

## TIGER NUTS

*(It is an underappreciated, nutrient-rich crop with many applications.)*

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### Abstract

*The body homes of pure tiger nut (Cyperus esculentus) were determined with a moisture content of 41.20% and 16.40% on a wet substrate. The physical homes of tiger nuts, additionally called chufa and ground almonds, include various aspects of their appearance, texture, size (usually ranging from 1 to 2 cm in diameter), shape (normally round or slightly rectangular), color (commonly brown), smell (smooth and delicate aroma), taste (sweet and nutty taste with diffused earthiness), density (especially dense due to their strong composition and small size), water observation (ability to absorb water), composition (rich in vitamins, healthy fats, together with dietary fiber), storage balance (while beautifully stored in a cool, dry area, they have an amazing shelf life), harvest and processing (normally harvested by rooting the whole plant), and culinary use (used in exceptional culinary applications including snacking, baking and as part of liquids). it could range entirely based on factors including different tiger nuts, growing conditions, and processing techniques. Tiger nut is the tuber of Cyperus esculentus, which is a healthy crop that carries 3.28-8.45% protein, 22.14-40.92% lipid, 23.21% starch.26%-12% fiber.2, vitamins (including Diet E and Diet C), minerals (along with iron, magnesium and phosphorus) and bioactive elements.*

**Keywords:** *Moisture, application, culinary, bioactive*

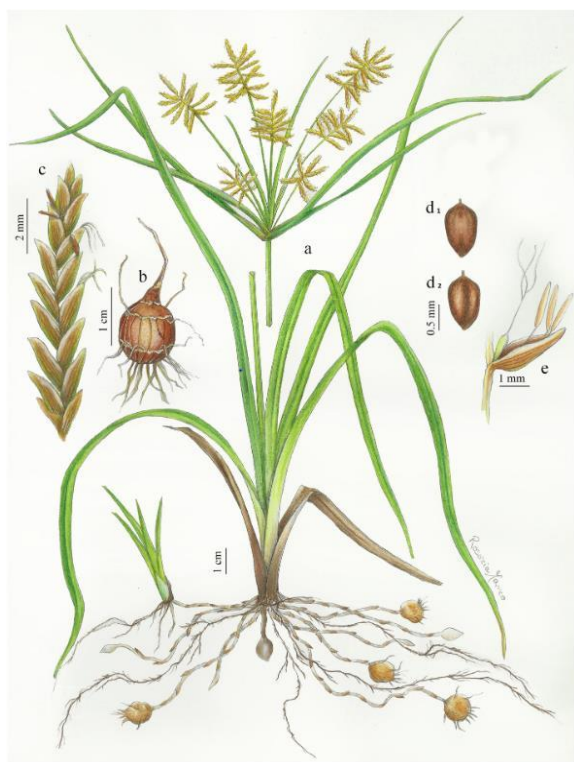
### Introduction

Tiger nuts, scientifically known as *Cyperus esculentus*, are small tubers or rhizomes belonging to the *Cyperus* family. Tiger nuts grow wild in many parts of the world, including Africa and southern Europe. Tiger nuts, also known as "underground walnuts," are cultivated worldwide for their high yield. Although tiger nuts are widely cultivated throughout the world. Despite the name, tiger nuts are not nuts, but small, nutritious tubers. Tiger nuts are perennial grass-like plants. Tiger nut is eco-friendly because it is drought tolerant and can grow in different types of

soil. Tiger nuts are consumed in various forms: raw, roasted, or processed into various products such as tiger nut milk, tiger nut flour, snacks, and tiger nut oil. Tiger nuts contain fiber, healthy fats, vitamins, and minerals. It is known for its high content of resistant starch, which acts as a prebiotic and supports gut health. Tiger nuts are an excellent source of edible oils that are high in fatty acids. Tiger nuts are naturally gluten free.

## Morphology

*Cyperus esculentus* is classified in the order Poaceae, class Angiosperms, and subclass Monocot, and is a plant of the family Cyperaceae, which consists of approximately 75 genera and more than 4000 species. Tigernuts may be produced annually by seeds or perennially by hard, tuberous bulbs or rhizomes at the base of leaf clusters. This is a perennial plant that is propagated annually through seeds or permanently through a hard, tuber-like bulb at the base of the leaf bunch. Yellow nut edge is a fast-growing perennial herb. It is straight, firm, and smooth (Gen, 1987).



**Figure 1.** *Cyperus esculentus* (original drawing by Rosaria Manco): (a) habit of the flowering plant; (b) mature tuber; (c) spikelet; (d1) achene: dorsal view; (d2) achene: ventral view; (e) details of flower and rachilla.

## Physical Properties

The physical properties of tiger nuts, also known as chufa or peanuts, include various aspects such as appearance, texture, and size. Here are some important physical properties.



**Figure 2.** Tiger nut tubers

### 1. Size and Shape

- They are small, rounded tubers typically ranging from 1-2 cm in diameter.
- They have a generally spherical or slightly oblong shape.

### 2. Color

- Typically, brown in color.

### 3. Texture

- Tiger nuts have a firm and crunchy texture similar to nuts.

### 4. Odor and Taste

- They have a sweet and nutty flavor.
- They have mild pleasant fragrance.

### 5. Water absorption

- Tiger nuts have the ability to absorb water and they often soaked before consumption.

### 6. Density

- Relatively dense given their small size and solid composition.

## **7. Composition**

- Tiger nuts are nutrient dense and contain nutrient fiber, healthy fats, vitamins, minerals and bioactive factors.

## **8. Storage stability**

- Proper storage helps prevent mold or spoilage.

## **9. Harvesting and Processing**

- Harvested by uprooting the entire plant.
- Processed into various products such as tiger nut milk, tiger nut flour or tiger nut oil.

## **10. Culinary uses**

- Used in various culinary applications such as snacking, baking, and making beverages.

## **Usage and Products**

Tiger nuts can be eaten as a snack, roasted, fried, or baked, and they can also be used in foods to make flour, starch, cakes, and biscuits. Also, due to its special sweetness, it smells like ice cream or cookies (Gumbo and Dow, 2014). About 4000 years ago, tiger nut oil (TNO) was used medicinally by the Egyptians. In addition, it is suitable for frying oil and cosmetics (Mohdaly, 2019). To use the tubers, they must be sorted, washed, and dried after harvesting. Drying methods vary depending on the desire of the producer (milk, oil, flour, etc.) and can be natural or artificial drying (Asante et al., 2014; Karim et al., 2015). Chufa is often used in Spain, especially in Valencia, where the tubers can be made into a refreshing drink to make a type of milk called "horchata" (Mohdaly, 2019). Caramel extracted from the malted

tubers of tiger nuts can be used to prepare, flavor, or color baked goods. In addition, it may be added to non-alcoholic malt beverages, dark beer, and flavored products.

## **Nutrition and health benefits of Tiger nuts**

Tubers are cultivated for their nutritional and health benefits (Achoribo and Ong, 2017; Asare et al., 2020). It is rich in fiber, low in fat, and high in protein (Rosell, 2020). Tubers contain 45.73% carbohydrates, 30.01% fat, 5.08% protein, 2.23% ash, and 14.80% crude fiber (Sabah et al., 2019). Ismail et al. (2020) reported that the protein content of the yellow and black varieties was 7.90% and 10.25%, respectively. Tiger nuts contain 77.49–80.01% of essential fatty acids and 31.32–34.03 mg of essential amino acids per 100 g (Ijarotimi et al., 2018). Tubers are rich in disaccharides. D. Sacars. During hydrolysis, it produces D-glucose, D-galactose, D-xylose, and D-arabinose (Marchyshyn et al., 2021). The total sugar content of yellow is reported to be 10.09–12.64% (Obinna-echem et al., 2019). Tubers contain 13.49% fructan (Marchyshyn et al., 2021). Brown contains a lot of fat and energy (Ayo et al., 2016), and black color contains minerals (Nina et al., 2019), protein, carbohydrates (Ayo et al., 2016), and fiber (Ayo et al., 2016). It also contains phosphorus and calcium (Roselló-Soto et al., 2019). Ismail et al. (2020) show calcium, sodium, phosphorus, potassium, iron, zinc, and copper in different types of yellow and black. Tubers contain active ingredients such as sterols, alkaloids, tannins, saponins, resins, and vitamins E and C (Marchyshyn et al., 2021). The phytochemicals in the fruit are unique and can be used in the production of medicines

and therapeutic foods (Ihenetu et al., 2021). Tigernut contains 62% flavonoids, 23% phenolic acids and their derivatives, and 15% phenylethanoid glycosides (Mayer,2019). Black varieties contain more tannins, phytic acid, oxalates, and saponins, while brown varieties contain more flavonoids, polyphenols, and alkaloids (Ayo et al., 2016). This study generally reduces the phytochemical content of the fruit (Uchechi et al., 2020a). After fermentation, the concentrations of saponins, tannins, phytates, oxalates, hydrogen cyanide, and hemagglutinin decreased (Ji and Gi, 2018). Tannins, oxalates, and saponins can be reduced by soaking and cooking (Umaru et al., 2018). The abundance of phytochemicals with antioxidant capacity may explain the health benefits of tiger nuts (Roselló)-Soto et al., 2019; Willis et al., 2019). Tiger nut beverage can be used as a functional food depending on its chemical composition (Oluwadunsin et al., 2021). Olagunju and Oyewumi (2019) recommend the use of drinking water containing hazelnuts for the prevention of cardiovascular diseases. Gugsu and Yaya (2018) reported that the smoke from burning hazelnuts contains various compounds with antioxidant, anti-inflammatory, anti-cancer, anti-inflammatory, and anti-inflammatory properties. Tiger nut consumption improves the antioxidant system and may also reduce the risk of obesity and diabetes due to its  $\alpha$ -amylase and lipase inhibitory abilities (Willis et al., 2019). Phytochemicals in tiger nut milk have been reported to prevent liver inflammation in mice by inducing glutathione synthesis or acting as antioxidants (Onuoha et al., 2017). Quercetin

and  $\beta$ -sitosterol found in olives are known for their anti-inflammatory properties (Achoribo and Ong, 2019). The antioxidant activities of DPPH radical scavenging and iron chelation were reported to be 24.5%–54.9% and 10.8–12.1%, respectively (Ijarotimi et al., 2018). The presence of DPPH radical scavengers in germinating tubers has been reported (Adebayo and Arinola, 2017). Tiger nut aqueous extract showed anti-cancer properties 48 hours after treatment (Achoribo and Ong, 2019). Eating nuts and their products can prevent cancer, thrombosis, and heart disease (Sethi et al., 2016), and treat diarrhea and pain (Bazine and Arslanoğlu, 2020). Arogundade et al. (2018) Improved memory function in rats fed tiger nut extract is associated with the antioxidant neurotherapeutic properties of tiger nut. More research is needed to understand the anti-cancer effects of hazelnuts (Achoribo and Ong,2017).

## **Conclusions**

The results show that they are rich in energy-giving nutrients and very high in protein. It is also rich in phosphorus, potassium, magnesium, and preventive nutrients. Tiger nut is an excellent and healthy crop from a nutritional and commercial point of view. Tiger nut is a valuable source of various nutrients like oil, starch, fiber, protein, etc. Due to its high fiber content, it can be used in food development to improve gut health and weight loss. Tiger nuts can bring many benefits to people in developing countries by playing an important role in providing food security, enhancing livelihoods, and improving nutritional status.

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