

## Study of Physicochemical Properties and Mineral of Seeds from two date palm cultivars grown in Libya

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### دراسة الخصائص الفيزيائية والكيميائية والمعادن لبذور نوعين من نخيل التمر المزروع في ليبيا

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Received: 31-12-2025; Accepted: 16-02-2026; Published: 05-03-2026

#### Abstract

In the present study, the seeds of two date palm (*Phoenix dactylifera* L.) cultivars grown in the North (Al-Brince) and the South (Al-Allig) of Libyan were analysed and compared for their chemical, physical properties and macroelements. The following values (Based on dry matter) were obtained for Al- Brince and Allig cultivars, respectively: The seeds constitute about 14.73- 11.16% seed/date fruit weight, the length from 2.4-2.5cm, and the diameter from 1.2-1.3cm. The chemical properties of present research consists of moisture 4%, ash 1.90% for both samples, protein 1.98 -1.10%, total sugar 0.35- 8.27g/100g, crud fiber 52.20 - 34g/100g of date seeds powder (DSP) on dry weight basis (DW). Whereas the mineral analysis of seeds showed higher concentration of K(205.36 – 217.57mg /100 g) followed by P(113.1- 114.1mg/100g), Ba (47.55 – 51.34mg/100g), Na (34.93 – 22.30 mg/100g), Ca (5.89- 1.68 mg/100g), for (Al-Brince) and (Allig) seeds, respectively.

**Keywords :** Date seeds, Date seeds powder, Physicochemical properties, Macroelements.

#### المخلص:

في هذه الدراسة، تم تحليل بذور صنفين من نخيل التمر (*Phoenix dactylifera* L) المزروعين في شمال ليبيا (البرنس) وجنوبها (العليق) ومقارنتها من حيث خواصها الكيميائية والفيزيائية وعناصرها الكبرى. وقد تم الحصول على القيم التالية (بناءً على المادة الجافة) لصنفي البرنس والعليق على التوالي وتشكل البذور حوالي 14.73-11.16% من وزن البذرة/ثمرة التمر، وطولها من 2.4-2.5 سم، وقطرها من 1.2-1.3 سم. تتكون الخصائص الكيميائية للبحث الحالي من رطوبة 4%، ورماد 1.90% لكلا العينتين، وبروتين 1.98-1.10%، وسكر كلي 0.35-8.27 جم/100 جم، وألياف خام 52.20-34 جم/100 جم من مسحوق بذور التمر (DSP) على أساس الوزن الجاف (DW). في حين أظهر التحليل المعدني للبذور تركيز أعلى من البوتاسيوم (205.36 - 217.57 ملجم / 100 جم) يليه الفوسفور (113.1 - 114.1 ملجم / 100 جم)، والباريوم (47.55 - 51.34 ملجم / 100 جم)، والصوديوم (34.93 - 22.30 ملجم / 100 جم)، والكالسيوم (5.89 - 1.68 ملجم / 100 جم)، لبذور (Al-Brince) و (Allig) على التوالي.

**الكلمات المفتاحية:** بذور التمر، مسحوق بذور التمر، الخصائص الفيزيائية والكيميائية، العناصر الكبرى.

#### 1. Introduction

Libya is one of the most prominent countries in palm cultivation and dates production in the world; this is due to the climatic conditions, especially in the Libyan desert. Date palm trees called (*Phoenix dactylifera*), botanically date palm (known as palmaceac or palmac), which is a monocotyledonous plant is among the arecaceae family that includes to the Arecaceae family which contains 200 genera and more than 2000 species (Diaz et al., 2003; Asma et al., 2025). The appropriate environment of planning palm trees is the arid and semi-arid regions, which represent 90% of the Arab world. In addition, these palm trees and their products (dates) have

a great importance for medicine and economy (FAO 2018). The fruit consists of two main parts: the fleshy part, which is the edible part and represents 85%-87% of the fruit weight. The second part is the seed which represents 13%-15% of the whole fruit weight, however, it is not exploited for optimum use. The fruits of date palm are called dates (Al-Yahyai and Al-Kharusi 2011; 6. Aloraibi et al., 2025). Dates seed (pits, stones, kernels, pulp) contains protein, fats, fiber, mineral salts and carbohydrates (Mrabet et al., 2015). Date seeds are a good source of oil (5 to 13%), which is rich in phenolic compounds, tocopherols, and phytosterols (Besbes et al., 2006; Nehdi et al., 2010; Rahman et al., 2007). Seed oil has been studied by other authors, and its composition in vitamins, minerals and fatty acids makes it valuable for food formulations (Habib et al., 2013; Nehdi et al., 2010).

## 2. Materials and methods

### 2.1. Sample Collection

Two samples were collected randomly from the local market of Al-Khoms for dates, the process of extracting the seeds from the fruits was done manually. Then the seeds were washed well with top water, after that washed with distilled water, then the samples were dried in the shade, away from heat, with stirring from time to time for eight consecutive days.

### 2.2. Physical Properties of Date Seeds

The seed to fruit ratio was determined by using a random sample of 10 fruits, then separating the seeds from the dates and calculating their weight for the same samples, using sensitive balance. The length and width of the seed of each variety were measured using calipers (Acourene and Tama 1997).

### 2.3. Prepare Date Seed Powder

The seeds are ground after drying with a hammer and then with an electric grinder (Moulinex) to get the crushed date seed powder, and it is stored in airtight plastic bags at a temperature of 4-5 C°, on which the name of each sample is recorded until it is used (Ben-Youssef et al., 2017).

### 2.4. Proximate composition of date seeds

The moisture was determined by oven-drying at 105C°, to constant weight (Ac, 1990). The ash was determined using (Windham, 1995). Total nitrogen was determined by the Kjeldahl method (Abrams et al., 2014), and then the protein amount was calculated using a factor of 6.25. Total sugar content was determined using the method of (DuBois et al., 1956). And crude fiber was determined using the method (Cunniff, 1995).

The seed lipids were extracted in a soxhlet apparatus using n-Hexane as a solvent for 8 h. The solvent was removed using a rotary evaporator at 40 C and the lipids were weighed and then the oils obtained stored in a freezer at 6.

### 2.4. Minerals determination

Dry-ashing digestion is the approved method for the determination of the essential minerals. This is by adding nitric acid HNO<sub>3</sub> 65% to the ash for 24 h. Then filtering it with filter paper No. 41 in a volumetric flask with a capacity of 100 ml, and then adding distilled water to it at the mark. Where was measured minerals [calcium (Ca), lithium (Li), sodium (Na), potassium (K), and Barium (Ba)], were analysed using flamphotometer. While Phosphorus content (P) was determined by the UV-spectrophotometer (FAO, 2008).

### 3. Results and Discussion

#### 3.1. Physicochemical properties

Table (1), summarizes the physical measurements, for the date variety used in this study. The highest seed/date fruit weight ratio was observed in Al-Brince seed 14.73%, and the lowest was observed in Al-Allig seed 11.16% seed. The average seed length of Al- Brince and Al-Allig seed cultivars was 2.4cm and 2.5cm respectively, while the length 1.2cm-1.3cm for Al-Brince and

Al-Allig seeds, respectively. The results were in agreement with (Abdullah M. EL- Alwani and Salah S. EL- Ammari, 1999, Khadra Azri 2013), This characteristic is very used by the farmers to evaluate the quality of varieties. It can be influenced by climate factors and some cultural practices such as reducing the number of dates fruit bunches per palm trees, in addition to the varieties effect( H. El-Din and Tariq2015; Bouhlali. et al., 2015). The date seed powder contains of 4% moisture and Ash 1.90% for both seeds, The protein content in the date seeds powder was significantly higher in Al-Brince 1.98%. While lower in Al-Allig 1.10%. The protein values of date seeds found in the current study are within the range of values presented earlier in the literature by (Rehman et al., 2017). The highest amount of total sugar in Al-Allig seed 8.27g/100g. Whereas, were the lowest contents of fiber in Al-Allig 34% and the highest in Al-Brince 52.22%. In addition, observed for the lipid content between 12% for Al-Brince and 16.8% for Allig. These findings are very close to the results presented by(Lama Jasim M. Al-Anber2013), but higher than those of ( H. El-Din Tariq Bouhlali. alet 2015).. The dimensions of seeds show a significant difference ( $p \leq 0.05$ ) as illustrated in Table (1).

**Table 1. Physicochemical properties (dry basis) of date seeds from Brince and Allig**

Component	Al-Brince seed	Al-Allig seed
Seed/date fruit mass ratio (%)	14.73 ± 0.14	11.16 ± 0.02
Length, cm	2.4 ± 0.33	2.5 ± 0.40
Diameter, cm	1.2 ± 0.16	1.3 ± 0.21
Moisture(%)	4 ± 0.24	4 ± 1.24
Total lipid content (%)	12 ± 1.69	16.8 ± 0.73
Ash(%)	1.90 ± 0.45	1.90 ± 0.47
Protein (%)	1.98 ± 0.23	1.10 ± 0.18
Total sugar( g/100g)	8.27 ± 0.42	0.35 ± 0.12
Crude fiber (g/100g)	52.20 ± 0.40	34 ± 0.35

#### 3.2. Macroelements Composition:

Table 2 shows the macroelements composition. The results show significant ( $P \leq 0.05$ ) differences among several of the two varieties. Ca levels ranged between 5.89 mg/100 g and 1.68 mg/100 g. Al-Allig had the lowest level, while Al-Brince had the highest level. Na levels ranged between 34.93 mg/100g and 22.30 mg/100g, Al-Allig had the lowest level. Ba ranged between 51.34 and 47.55 mg/100g. Al-Brince had the lowest level. K levels ranged between 217.57 and 205.36 mg/100 g Al-Brince had the lowest level.. Phosphorus (P) contents ranged between 114-113.1 mg/100g for Al-Allig and Al-Brince , Li was not detected in any of the varieties at the detection limits tested. Perhaps the lack of lithium in the seeds, where the natural lithium is found in meat of all kinds and legumes, and date seeds are a by-product of dates, and it is likely that there is no lithium in it. Comparable levels of macroelements and trace elements were reported by (Sawaya et, al., 1984, Ahmed Y. Ali-mohamed and Ahmed S. H. Khamis, 2004, Jacopo Mistrello et, al., 2014, Rezaeenia,A., A.A. Naserian and A. Mokhtar, 2016).

**Table 2. Macroelements Composition of Date Seeds from Brince and Allig**

Minerals ( mg /100g)	Al-Brince seed	Al-Allig seed
Ca <sup>2+</sup>	5.89 ± 0.08	1.68 ± 0.20
Na <sup>+</sup>	34.93 ± 0.43	22.30 ± 0.55
Ba	47.55 ± 0.31	51.34 ± 0.45
K <sup>+</sup>	205.36 ± 0.45	217.57 ± 0.84
P	113.1 ± 0.25	114 ± 0.14
Li	ND	ND

#### 4. Conclusion:

The results presented in this study show that the varieties of two date seeds analyzed serve as excellent sources of dietary fiber, protein, sugar and high amounts of minerals. We can conclude that this by-product of dates could be an excellent source of antioxidants in food and medicine preparation. These findings improve our knowledge on the value of utilizing date seeds. But further research is needed to characterize date seeds isolated components and its bioactive constituents with other health-promoting activities and also to explore the possibility of preparing more value-added processed products from date seeds.

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