

Weed Risk Assessment: *Cyperus esculentus* L.

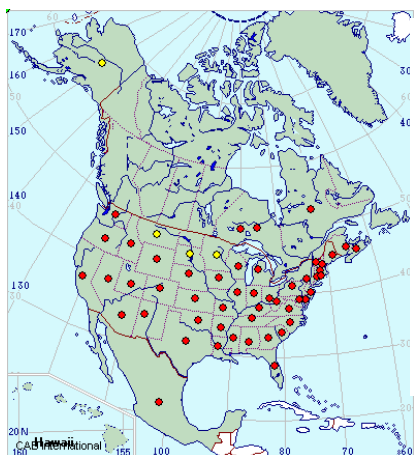
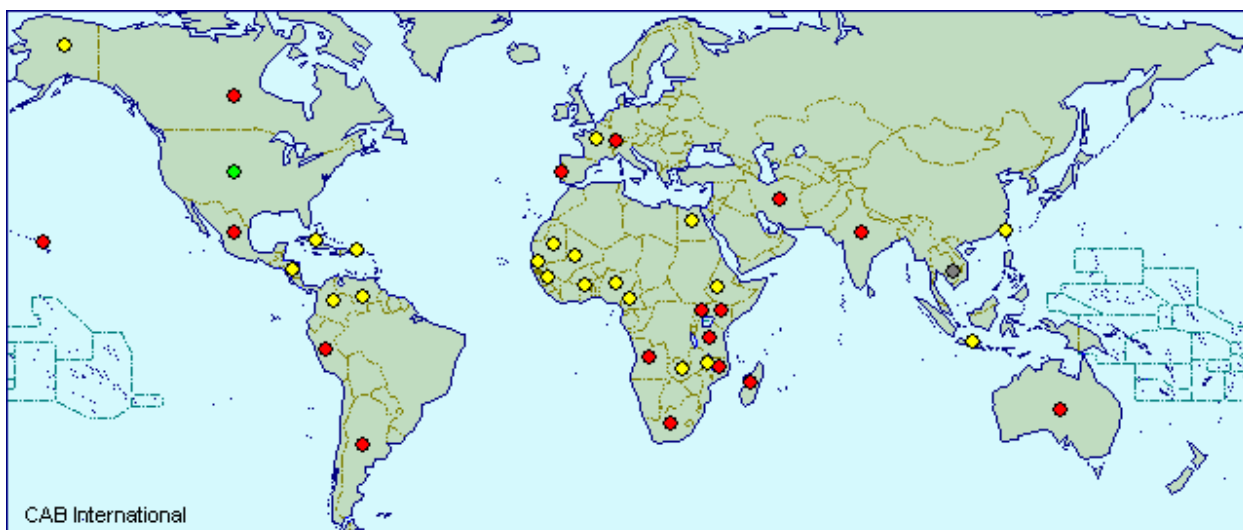
1. Plant Details

Taxonomy: *Cyperus esculentus* L. Varieties: *C. esculentus* L. var. *esculentus* (weedy), *C. esculentus* L. var. *sativus* Boeckeler (cultivated) *C. esculentus* L. var. *macrostachyus* Boeckeler, *C. esculentus* L. var. *leptostachyus* Boeckeler, *C. esculentus* L. var. *hermanii* (Buckl.) Britt, *C. esculentus* L. var. *angustispictatus* Britt, *C. esculentus* auct. non L. p.p. Family Cyperaceae (Sams 1999, USDA PLANTS database).

Common names: nut grass, yellow nut grass, chufa flatsedge.

Origins: Pan-tropical to temperate (GRIN database).

Distribution: a weed in warm and temperate countries including southern Europe, Africa, Asia, most of the Americas from southern Canada to Argentina. Occurs on all continents (State Noxious Weed Control Board, Washington at www.nwcb.wa.gov, Crop Protection Compendium, 2004).



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. esculentus* is an erect perennial sedge that may grow to 70cm high. Stems are erect, smooth, light-green and triangular in cross section. Leaves are V-shaped in cross section, green, glossy with a prominent mid-vein, coarse with small serrations and arising from three rows near the base of the plant. 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 many yellowish-brown or brown compressed florets. Seeds are yellow-brown and three angled. The root is an extensive system of fibrous rhizomes, tubers and basal bulbs. The tubers, also known as nuts, occur singly at the end of 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 (State Noxious Weed Control Board, WA at www.nwcb.wa.gov).



Biology and ecology:

Habitat. *C. esculentus* occurs mostly in moist, disturbed habitats and can tolerate a wide range of soil types. It grows in riparian areas and along lake-sides and marshes. Spring flooding in these areas favours this plant. It also occurs in cultivated areas, along roadsides, waste places and in lawns. It does not thrive in shaded situations. It is less cold sensitive than its relative *C. rotundus*. (State Noxious Weed Control Board, WA at www.nwcb.wa.gov – check where this is from).

Life cycle. In temperate areas *C. esculentus* produces tubers in summer and autumn. Tubers generally produce three shoots in spring which, as they extend towards the light, form swollen basal bulbs. Shoot, rhizomes and other tubers develop from these. Flower stems form in late spring and flowers are produced during summer. All aerial growth dies back over autumn. The plant does not exhibit apical dominance in its tubers since only one tuber occurs along a rhizome (State Noxious Weed Control Board, WA at www.nwcb.wa.gov).



Reproduction and dispersal.

Reproduction occurs primarily via tubers. Seed production is variable and in most cases viability is low although there are reports of prolific seed production in parts of the USA. Plants are self-incompatible. Tubers are far more significant. Each tuber has a number of small buds that form new plants. A

single tuber can produce 1900 plants and 7000 new tubers in one year. Tubers are resistant to frost and desiccation and show dormancy when first formed. Dispersal occurs when the tubers are moved by cultivation equipment or in the movement of contaminated soil, gravel or water (Sams 1999, State Noxious Weed Control Board, Washington at www.nwcb.wa.gov, Crop Protection Compendium, 2004).

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

Competition. *C. esculentus* 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 and is able to reach densities that effectively exclude desirable species. It is also known to spoil crop quality. For example, it can grow into potato tubers. 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).

Economic benefit: *C. esculentus* var. *sativus* is still used for culinary purposes and is known as chufa. Flour is made by grinding the nuts which are also used to produce a cold drink, a coffee substitute, vegetable oil, chocolate and cellulose or eaten roasted. Chufa is thought to have been an ancient food crop, nuts having been found in Egyptian tombs. Chufa is also used as livestock food in the USA (Sams 1999, State Noxious Weed Control Board, Washington at www.nwcb.wa.gov).

2. Weed Risk

World weed status

C. esculentus var. *esculentus* is considered a significant weed in many countries and ranked as the 16th 'world's worst weed'. Auld and Medd (1987) note it as a major weed of North America and southern Africa. It is a weed of a large range of crops but it is not considered as aggressive as its relative *C. rotundus* (State Noxious Weed Control Board, Washington at www.nwcb.wa.gov).

Australian weed status

C. esculentus is naturalised in Australia. Auld and Medd (1987) note it is not as widespread as *C. rotundus* and only considered significant on the north coast of Queensland. Groves et al. (2003) rate it as a minor weed in more than four locations in an Australia state or territory.

Weed potential in Tasmania.

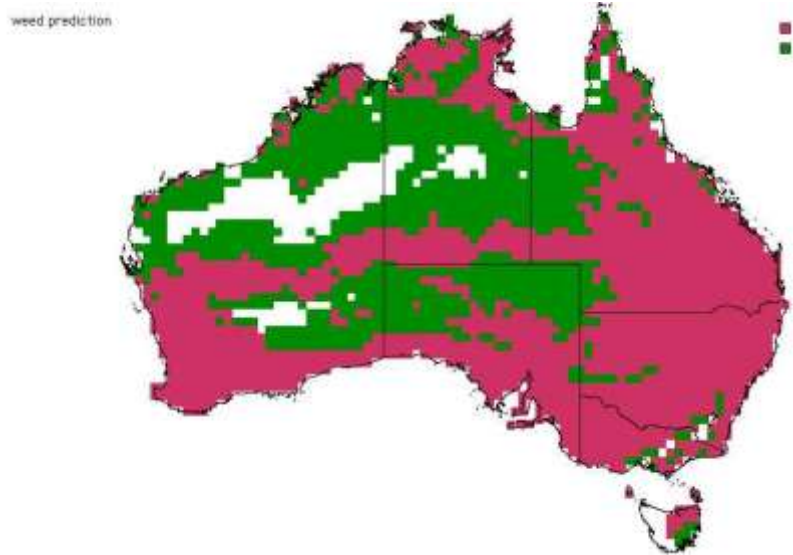
C. esculentus is not naturalised in Tasmania. A plant, now apparently eradicated, was detected on sandy soils in association with a tuber rose (*Polyanthes tuberosa*) crop in a flower and bulb enterprise in the state's north east in 1995. It is thought to have been *C. esculentus*. It was probably imported with stock from a Victorian bulb farm (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 Tasmanian environments. The following analyses indicate the weed potential of *C. esculentus* in Tasmania.

Weed risk assessment

Weed risk assessment undertaken by DPIWE involves use of a point scoring system devised by Pheloung (1996). *C. esculentus* scores 13 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 esculentus in
Australia using CLIMATE
(Pheloung, 1995)



3. Weed Impact Assessment

Weed impact assessment is based on the DPIWE scoring system designed for that *C. esculentus* 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. esculentus* was assessed for its potential impacts upon agriculture including horticulture at moderate densities.

Economic impact. The potential economic impact of *C. esculentus* in Tasmania is relevant to agricultural situations, especially those involving a regular cultivation regime in 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. esculentus* is not described as a serious weed of natural areas although a suitable soil disturbance regime in open vegetation or vegetation in riparian, lake-side or wetland areas may facilitate its establishment and spread in Tasmania.

Social impact. *C. esculentus* 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. esculentus* is highly dependent upon effective import prohibition, early detection and reporting of any occurrences and, community and industry education.

5. Declaration Recommendation.

C. esculentus 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. 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.

Auld, B. A. and Medd, R. W. 1987, *Weeds: an illustrated botanical guide to the weeds of Australia*. Inkata Press, Melbourne.

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

Groves, R.H. (Convenor), Hosking, J.R., Batianoff, G.N., Cooke, D.A., Cowie, I.D., Johnson, R.W., Keighery, G.J., Lepschi, B.J., Mitchell, A.A., Moerkerk, M., Randall, R.P., Rozefelds, A.C., Walsh, N.G. and Waterhouse, B.M., 2003, *Weed categories for natural and agricultural ecosystem management*. Bureau of Rural Sciences, Canberra.

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

Sams, D. J., 1999, *Nutsedge: weedy pest or crop of the future?* Ethnobotanical leaflets produced by Southern Illinois University Carbondale. <http://www.siu.edu>

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.