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Ivy gourd

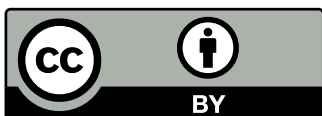
Coccinia grandis



Queensland
Government

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Summary

Coccinia grandis is listed as a noxious weed in Hawaii and in Western Australia. It is among the most abundant weeds of open sites in Fiji and other Pacific Islands. In Hawaii, it is the target of biological control research. *C. grandis* exists as small populations in coastal North Queensland, the Northern Territory (Top End only) and Western Australia (Kimberley region). Perhaps the worst infestations in Queensland are near Townsville, where it has formed dense mats over shrubs and small trees. The origin of *C. grandis* is confused and some early literature listed this species as native to Australia. However, the Queensland Herbarium currently lists this species as 'naturalised' (not native). *C. grandis* is probably native to tropical parts of Africa, India and Asia. Climatically, *C. grandis* appears well suited to the seasonally dry tropics of North Queensland. Habitats most at risk are predicted to be open, disturbed sites and riparian areas within seasonally-dry tropical forest and savannah. It is unclear whether *C. grandis* could invade monsoon rainforest. There seems little doubt that *C. grandis* has the potential to become much more widespread and abundant if it is not controlled. At present, the plant exists as small, scattered populations that might be susceptible to control. There is insufficient information on the distribution of *C. grandis* to assess feasibility of statewide eradication.

Important note: This weed risk assessment is a working draft only and requires more information before firm recommendations can be made. Please send any additional information, or advice on errors, to the authors.

Identity and taxonomy

Taxa: *Coccinia grandis* (L.) Voigt.

Synonyms: *Coccinia cordifolia* auct., *Coccinia indica* Wight and Arn., *Bryonia grandis* L. Other possible synonyms and varieties are *Bryonia alceifolia* Willd., *Cephalandra indica* Naud., *Coccinia cordifolia* (L.) Cogn., *Coccinia alceifolia* (Willd.) Cogn., *Coccinia cordifolia* var. *wightiana* (M.Roem.) Cogn., *Coccinia grandis* (L.) Voigt var. *wightiana* (M.Roem.) Greb., *Coccinia loureiriana* M.Roem., *Coccinia wightiana* M.Roem., *Cucumis pavel* Kostel., *Momordica bicolor* Blume, *Momordica covell* Dennst. and *Momordica monadelpha* Roxb (GISD 2005).

Common names: Ivy gourd, scarlet-fruit gourd.

Taxonomy: *C. grandis* is in the Cucurbitaceae family. There are about 120 genera and 825 species in this family. Members of the Cucurbitaceae are commonly known as gourds or cucurbits and include some important crop species such as cucumber, squash, pumpkin, luffa and melons (Andres 2004). Most of the plants in this family are annual vines but there are also woody vines, thorny shrubs and trees (Renner et al. 2007).

The *Coccinia* genus has about 30 species, including *C. abyssinica*, *C. adoensis* (wild spinach) and *C. palmata*. *C. grandis* is the best known cultivated crop of the genus (Andres 2004).

Description

C. grandis is a fast-growing perennial vine that grows several metres long. It can form dense mats that readily cover shrubs and small trees (Csurhes and Edwards 1998). Its leaves are arranged alternately along the stems; they vary from heart to pentagon shape and are up to 10 cm wide and long. The upper leaf surface is hairless, whereas the lower surface is hairy. There are 3–8 glands on the blade near the leaf stalk. Tendrils are simple. *C. grandis* is dioecious (male flowers are produced on separate plants to female flowers). Flowers are large, white and star-shaped. The calyx has five subulate, recurved lobes, each 2–5 mm long on the hypanthium; peduncle 1–5 cm long. The corolla is campanulate, white, 3–4.5 cm long, deeply divided into five ovate lobes. Each flower has three stamens (present as staminodes in female flowers). The ovary is inferior. The fruit is red (when ripe), ovoid to elliptical, 25–60 mm long, 15–35 mm in diameter, hairless on stalks 10–40 mm long. Seeds are tan-coloured and 6–7 mm long. The roots and stems are succulent and probably enable the plant to survive prolonged drought (PIER 2003). For more detail see Flora of Australia (1982). For photos see AWC (2008).

Reproduction, seed longevity and dispersal

C. grandis can be dispersed from seeds as well as from broken pieces of roots and stems. Seeds can be dispersed by birds and feral pigs (PIER 2003).

Seeds do not exhibit dormancy (PIER 2003) and usually germinate within 2–4 weeks at 20 °C (Bird 1990).

The shoot tips are used in Asian cooking and long-range dispersal is often the result of introduction and cultivation by people (PIER 2003). Long-range dispersal is also a consequence of its popularity as a garden ornamental.

C. grandis flowers from August to September. The species is dioecious and pollinated by insects. The plant is not self-fertile (Plants for a Future 1996–2003).

Origin and worldwide distribution

C. grandis is believed to be native to central Africa, India and Asia. However, its long history of use, cultivation and transportation by people has obscured its origin.

It is a common weed in South-East Asia. It has naturalised in Texas (US), Florida (US), Hawaii (US), the Philippines, the Caribbean, Papua and New Guinea, Vanuatu, Fiji, Guam, Marshall Islands and the Solomon Islands (Agricultural Protection Board of Western Australia 1994, PIER 2003). An infestation on Saipan was probably introduced from Thailand (PIER 2003).

Distribution maps from the Missouri Botanic Gardens' Tropicos database (2008) and the USDA's Plants database (2008) are presented in Figure 1 and 2.

Figure 1. Locations where specimens of *C. grandis* have been recorded by the Missouri Botanic Gardens' Tropicos database (MBG 2008).

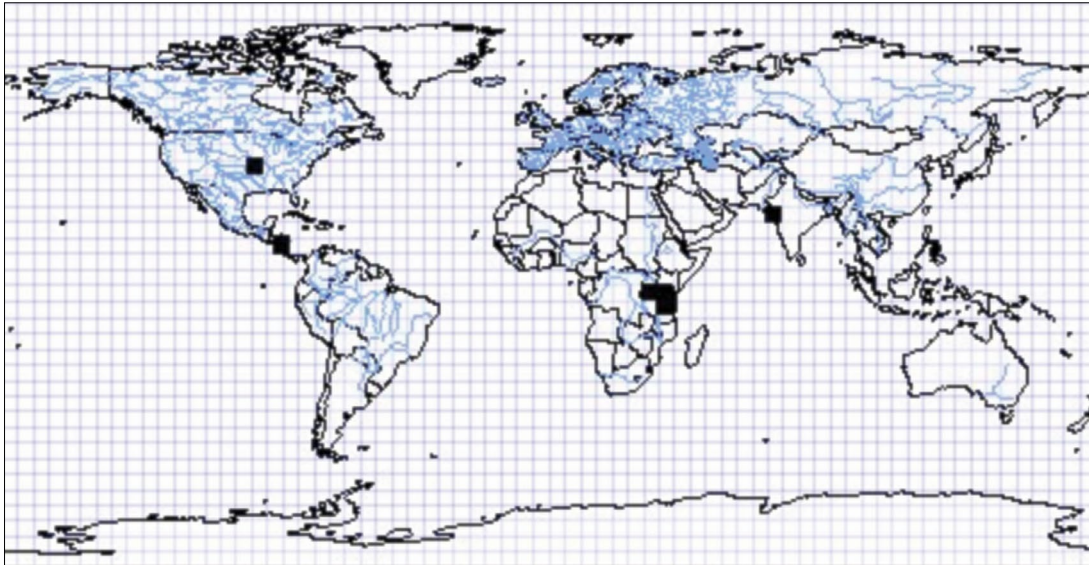


Figure 2. States where *C. grandis* has been recorded in the US (USDA 2008).

Ecology and preferred habitat

Preferred soil types and habitat types

The natural habitat of *C. grandis* within its native range has been described as 'deciduous bush, savannah, dry evergreen forest and thickets' (Huxley 1992).

Field observations in northern Queensland suggest that it prefers open, disturbed sites and riparian habitats in the dry tropics (e.g. around Townsville). It is unclear whether this species might also prefer the margins of monsoon rainforest.

This study was unable to find information on this species' preferred soil types.

Climatic requirements

The global distribution of *C. grandis* suggests that it is adapted to seasonally dry tropical climates (areas subject to monsoonal wet seasons). There is a lack of detailed information in the literature on this species' exact climatic requirements.

Tolerance of fire

This study was unable to find information on this species' tolerance of fire.

History of introduction

There has been confusion regarding the plant's origin in Australia. Some early literature states that it is native to Australia (e.g. Hnatiuk 1990). Mitchell (pers. comm.) suggests it might have been introduced by humans prior to European settlement of Australia, along Indonesian fishing routes, to the isolated coastal regions of the Northern Territory, where it now occupies remnant vine forests. The Queensland Herbarium currently lists this species as 'naturalised' (not native).

Distribution in Queensland and Australia

In Australia, *C. grandis* has been recorded in three states. In Western Australia, it exists in the Kimberley region. In the Northern Territory, it has been found in Arnhem Land, Darwin and the Gulf region (Agricultural Protection Board of Western Australia 1994). In Queensland, it has been detected near Townsville, Cairns and other parts of coastal North Queensland (B Waterhouse pers. comm.; Hnatiuk 1990).

History as a weed overseas and interstate

C. grandis is recorded as an invasive weed in Saipan, Fiji, Guam, Hawaii, Solomon Islands and Tongatapu Island (PIER 2003). In Hawaii, it is listed in legislation as a noxious weed.

In Hawaii, PIER (2003) and Thomas (1998) commented that it is 'naturalized and rapidly spreading in disturbed sites, 0–100 m' and that 'it is a severe pest in gardens, on utility poles, roadsides, and in natural areas'. In Fiji, it is 'a naturalised weed of waste places, cane fields and roadsides near sea-level' (PIER 2003). Greg Calvert (pers. comm.) comments that it is among the most abundant weeds in Fiji and Hawaii.

In Hawaii and elsewhere, *C. grandis* smothers other vegetation and objects, forming a dense canopy. It also serves as an alternate host for the crop pest ‘melon fly’ and possibly ‘ring spot virus’.

C. grandis spread rapidly across Hawaii after its introduction in 1968. In response, the USDA Division of Plant Industry initiated a biological control research program on the plant. The USDA have warned authorities in Australia to avoid importation of this plant.

C. grandis is declared noxious in the Kimberley region of Western Australia. In Broome (north-west Western Australia) it had invaded suburban gardens but was subsequently eradicated.

Uses

The young leaves and shoot tips of *C. grandis* are used in Asian cooking (Facciola 1990; PIER 2003). Both tender green fruits and ripe fruits are used in salads or cooked (Facciola 1990). In some countries, juice from the roots and leaves is used to treat diabetes and juice from the stem is dripped into the eyes to treat cataracts. The leaves are used as a poultice in treating skin eruptions. Aqueous and ethanolic extracts from the plant have shown hypoglycaemic principles (Chopra et al. 1986; Manandhar 2002). *C. grandis* has been used as a garden ornamental and there is a specimen growing along a fence in the Flecker Botanic Gardens in Cairns.

Pest potential in Queensland

There is considerable evidence in the literature to suggest that *C. grandis* has the potential to become a significant weed in Queensland. In particular, it has a history as a significant weed in Hawaii and Fiji and has naturalised in numerous other countries. Its impact in Hawaii was sufficient to justify listing as a noxious weed and biological control research.

In order to predict which areas of Queensland may be at risk of invasion by *C. grandis*, this study reviewed available information on the species’ native range and the climatic parameters that appear to define its distribution. *C. grandis* is native to tropical parts of Africa, India and Asia and has naturalised in many other tropical countries and islands, generally in areas that experience a monsoonal wet season and a distinct dry-season. This suggests that *C. grandis* is well adapted to the seasonally-dry, monsoon tropics of North Queensland. This climate-based prediction is supported by visual observation of the species’ current distribution in Australia, which extends across tropical monsoon areas of Western Australia, the Top End of the Northern Territory and North Queensland. A prediction of the species’ potential distribution, based on climatic parameters alone is provided (Figure 3).

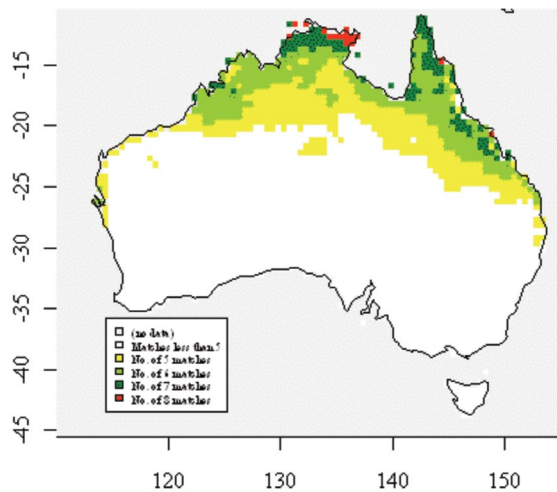


Figure 3. Potential range of *C. grandis* in Australia, as predicted by CLIMATE modelling software (red indicates areas where climate is suitable, green is marginal and yellow/white are unsuitable for this species).

Habitat types at risk of invasion in Queensland are difficult to predict due to the lack of detailed information on habitats occupied by *C. grandis* within its native range. However, since Huxley (1992) described the species' natural habitat as 'deciduous bush, savannah, dry evergreen forest and thickets' it seems reasonable to predict that *C. grandis* poses a threat primarily to comparable habitats in North Queensland. Field observations in North Queensland suggest that it prefers open, disturbed sites and riparian habitats within our 'dry tropics' (e.g. around Townsville). There is a possibility that this species might also persist along the edges of monsoon rainforest (wherever there is a distinct dry season) but the Wet Tropics of North Queensland might be less suitable.

An examination of limited information presented from places like Hawaii and Fiji suggests that *C. grandis* may grow most prolifically in fairly open (full sun), disturbed sites. It is unclear whether *C. grandis* can invade undisturbed, closed-canopy monsoon rainforest.

This study concludes that, based on the evidence of 'history as a major pest elsewhere' (in similar climates), combined with visual observations of the plant's behaviour in North Queensland, where it has dominated small disturbed sites, *C. grandis* should be considered a 'high-risk' species. Evidence from Hawaii and Fiji in particular suggests that *C. grandis* has long-term potential to become an abundant and troublesome pest in suitable habitat types in North Queensland.

Biological control

In Hawaii, three natural enemies were introduced from east Africa: *Melittia oedipus*, *Acythopeus cocciniae* and *Acythopeus burkhartorum*. These three species have also been tested in Guam (PIER 2003). A decade of low rainfall in Hawaii has not provided ideal conditions for the proliferation of ivy gourd so the true impact of the biocontrol agents is difficult to assess (K Teramoto, pers. comm.).

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