

Pannicle jointvetch

Aeschynomene paniculata



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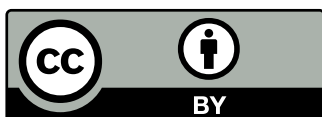
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Front cover: *Aeschynomene paniculata*

Photo: Kendrick Cox

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Summary

Aeschynomene paniculata (pannicle jointvetch) is a perennial legume native to tropical America. It was first planted in Queensland in the 1980s and 1990s, at c. 17 sites, to evaluate its potential use as a pasture legume. However, these trials concluded that it was of little value as cattle feed.

A. paniculata is currently invading grassy understoreys within open tropical woodlands, near where it was planted in North Queensland. At some sites, it is showing clear propensity to dominate both disturbed and relatively natural sites. Analysis of available literature on this species' native range, including information on its preferred climate and habitat types, supports a conclusion that it is well adapted to the open *Eucalyptus* woodland within the seasonally dry tropics of North Queensland.

This study was unable to find evidence that *A. paniculata* was a major weed anywhere else in the world. However, it has naturalised in Hawaii and three congeners, *A. indica*, *A. virginica* and *A. rudis* are noxious in some US states.

Currently, *A. paniculata* exists as small, isolated populations along the east coast of Queensland, with the largest population at Batavia Downs in Cape York. All sites are currently the target of an ongoing eradication program funded by the Queensland Department of Primary Industries and Fisheries, co-sponsored by the Meat and Livestock Association (MLA) and the Australian Government's 'Defeating the Weeds Menace' program. To date, more than \$0.5 million has been spent on eradication, with remaining populations of the plant proving resilient.

If control proves unsuccessful, *A. paniculata* has the potential to become widespread and abundant over substantial areas of North Queensland's tropical open eucalypt woodlands, possibly replacing more valuable pasture species and replacing native understorey plants.

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Introduction

Identity and taxonomy

Scientific name: *Aeschynomene paniculata* Willd. ex Vogel

Common names: pannicle jointvetch (US and Australia), lengua de pájaro (El Salvador)

Synonyms: *Aeschynomene gracilis* Miq., *Aeschynomene hedysaroides* M. Martens and Galeotti, *Aeschynomene laevis* M. Martens and Galeotti

Family: Fabaceae (also Papilionaceae)/Aeschynomeneae

Description

A. paniculata is an erect, perennial, leguminous plant growing 1–2 m tall (to a maximum of about 2.5 m). It has compound (pinnate) leaves up to 8 cm long. Each leaf comprises 50–60 leaflets (pinnae) (Figure 1).



Figure 1. Compound leaves of *Aeschynomene paniculata*, with 50–60 leaflets evident in each leaf (photo: Kendrick Cox, QPIF).

The petiole and rachis are strigillose (set with stiff slender bristles) and also sparingly beset with glandular hairs. Leaflets are oblong, obtuse, 2–5 mm long, 1–1.5 mm wide, the upper surface glabrous and the lower surface strigillose. Stipules are lanceolate, acuminate, 3–6 (–10) mm long, 1–2 mm wide at base and glabrous. Stems are reddish-brown, spindly and striated (grooved). Inflorescences are terminal, sometimes also axillary, many-flowered, the peduncles and pedicels subglabrous, sometimes glandular, the bracts and bracteoles deltoid-ovate, 1–2 mm long, about 1 mm wide. Individual flowers are pea-shaped, yellow and 6–6.5 mm long. Each calyx is 2–3 mm long; standard commonly 6.5 mm long, the claw 1.5 mm long, the blade orbiculate-cordate, about 5 mm in diameter, retuse; wings and keel about as long as the standard, the wing blades 2 mm wide, the keel blades 1.5 mm wide; stamens about 6 mm long. Pods are 15–20 mm long, straight or slightly curved, moniliform,

4–6 articulate, stipes 4–5 mm long, glabrous, with a suture at the base of the first article; the articles suborbiculate 2.5–3.5 mm in diameter, sparsely pubescent, often glabrate. Seeds are about 2.5 mm long and 1.5 mm wide, smooth and dark brown (Figure 2).



Figure 2. Seeds of *Aeschynomene paniculata* (photo: Kendrick Cox, QPIF).

Field observation in Cape York suggests that flowering occurs once the plant has experienced sufficient summer rainfall to trigger growth of new branches (upon which flowers are produced) (K. Cox, pers. comm.). Seeds mature about one month after flowering. Seed production is prolific with a single plant capable of producing 800 seeds at one time (but more commonly about half that).

Origin and worldwide distribution

A. paniculata is native to tropical areas of North, Central and South America (Mexico, Belize, El Salvador, Guatemala, Honduras, Guyana, Suriname, Venezuela, Brazil, Bolivia, Colombia and Paraguay) (USDA-GRIN 2008). This range extends from 22° N in Mexico to 23° S in Paraguay (Figure 3).



Figure 3. Native range of *Aeschynomene paniculata* (data points from the Global Biodiversity Information Facility 2008).

Distribution in Australia

A. paniculata exists in Queensland and the Northern Territory. In Queensland, it is restricted mostly to very small populations scattered along the east coast of the state. The largest infestation is at a property called Batavia Downs near the northernmost tip of Cape York Peninsula. There are recent records of small populations of this species at Birralee (Collinsville), Blue Mountain (Mackay), Eungy (Mount Nebo), Glensfield (Sarina), Granite Vale (St. Lawrence), Goorganga (Proserpine), Swans Lagoon (Ayr), Southedge Research Station (Mareeba), Tedlands (Koumala), Walkamin Research Station (Mareeba), while populations at 14 other plant sites may have become eradicated or failed to establish.

A. paniculata has been planted for research purposes in the Northern Territory in at least three areas mentioned in a report by Cameron (2001): the Darwin area (which includes Berrimah Agricultural Research Station); the Northern Coastal Upland Area (which includes the Coastal Plains Research Station and Beatrice Hills Research Station); and the Douglas Daly area (which includes the Douglas Daly Research Farm and the Mount Bundy station).

In the Northern Territory the species has been recorded at Fogg Dam (near Darwin) in 2005.

History of introduction

Accessions of *A. paniculata* were planted in Queensland in the mid-late 1980s and 1990s to evaluate the species' potential use as a new pasture legume. Original seed stock was believed to have originated in Mexico and Brazil (CPI database and QPastures database).

Ecology and preferred habitat

Climatically, *A. paniculata* is adapted to seasonally dry tropical areas. While it can persist in areas with an annual rainfall ranging from about 900–3000 mm, it appears best suited to areas with 800–1000 mm per annum. Within its native range, it extends from 22° N in Mexico to 23° S in Paraguay, and occurs found from sea level (11° N in Costa Rica) to 1500 m (22° N in Mexico), an area that experiences a 24-hour annual average temperature range of about 22° to 28° C (Cook et al. 2005).

Within its native range, *A. paniculata* has been recorded to occur on ‘rocky, brushy slopes, in meadows, open woods/savannahs and wet savannah’. While this study was unable to find more detailed descriptions of this species’ preferred habitat within the published literature, it seems reasonable to conclude that this species is adapted to open habitat types (more or less full sun), including savannahs and other open woodlands. Field observation of this species’ successful invasion of open tropical woodlands (seasonally dry ‘monsoon tropics’) in North Queensland, including the coastal tropics south to about Mackay, supports this conclusion.

A. paniculata can tolerate partial shade but seems to prefer full sun.

Preferred soil types appear to be sandy to silty loam soils, sometimes with a clay sub-soil.

Reproduction and dispersal

A. paniculata reproduces from seeds, which are produced in considerable numbers. Experiments have recorded seed yields of 0.8 t/ha from two harvests in a single growing season. This plant readily establishes in uncultivated ground under summer-rain conditions. Mature seeds can be produced in as little as four months after establishment from seed, or three months if re-growing from perennial plants. Seeds often exhibit high levels of hard-seed dormancy. Recruitment from seed produced in-situ often results in formation of dense stands. Early winter frosts can suppress seed production (K. Cox, pers. comm.).

Seeds can be dispersed through the gut of ruminants and readily establish in dung. In monsoonal areas, seeds are suspected to have been transported down-slope by heavy rain. Vehicles might also carry seeds imbedded in mud.

History as a weed elsewhere

This study was unable to find evidence that *A. paniculata* was a major weed elsewhere in the world. However, it has naturalised in Hawaii (Hawley and Leilani 1994) and three congeners, *A. indica*, *A. virginica* and *A. rudis* are noxious in some US states (US Fish and Wildlife Service 2003, USDA 2005). In addition, *A. indica* is recorded as a dominant weed of crops in parts of Asia (Thailand) (TNC 2008).

Current impact in Queensland

At Batavia Dows (Cape York), *A. paniculata* has displaced more palatable native pasture species and, in places, formed pure stands. It can dominate grasslands of lower plant density on poorer soils, particularly in areas where ground-cover is reduced by a dry season or fire. Some vigorous grass species may compete with *A. paniculata* (such as *Digitaria milanjiana*);

however, sown pastures are often uneconomic in the monsoon tropics, due to poor soil fertility and a strong dry season.

The current impact of *A. paniculata* is locally significant, being restricted to small areas of the state in close proximity to where it was planted as a potential forage species. This situation could change, however, as discussed below.

Potential impact in Queensland

A. paniculata was recognised as a potential weed soon after it was planted as a potential pasture plant at trial sites in North Queensland, especially at Batavia Downs, where it quickly escaped from cultivated plots to invade nearby areas of open woodland. This plant loses its leaves early in the dry season, produces abundant long-lived seeds and is poorly utilised by cattle. Hence, there are few impediments to its proliferation and spread. After becoming aware of this plant's attributes, pasture scientists decided to seek its eradication. Soon after, it was listed as a potential weed of agriculture ('sleeper' weed) in various reports on emerging weed threats in Australia (Groves et al. 2002, Brinkley and Bomford, 2002).

The population at Batavia Downs provides a valuable insight into the plant's long-term pest potential. At this site, it has spread rapidly, particularly in grasslands, dry *Eucalyptus* and *Corymbia* woodlands and seasonally wet Melaleuca woodlands, where the soil tends to be exposed each dry season. Unchecked, large numbers of seeds are dropped near parent plants, resulting in the development of more or less pure stands over a few years (K. Cox, pers. comm.).

Climatically, *A. paniculata* appears well adapted to the seasonally dry tropics of North Queensland. Within this climatic zone, it is perhaps best adapted to open, tropical woodland (savannah woodlands). A prediction of this species' potential range is provided in Figure 5.

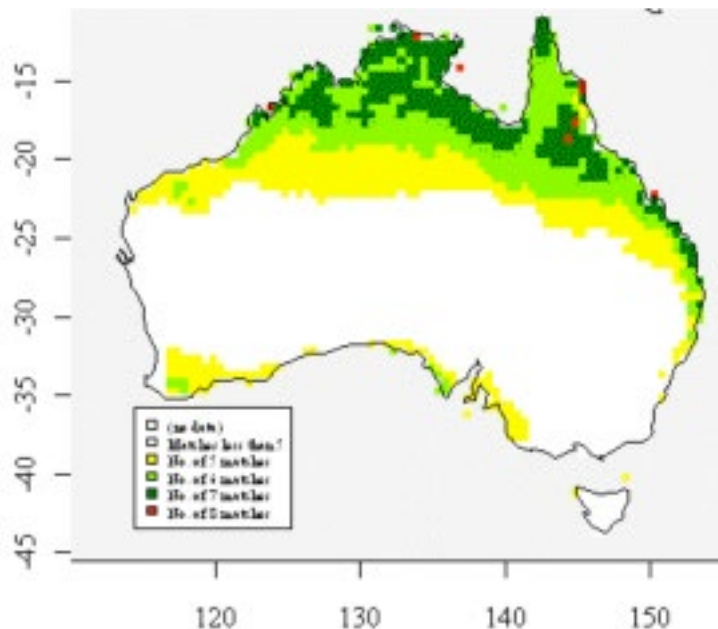


Figure 5. Potential range of *A. paniculata* in Australia, as predicted by CLIMATE computer modelling software (red areas indicate suitable climate, green areas are marginally suitable, yellow and white are unsuitable).

Uses

A. paniculata has been evaluated as a potential forage legume for consumption by cattle. While some light grazing soon after flowering (including consumption of pods) has been observed in Central Queensland, most pasture experts agree that it provides insignificant benefits to livestock and threatens to replace more useful pasture species.

Control

A. paniculata can be controlled with herbicides during active growth, just prior to seeds being produced in late summer, a period of opportunity that tends to be limited to 2–3 months in the monsoon tropics.

Grazing is not a useful form of control as it generally does not prevent seeding in North Queensland. However, grazing can assist control in some situations, as it suppresses grass cover and makes detection of *A. paniculata* more feasible. The maintenance of vigorous pasture generally slows establishment and spread of *A. paniculata* (K. Cox, pers. comm.).

Fire appears to soften some seeds and destroy some mature plants, depending on the intensity of the fire. Field experience in North Queensland has found that fire results in mass germination, with more than 500 seedlings recorded per square metre (K. Cox, pers. comm.). Hence, fire can be a useful tool to deplete the soil seed bank, provided the seedlings are treated soon after with herbicide.

Pests and diseases

This study was unable to find any information on pests and diseases of *A. paniculata*.

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