

## THE INTRODUCTION INTO THE UNITED STATES AND THE CULTURE OF *ELEOCHARIS DULCIS*, THE 'MATAI' OF CHINA

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Aquatic plants, particularly those of economic importance, should receive greater consideration for field crop production upon the wide areas of Florida's low, wet lands. For possible water crops, and knowledge of their culture, we should look more and more to the delta- and ocean-bordered lands of Asia. The most important water crops of South China, grown upon a field basis and in rotation one with the other, include rice (*Oryza sativa*); wild rice (*Zizania aquatica*) prized for the tender, edible stems which become enlarged by inoculation of a special fungus; old world arrowhead (*Sagittaria sagittifolia*), the underground tubers of which are widely eaten in the Orient; a special form of the tropical or sacred lotus lily (*Nelumbium nelumbo*) so widely grown here in Florida in shallow pools for their attractive, fragrant flowers, but more especially in the Orient for the rootstocks and seeds which there are prized for food; the water caltrop (*Trapa natans*), the common name in the United States 'water chestnut' being frequently confused with the "Chinese water-chestnut" or 'Matai' (*Eleocharis dulcis*), the fifth species in our series and the subject of this paper.

### The Botany of the Chinese 'Matai'

The species under consideration belongs to the water-loving family of grass-like plants *Cyperaceae*. In times past various writers on plants have assigned it to the following genera: Rumphius, in 1750, to *Cyperus*; Burman's son, in 1768, to *Andropogon*; Loureiro, in 1790,

to *Hippuris*; and Blanco, in 1837, to *Carex*. Still other authors have placed it under *Scirpus*, a key-character for which is *style-base passing gradually into the nutlet*. The 'Matai', now correctly placed within the genus *Eleocharis*, has *style-base constricted or jointed above the nutlet*. And *hypogynous bristles are present*, thus differing from *Fimbristylis* with *hypogynous bristles none*.

It is an interesting story how that Robert Brown, in 1810, first established the generic name *Eleocharis* from the Greek '*Heleos*', meaning 'marsh' and '*charis*', meaning 'delight'. Strangely he spelled the generic name *Eleocharis* instead of *Heleocharis* which some authors have used. But the international rules preserve Robert Brown's name. The specific name *dulcis*, means 'sweet'. Thus we have for 'Matai' the very fitting name '*the sweet delight of the marsh*'. And such it is. A transliteration into English of the Chinese characters for 'Matai' means 'Horse's hoof'. The Chinese literature covering this Chinese plant name is quite copious, and cannot be dealt with in this paper. Nor can we delve into the extensive synonymy of both Latin and Chinese names.

As the genus *Eleocharis* now stands there are about 146 species of these interesting marsh plants, extending into most parts of the world. The various floras of North America list approximately 40 species, of which at least 5 are also common to East Asia. Many of our native species are recognized as food yielding to wild life. *E. dulcis* is not native, but introduced from China where it is widely cultivated. My friend Dr. E. D. Merrill, authority on the plants

of Southeast Asia, writes under date of Oct. 29, 1949:

"*Eleocharis dulcis* is of very wide, more or less natural distribution in the Old World tropics. Man may have aided and abetted its distribution. S. E. China and Formosa to India, Madagascar, and tropical Africa, throughout Malaysia to the Philippines, New Guinea, New Caledonia, Mariannas Islands and Fiji. In most of this vast range it is *never* cultivated. You can safely say that the Chinese developed its cultivation. In fact, China is the only place where I definitely know it is cultivated, but I would guess also in Indo China and perhaps Japan."

Merrill's citation for the species under consideration is: *Eleocharis dulcis* (Burm. f.) Trin. Ex Henschel, Vita Rumph, 186. 1833. In modern literature '*tuberosa*' is often used synonymously with '*dulcis*' as a specific name.

#### Introduction of Matai, Its Distribution and Testing in the United States

The fresh corms of Matai have long been imported into this country from China by Chinese merchants. They are still preferred to the locally grown product. At present they sell in New York at 80 cents a pound retail, 60 cents a pound wholesale. And peeled Matai, preserved in cans, bring \$9.50 for a box of 12. Peeled and sliced, and processed in this country, they are available in many delicatessen shops at higher prices. One must ask for '*Chinese Water Chestnuts*' instead of '*Matai*'. No doubt loyalty to the Chinese product has refrained Chinese gardeners in this country from growing the product here at any extent.

The Division of Plant Exploration and Introduction of the United States Department of Agriculture, Washington, D. C., has for at least twenty years been interested in the possible introduction of

'Chinese water chestnuts', for which they now recommend the name '*Matai*', so as to avoid confusion with the edible species of *Trapa*. Prior to 1934 there were some introductions but with no great success. In this year we of Lingnan University, Canton, China, received a request from the division for a supply of corms of a desirable variety of Matai, together with data covering culture as practiced by the Chinese. These were received in Washington August 31, 1934, and listed under plant inventories with the following brief notes:

*SPI No. 106274*. "A Chinese vegetable which grows very much in the same manner as wet-land rice. The corms or tuberous rhizomes are mostly eaten raw, but are also sliced or shredded in soups and in meat and rice dishes. The plants which are grown on muck or clay soil need a hot summer to mature."

The U. S. Plant Introduction Garden at Savannah, Georgia, was made the chief center for the production of corms for seed distribution, and to date they have gone out in small quantities to most areas of the United States. Unfortunately reports have been meager, and apparently the crop is not yet permanently established in any given region. Mr. D. A. Bisset, Chief Scientific Aid at Savannah, is giving the crop considerable experimental culture and marketing attention. At Orlando, Florida, Mr. James Banks has carried on extensive field tests for commercial production. At Laurel, Florida, we have carried out upon the Lingnan Plant Exchange plats small test plantings since 1942. We are gradually extending our plantings from which interested parties can receive seed corms in late fall to early spring.

In China the species is in culture chiefly in the southern provinces, but extends northward as far as the Yangtze river area. In this country Virginia seems to be the safe northern limit.

While in Florida it can be grown as far south as the Keys we believe that the corms are sweeter when grown within a more northern range.

In this paper we are restricted in space to any adequate discussion of cultural methods and uses of Matai. Our Federal Government's Department of Agriculture has issued admirable mimeographed statements covering SPI No. 102674. We suggest, if further interested, you request their current literature on Matai.

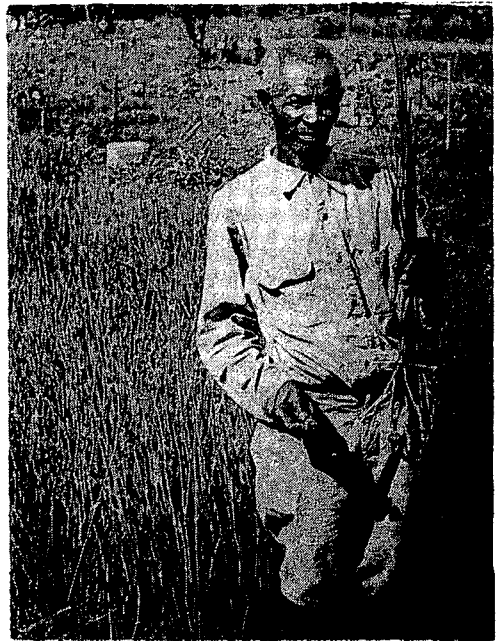
#### Brief Cultural Notes On Matai

At Laurel, in Sarasota County, the corms are planted in seed beds, close to flowing wells. They are set out in rows about two feet apart and one foot apart in the rows. The ground is kept very moist but not submerged. The young plants are raised from these seed beds in May, when the rains begin to break. They are then set out in carefully leveled field plats, 3 by 3 feet apart. Small dykes are raised around these fields which are then flooded with pond or artesian water and remain thus throughout the entire growing season. The plants spread rapidly by rhizomes and by August or September completely cover the field, as shown in our illustrations. The fields are then of fine green appearance, and the space between the rows is completely occupied by the underground-stem mat of growth, to which the enlarging, starchy corms are attached. By late November the vegetative top growth turns a beautiful brown color. The fields are then dried down, and the corms are harvested and used at any time thereafter. They store well in refrigeration, which adds considerably to their sweetness.

Matai grow best in a rich clay or muck soil. In very sandy soils, difficult to irrigate, they seem quite unhappy. Organic, garden fertilizers, spread be-

tween the plants in the watery rows, dissolve readily and are quickly assimilated by the vigorous root system. To date the only insect pest that has troubled us is the rice water weevil which tunnels into the corms. Mr. Banks, at Orlando, has also experienced heavy infestation of these but has controlled their spread with insecticides. Rodents are also troublesome after the fields are in a dry condition.

It is well to note that the natural habitat of most species of the genus *Eleocharis* is the more shallow border lands of marshy areas. Under favorable conditions the species spread rapidly by underground stems in moist soil. They will thoroughly occupy a favorable area within a few months of hot, wet weather by means of their spreading, matted growth. In the late fall and winter



*Plantsman holding above- and underground parts of a stalk of Eleocharis dulcis, the Matai of China. Note edible corms.*

dormant stage, when these lands begin to dry down, the corms, if not harvested by man or rodents, remain dormant and retain their viability within this natural setting. In spring they sprout and occupy any available new areas. Here, as the young plants develop in height and spread, and the rains gradually advance and low spots become submerged, they become quite at home. Thus by a study of the natural habitat and growth of the Chinese and other species much can be learned as to how best to prepare the beds or fields for culture. Under a good system of irrigation or water control, for submerging the plants to the right depth of a few inches, natural conditions can often be improved.

### Conclusion

*Eleocharis dulcis*, the 'Matai' or 'Water Chestnut' of China, is a strictly water-loving plant particularly well adapted to many of our lower areas of the Southland. It has been successfully introduced from China and since 1934 has received considerable experimental testing. However, it has not yet attained to commercial production in this country. It should be grown more widely by the home gardener with suitable land available. In culinary art it has many possible uses and is frequently listed in cook books. The botany of the species is an extremely interesting subject and improvement through breeding and selection is quite possible.



A field of Matai on Lingnan Plant Exchange Grounds, Laurel, Sarasota County, September 1949.