

Weed Risk Assessment: *Cyperus rotundus* L.

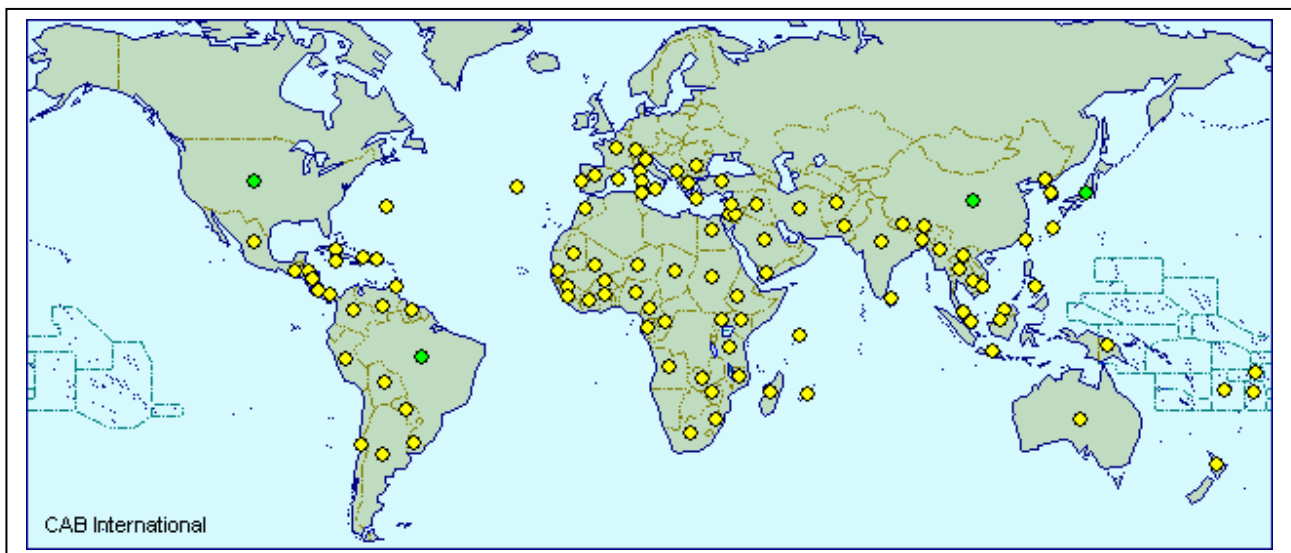
1. Plant Details

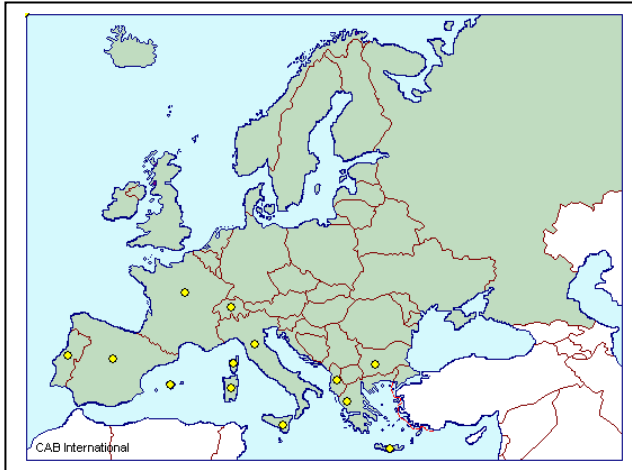
Taxonomy: *Cyperus rotundus* L. Synonyms: *Cyperus purpuro-variegatus* Boeckeler, *Cyperus stoloniferum palidus* Boeckeler, *Cyperus tetrastachyos* Desf., *Cyperus tuberosus* Roxb. *Chlorocyperus rotundus* (L.) Palla. Family Cyperaceae.

Common names: nut grass, purple nut sedge purple nut grass.

Origins: Pan-tropical plant of doubtful origin (Parsons and Cuthbertson, 2001 GRIN database).

Distribution: a weed in tropical and warm-temperate countries including India, China, Taiwan, Korea, Philippines, Thailand, Vietnam, Malaysia, Indonesia, the Pacific Islands, Africa, south America, the Middle East, north America (eastern and southern USA), Mexico New Zealand, Australia (Gunasekera and Fernando, 1994, Parsons and Cuthbertson 2001, www.hear.org).





Distribution maps from the Crop Protection Compendium.

Red dots mean widespread in the region.

Yellow dots mean present in the region.

White dots mean present and localised

Description: *C. rotundus* is an erect perennial sedge that may grow to 50cm high. Stems are erect, smooth, unjointed and triangular in cross section. Leaves are V-shaped in cross section, tapered, dark green, glossy with a prominent mid-vein, coarse with small serrations and arising from three rows near the base of the plant. Leaves are shorter than the stem and there are generally not more than 10 per plant. 3-9 flower stalks emerge from 2-4 leaf-like bracts. The inflorescence is a cluster of spikelets arising from a common point on the flower stalk in the fashion of an umbel. Each spikelet has up to 40 reddish brown, brown or purplish brown compressed florets. Seeds are black, brown, olive or grey, ovoid and beaked. The root is an extensive system of rhizomes, tubers and basal bulbs. The tubers, also known as nuts, are purplish and occur along the rhizomes while roots are produced from tubers and at the base of the plant. Basal bulbs occur as swellings of the stem base and are just below the soil surface. The rhizomes may extend to more than 1m. This plant looks very similar to *Cyperus esculentus* but may be distinguished on the basis of its brown to purple inflorescence (Auld and Medd 1987, Gunasekera and Fernando 1994, Parsons and Cuthbertson 2001).

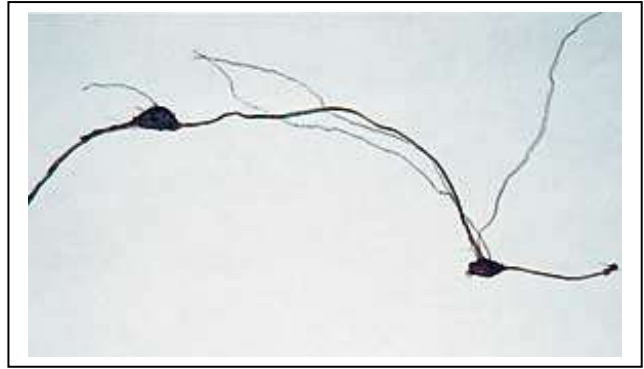
Biology and ecology:

Habitat. *C. rotundus* occurs mostly in open, unshaded situations, usually in association with moderate to high moisture and fertility. It grows best on light to medium soils. Growth underground is influenced by compaction, aeration and moisture relations in the soil. It does not thrive in shaded situations and is not tolerant of saline conditions or low temperatures. It is a weed of crops and gardens and is prevalent in cultivated areas, disturbed areas, roadsides, lawns, parks and waste places (Auls and Medd 1987, Gunasekera and Fernando 1994, Parsons and Cuthbertson 2001, Hawaiian ecosystems at risk website at www.hear.org).

Life cycle. In temperate areas *C. rotundus* produces new growth from seedlings or tubers as temperatures rise in spring. Tubers will generally not sprout at temperatures below 20 degrees celcius. As tuber shoots extend towards the light they form swollen basal bulbs. Shoot, rhizomes and other tubers develop from these. Flower stems form in late spring and flowers



are produced during summer. In some instances a plant may reach maturity in a very short time (3-6 weeks). All aerial growth dies back over autumn. The plant exhibits apical dominance in its tuber development meaning that when one tuber along a rhizome grows, growth from others is inhibited (Parsons and Cuthbertson, 2001).



Reproduction and dispersal. Reproduction occurs primarily via tubers. Seed production is variable and in most cases viability is low. Seedling vigour is also observed to be poor so overall, seeds are considered to be unimportant to the reproductive capabilities of this plant. Tubers are far more significant. Each tuber has a number of small buds that form new plants. Some studies indicate that a single tuber can give rise to more than 600 plants. Also, more than 53 000 tubers have been recorded in a cubic meter of soil. Dormant tubers are found mostly in undisturbed ground or at greater depths, probably due to poor aeration. Tuber dormancy is also directed by apical dominance. Dormancy release occurs when the rhizome along which the tubers are found is cut into pieces. Dispersal occurs when the tubers are moved by cultivation equipment or in the movement of contaminated soil, gravel or water. Spread from an infestation can be up to 1m/year if disturbance does not occur but spread rates of 3m/year have been recorded (Gunasekera and Fernando 1994, Parsons and Cuthbertson, 2001).

Hybridisation. There is limited information about hybridisation of *C. rotundus*.

Competition. *C. rotundus* is described as an aggressive competitor because of its fast growth, dense, rhizomatous habit, prolific reproduction, C4 biochemical pathway, allelopathic properties. It is capable of reducing yields in some crops by up to 75% and is able to reach densities that effectively exclude desirable species. This species also employs a C4 metabolic pathway which means it is able to grow well in conditions of high temperature and low light, as might be found under an emerging crop canopy. It is also allelopathic and a number of studies indicate a range of crop species may be susceptible. Its regenerative capacity and the difficulty of killing all tubers in an infested area also contribute to its competitive advantage (Gunasekera and Fernando 1994, Parsons and Cuthberston 2001).



Harmful properties: *C. rotundus* is not toxic to humans or stock. It is capable of growing through road pavements and so may cause damage to infrastructure.

Economic benefit: *C. rotundus* is still used for culinary and medicinal purposes by various Asian communities, especially in India and China. It has also been used as a medicine in Germany. Tubers were eaten by Australian aborigines (Parsons and Cuthbertson, 2001). Leaves are used for basketry and the aromatic root is used for perfumery in India (Gunasekera and Fernando 1994, Plants for a Future Database).

2. Weed Risk

World weed status

C. rotundus is considered a significant weed in at least 92 countries and is often referred to as one of the 'world's worst weeds'. It is a weed of a large range of crops (Gunasekera and Fernando 1994, Parsons and Cuthbertson 2001).

Australian weed status

C. rotundus is naturalised in all Australian mainland States and Territories (Parsons and Cuthbertson, 2001). It is considered a particularly serious weed in Queensland and northern New South Wales where it infests a range of crops in coastal and sub-coastal areas. Some operations have been forced out of production by it because selective chemical control options are not available and manual removal is not practical. It is regulated in South Australia. Groves et al. (2003) rate it as a major weed in more than four locations in an Australia state or territory.

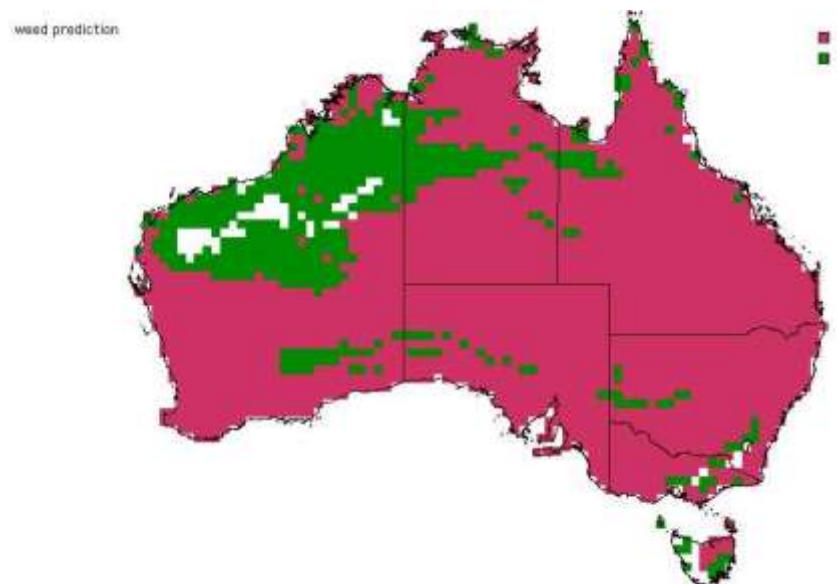
Weed potential in Tasmania.

C. rotundus is not naturalised in Tasmania. A plant detected on sandy soils in association with a tuber rose (*Polyanthes tuberosa*) crop in a flower and bulb enterprise in the state's north east in 1995 was thought to have been *C. rotundus*. It was probably imported with stock from a Victorian bulb farm. Subsequent examination of fresh material revealed that it was more likely to be a relative, yellow nut sedge, *C. exculentus* (Welsh, 1999). This has yet to be confirmed by the Tasmanian herbarium.

Climate matching indicates the plant is only likely to grow in a range of warmer Tasmanian environments. The following analyses indicate the weed potential of *C. rotundus* in Tasmania.

Weed risk assessment

Weed risk assessment undertaken by DPIWE involves use of a point scoring system devised by Pheloung (1996). *C. rotundus* scores 10 on a scale that is positively correlated to weediness. The nominal score for rejection of a plant on this scale is 7 or greater (see Appendix 1 for risk assessment scoring).



Potential distribution of *Cyperus rotundus* in Australia using CLIMATE (Pheloung, 1995)

3. Weed Impact Assessment

Weed impact assessment is based on the DPIWE scoring system designed for that *C. rotundus* scores 4 points on a scale where 4 points or more indicates a plant has significant potential impact. The impact scoring system requires that questions be answered with a particular land use in mind. *C. rotundus* was assessed for its potential impacts upon agriculture including horticulture.

Economic impact. The potential economic impact of *C. rotundus* in Tasmania is relevant to agricultural situations, especially those involving a regular cultivation regime in warmer areas that are either naturally well watered or irrigated. The consequence of land owners failing to control the plant would include a larger source of tubers for potential distribution to other areas. In addition, the dense habit of the plant means infested areas may need to be removed from production in order for control to be successful.

Environmental impact: *C. rotundus* is not described as a weed of natural areas although a suitable soil disturbance regime in open vegetation may facilitate its establishment and spread in select areas of Tasmania, provided a source of water and nutrients was also available.

Social impact. *C. rotundus* is unlikely to have significant social impacts in Tasmania.

4. Management Feasibility.

Since this plant is not naturalised in Tasmania at this time, management feasibility is not an issue. However, maintaining freedom from *C. rotundus* is highly dependent upon effective import prohibition, early detection and reporting of any occurrences and, community and industry education.

5. Declaration Recommendation.

C. rotundus appears to have potential to establish, reach moderate densities and cause harm in to agriculture in Tasmania. It may also become a weed of roadsides and amenity areas. Therefore it should be nominated for declaration under the *Weed Management Act 1999*. This will support removal of the plant from trade and eradication of any infestations that are detected.

6. References.

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Crop Protection Compendium at <http://www.cabicompendium.org>.

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Plants for a Future Database: www.scs.leeds.ac.uk

USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN), online database at www.ars.grin.gov/cgi-bin/ngps/html, National Germplasm Resources Laboratory, Beltsville, Maryland

Welsh, S., DPIWE internal Weed Occurrence Report for nut grass 04/06/99.