TIGER NUT (Cyperus esculentus Lativum) IS A PROMISING AGRO-ECOSISTEM PLANT FOR ENSURING FOOD SECURITY

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Abstract. *Tiger nuts are rich in minerals such as phosphorus, potassium, calcium, magnesium and iron. It also contains large amounts of vitamins E, C and B1, which help stabilize the central nervous system and cope with stress. In addition, chufa helps restore the function of the intestinal epithelium, normalize intestinal peristalsis and treat constipation.*
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In the contemporary era, healthy nutrition is considered to be the most important factor influencing human life expectancy. Therefore, the search for new food sources and their use is one of the pressing issues of our time. One of these sources is the ancient plant quinoa *(Cyperus esculentus Lativum)*.[1]

In recent years, a network of suppliers of environmentally friendly natural products has been actively developing around the world, offering flour, jelly, tea and balms, natural drinks from rare medicinal plants. In addition to meeting food needs, the *Cyperus esculentus Lativum* plant can also be used to increase soil fertility, its grains can be used for poultry farming, and green biomass and plant residues can be used for effective livestock feeding.[4]

It is worth acknowledging that tiger nut or *Cyperus esculentus* is indicated in some scientific sources as native to Africa and tropical Asia, while other authors consider its homeland to be tropical and subtropical regions of the world. It belongs to the Cyperaceae family, which produces rhizomes and globose root tubers. *Cyperus esculentus* is a fast-growing plant, reaching a height of 20 to 70 cm. It can be grown in all soils except saline, in temperate climates at temperatures between 20 °C and 30 °C. It is edible; tiger nuts can be eaten dry, raw, roasted or ground, and its nuts can be used to make a milk called "Horchata".

Tiger nuts are mainly eaten raw for their unique sweetness, in the production of gluten-free flour, milk extract for ice cream.[6]

It must be carefully considered that tiger nuts are considered as food and industrial materials with more promising applications; they can be used in beverages, milk or yogurt, flour, jam, beer production, chocolate, as a source of feed, edible oil and soap [2]

Cyperus esculentus has many medicinal properties. In particular, due to the presence of a valuable source of oil and the presence of starch, glucose, protein and minerals in its composition, it reduces the risk of colon cancer, is used as a cardiac stimulant, is used as an effective diagnostic and antidiarrheal agent. [5]

Tiger nut is rich in minerals such as phosphorus, potassium, calcium, magnesium and iron. (Ma duka and Ire, 2018). It also helps to stabilize the central nervous system and cope with stress due to the high content of vitamins E and C, B1 (David, 2005).

In addition, tiger nut helps to restore the function of the intestinal epithelium, normalize intestinal peristalsis and treat constipation (Maduka and Ire, 2018).

Taking into account these characteristics, we aimed to study the introduction of this plant, its bioecology, the influence of various soil and climatic conditions and environmental factors of our country on the productivity of tiger nut and substantiate this.

Tiger nut *"Cyperus esculentus Lativum"* is a plant of the *Cyperaceae* family, which is also known by other names in different countries such as chufa, yellow nut, ground almond and earth almond. Cyperus esculentus Lativum is a perennial plant widely distributed in Asia, East Africa, parts of Europe, especially in Spain, and also in the Arabian Peninsula (Abdelkader et al., 2017).

It should be further clarified that tiger nut is an ancient cultivated plant whose dried tubers have been found in tombs in Egypt dating back to about 6,000 years ago, and it was an important food source and the roots were used as sweets by people of that time (Zohary, 1986). Tiger nut oil (TNO) was used by Egyptians in cosmetics and medicine about 4,000 years ago (Mohdaly, 2019).



Cyperus esculentus Lativum

Tiger nut has erect stems with yellowish-green leaves, a triangular crown, and a height of about 20–70 cm. Its flowers are golden-brown, and its root system is taproot. Its roots contain numerous root nodules that store proteins, starches, and other nutrients. The plant's fine fibrous roots do not penetrate deeply into the soil, forming a shallow underground system of slightly elongated or rounded globular roots ranging from 8 to 16 mm in length (Abdelkader 2017).

Cyperus esculentus Lativum thrives and grows in sandy or loamy soils with temperatures above 20 °C and a pH of 5.0 to 7.5 (Dyer, 2009).

Tiger nut is cultivated in the Mediterranean, Africa, India, North America, Mexico, Peru, and other countries (CABI, 2020). West African countries such as Nigeria, Senegal, and Ghana, as well as Spain, are good producers and exporters of tiger nuts (Ezeh et al., 2014).

Tiger nuts can grow for 90–110 days. They are sown in April–July and harvested in September–November (Maduka and Ire, 2018).

It grows well in slightly acidic to neutral (pH 5.0 to 7.5) soils, and chufa grows and develops well when the temperature fluctuates between 30°C and 20°C during the day and night. Drip irrigation increases the yield of chufa.

As evidenced through methodological scrutiny, our field experiments were arranged in a single layer with 4 rows. We know that soil is an important edaphic factor that affects the growth

and development of introduced plants. Introduced plants also affect the physicochemical properties of the soil and all biotic components present in the agrocenosis.



Development and underground nodules of Cyperus esculentus Lativum

For this, to study the chemical and physical state of the soil before sowing chufa seeds, samples were taken from the 0-25-240 cm soil layer and laboratory tests were carried out. According to the results of the tests, the soil of the experimental plot turned out to be slightly saline, medium loamy of the 2nd degree. Since chufa is a plant that can grow on sandy soils with a pH of 5.0 to 7.5, it was planned to sow the seeds on this soil.[1]

As a result of studying the ontogenesis of medicinal chufa (*Cyperus esculentus Lativum*), it was found that its seeds have a high germination rate, and it was determined that scarification or stratification before sowing is not necessary. \

In light of the preceding discussion, the most optimal option for germination of medicinal *Cyperus esculentus Lativum* seeds in laboratory conditions, observations were conducted at the following temperatures: +10°C, +15°C, +20°C, +25°C, +30°C, +35°C. Our experiments show that the seeds began to germinate in laboratory conditions on the 5-6th day. In laboratory studies of our study, it was determined that the optimal temperature for germination of Chufa (*Cyperus esculentus Lativum*) seeds is 20°C. After sowing, 6.6 seeds germinated on the third day, 18.6 on the fifth day, 62.7 on the fifteenth day, 78.8 on the twentieth day, and 93.6 on the twenty-fifth day, which amounted to 93.44% of the total number of sown seeds. At this stage, seed germination was not observed in the following days. The maximum temperature had a negative effect on seed germination, which led to their drying.

Drawing together the central insights, according to the results of the experiments, it was noted that the most optimal temperature for the germination of chufa seeds (*Cyperus esculentus Lativum*) was +20°C, and the germination index in this variant was 20°C.

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