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Preliminary Physico-Chemical and Phytochemical Study of Seeds of Balanites Aegyptiaca

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ABSTRACTS

The *Balanites aegyptiaca* is an important tree found in some African countries. This study aimed to assess the seeds of the *Balanites aegyptiaca physicochemically* and *phytochemically*. pH, Moisture, ash, protein, and lipid contents of *Balanites aegyptiaca* seeds are 5.8, 2.10%, 5.6%, 17.5%, and 10.7%, respectively. The mineral elements analysis showed that the *Balanites aegyptiaca* is rich in calcium (247.4 mg/100 g), potassium (140 mg/100 g), sodium (30 mg/100 g), magnesium (24.6 mg/100 g), iron (8.50 mg/100 g) and zinc (5.50 mg/100 g). The result suggests that the seeds of *Balanites aegyptiaca* fruits could contribute greatly towards meeting the human nutritional requirement for normal growth. The presence of several phytochemical compounds showed high therapeutic potential of *Balanites aegyptiaca* and it can take for medicinal purposes after determining the seeds pharmacologically.

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1. INTRODUCTION

Balanites aegyptiaca, commonly known as "desert date", is native to arid and sub-arid parts of Africa and the Middle East but most widely in various parts of Africa and South Asia (Al-Thobaiti & Abu Zeid, 2018). The presence of trees is well reported in Sudan, Nigeria (Locket *et al.,* 2000), Ethiopia, Ghana (Augustus *et al.,* 2014), Burkina Faso (Sourabie *et al.,* 2013), and Mauritania. *Balanites aegyptiaca* is a multipurpose tree and is used for food and fodder in almost all parts of Africa and South Asia (Fadel *et al.,* 2002). Among the various plant parts, the fleshy pulp of the fruit is eaten fresh or dried. The kernel produces high-quality edible oil (Obidah *et al.,* 2009) with a large number of medicinal properties (Montasser *et al.,* 2017). The kernel is also rich in protein and mineral contents (Elfeel & Warrag, 2011). The seed is also used for biodiesel production (Kumawat *et al.,* 2012).

The objective of this study was to assess the seeds of the *Balanites aegyptiaca* physicochemically and phytochemically. In this study, the physicochemical composition of the seeds of the *Balanites aegyptiaca* such as pH, moisture, ash, protein, lipid, calcium, potassium, sodium, magnesium, iron, and zinc were analyzed. Qualitative phytochemical screening of *Balanites aegyptiaca* seed such as flavonoids, saponins, steroids, terpenoids, anthraquinones, and Phlobatannins were carried out.

2. METHODS

2.1. Sample Collection and Preparation

All the chemicals and reagents used were of analytical grade. The *Balanites aegyptiaca* fruits were purchased from a vendor at Sebkha market, Nouakchott City in Mauritania. The fruit was manually removed from the pulp and seeds of the fruit. The seeds were washed with distilled water and subjected to shade dry for five days. The seeds were crushed in powder and stored in a desiccator before use.

2.2. Analytical procedures

The pH was determined by a pH meter according to Malik *et al.* (2015). The moisture was determined as described by Karaye *et al.* (2020). The proteins and ash were determined using the method. Mineral ions like calcium, magnesium, sodium, potassium, iron, and zinc were determined by placing 0.5 g of the *Balanites aegyptiaca* seed powder samples in a Teflon digestion tube. 7 mL of HNO_3 (65%) and 1 mL of 30 % H_2O_2 were also added. The tubes are then introduced into the microwave mineralizer (Aton Paar, France) until complete mineralization. The mineralization solutions are transferred into 50 mL flasks and then filled up with distilled water. Calcium, magnesium, zinc, and iron were determined by Spectrometer Atomic Absorption PGG 990 while potassium and sodium were determined by Flame Photometric FP 640. All experiments are conducted in triplicate and the mean values have been reported.

Qualitative phytochemical screening of *Balanites aegyptiaca* seeds such as flavonoids, saponins, steroids, terpenoids, anthraquinones, and Phlobatannins was carried out of the *Balanites aegyptiaca* seeds samples using standard procedures described by several reports (Obadoni *et al.,* 2001).

3. RESULTS AND DISCUSSION

3.1. Physicochemical parameters

Proximate components of the seeds of *Balanites aegyptiaca* are presented in **Table 1**. The moisture content of the *Balanites aegyptiaca* seeds is 2.10% lower than Phaseolus coccineus

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which is 3.7% (Audu & Aremu, 2011), and *Zizyphus Mauritania* seeds (29.42%) (Mohd Jailani *et al.,* 2020). The low moisture value ensures a long life of the seed without microbial spoilage (Hassan *et* al, 2006). The ash content of the *Balanites aegyptiaca* seeds is 5.6 % higher than *Balanites aegyptiaca* seeds which are 3.42 to 3.62%, castor seeds (3.2%) (Aremu *et al.,* 2010) and melon seeds (3.3%) (Aremu *et al.,* 2014). The protein content of the *Balanites aegyptiaca* seeds is 17.5 % higher than dates seeds which are 4.8% (Habib & Ibrahim, 2009), and *Zizyphus mauritiana* seeds (6.64%) (Mohd Jailani et *al.,* 2020). The high protein content indicates that the *Balanites aegyptiaca* seed could be an important source of protein supplement. The lipid content of *Balanites aegyptiaca* seeds is 10.7% higher than dates seeds which are 5 to 5.1% (Al - Farsi *et al.,* 2007) and *Zizyphus mauritiana* seeds (1.89%) (Mohd Jailani *et al.,* 2020). This comparison indicates that the *Balanites aegyptiaca* seed could be a good and promising source of oil.

Table 1. Proximate composition content of *Balanites aegyptiaca* seeds.

Parameters	Mean
pH	5.80
Moisture (%)	2.10
Ash (%)	5.60
Protein (%)	17.50
Lipids (%)	10.70

The minerals content as macro-elements such as (calcium, magnesium, sodium, and potassium) and micro-elements such as (iron and zinc) in mg/100 g of *Balanites aegyptiaca* seeds are given in **Table 2**.

Table 2. Minerals composition of *Balanites aegyptiaca* seeds (mg/100 g).

Mineral elements	Mean
Calcium	247.40
Magnesium	24.60
potassium	140.00
Sodium	30.00
Iron	8.50
Zinc	5.50

Of all the minerals determined, calcium is the most abundant having value of 247.4 mg/100 g. It is followed by potassium (140 mg/100 g), sodium (30 mg/100 g) and magnesium (24.6 mg/100 g). According to researchers, these macro-elements have beneficial effects on the human body (Olaleke *et al.,* 2006; Hassan *et al.,* 2008). On the other hand, the Na/K ratio in the body is important because it helps in controlling high blood pressure. A Na/K ratio of less than one is recommended (Ogunlade *et al.,* 2005). The Na/K ratio obtained in this study is about 0.21, which indicates that the seeds of *Balanites aegyptiaca* could be useful in lowering blood pressure. The iron content of the *Balanites aegyptiaca* seeds is 8.5 mg/100 g higher than *Zizyphus mauritiana* seeds which are 1.21% (Yerima & Adamu, 2011). Iron is an important element in the diet of pregnant women, nursing mothers, and infants to prevent aneaemia (Oluyemi *et al.,* 2006). The zinc content of the *Balanites aegyptiaca* seeds is 5.50 mg/100 g higher than *Zizyphus mauritiana* seeds which are 1.89% (Yerima & Adamu, 2011). Zinc could play a major role in normal body development (Abitogun *et al.,* 2010). According to (Batra & Seth, 2002), micronutrient deficiencies are a major public health problem in many developing countries, with infants and pregnant women especially at risk because they need adequate micronutrients to maintain normal growth and development. This important

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content on microelements such as iron and zinc can encourage food industries to use the flour of *Balanites aegyptiaca* seed to fortify their products.

3.2. Qualitative phytochemical analysis

The results for the phytochemical constituent of the seed of the *Balanites aegyptiaca* are presented in **Table 3**. The results of the phytochemical screening test of the seed of the *Balanites aegyptiaca* revealed the presence of flavonoids, saponins; steroids, and terpenoids, while Phlobatannins and anthraquinones were absent. These findings agree with many similar findings as reported by some researchers (Yadav & Panghal, 2010; Yau *et al.*, 2020). According to researchers (Awe & Sodipo, 2001; Gloria *et al.,* 2011; Chukwuebuka & Chinenye, 2015; Patel & Savjani, 2015), the presence of these phytochemicals showed high therapeutic potential for the seed of the *Balanites aegyptiaca* and it can take for medicinal purposes.

Table 3. Phytochemical constituent of the seeds of the *Balanites aegyptiaca.*

Phytochemical	Observation
Flavonoids	+
Steroids	+
Saponins	+
Terpenoids	+
Anthraquinones	-
Phlobatannins	-

4. CONCLUSION

This research analyzed the physicochemical composition and phytochemical screening of the seed of *Balanites aegyptiaca*. The results of the proximate and minerals analysis showed that the seeds from *Balanites aegyptiaca* could be considered rich in minerals elements. The result suggests that the seeds of *Balanites aegyptiaca* could contribute greatly towards meeting the human nutritional requirement for normal growth and adequate protection against disease arising from malnutrition. The presence of several phytochemical compounds such as flavonoids, saponins; steroids, and terpenoids showed high therapeutic potential of *Balanites aegyptiaca* and it can take for medicinal purposes after determining the seeds pharmacologically.

5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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