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CURRENT TOPIC

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Chinese water chestnut belongs to the family of grass-like wetland plants, Cyperaceae, which includes the sedges (*Cyperus* and *Carex*) as well as the spike rushes (*Eleocharis*). It is cultivated in much the same manner as paddy rice. The corm, a fleshy underground bulb-like portion of the plant, is the part that is harvested and sold to both fresh and canned markets for use in Oriental cooking.

In the late 1980s, researchers in Florida spent several years investigating the production of Chinese water chestnuts in Florida. Enclosed are two items from this effort:

Snyder, G.H., and C.A. Sanchez. 1989. Chinese Waterchestnut Production on Shallow Organic Soils: Final Report. University of Florida Everglades Research and Education Center, Belle Glade, FL. 19 p.

Morton, J.F., C.A. Sanchez, and G.H. Snyder. 1988. Chinese waterchestnuts in Florida – past, present, and future. p. 139–144. In: Proceedings of the Florida State Horticulture Society. Vol. 101.

Some of the interesting facts and conclusions from these reports:

- Over \$25,000,000 of Chinese water chestnuts were imported into the U.S. in 1988 as canned and frozen product. Chinese water chestnuts were also imported as fresh produce. While a dollar figure is not available, the USDA Economic Research Service reported that imports of fresh Chinese water chestnuts were 152 metric tons in 1983, increasing to 529 metric tons in 1987.
- The biggest source of imports comes from mainland China, with the remainder coming from Hong Kong and Taiwan. Ports of entry for imports included Los Angeles, San Francisco, New York City, and New Jersey.
- Chinese water chestnuts were introduced to the United States in the 1930s. Historically, states with commercial production include Florida, Georgia, and California.
- Seed corms or vegetative transplants can be used to establish a crop. Establishment from seed takes too long – as much as two years. Propagation from transplants can shorten the time to maturity by six weeks.
- Muck soils, clay loam soils, and sandy loam soils with a hardpan understructure are well suited to water chestnut production. Fields are leveled and diked in a manner similar to commercial rice production.

- Sowing a one-hectare (2.54 acres) field requires 500 kg corms. The field must be immediately flooded with at least 12.5 cm of water, which is then allowed to drain off. Within a week after planting, the field is re-flooded with 10 to 20 cm of water. This level is maintained throughout most of the growing season.
- By late November, the tops turn brown. The field is then drained after which time the tops (vegetative growth) are allowed to turn brown, then burned or clipped off. Harvesting is begun 2 to 3 weeks later.
- Home gardeners or small-scale growers can raise water chestnuts in water-tight containers or troughs. Yields of 9 kg of corms per square meter can be realized.
- A single plant can yield 2.3 kg per season. This translates to a theoretical yield of 92,000 kg per hectare. However, yields from growers in Georgia average about 48,000 kg per hectare. Yields in Florida have ranged from 47,000 to 85,000 kg per hectare.
- Despite its introduction to Florida over 60 years ago, there has been little progress toward the establishment of a viable industry. This may be due to lack of a suitable mechanical harvester and the high labor costs involved with hand harvesting and peeling the crop. Experimental harvesting and peeling equipment in Florida and Georgia were mentioned in the reports, and these may be worth investigating further.
- Still, some hope was expressed for Chinese water chestnut as a commercial crop in south Florida. It is well adapted to this climate, has a proven history of production, produces large yields with limited inputs, and from an environmental viewpoint is an ideal aquatic vegetable crop for natural wetland areas such as the Everglades region.

In addition to production as a wetland food crop raised much the same way as paddy rice, there is some interest in Chinese water chestnut as a minor hydroponic crop. For a glimpse into a simplified method of hydroponic food production that can be done outdoors or in a greenhouse using tubs and low-cost production methods, see the **Institute for Simplified Hydroponics** website at <<http://www.carbon.org/>>.

Aquaponic greenhouse growers, especially those who use gravel as an aggregate medium, sometimes raise Chinese water chestnut as a companion crop. For an introduction to aquaponics and resource listings, request the ATTRA publication *Aquaponics – Integration of Hydroponics with Aquaculture*, or read it on-line at <<http://www.attra.org/attra-pub/aquaponic.html>>.

There is also interest in the use of Chinese water chestnut as an aquatic plant in constructed wetlands (1-2). In a constructed wetland, wetland plants function as a biofilter to remove nutrients from the wastewater. Chinese water chestnut performs this function, while yielding a secondary food product that can be fed to livestock. The enclosed information sheet by Kingsley and Maddo addresses the use of Chinese water chestnut in association with constructed wetlands and livestock waste facilities.

Seed corms are available in limited quantities from ornamental aquatic plant nurseries. Growers thinking about raising Chinese water chestnuts are advised to seek wholesale quantities and prices. However, it may be necessary to obtain a few pounds of corms as stock plants, raise a crop of seed corms, and establish a larger planting in the second year. The tub method, as described by the Florida researchers, may be appealing to small-scale growers and home gardeners.

Trapa natans, The European Water Chestnut

To avoid confusion, growers looking into Chinese water chestnut as a commercial crop should be aware that there is an invasive, weedy wetland plant commonly known as water chestnut, *Trapa natans*, that has become naturalized in parts of the Eastern U.S.

T. natans, often called water chestnut or European water chestnut in the U.S., belongs to the Trapaceae family (which happens to be a monogeneric or single genus family). In contrast to the Chinese water chestnut which is harvested for its corm, the harvestable portion of *T. natans* is the seed or fruit—thus the common name of Singhara Nut in India and the Ling Nut in other parts of Asia. In India, Singhara Nut is considered a minor crop, and is sometimes only harvested as survival food under severe conditions.

T. natans was introduced to North America from Eurasia around 1874, and has since become a serious aquatic weed in much of the eastern U.S. and Canada. *T. natans* is a prohibited or restricted aquatic plant in states like South Carolina and Florida. It is illegal to import or distribute or even transport this plant through these states.

See **Further Resources** below for websites with more information on *T. Natans*, as well as background information on invasive wetland plants.

References:

- 1) Maddox, J.J., and J.B. Kingsley. 1989. Waste treatment for confined swine with an integrated artificial wetland and aquaculture system. p. 191–200. In: D.A. Hammer (ed.) *Constructed Wetlands for Wastewater Treatment*. Lewis Publishers, Chelsea, MI.
- 2) Kingsley, J.B., J.J. Maddox, and P.M. Giordano. 1989. Aquatic plant culture for waste treatment and resource recovery. p. 542–549. In: D.A. Hammer (ed.) *Constructed Wetlands for Wastewater Treatment*. Lewis Publishers, Chelsea, MI.

Enclosures:

Anon. 1989. *Aquaculture Report Series*. Florida Department of Agriculture and Consumer Services, Tallahassee, FL. Contains the following publications:

Snyder, G.H., and C.A. Sanchez. 1989. *Chinese Waterchestnut Production on Shallow Organic Soils: Final Report*. University of Florida Everglades Research and Education Center, Belle Glade, FL. 19 p.

Enclosures: continued

Morton, J.F., C.A. Sanchez, and G.H. Snyder. 1988. Chinese waterchestnuts in Florida – past, present, and future. p. 139-144. In: Proceedings of the Florida State Horticulture Society. Vol. 101.

DeRigo, H.T., and H.F. Winters. 1968. Nutritional studies with Chinese water chestnuts. American Society for Horticultural Science. Vol. 92. p. 394-399.

Kingsley, J.B., and J.J. Maddox. No date. Water Chestnut Production. Unpublished manuscript. 4 p.

Morgan, Lynette. 1998. Hydroponic water chestnuts & other aquatic crops. The Growing Edge. July-August. p. 43, 46-47, 50-55.

Waite, S. 1991. An introduction to Chinese waterchestnuts. Missouri Farm. December. p. 36-37.

Further Reading:

Bird, K. 1992. Aquatic plants, new profits for aquaculturists. Aquaculture Magazine. January-February. p. 30-40.

Hodge, W.H., and D.A. Bisset. 1955. The Chinese Waterchestnut. USDA Circular No. 956. U.S. Dep't of Agriculture, Washington, D.C. 16 p.

Groff, G.W. 1950. The introduction into the United States and the culture or *eleocharis dulcis*, the 'matai' of China. Proceedings Florida State Horticultural Society. Vol. 63. p. 262-265.

Leeper, G.F., and A.K. Williams. 1976. Peeling of Chinese waterchestnuts. Journal of Food Science. Vol. 41, No. 1. p. 86-88.

National Academy of Sciences. 1976. Making Aquatic Weeds Useful: Some Perspectives for Developing Countries. National Academy of Sciences, Washington, D.C. 175 p.

Hodge, W.H. 1956. Chinese water chestnut or matai – paddy crop of China. Economic Botany. Vol. 10, No. 1. p. 49-65.

Twigg, B.A., F.C. Starck, and A. Kramer. 1957. Cultural studies with Matai (Chinese water chestnut). American Society of Horticultural Science. Vol. 70. p. 266-271.

McGeachin, R.B., and R.R. Heidinger. 1979. Culture of Chinese waterchestnuts in the southeastern United States. Proc. S.E. Game and Fish Ag. Vol. 33. p. 606-610.

Web Resources:

<http://www.agric.wa.gov.au/agency/Pubns/farmnote/1999/f12899.htm>
Chinese Water Chestnuts for the Fresh Market
Agriculture Western Australia Farmnote

<http://www.nre.vic.gov.au/>
Farming & Agriculture | Agriculture Notes | Specialist Rural Industries | Horticulture |
Chinese Water Chesnuts
Chinese Water Chestnuts. Notes Series No AG0643.
Farm Diversification Information Service, Bendigo
State of Victoria (Australia) Department of Natural Resources and Environment

<http://www.rbgekew.org.uk/herbarium/sedges/sedges.html>
Sedge Research at Kew

<http://www.rbgekew.org.uk/herbarium/sedges/sedges.htm>
CYPERACEAE Newsletter

In addition, I call your attention to the **New Crops** website and symposium proceedings, sponsored by the Center for New Crops & Plant Products at Purdue University. These contain a wealth of information on minor crops, specialty crops, and ethnic crops. The New Crops symposiums held in 1990, 1993, 1996, and 1999 were published in a series of hard-bound proceedings that contain a wealth of information on new, specialty and ethnic crops. All volumes are available for sale in print; however, the first three volumes are also online.

Advances in New Crops (1990)

<http://www.hort.purdue.edu/newcrop/proceedings1990/v1-toc.html>

New Crops (1993)

http://www.hort.purdue.edu/newcrop/CropInfoSources/NewCropsBook1993_info.html

Progress in New Crops (1996)

http://www.hort.purdue.edu/newcrop/CropInfoSources/NewCropsBook1996_info.html

Web Resources on *T. natans* and invasive wetland plants:

Invasive Exotic Plants of Canada Fact Sheet No. 13: European Water Chestnut (Water Chestnut, Bull Nut, Jesuit Nut, Water-Caltrop)

Wildlife Habitat Conservation, Canadian Wildlife Service
Environment Canada, The Green Lane
<http://infoweb.magi.com/~ehaber/factnut.html>

Invasive Plants of Natural Habitats in Canada An Integrated Review of Wetland and Upland Species and Legislation Governing their Control

Wildlife Habitat Conservation, Canadian Wildlife Service

Web Resources on *T. natans*: continued

Environment Canada, The Green Lane
http://www.cws-scf.ec.gc.ca/habitat/inv/index_e.html

Illegal Aquatic Plants in South Carolina: Water Chestnut

South Carolina Department of Natural Resources
<http://water.dnr.state.sc.us/water/envaff/aquatic/index.html>
<http://water.dnr.state.sc.us/water/envaff/aquatic/illegal2.html#chestnut>

Plant Material:

The following aquatic plant nurseries are listed here as likely sources of propagation material.

Please note that phone numbers and addresses have not been verified. Most listings come from **Cornucopia II: A Source Book of Edible Plants, 2nd Edition** (1998) by Stephen Facciola (Kampong Publications, Vista, CA. 713 p.):

Aqua Mart, Inc.
P.O. Box 547399
Orlando, FL 32854
800-254-5814

Lilypons Water Gardens, Inc.
P.O. Box 10
Buckeystown, MD 21717-0010
800-999-5459

Maryland Aquatic Nurseries
3427 North Furnace Rd.
Jarrettsville, MD 21084
410-557-7615

Oregon Exotics Nursery
1065 Messinger Rd.
Grants Pass, OR 97527
541-846-7578

Paradise Water Gardens
14 May Street
Whitman, MA 02382
800-966-4591

Scherer & Sons
104 Waterside Rd.
Northport, NY 11768
516-261-7432

Plant Materials: continued

Slocum Water Gardens
11010 Cypress Gardens Blvd
Winter Haven, FL 33884-1932
941-293-7151

William Tricker, Inc.
7125 Tanglewood Dr.
Independence, OH 44131
800-524-3492

Van Ness Gardens
2460 North Euclid Ave.
Upland, CA 91786-1199
909-982-2425

Waterford Gardens
74 East Allendale Rd.
Saddle River, NJ 07458
201-327-0721

Wicklein's Water Gardens
P.O. Box 9780
Baldwin, MD 21013
800-382-6716

Coastal Gardens and Nursery
4611 Socastee Blvd.
Myrtle Beach, SC 29575
803-293-2000

Eco-Gardens
P.O. Box 1227
1346 S. Indian Creek Dr. (Stone Mountain)
Decatur, GA 30031
404-294-6468