بسم الله الرحمن الرحيم

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صدق الله العظيم

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Ain Shams University
Faculty of Specific Education
Home Economics Department

STUDIES ON TIGER NUT AND IT´S PRODUCTS

Ph .D Thesis

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THESIS

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List of Abbreviations

Abbreviate	Definition
AOAC	Association of Official Analytical Chemists
AOCS	American Oil Chemists Society
A.V.	Acid value
B.V.	Biological Value
º C	Degree of Celsius
EAA	Essential Amino Acids
FA	Fatty acid
FAO	Food Agriculture Organization.
FFA	Free fatty acid
Fig	Figure
IV	Iodine value
N.E.A.A	Non-essential Amino acid
N.F %	% Nutritional Factor
PER	Protein Efficiency Ratio
PV	Peroxide Value
RDA	Recommended Dietary Allowances.
RI	Refractive Index
SD	Standard deviations
TSFA	Total saturated fatty acids
TUFA	Total unsaturated fatty acids
WHO	World Health Organization.

1. INTRODUCTION

(*Cyperus esculentus L.*) tubers, commonly known as tiger nut or chufa, is a member of the Cyperaceae family. Tiger nut grows mainly in the middle belt and in the northern regions of Nigeria **. Osman and Gad (1972); Gogolewski and Mackowiak (1977) and Okigbo (1989)**

Tiger nut or Chufa, earth chestnut, earth almond, yellow nut grass, ground almond and rush nut, historically was an important food crop in ancient Egypt and cultivated today in West Africa , Span and China. Currently, in the central and southern United States, chufa is used for. Wildlife habitat improvement, particularly as a winter food source for deer and wild turkeys; **Negbi. (1992).**

Tiger nut is a very fast growing perennial grass-like plant from the rush family, and is very easily grown in warm climates in moist or wet soils. The small round tubers found along the roots have a slightly almond flavor and are eaten raw or cooked, or made into the traditional drink horchata. The plant's tubers contain high levels of protein, carbohydrate and olic acid, 20 to 28 percent of their mass in the from of a no- drying oil. The oil obtained by pressing the cleaned tubers, in the same manner as traditional olive-oil extraction. The oil has a mild, pleasant flavor and considered as a food oil to be similar but of superior quality, to olive oil. **Mosquera. *et al* . (1996).**

In Africa, Europe and Asia, chufa is grown for its edible tubers. Tubers contain protein, carbohydrates, sugars, and lots of oil and fiber. The chufa nut is good for human health, containing high levels of iron and potassium, and no sodium. In Spain a drink called "horchata" made from (tubers) of the yellow nut sedge. The popularity of this drink has recently extended to other countries such as France, Great Britain, and Argentina. Chufa tubers are ground into flour, as well as being used to produce a cold drink (horchata*), a* coffee substitute, vegetable oil, and cellulose **Lapham, Jon and Drennan (1990).**

Even today the Egyptians are cultivating a native species in Cyprus in moist soils or sandy shores for their edible tubers.” These are called "tiger nuts" and are first fried, and then soaked in water. The Milky-looking aqueous extract of chufa pleasant and has characteristic flavor of vanilla and almonds.’ Chufa is potentially a commercial source of high-oleic acid vegetable oil and high-carbohydrate tuber cakes **Mosquera *et al* (1996).**

Tiger nut tubers are also used as aphrodisiac, carminative, diuretic, emmanogogue, stimulant and tonic **Oladele and Aina(2007).** It was reported to be used in the treatment of flatulence, indigestion, diarrhoea, dysentery, and excessive thirst **Chevallier,(1996) .**And as a digestive tonic having a heating and drying effect in digestive system and alleviating flatulence. They also promote urine production. The nuts are said to be

stimulant tonic and also used in the treatment of indigestion, colic diarrhoea, dysentery and excessive thirst**. Belewu and Abodunrin (2006)**

The tubers contain about 25% oil, which are resistant to peroxidation, 50% digestible carbohydrates, 4% protein and 9% crude fiber **Shilenko *et al.* (1979) and Emmanuel *et al.* (1984).** In addition, tiger nut has a higher essential amino acids than those proposed in the protein standard by the FAO/WHO (1985) for satisfying adult needs **Bosch et al.(2005)**

Aim of the study

1- Studying the nutritional value of
   a- tiger nut tubers.
   B- tiger nut flour
   C- tiger nut oil
2- Studying possibilities Using products of tiger nut flour (cake and biscuit)
3- Using tiger nut oil in frying .

2. REVIEW OF LITERATURE

2.1. Tiger nut tubers

Cyperus esculentus L, known as tiger nut or chufa, plant is a member of the grass family Cyperaceae to which nut sedge weeds also belong. Chufa tubers are daily ingredients of the diet of many people in North Africa and Spain. . **Okladnikov *et al.* (1977).**

Tiger nut requires soils with special characteristics for quality production. The types of soil suitable for the tiger nut are those which are loose as harvesting requires sieving down to a depth of 15-20 cm of soil where the tuber grows. If it is sieved in compact soils, the tubers come out covered in soil making the washing process much more difficult. Furthermore, in loose, open, sandy soils . Tiger nut grows better and has a sweet, strong flavour, a thinner skin and lacks the roots which reduce its value (the hairy tiger nut). It is also bigger and more uniform in size .**Vaya (1981) and Schwartz (1983).**

Tiger nut is a perennial tuber or nut commonly found wild and cultivated in Northern Nigeria. The spherical underground tubers are edible and have a sweet nutty flavour and are consumed fresh, dried and roasted. Fresh tubers are also fermented to produce a local alcoholic drink. **Bokhari and Ahmed (1979) and Andy and Eteshola (1984) .**

Tiger nut is a tuber of the species *Cyperus esculentus L*. which is used both in animal feed and for human consumption where is used to make Valencian horchata (a nut milk drink). This plant grows in areas with a temperate, humid climate .**Pascual (1984).**

It is a root crop, which grows widely in wet places as a grass and is sometimes cultivated for its small and sweet tubers. In some parts of Nigeria, the tubers are eaten like nuts or pounded into cakes and served at the end of a meal. **Osman and Gad (1972); Gogolewski and Mackowiak (1977) and Okigbo (1989)**

Tiger nut (*Cyperus esculentus*) is a weed plant of tropical and Mediterranean regions. Its tubers are widely eaten under different forms in West and Central Africa: unprepared, soaked in water or dried and mixed with roasted groundnut. **Temple, Ojobe and Kapu (1990)**

The search for lesser known and underutilized crops, many of which are potentially valuable as human and animal foods has been intensified to maintain a balance between population growth and agricultural productivity, particularly in the tropical and sub-tropical areas of the world. Tiger nut *(Cyperus esculentus*) is an underutilized sedge of the family Cyperaceae which produces rhizomes from the base and tubers that are somewhat spherecal. In Egypt, it is used as a source of food, medicine and perfumes. **De Vries (1991).**

Tiger nut has different varieties, the notable ones being, black, yellow and brown with various sizes. Although information on proteins, sugars and lipids are available. **Ibiyemi *et al.(*1992)**

Chufa or Tiger nut, earth chestnut, earth almond, yellow nut grass, ground almond and rush nut, historically was an important food crop in ancient Egypt and is cultivated today in West Africa, Span and china. Currently, in the central and southern United States, chufa is used for Wildlife habitat improvement, particularly as a winter feed source for deer and wild turkeys. One such example of tiger nuts is depicted in a wall painting of an Egyptian tomb in 15th century b.c. In the painting workers are shown to be weighing the nuts while a scribe records their work. In another part of the same tomb instructions were written for eating the tubers as sweets after grinding and adding honey. Tubers have been found in the tombs and are considered to be locally domesticated in Egypt. This gives the impression that the tubers were greatly valued by people as a food source. It appears *Cyperus esculentus* is one of the ancient food crops in Egypt in the company of emmers and barley. From this information it may be concluded that the cultivated variety was born out of the weedy variety. **Negbi (1992).**

Root and tuber crops have considerable unrealised potential as new products for human , animal and

industrial use as manifested in the remarkable increase in their utilization in processed form in a number of developing countries. Among the factors contributing to this emerging pattern are the agronomic and biological characteristics of the crops, and recent trends in production and development beyond the food system for these particular commodities. **Scott (1992)**.

Tiger nut is also produced in the southern part of the United States (Florida) as fodder for livestock. Nut sedge is also popular with hogs, deer and turkey. Nut sedge is of major importance as food for waterfowl as well **Mosquera *et al.* (1996)**.

In Cameroon, the plant grows in the northern part of the country, where it is mainly consumed uncooked as a side dish. In spite of the abundance of the crop in the region, its valorisation is low, which may justify the low price of tubers sold on market (less than USD 0.5 kg^{-1}). In addition, the crop has attracted very few scientific and technological interest. **Omode *et al.* (1995). ; Etshola and Orasedu (1996) and Kapseu et al. (1997).**

Tiger nut can be eaten raw, roasted, dried, baked or as a refreshing beverage called “Horchata De Chufas” or tiger nut milk. It also finds uses as a flavouring agent for ice cream and biscuits, as well as in making oil, soap, starch and flour. **Cantalejo (1997).**