

## ***Cyperus rotundus* L.: an ancient food staple but now designated the world's worst weed**

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**Summary** The cosmopolitan perennial sedge, *Cyperus rotundus* L. (nutgrass), has been associated with humans as a food staple for millennia, as is demonstrated by recent research based on the extraction of dental calculus from pre-historic skeletons in Central Sudan. The dental calculus paper asserted that *C. rotundus* tubers formed part of the diet of Aboriginal people in Australia. But accounts have varied as to the tubers used by Aboriginal people, and there is no conclusive evidence that *C. rotundus* was so used. Opinions have also differed as to whether *C. rotundus* is an introduced species in Australia. *C. rotundus* was designated the World's Worst Weed, but it is not the worst weed in Australia. Although a weed of cultivation and gardens throughout the mainland, associated with disturbed sites, *C. rotundus* does not seem to be an invasive species. The plant's long association with humans is likely to have played a part in extending its range.

**Keywords** World's worst weed, prehistoric food staple, archaeological findings, Aboriginal use, weed status in Australia.

### INTRODUCTION

Some plants long associated with humans and now often thought of as mere weeds have had extensive periods in ages past when they were used for food and medicine. *C. rotundus* is an outstanding example. This persistent perennial plant, having been in association with humans for thousands of years, has in modern times been designated the worst weed in the world, as a weed of 52 crops in 92 countries (Holm *et al.* 1977). But there is much more to *C. rotundus* than that.

*Cyperus rotundus* is not a grass but a sedge. Both the common and the botanical names come from the nut-like underground tubers: *Cyperus* from *kuperos* or *Cypeiros*, a Greek name for some sedges, and *rotundus*, Latin for the round tubers. There are about 600 species of *Cyperus* world wide (Walsh and Entwisle 1994), found mainly in the tropics and sub-tropics, with very few species in temperate regions. That said, *C. rotundus* is found in New Zealand from Auckland to the far north, usually as a weed of gardens (Calder 1952).

Sedges are identified by their triangular stems, the dark green, sheathed leaves, and the characteristic flowers in very narrow, sharply pointed spikelets at the end of the rays. *C. rotundus* and the related *Cyperus esculentus* L. (yellow nutgrass), may grow together in mixed populations, and can be difficult to distinguish before they flower (Auld and Medd 1997). The inflorescence of *C. rotundus* is a loose umbel (flowers in a head with stalks arising at the same point) of brown to purple flattened persistent spikelets, while that of *C. esculentus* is a yellowish green. *C. rotundus* has an extensive underground system of roots, rhizomes, tubers and basal bulbs, making it very hard to eradicate (Maiden 1920, Whittet 1962).

This paper considers the role of nutgrass in pre-historic times, and whether it was used as food by Aboriginal people in Australia. Opinions have differed as to whether it is indigenous. Its present weed status is reviewed.

### DISCUSSION

**The medicinal uses of *C. rotundus*** *Cyperus rotundus* was used by humans as medicine in ancient times. Both Dioscorides (c40–90 AD) and Pliny (23–70 AD) wrote of its medicinal properties and its use to treat a range of ailments (Gunther 1934, Holland 1601).

A recent Indian study of the benefits of 'Nagarmotha' (*C. rotundus*) lists numerous current pharmacological uses, whether diuretic, carminative (anti-flatulence), emmenagogue (promoting menstruation), anthelmintic (killing parasitic worms), stimulant, analgesic, hypotensive, anti-inflammatory, anti-dysenteric, or anti-rheumatic. On top of all this, the tuber's essential oil is used in perfumery, soap making, and insect repellents. As an insecticide, *C. rotundus* was shown to be more effective than organophosphate and carbamate, and the essential oil is effective against a range of bacteria and fungi (Imam *et al.* 2014). Long used in traditional medicines in India, modern alternative medicine recommends using the plant to treat fever and inflammation, reduce pain, and relax muscles, and other uses (van Wyk and Wink 2005).

***Cyperus rotundus* as food** *Cyperus rotundus* has been in association with humans from remote

pre-history to the present: as a food for thousands of years in prehistoric times, and as a troublesome weed in modern times. Abundant remains of *C. rotundus* tuber, thought to have been collected as food, were found at the 18,000 year old site of Wadi Kubbania, near Aswan, Egypt (Hardy *et al.* 2016). At later sites at Al Khiday, 25 kilometres south of Omdurman (the ancient city opposite Khartoum) on the White Nile in Central Sudan, use of the tubers as food has been demonstrated by recent research based on the extraction of chemical compounds and microfossils from dental calculus derived from prehistoric skeletons, that has shed light on plants used as food in ancient Nubia. The complex of burial sites has yielded dental calculus samples from pre-Mesolithic, Neolithic, Late Meroitic and Mesolithic ages, covering a time span of more than 7000 years (Buckley *et al.* 2014). The periods stretched from the pre-agricultural fisher-hunter-gatherer based economy, through the early Neolithic with its incipient agriculture, through the sedentary culture known as the Kartoum Mesolithic that existed approximately 8000 years ago (Haynes 1996), and on to the fully developed agricultural context of the Meroitic, the Nubian civilization centred on the ancient town of Meroe that flourished for 1000 years from about 750 BC to about AD 350 (Shinnie 1996). *C. rotundus* material was found on the teeth of people from all of these periods, and was probably a carbohydrate staple for millennia, as well as being used for perfume and medicine (Buckley *et al.* 2014).

Kloot (1979) suggests that nutgrass was cultivated in South Australia in the late 19th century. He describes the cultivation of yellow nutgrass for its sweet edible tubers called, 'groundnuts', or 'chuffas' that were roasted and eaten as snack food much as peanuts or potato chips are used today. Demand was so great that there was a shortage of bulbs with action taken by the Central Bureau of Agriculture to distribute seed. Kloot suggests that 'due to honest misidentification and a little bit of fraud most of the so-called "*C. esculentus*" that was being circulated was probably *C. rotundus*', leading, he thinks to the sudden end of the fad. He concluded, 'regardless of what was being planted as *C. esculentus*, only *C. rotundus* has survived.' (Kloot 1979)

#### **Was *C. rotundus* the 'Yalka' of Aboriginal people?**

The scientists who examined the dental calculus of the ancient Sudanese skeletons also argued that recent hunter-gatherers in tropical regions ate *C. rotundus* tubers as a carbohydrate staple, and that in some agrarian societies the tubers served as a famine food. They pointed out that the nutritional value is enhanced by the presence of lysine, an a-amino acid

essential for humans as a building block for protein (Buckley *et al.* 2014). They also said that despite its bitter taste *C. rotundus* was one of three tuber staples among Aboriginal populations in Central Australia, citing Latz (1995).

The plant discussed by Latz (1995) was, however, not *C. rotundus* but another species, *Cyperus bulbosus* Vahl. (yalka or onion grass); although Latz (1995) did contain a passing reference to *C. rotundus* as a synonym for *C. bulbosus*. Kloot (1979) identified *C. bulbosus* as native to South Australia. Other sources such as Clarke (2011) confirm that yalka was *C. bulbosus*. Clarke does say in a footnote that yalka was formerly often identified as *C. rotundus*. For example, Basedow (1925) described *C. rotundus* as one of the commonest vegetables, eaten in very large quantities in the central and west-central regions, called yelka (sic) by the Arundta (sic) people. His observation that the bulbs have a sweetish, nutty flavour confirms the error. Maiden (1920) wrote of *C. rotundus* that 'aborigines roasted and ate the tubers in many parts of the continent, and continue to do so in South Australia.' From Low (1997) we have another Aboriginal name *Nalgoo* for *C. bulbosus*, and confirmation that it was previously misidentified as *C. rotundus*. To add to the uncertainty, Auld and Medd (1997) wrote that tubers of *C. esculentus* were eaten raw or roasted by Aboriginal people. They made no mention of *C. bulbosus*. Yet another *Cyperus* species, *C. victoriensis* C.B.Clark, found in all mainland States of Australia, was a food plant eaten by Central Australian Aborigines according to Gott (1993), but she did not give the name used by them. The suggestion that nutgrass was used as food by Aboriginal people in Australia has not been established.

**Is *C. rotundus* indigenous to Australia?** Botanists have differed in their opinions on whether *C. rotundus* is native or introduced in various parts of Australia. Some authorities claim it to be indigenous only to India, while others suggest the origin to be more widespread, including northern and eastern Australia.

*Cyperus rotundus* might be one of a number of tropical or subtropical plants indigenous in northern Australia but introduced in the south; or an introduction from other parts of the world. One reason why *C. rotundus* has been seen as probably indigenous to Australia is the fact that it has been a troublesome weed of cultivation since the days of the first European settlers (Lamp and Colett 1984). Michael (1972) suggested that *C. rotundus* had been introduced at least into southern Australia, and referred to the 1858 Report of the Sydney Botanic Gardens as the earliest record known to him of *C. rotundus* as a weed problem.

Michael seems to have regarded *C. rotundus* as one of a number of subtropical or tropical plants probably indigenous in northern Australia but introduced in the south; and left open introduction of *C. rotundus* from other parts of the world.

A paper by the clerical botanist Woolls (1867) 'Plants introduced accidentally' discusses *C. rotundus*, under the name *C. hydra* of the West Indies, as an introduced troublesome weed. Maiden (1920) accepted that *C. hydra* was a synonym for *C. rotundus*. The name 'hydra' invoked the nine-headed monster encountered by Hercules: as soon as he struck off one of its heads, two shot up in its place. One American study reported that one tuber produced 600 plants and spread 10 feet in one year (Ridley 1930).

In 1923 the plant was proclaimed a noxious weed in Victoria, having previously been declared a Thistle in 1890 under the then artificial system for proscribing noxious weeds by designating them as Thistles under the *Thistle Act* (Parsons 1981). Its noxious weed status was continued in a proclamation of 1974 but following the introduction in 1994 of a new system for dealing with noxious weeds under the *Catchment and Land Protection Act* it was not included in any category (Anon. 1998).

Ewart (1930) was convinced the plant was native to Victoria: 'Speaking from an experience of 25 years, the proclamation [as a noxious weed] of this native plant has served no useful purpose.' Currie (1945) wrote that the plant was 'indigenous to Australia in common with other parts of the world, [and] a pest in all States, but causes most harm in Queensland.' Willis (1973), was more cautious, describing the plant as 'probably indigenous in northern Victoria but now widespread with settlement... all States except Tasmania, cosmopolitan in most warm countries.'

The 25 species of *Cyperus* recorded in South Australia were carefully considered by Kloot (1979). Kloot sought to distinguish between native and introduced species, but suggested that the status of *C. rotundus* seemed to be a matter of opinion. It might be said that the differences of opinion as to whether *C. rotundus* was a native demonstrated the fragility of the category, which has come under sustained criticism in recent years (Chew and Hamilton 2001).

Kloot (1979) noted that the first recorded introduction of *C. rotundus* to South Australia was as a garden plant, of unspecified 'Australian' origin, into the Botanic Gardens in 1884. He concluded that *C. rotundus* was one of several species probably native to tropical eastern Australia, but introduced to South Australia. This theory would not be accepted by some botanists today: the consensus seems to be that while some species of *Cyperus* may be indigenous to

Australia, *C. rotundus* is an introduced species. Walsh and Entwisle (1994) regard *C. rotundus* as an introduced plant naturalized in all mainland States, as do Randall (2002) and Richardson *et al.* (2011). The plant may be indigenous in some parts of Australia, but has been introduced to many places where it is now a weed of cultivation, gardens and disturbed sites.

#### How serious a weed is *C. rotundus* in Australia?

*Cyperus rotundus* seems to be a weed of cultivation rather than of bushland, 'an unmitigated nuisance in gardens and arable land' as Maiden (1920) put it. Lazarides *et al.* (1997) describe it as a troublesome weed of cultivation and gardens throughout mainland Australia. Parsons (1981), however, was of the opinion that *C. rotundus* was not of great importance in Victoria, occurring in roadsides, parklands, channel and drain banks, and occasionally in orchards, vineyards and market gardens. Although it has been a proclaimed noxious weed in Victoria as noted earlier, and in South Australia, it is a serious problem only in Queensland and northern New South Wales.

*Cyperus rotundus* seems not to be an invasive environmental weed. Weber (2003) listed the related *Cyperus eragrostis* Lam. as an invasive species, but not *C. rotundus*. It was not included in Australian publications on environmental weeds such as Blood (2001), Muylt (2001) or Carr, *et al.* (1992). Despite its importance as a weed in India, Asia, the Pacific Islands, Africa, South America, North America and the Middle East, *C. rotundus* is not the worst weed in Australia.

The plant may well have been assisted in extending its range by its association with humans as a source of food and medicine for millennia in ancient times. When humans were using *C. rotundus* for their own purposes it is most unlikely that they called it a weed.

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