

Nutritional potential of fruit, bark and leaves of *Terminalia catappa* (شجرة اللوز الهندية)

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Abstract

Introduction: *Terminalia catappa* (TC) is a large tropical tree in the lead wood tree family, Combretaceae, native to Asia, Australia, the Pacific, Madagascar and Seychelles. This tree is a vital part of the cultural heritage of United Arab Emirates (UAE) and to natural desert ecology. *T. catappa* is considered as one of the highly valued trees in many arid areas in the world. It is commonly used as a shade giving tree but its seeds are edible and tasty. Even though it has been used in traditional medicine for wide range of ailments related to digestive, endocrine, reproductive systems and anti-cancer properties, in recent years there has been an interest in *Terminalia catappa* due to its medicinal and nutritional value. *Terminalia catappa* is an important underutilized fruit tree which has emerged as a good source for the treatment of various ailments and malnutrition. Thus, in the future a higher demand could be anticipated for various products from this tree.

Objective: In the present research work, we have attempted to analyze the nutrient content of the *T. catappa* leaves, fruit and bark to understand its health benefits and nutritional properties.

Results and Discussion: Nutritional analysis shows that it as a good source of minerals like sulphate, magnesium, nitrate, phosphorous, nitrite, iron and copper. This study demonstrates that *T. catappa* leaves and fruit can be used as nutraceutical food with rich nutrition, disease prevention and health promoting effects.

Conclusion: This research was carried out as an awareness of nutrition value of *Terminalia catappa* as nutraceutical. We need to spread awareness on the importance of this tree and the role they played in the functioning of a healthy ecosystem and thereby protecting the species from extinction. Thus, in the future a higher demand could be anticipated for various products from this tree for concern towards a possible integration into the food security and healthcare system.

Keywords: *Terminalia catappa*, Combretaceae, nutritional value, traditional usage, tropical almond

Introduction

Terminalia catappa (TC) is a multifunctional tree that is easily found in the Asia, Australia, the Pacific, Madagascar and Seychelles. [1], stated that *T. catappa* is a decorative tree which is widely planted in many countries. Ecologically, fruit of *T. catappa* is widely used as a food source for small mammals such as squirrels and bats. The leaf of *T. catappa* is a functional food to relieve symptoms of oxidative stress and neurodegenerative diseases [2]. In addition to leaves, seeds of *T. catappa* are rich in nutritional value and fibre, so they are also known as tropical almonds (Figure 1) with high fat content and energy value [3]. *T. catappa* seeds are used to overcome nutritional deficiencies because they are rich in macro and micronutrient

content of seeds [4]. *T. catappa* seeds contain mineral salts in the form of Calcium, Iron, Zinc and tannins depending on the location [4]. Besides being used as food, TC is also used as traditional medicine. Bedouin traditional lifestyle in UAE has been very much associated with this tree and their products [5]. In Nigerian folklore, the leaves and bark of TC are used to treat hypertension [6], while in Taiwan it is used to prevent hepatoma and treat hepatitis [7]. The TC is also useful for treating inflammatory bowel disease, oxidative stress, immune dysfunction [8], overcoming depression and anti-aging [9,10]. The leaves and bark of *T. catappa* can be a latent natural source for the development of a new compound antihypertensive agent [6]. The use of plants as traditional medicines is relatively safer than synthetic drugs, although understanding of their

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Figure 1: The *Terminalia catappa*, tree, leaves, fruit and bark.

bioactivity needs to be increased so that side effects can be minimized. Minnel et al. 2014 stated that the hydro alcoholic leaf extract of T [11]. catappa has mutagenic activity so that its use for medicinal purposes should be used with caution. This study aims to explain the use of TC as a food ingredient.

Botany

The tree grows to a height of 35 m with an upright, symmetrical crown and horizontal branches. Its branches are characteristically arranged in tiers. The leaves are large, 15-25 cm long and 10-14 cm broad, ovoid, glossy dark green, and leathery. The trees are monoecious, with distinct male and female flowers on the same tree. Both are 1 cm in diameter, white to greenish, and inconspicuous with no petals. The fruit is a drupe 5-7 cm long and 3-5.5 cm broad, green at first, then yellow, and finally red when ripe, containing a single seed. The seed within the fruit is edible when fully ripe. As the world rapidly modernizing and continuous population grows, inadequate nutrient sources, exorbitant cost of animal protein is considered the main reasons for malnutrition and undernourishment among people. Due to rapid change in socioeconomic conditions of the countries, less number of people get benefit by the plant as was practiced earlier. Therefore, the plant has been badly neglected for scientific studies [12]. The negligence is reflected from the fact that almost no scientific work has been carried out on the plants especially from the medicinal and nutritional potential point of view. In our previous study we investigated about the nutraceutical, antimicrobial properties of ghaf [13-17]. Also, we investigated that ghaf and mangrove has potential of antioxidant and antimicrobial properties [18-20]. Therefore, to continue our further research and to meet the increasing demand of nutrition and protein, alternative strategies and unconventional sources of nutrition and protein for human and animal, this study have been considered recently. Despite fabulous importance of *Terminalia catappa* in desert culture, there is less scientific studies and minimal awareness, in the developed communities about TC as nutraceutical. Hence, the objectives of the study were to study the nutritional properties of extract of leaves, bark and fruit of TC. This research was carried out as an awareness of nutritional value of *Ter-*

minalia catappa tree in food and value added products. We need to spread awareness on the importance of these trees and the role they played in the functioning of a healthy ecosystem and thereby protecting the species from extinction.



Figure 2: Sample preparation for Nutrient Analysis.

Table 1: Nutritional values of *Terminalia catappa* bark, fruit and leaves.

Parameter	<i>Terminalia catappa</i> Bark (mg/Kg)	<i>Terminalia catappa</i> Fruit (mg/Kg)	<i>Terminalia catappa</i> Leaves (mg/Kg)
Nitrate	580	440	1710
Nitrite	1300	800	5912.5
Sulphate	625	700	1612.5
Phosphorous	194	21	469.77
Copper	0	12.5	41.5
Magnesium	0	1687.5	825
Nickel	0	93.75	729.5
Iron	0	25	5
Ammonium	0	48.75	9.05
Lead	0	0	0

Material and methods

Sample collection

Samples of leaves, bark and fruit (Three different trees) of *Terminalia catappa* were collected from Dahan and Al Dhait area of Ras Al Khaimah, United Arab Emirates. Samples were kept in sterile polythene bags till their use.

Chemicals

The chemicals used in the present investigation were of analytical grade and of high purity from Merck. Standard used for analysis were purchased from Germany and USA.

Preparation of sample for nutrient analysis

The samples (leaves, bark and fruit) were washed with sterile water. Weighed 10g of sample (each) by analytical balance (RADWAG-PS 2100.R2, Poland) and transferred it into sterile mortar pestle and then grounded the sample to make a clear fine solution with milli Q [19]. Transferred the sample into volumetric flask and diluted up to 100 mL (sample concentration 10%). Further diluted the sample 5 mL to 100 mL with help of water (Figure 2). Samples were mixed using IKA Vortex Genius 3 shaker. The Centrifugation of sample was done by using Frontier™ Centrifuge FC5706 at 4000rpm for 15 minutes to collect clear sample. Samples were filtered and used for nutrient analysis by Hach spectrophotometer –DR3900 (Germany) and Spectroquant prove100, Merck, Germany.

Statistical analysis

Data are expressed as mean. Pair wise comparisons were performed. Experimental error was determined for triplicate and expressed as standard deviation (SD).

Results and Discussion

This is probably the first report of comparison of *T. catappa* nutrient content in leaves, bark and fruit; to understand its health benefits and nutritional properties. In the present investigation for nutrient analysis in all types of samples, Hach spectrophotometer DR3900 and Spectroquant prove100, Merck, Germany was used. Different types of nutrient like nitrate nitrite, sulphate, phosphorous, copper, magnesium, nickel, iron, ammonium, lead was investigated (Table 1). According to the present research findings, *Terminalia catappa* leaves have maximum amount of sulphate (1612.5 mg/kg), magnesium (825mg/kg), phosphorous (469.77mg/kg), nitrate (1710 mg/kg), Iron (5 mg/kg) and nitrite (5912.5 mg/kg) as compared with *Terminalia catappa* fruit, which have sulphate (440 mg/kg), magnesium (1687.5mg/kg), phosphorous (21 mg/kg), nitrate (440 mg/kg), Iron (25 mg/kg) and nitrite (800 mg/kg). In case of *Terminalia catappa* bark, the amount of sulphate (625 mg/kg), phosphorous (194 mg/kg), nitrate (580 mg/kg) and nitrite (1300 mg/kg) (Table 1). Similar work was reported that seed and fruit have many nutritional properties [21-23].

Similar work was reported by Oyeniran et al 2021, stated that TC leaf is a functional food to relieve symptoms of oxidative stress and neurodegenerative diseases. In addition to leaves, it turns out that TC fruit is rich in nutritional value and fiber, so it is also called tropical almond (Figure 1) with its fat content and high energy value [3]. TC seeds contain mineral salts in the form of Calcium, Iron, Zinc and tannins depending on the [4]. In Nigeria, TC seeds are used to overcome nutritional deficiencies because they are rich in macro and micronutrient content of seeds [4]. Nwosu et al reported that, TC fruit mesocarp contains ash (8.10-12.65%), carbo-

hydrates (84.93-89.25%), oil (0.37-0.95%), glucose (238-316 mg/g) and anti-nutrition (1.30 mg/g). The mesocarp of TC fruit is also rich in mineral salts mg/100 g, namely Ca, Mg, Fe, Cu and Zn so they are suitable for use as a food source [24].

Conclusion

As a conclusion *Terminalia catappa* is an important underutilized fruit tree which has emerged as a good source of nutrients. The nutraceutical investigations carried out on *T. catappa* validate the immense potential of this plant in the treatment of malnutrition. The *T. catappa* bark, fruit and leaves can be used as food because they are rich in nutrients and mineral. This research was carried out as an awareness of nutrition value of *T. catappa* as nutraceutical and to spread awareness on the importance and the role they played in the functioning of a healthy ecosystem and thereby protecting the species from extinction. Additional research and trials are needed for the product development to strengthen the use of *T. catappa* for the future generations. Thus, in the future a higher demand could be anticipated for various products from this tree for concern towards a possible integration into the food security and healthcare system.

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