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INTERNATIONAL DIGITAL ORGANIZATION FOR SCIENTIFIC RESEARCH ISSN: 2550-794x
IDOSR JOURNAL OF SCIENTIFIC RESEARCH 2(1):53-65, 2017.

Proximate and Mineral Compositions of *Phoenix dactylifera* (Fruit Sold in Hausa Quarter Abakaliki, Ebonyi State, Nigeria

Aja P. M., Ugwu Okechukwu P.C., Ekpono E. U., Mbam M. L., Alum E. U. and Ibere, J. B.

Department of Biochemistry, Faculty of Sciences, Ebonyi State University, P.M.B Abakaliki, Ebonyi State, Nigeria

ABSTRACT

This study was designed to evaluate the proximate and mineral compositions of *Phoenix dactylifera* fruit sold in Abakaliki, Ebonyi State, Nigeria. The method of Association of Analytical Chemists (AOAC) and Atomic Absorption Spectrophotometric (AAS) method were used for the study. The result of proximate analysis revealed that *Phoenix dactylifera* contains carbohydrate (78.92±0.27%), moisture (7.96±0.53%), fat (5.66±0.82%), protein (2.89±0.61%), fibre (2.32±0.45%) and ash (2.25±0.64%). Mineral analysis revealed that phosphorus (3.12±0.01mg/100g) and potassium (0.59±0.01 mg/100g) are the major minerals present in the sample. The results indicate that *Phoenix dactylifera* fruit is a good source of human nutrients such as carbohydrates and phosphorus and therefore should be encouraged as a supplement in our diet.

Key Words: Proximate, Mineral, *Phoenix dactylifera* fruit, AOAC and AAS

INTRODUCTION

Phoenix dactylifera (date palm*)* has long been one of the most important fruit crops in the arid regions of the Arabian Peninsula, North Africa, and the Middle East. During the past three centuries, dates were also introduced to new production areas in Australia, India, Pakistan, Mexico, Southern Africa, South America, and the United States [1]. Dates are oval-cylindrical, 3–7 cm long, and 2–3 cm diameter, and when ripe, range from bright red to bright yellow in colour, depending on variety [2]. Three main cultivar

groups of date exist: soft (e.g. 'Barhee', 'Halawy', 'Khadrawy', 'Medjool'), semi-dry (e.g. 'Dayri', 'Deglet Noor', 'Zahdi'), and dry (e.g. 'Thoory') [2]. The type of fruit depends on the glucose, fructose and sucrose content. The date palm is dioecious, having separate male and female plants. They can be easily grown from seed, but only 50 percent of seedlings will be female and hence fruit bearing, and dates from seedling plants are often smaller and of poorer quality [3]. Date palms can take 4 to 8 years after planting before they will bear fruit, and produce viable yields for commercial harvest between 7 to 10 years. Mature date palms can produce 68 to 176 kilograms of dates per harvest season, although they do not all ripen at the same time so several harvests are required [2]. In Nigeria, vernacular name of *Phoenix dactylifera* is “dabino” in Hausa.

Proximate are used in the analysis of biological materials as a decomposition of human-consumable good into its major constituents. The purpose of proximate analysis is to estimate and determine how much of the food major components, which are moisture, carbohydrate, ash, proteins, lipids and crude fibre that exist in a given food or fruits. Minerals are naturally occurring substances that are solid and inorganic which are represented by a chemical formula, usually abiogenic, and has an ordered atomic structure [4]. Like vitamins, minerals are also necessary to maintain proper body functions. There are 22 minerals that are needed in varying amounts; 250 mg and higher are the major minerals (e.g. calcium, potassium, phosphorous, magnesium, sodium, chloride, etc), while the trace minerals are 20 mg or less (e.g. zinc, iodine, boron, molybdenum, manganese, fluorine, iron, chromium) [5]. Minerals are involved in several metabolic functions that occur within the human body. Several minerals are components of enzymes (protein based molecules that speed up a chemical reaction in a living organism) which act as catalysts for many of the

chemical reactions that occur within the body. Minerals also regulate and manage the normal function of human and animal organs, muscles, and tissues [5].

For example, sodium and potassium are crucial for maintaining proper fluid balance, calcium is the primary structural component in bones and teeth, and iron is responsible for transporting oxygen, in the blood, throughout the body. Skin, hair, nails, teeth, bones, and all other tissues require minerals to be able to form. In addition, minerals are also involved in several bodily functions, including controlling several systems within the body and in the production of energy. In the event that an individual is deficient in any one of the major or trace minerals, the human body will digress to a level of structural weakness, internal system dysfunction, and over time, contract some form of debilitating disease [6].

However, despite that the fruits are eaten commonly by Nigerians more especially the people of the north, no information has been published to ascertain the nutritive value of the fruit and thereby stimulate interest in its utilization beyond the traditional localities, this study was designed to determine the levels of the major nutrients in the fruits. This study was aimed at evaluating the proximate and mineral compositions of *Phoenix dactylifera* fruits sold in Abakaliki, Ebonyi State.

MATERIALS AND METHOD

Materials

Collection of *Phoenix dactylifera* Fruits Sample

The fruits of *Phoenix dactylifera* were collected by hand picking in the month of September, 2015 from Hausa quarter in Abakaliki, Ebonyi State, Nigeria and were identified by a taxonomist in Applied Biology Department,

Ebonyi State University, Abakaliki, Nigeria. A part of the plant was also deposited in the herbarium for reference purposes.

Figure 1: *Phoenix dactylifera fruits*

Sample Preparation: Fruits of *Phoenix dactylifera* were cleaned with soft tissue. The cleaned fruits were ground to powdered form using a manual grinding machine. The ground samples were stored in airtight bottles and was kept in a refrigerator till required for analysis.

Chemical and Reagents: The chemicals and reagents used for the analyses were of analytical grades.

Methods

Proximate and some minerals analyses were carried out according to the procedure of Association of Official Analytical Chemist (A.O.A.C., 1997) [7] to determine the carbohydrate, protein, oil, crude fibre, ash, moisture, calcium, phosphorus, magnesium, calcium, iron, zinc, copper and sodium components of the sample.

RESULTS

Results of Proximate Analysis of *Phoenix dactylifera* Fruit

The result of the proximate analysis of *Phoenix dactylifera* fruit showed that carbohydrate had the highest value, followed by the moisture, fat and oil and protein contents while fibre and ash contents were the least as shown in Figure 2.

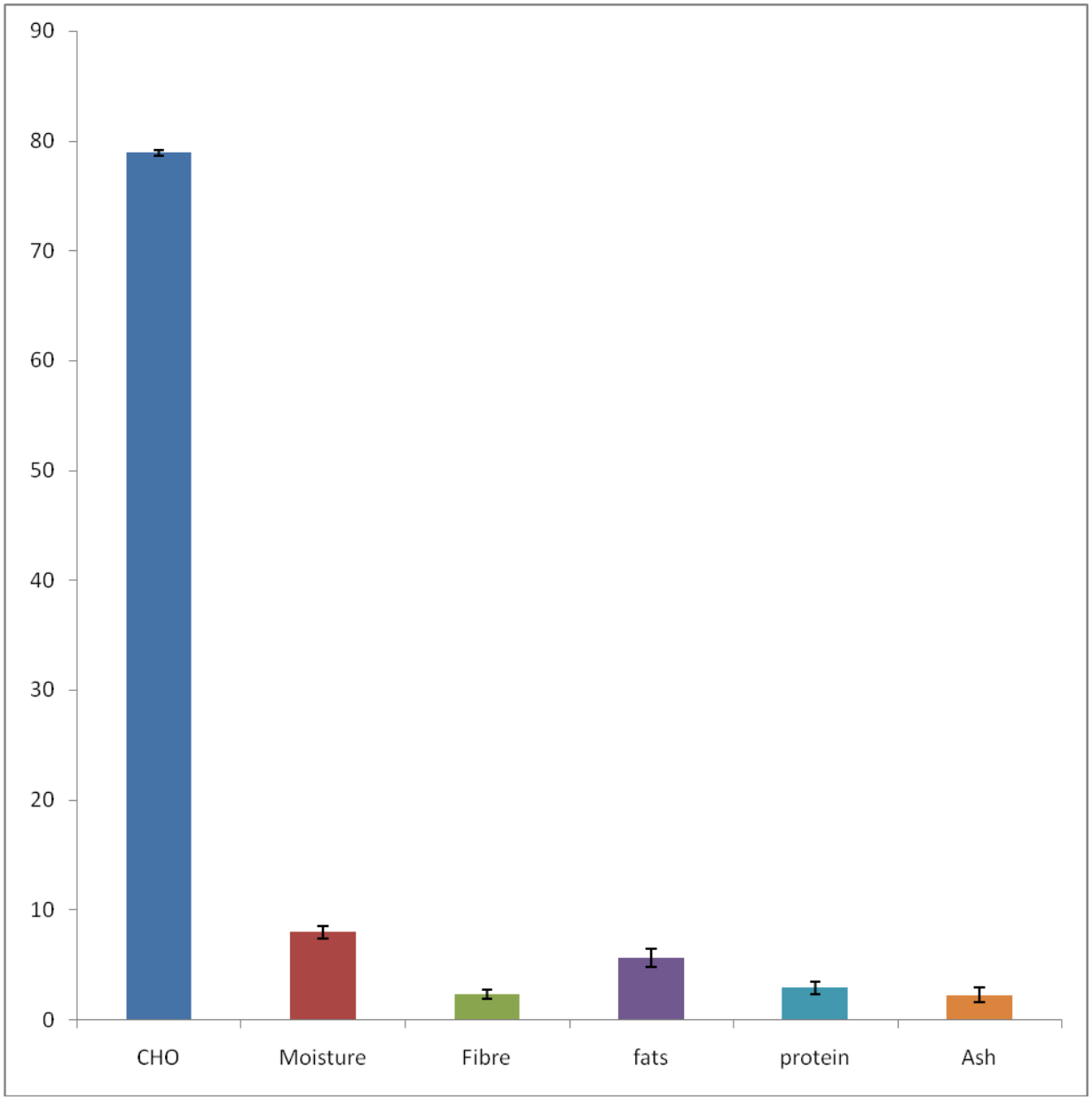

Figure 2: Proximate Compositions of *Phoenix dactylifera* Fruit in Percentage (%)

Results of Minerals analysis of *Phoenix dactylifera* Fruit

The result of mineral composition of *Phoenix dactylifera* fruits showed that phosphorus had the highest level, followed by potassium, zinc, iron, sodium, calcium and magnesium while copper was the lowest as shown in Figure 3 and 4.

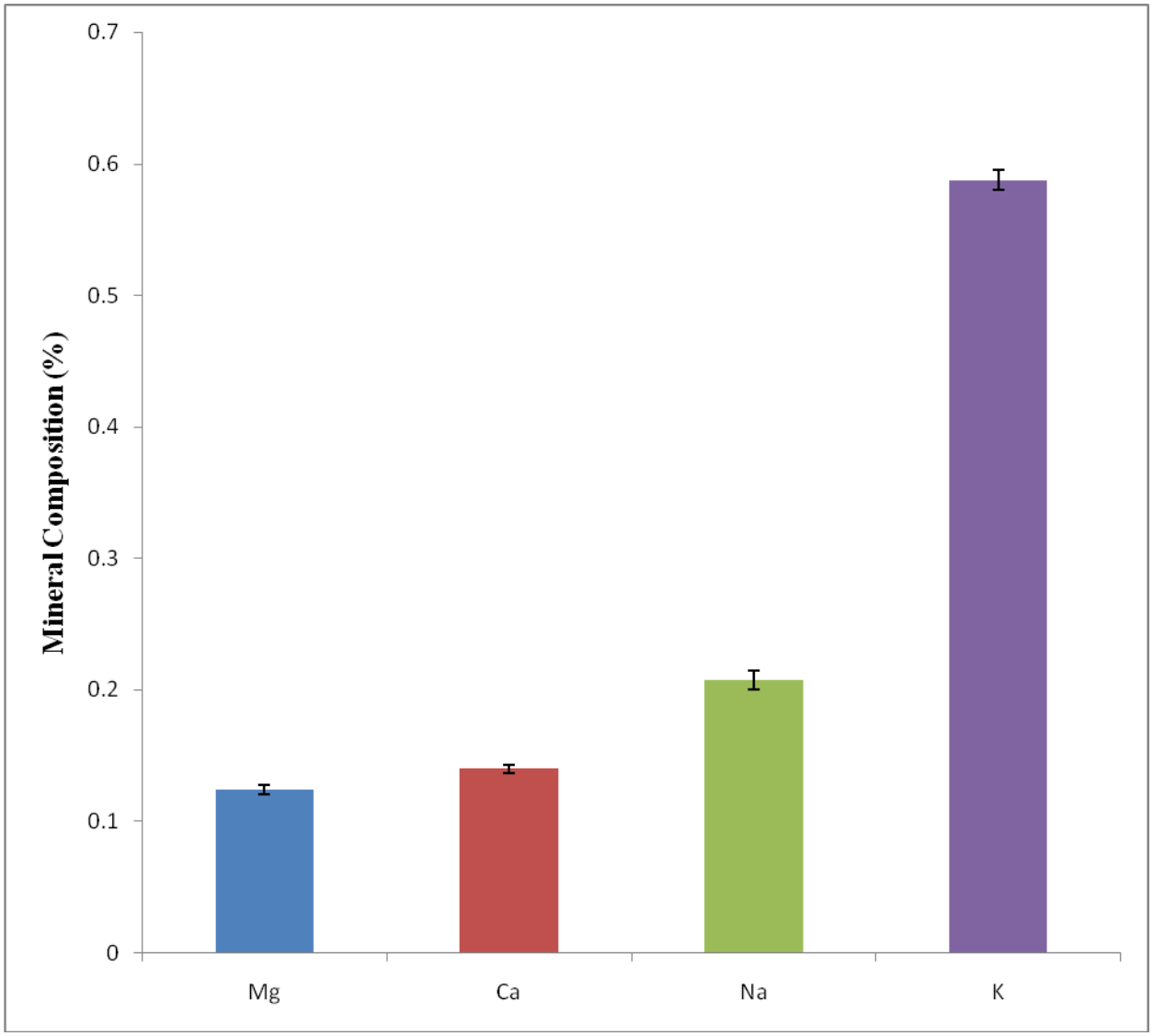

Figure 3: Mineral Compositions of *Phoenix dactylifera* Fruits in Percentage (%)

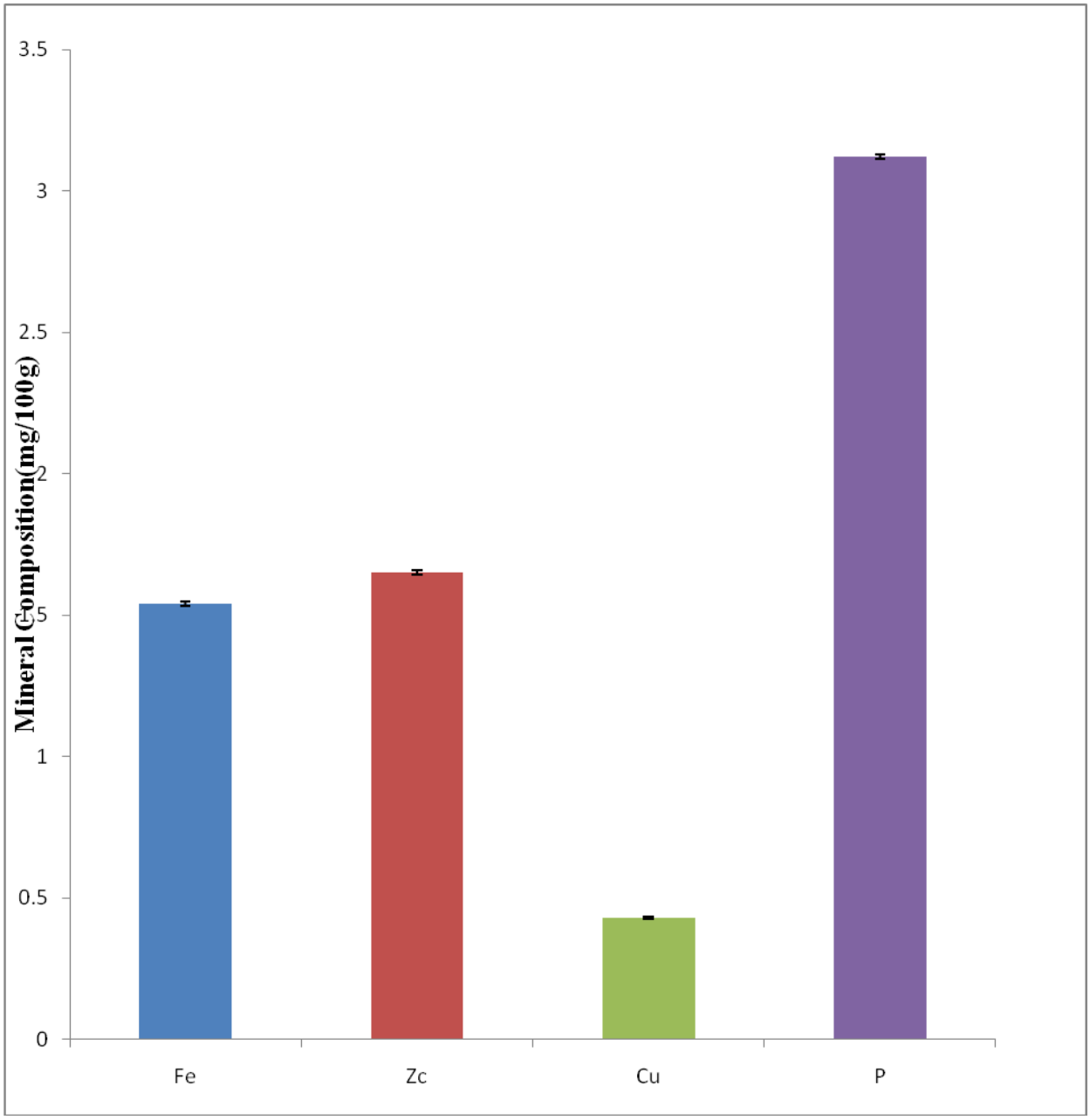

Figure 4: Mineral Compositions of *Phoenix dactylifera* fruits in mg/100g.

Discussion

The result of this study revealed that fruits of *Phoenix dactylifera* contain an appreciable amount of carbohydrate (78.92±0.27%). The result is in correlation with Nwali *et al.* (2014) [8] that reported 72.92 ± 1.08% carbohydrates in *Bryophyllum pinnatum* leaves. Igwenyi *et al.* (2011) [9], also reported 42.18% of carbohydrates in *Ipomea aquatic*. The result of Aja *et al.* (2013) [10], also revealed low percentage of carbohydrates (23.60% and 18.00%) in *Moringa oleifera* leaves and seeds. Proximate compositions of *Irvigna gabonesis* and *Citrullus colocynthis* also revealed that they are rich in carbohydrate and oil, but low in protein [11]. Aja *et al.* (2015) [12] also reported 57.06% of carbohydrates in *Parkia biglobosa* fruits. This confirms *phoenix dactylifera* as a good source of carbohydrates. The major function of carbohydrate is to provide the body with energy. The observed low levels of crude fibre and ash revealed that *Phoenix dactylifera* fruit is not a good source of crude fibre and ash (Figure1). The result is in correlation with the observed low level of crude fibre in *Parkia biglobosa* fruit by Hasson, (2008) [6] which revealed the crude fibre value of *Parkia biglobosa* fruit to be 3.17± 0.29%. Aja *et al.* (2015) [12] also reported 2.55% of crude fibre in *Parkia biglobosa* fruit. Fibre plays a role in the prevention of a number of diseases by reducing the level of cholesterol. Low values of protein, moisture and ash revealed that *Parkia biglobosa* fruit is not a good source of these primary nutrients (Figure 2). This result is in accordance with the result of Aja *et al.* (2013) [10] which reported low percentage of 10.0 + 0.30% of moisture, 1.40 + 0.1% of protein and 20.0 + 0.50% of fat /oil in *Moringa oleifera* leaves and seeds. The result does not agree with proximate composition of *Parkia biglobosa* fruits by Aja *et al.* (2015) [12] which revealed high oil content in *Parkia biglobosa* fruits. Dietary fiber in dates helps to move waste smoothly through the colon and helps prevent LDL

(bad) cholesterol absorption by binding with substances containing cancer-causing chemicals (Moyer, 2014).

The mineral contents of *Phoenix dactylifera* fruits were also investigated, the result showed that phosphorus has the highest value of 3.12±0.01mg/100g followed by potassium, zinc, iron, sodium, calcium and magnesium respectively with the following values 0.59±0.01%, 1.65±0.01 mg/100g, 1.54±0.01 mg/100g, 0.21±0.01%, 0.14±0.003% and 0.12±0.003%. This result does not agree with the report of Nwali *et al.* (2014) that revealed high values of potassium (3.49±0.01and 3.74 ±0.04 %) and calcium (4.99±0.01 and 6.82 ± 0.04 %) in *Bryophyllum pinnatum* leaves in wet and dry samples. Whereas, Igwenyi *et al.* (2011) reported relatively high values of iron, magnesium and calcium in μg/ml and low values of phosphate, manganese, sulphate and nitrates in *Ipomea aquatic* leaves. Aja *et al.* (2013) revealed Calcium concentration of 1.475 x 10^2 + 0.15mg/l, Chlorine concentration of 2.482 x 10^2 + 0.01mg/l and Phosphorus concentration of 3.85 + 0.20mg/100g in seed of *Moringa oleifera* whereas the concentration in the leaves recorded calcium (1.151 x 102 + 0.02mg/l), Chlorine (0.319 + 0.07mg/l) and Phosphorus (3.85 + 0.04mg/100g). Phosphorus formed part of the constituents of bone tissue and they form compounds needed for energy conversion. Also a high potassium content obtained in Figure 3 showed that *Phoenix dactylifera* plays a vital role in normal cell function including neurotransmission, muscle contraction, and maintaining acid-base balance. Lower copper content of *Phoenix dactylifera* has been associated with disturbances to the nervous system and bone diseases. Magnesium is essential for healthy bones and proper functioning of muscle and nerve tissue. The iron content, a component of hemoglobin in red blood cells, determines the balance of oxygen in the blood. When low or deficient, it leads to fatigue, anxiety, nausea and low bone density.

Conclusion

The result of this study revealed that *Phoenix dactylifera* fruit can contribute significantly to the nutrient requirements and health management of man and should be recommended in our daily diet.

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