or perennial *herbs*, erect, diffuse or decumbent; indumentum of glandular hairs or glabrous; raphides commonly present. *Leaves* opposite, entire (often sinuate or undulate), usually grading to bracts and those at each node of unequal size. *Inflorescence* terminal or axillary, a solitary flower, or a simple or compound inflorescence with the basic unit a glomerule or an umbel; bracteoles minute, membranous. *Flowers* bisexual. *Perianth* generally connate, tubular, campanulate or trumpet-shaped, distinguished into two parts, the lower-half constricted to above the ovary, sepeloid and green and often ribbed; the upper-half petaloid, 5-lobed and caducous. *Stamens* 1–4 (6), anthers suborbicular, included or exerted. *Style* thin, stigma capitate. *Fruit* obconical, obovoid, ovoid or terete, with blunt, acute or winged ribs, glabrous or densely glandular viscid.

A genus of about 40–50 species, with *c.* 15 in Australia, and perhaps eight in the N.T. and four in the D.R.

Boerhavia is recognised as a taxonomically difficult genus. Many recognised species are polymorphic and intergrade (Fosberg 1990) and a monograph or comprehensive revision is required before the taxonomic issues discussed below can be resolved. Meikle & Hewson (1984) regarded *B. coccinea*, *B. dominii* Meikle & Hewson and *B. schomburgkiana* Oliver as a complex. The names *B. dominii* and *B. schomburgkiana* were applied to Top End specimens by Meikle & Hewson but it has not been possible to unequivocally apply either names to any D.R. specimens. Indeed, *B. schomburgkiana* only appears to be found in southern N.T. The northern populations discussed by Meikle and Hewson (*l.c.*) under *B. dominii* as having particularly diffuse cymose inflorescences are treated here under *B. coccinea*.

In Australian material the glandular hairs are classified into three types (Fig. 1) following Meikle & Hewson (1984):

Type 1: hairs less than 0.5 mm long, terminal gland large, elongate, usually orientated at right angles to the stalk, not persisting with exudate.

Type 2: hairs more than 0.5 mm long, needle-like, rigid or weak, often with cells collapsed at right angles when dry, terminal gland cell small, not persisting with exudate.

Type 3: hairs about 0.5 mm long, usually rigid, terminal gland cell large, globular, usually persisting with exudate.

Taxonomic references: Meikle & Hewson (1984); Bittrich & Kühn (1993); Whitehouse (1996).

- | | | |
|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1 | Inflorescence a large diffuse cyme, the basic inflorescence unit a solitary flower | B. gardneri |
| 1: | Inflorescence simple or compound, but not large and diffuse, the basic inflorescence unit a glomerule or umbel but some single flowers may be present | 2 |
| 2 | Peduncle filiform, 0.1–0.25 mm diam.; inflorescence often including some solitary flowers | B. burbridgeana |
| 2: | Peduncle stout, 0.15–0.9 mm diam., or if slender then not filiform; inflorescence rarely including some solitary flowers | 3 |
| 3 | Plants with predominantly type 1 hairs, if type 2 hairs present very scattered or only at nodes | B. albiflora |
| 3: | Plants with long, type 2 hairs on stem | B. coccinea |

B. albiflora Fosberg

Perennial *herb*, prostrate, decumbent or suberect. *Indumentum* absent or present and of glandular hairs, with predominantly type 1 hairs and intermediate hairs (between type 1 and type 2) scattered throughout or concentrated at nodes. *Leaves* with petioles to 25 mm long; lamina lanceolate to widely ovate or narrowly elliptic to elliptic, to 62 mm long, 42 mm wide, succulent, often asymmetric, discolorous. *Inflorescence* axillary or terminal, simple or compound with the basic unit a glomerule. *Peduncle* to 30 mm long in simple inflorescences, 0.15–0.5 mm diam. *Pedicels* 0.6–0.9 mm long. *Perianth* upper part campanulate, 2.2–2.7 mm long, glandular-hairy with predominantly type 1 hairs, white pink or lilac; lower part 1–1.8 mm long, with predominantly type 3 hairs. *Stamens* usually 3 or 4, 1.8–3.1 mm long. *Style* 1.9–3.6 mm long. *Fruit* fusiform or narrowly clavate, 3.5–5 mm long, 1.5–2 mm wide, ribs 5, glandular-hairy. *Flowering & fruiting* throughout the year.

Fig. 1 (*Leach 2654*).

Australia (N.T., Qld). Found across the Top End in coastal situations or on offshore islands east of Wagait to north-east Arnhem Land and the Gulf of Carpentaria, occasionally extending inland as far south as Mt Harris and Kapalga. Grows in grasslands, coastal vine thickets, monsoon vine thickets and coastal dunes on a variety of substrates including sand, quartzite, limestone, sandstone and laterite.

There is uncertainty as to the name which is best applied to this taxon. Meikle & Hewson (1984) included *B. albiflora* in a broadly defined *B. tetrandra* but it was recognised as a distinct species by Du Puy & Telford (1993). In discussing the problematic taxonomy of this complex Fosberg

(1988), by reference to one of his own specimens (*Fosberg 62517*) from Gunn Point, also implied that the name *B. mutabilis* may apply to the taxon described here, but in the Australian Plant Census (2006–) that species is considered to be only found in Qld.

B. burbridgeana Hewson

Perennial *herb*, prostrate. *Indumentum* of sparse predominantly type 1 glandular hairs throughout, occasionally with type 2 hairs scattered on leaves and at nodes. *Leaves* with petioles to 44 mm long; lamina lanceolate to ovate, occasionally linear, to 40 mm long, to 19 mm wide, often asymmetric, discolorous, sometimes resin-dotted. *Inflorescence* axillary or terminal, simple or compound, with the basic unit a few-flowered glomerule or occasionally solitary. *Peduncle* to 17 mm long in simple inflorescences, 0.1–0.25 mm diam. *Pedicels* 0.25–0.7 mm long. *Perianth* upper part campanulate, 1.25–2.25 mm long, glandular-hairy with predominantly type 1 hairs, white to pink; basal part 0.5–1.5 mm long, mostly type 1 and/or type 3 hairs. *Stamens* usually *c.* 3, 1–1.7 mm long. *Style* 1–1.7 mm long. *Fruit* narrowly clavate, 2.75–3.9 mm long, 0.9–1.6 mm wide, ribs 5, glandular-hairy; glabrous to sparsely hairy, furrows hairier than ribs with type 1 and type 3 hairs. *Flowering & fruiting* Oct.–May.

Fig. 1 (*Thomson 1358*); Pl. 1 (*Cowie 10632*).

Australia (W.A., N.T., Qld). This taxon appears to be more widespread than indicated by Meikle & Hewson (1984). It is found throughout the Top End, predominantly in coastal situations, and is recorded extending inland to Kakadu N.P., Judbarra (Gregory) N.P. and as far south as the S.A. border. In the D.R. localities include the Tiwi Islands, Perron Islands, Darwin and Shoal Bay.

Boerhavia
glandular hairs:

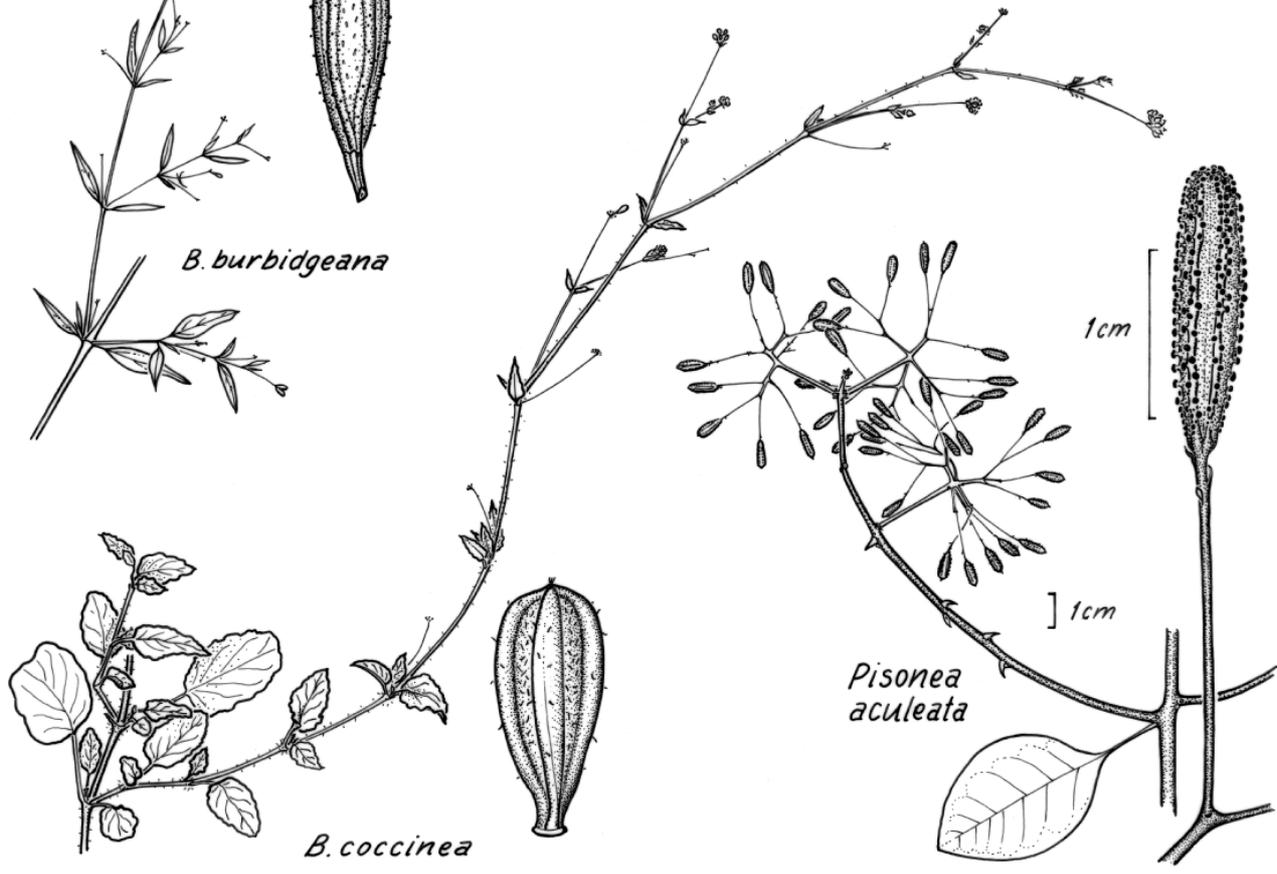
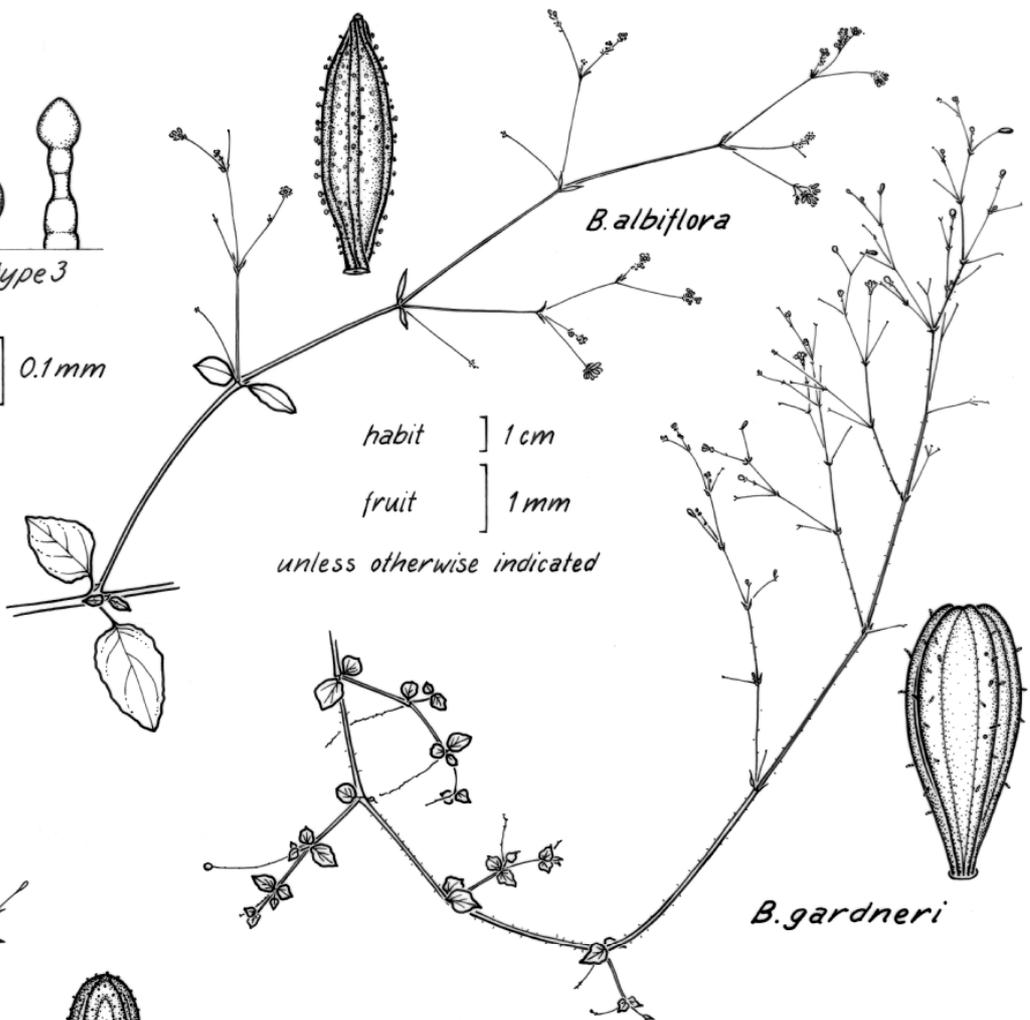
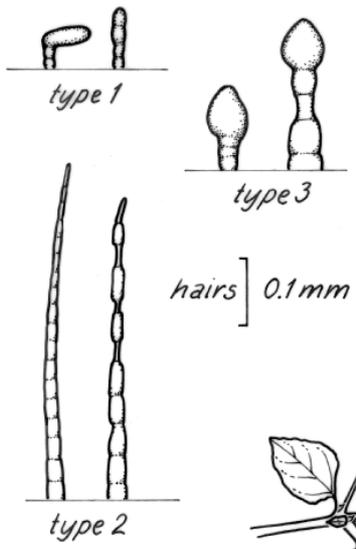


Fig. 1

The species is similar to *B. schomburgkiana*, both having slender and filiform peduncles, few-flowered inflorescences, and predominantly type 1 hairs. *Boerhavia burbridgeana* is distinguished in the N.T. by having generally longer and narrower peduncles, smaller fruit with a narrower articulation at the base, and more clustered rather than divergent glomerules. Contrary to Meikle & Hewson (1984), it is here considered that *B. schomburgkiana* is probably only in the very south of the N.T.

B. coccinea Mill. *sensu lato*

Perennial *herb*, prostrate or decumbent. *Indumentum* of medium to dense type 1, 2 and occasionally type 3 hairs. *Leaves* with petioles to 37 mm long; lamina lanceolate to widely ovate, oblong, elliptic, trullate or triangular to 55 mm long, 28 mm wide, often asymmetric, discolourous, resin-dotted. *Inflorescence* a simple axillary glomerule, 3–10 flowers or a terminal compound inflorescence, often on lateral shoots. *Peduncle* 45 mm long, 0.15–0.8 mm diam. *Pedicels* very short, to 1.25 mm long. *Perianth* upper part campanulate, 2–3 mm long, glandular-hairy with type 1 and type 3 or type 2 hairs or both, pink; lower part 1–1.5 mm long, with predominantly type 3 hairs. *Stamens* usually 2–5, 2–4 mm long. *Style* 1, 1.5–5.5 mm long. *Fruit* fusiform or narrowly clavate, 3.1–4.25 mm long, 0.9–1.5 mm wide, ribs 5, glandular-hairy. *Flowering & fruiting* throughout the year.

Fig. 1 (*Egan 1121*); Pl. 2 (unvouchered).

Australia (W.A., N.T., S.A., Qld, N.S.W.). This species is found throughout the N.T., from the arid zone to the Top End, and is highly variable across its range. Within the N.T. material two entities are generally distinguishable, one with simple axillary inflorescences, another with compound terminal inflorescences. Both entities are united by the abundance of type 1 and type 2 hairs and in the basic inflorescence unit being a glomerule. Although both are found throughout the N.T., specimens with a simple inflorescence

tend to come from south of the Barkly Tablelands, while those with compound inflorescences are more widely spread and include coastal situations. Both are found in a variety of habitats, including open woodland, grassland, lancewood thickets, creek-banks and vine thicket on a variety of substrates including, loam, coastal dunes, laterite, sand, sandstone and clay.

B. gardneri Hewson

Perennial *herb*, prostrate or decumbent. *Indumentum* of predominantly medium to dense type 2 hairs and occasionally type 1 hairs. *Leaves* sessile or with petioles to 15 mm long; lamina ovate to widely elliptic, to 35 mm long, 20 mm wide, discolourous. *Inflorescence* a terminal or axillary diffuse cyme, rarely simple and axillary; basic unit of inflorescence solitary or occasionally in pairs. *Peduncle* to 0.2 mm diam. *Pedicels* 17–15 mm long, to 35 mm in simple inflorescences. *Perianth* upper part campanulate, 2.55–4 mm long, glandular-hairy with type 1 hairs or glabrous, white or pink; lower part 1–1.6 mm long, with predominantly type 3 hairs. *Stamens* 4–5, 2.75–3.9 mm long. *Style* 2.75–3.9 mm long. *Fruit* fusiform or narrowly clavate, 3.5–4.8 mm long, 1.35–2.7 mm wide, ribs 5, sparsely glandular-hairy with type 3 and occasionally type 2 hairs. *Flowering & fruiting* Dec.–May.

Fig. 1 (*Cowie 8776*); Pl. 3 (*Stuckey 689*).

Australia (W.A., N.T.). In the N.T. distributed across the Top End from the Victoria River District to Wollgorang and from Melville Island to Cape Arnhem and on Bickerton Island in the Gulf of Carpentaria. Found in open woodland, monsoon vine forest, coastal vine thicket, samphire, heathlands, and *Melaleuca* communities on sandstone, stabilised dunes, loam or rocky hillsides.

The application of the name *B. gardneri* to N.T. material needs further investigation as D.E. Albrecht (*pers. comm.*) suggests N.T. material is different from this W.A. taxon.

PISONIA L.

Shrubs or trees without spines, or climbers with spines; indumentum puberulous, tomentose, glabrescent. *Leaves* opposite, alternate, sometimes crowded towards ends of twigs. *Inflorescence* terminal or axillary, cymes, clusters or panicles; bracts 2 or 3 or absent. *Flowers* bisexual or unisexual, species monoecious or dioecious. *Perianth* connate, campanulate, urceolate or funnel-shaped, the upper part coloured and caducous, 5-lobed or rarely 10-lobed. *Stamens* 2–20, mostly exerted, united into a ring. *Ovary* elongate-

ovoid; style longer than ovary; stigma capitate, lobed or fimbriate. *Fruit* oblong, linear or clavate, smooth or with 5 or 6 ribs, glandular-hairy.

Forty species, with three in northern Australia, including two in the N.T. *Pisonia aculeata* is recorded from the D.R. but *P. grandis*, a non-thorny shrub or tree, is only known from Raffles Bay on the Cobourg Peninsula and North East Crocodile Island near Milingimbi.

Taxonomic references: Meikle & Hewson (1984); Bittrich & Kühn (1993); Whitehouse (1996).

P. aculeata L.

Climber to 20 m tall, glabrous or with a puberulous or tomentose indumentum. *Stems* with decussate branches; with axillary, usually recurved thorns 5–10 mm long. *Leaves* with petioles to 25 mm long; lamina opposite or almost so, elliptic, ovate or broadly ovate, to 100 mm long, 70 mm wide, margin entire, apex rounded to acute. *Inflorescence* of dense cymes, axillary. *Flowers* unisexual (and species dioecious), scented, cream or yellow. *Pedice*l to 1 mm long; bracteoles present, small. *Male flowers* with the perianth funnel-shaped, 5-lobed, *c.* 3 mm long; stamens 6–8, 4–8 mm long; gynoecium vestigial. *Female flowers* with the perianth

campanulate or urceolate, 5-lobed, *c.* 2 mm long; androecium vestigial; ovary 2–4 mm long, glabrous; style short, stigma fimbriate, exerted. *Fruit* clavate, to 20 mm long, 2–3 mm wide, ribbed, ribs with double row of thickened glandular hairs or protrusions, sticky. *Flowering*: May–Aug. *Fruiting*: Aug.–Dec.

Fig. 1 (*Michell 1638; Russell-Smith 802; Wightman 127*); Pl. 4 (unvouchered).

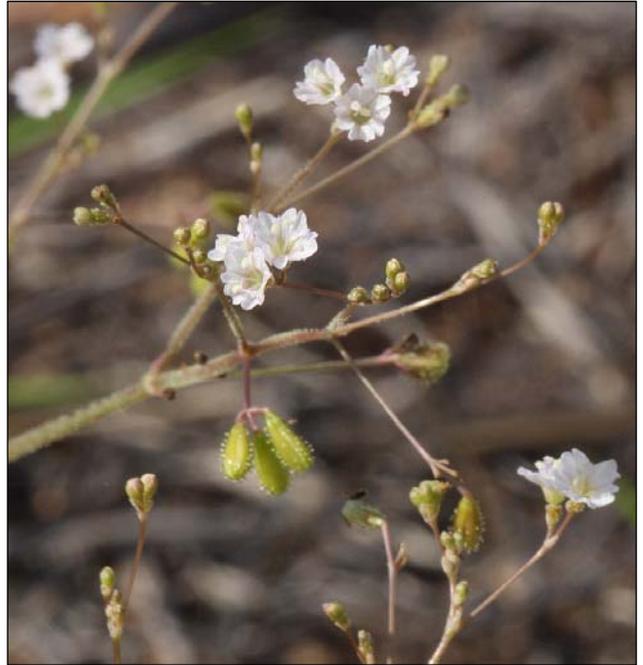
Australia (W.A., N.T., Qld, N.S.W.) and subtropical and tropical regions of the world, predominantly America and south-east Asia. In the N.T. widespread across the Top End in monsoon forest and, predominantly coastal, vine thickets.

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Pl. 1 *Boerhavia burbidgeana* (Photo: I.D. Cowie)



Pl. 3 *Boerhavia gardneri* (Photo: B.M. Stuckey)



Pl. 2 *Boerhavia coccinea* (Photo: B.M. Stuckey)



Pl. 4 *Pisonia aculeata* (Photo: B.M. Stuckey)