

**Bioprospecting Potential of *Balanites aegyptiaca*
for Access and Benefit Sharing**



Balanites aegyptiaca

Reviewed by Amare Seifu

**Genetic Resources Access and Benefit Sharing Directorate
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1. Introduction

Ethiopia is endowed with rich plant biodiversity and associated traditional knowledge which creates an environment for successful bioprospecting. However, like other developing countries, Ethiopia lacks financial resources to exploit the plant genetic resources significantly. The only option Ethiopia is to collaborate with the developed nations or domestic investors and interested ones in pharmaceutical, cosmetics and other companies alike and jointly utilize them strategically and wisely.

The Ethiopian Biodiversity Institute (EBI), the National Competent Authority through Genetic Resources Access and Benefit Sharing Directorate, plays a practical role in the implementation of the Nagoya Protocol on Access and Benefit Sharing of Genetic Resources and Associated Traditional Knowledge. Ethiopia has the officially permitted outline for the implementation of the ABS. Based on Proclamation No 482/2006 and Regulation 169/2009 (Access to Genetic Resources and Community Knowledge and Community Rights), Ethiopia has been implementing the access and benefit sharing objective of the CBD. Both the Proclamation and Regulation include a range of issues such as ownership, user rights, conditions for access, benefit sharing, types of benefits, powers and responsibilities, among the others.

Therefore, the objective of this information is to encourage any bioprospecting company or an individual interested to work on the genetic resource, *Balanites aegyptiaca* for medicinal uses such as antimicrobial, insecticidal, heptoprotective, antihelminthic, molluscicidal, antioxidant and its use as raw material for industrial production of contraceptive pills, corticoids, anabolisants and other sexual hormones, and biodiesel and edible oils.

2. Description of the Plant

Balanites aegyptiaca is a savannah tree, which belongs to the Family Balanitaceae. It is known by the common name Desert date (English), and ‘Bedeno’ (Amharic). It is with a height of more than 6 m. It has a spherical crown and tangled mass of long thorny branches (Sulaiman and Jackson, 1959 cited in Manji *et al.*, 2013). It has multiple uses. Almost every part of the plant including, leaves, thorns, back of root and fruit is useful. *Balanites aegyptiaca* has been used over thousands of years (Ajayi and Folorunso, 2013).

3. Distribution of *Balanites aegyptiaca*

The tree is widespread in the drier regions of Africa from Mauritania to Nigeria, Eastward to Ethiopia, Somalia and East Africa. It is also found in Israel, Arabia, India and Pakistan (Manji *et al.*, 2013). In Ethiopia, it is commonly distributed in the Dry and Moist Kolla agro-climatic zones of the Rift Valley in Gamo Goffa and in Sidamo, Tigray, Wollo, Showa, Gojjam, Illubabor, Arsi and upland Hararghe regions, 0–1,800 m (Azene Bekele, 2007).

Balanites aegyptiaca is one of most drought resistant tree species, which is widely distributed in Africa, Arabian Peninsula and other Asian countries. It has many adaptive mechanisms to grow in arid saline soil. *Balanites aegyptiaca* var. *aegyptiaca* is currently being planted in large numbers within the Great Green Wall for the Sahara and the Sahel Initiative (GGW). The wide range under which this species is found was reflected in a very wide variability in its morphology and products. For any successful domestication, conservation or transfer of seeds between sites, it is important to know the extent and magnitude of variation among different geographical sources (Elfeel and Hindi, 2014; Sagna *et al.*, 2014).

4. Ethno-medicinal uses

Balanites aegyptiaca is used traditionally in African countries as an anthelmintic (Koko *et al.*, 2000) and in the treatment of jaundice (Sarker *et al.*, 2000). The fruits are used as an oral antihyperglycemic in Egyptian folk medicine and herbalists. Its fruits are sold as an antidiabetic agent in the Egyptian market (Kamel *et al.*, 1991). *Balanites aegyptiaca* has also been used in a variety of folk medicines in India. Various parts of the plant are used in Ayurvedic and other folk medicines for the treatment of different ailments such as syphilis, jaundice, liver and spleen problems. The plant has also insecticidal, antihelminthic, molluscicidal and contraceptive activities (Yadav and Panghal, 2010; Sagna *et al.*, 2014).

Various parts of *Balanites aegyptiaca* have their own traditional medicinal properties. This plant has been reported to be purgative, vermifuge, febrifuge and emetic. It can also cure other types of ailments like skin boils, leucoderma, malaria, wounds, colds and aches. The bark of the plant is useful in curing mental diseases, epilepsy, yellow fever, jaundice and acting as a fumigant to heal wounds of circumcision. The boiled root of the plant can be used as a soup against stomach

pain and anthrax. The infusion of the root also acts as an antidote to snake bites. The infusion of root bark has been used to treat diarrhea and haemorrhoids. The paste of the shoot has been used for dressing wounds and as tooth brushes when frayed (Hamid *et al.*, 2001; Bukar *et al.*, 2004; Sagna *et al.*, 2014).

The thorns are used in the treatment of leprosy. Plant leaves are used in curing anthrax, for antihelminthic activities and to clean malignant wounds. The fruit can cure mouth ulcers, whooping cough, sleeping sickness and skin diseases. Fruit kernel has been found as a mild laxative, an antidote to arrow poison, and also acts as a vermifuge. Kernel oil helps in curing skin disease. The seeds are useful as ointments to cure cough, colic pain and also have magico-religious properties (Hamid *et al.*, 2001; Yadav and Panghal, 2010).

5. Chemical composition and Pharmacological Activities of *Balanites aegyptiaca*

The chemical composition of the root, stem bark, leaves, fruit pulp, seed kernel, and mesocarp of *Balanites aegyptiaca* has been studied by different scholars. A qualitative phytochemical analysis of the stem bark of *Balanites aegyptiaca* by Mutwali and Abdelgadir (2016) indicated the presence of alkaloids, tannins, triterpenoids, saponins and two biomolecules: amino Acids and carbohydrates. Balanitin 1, 2 and 3, alkaloids and diosgenin have been isolated from the root part of the East African *Balanites aegyptiaca*. Diosgenin is a steroidal sapogenin (5-spirostan-3-ol) compound which is very useful in pharmaceutical industries as a natural source of steroidal hormones (Zarroug *et al.*, 1990 cited in Yadav and Panghal, 2010).

The results of the study by Fregon and Shakak (2016) revealed that *Balanites aegyptiaca* seed contains oil, protein, fiber, carbohydrate and various minerals such as calcium, sodium, magnesium, phosphorus and potassium. The fatty acid profile of *Balanites aegyptiaca* seed oil also showed that it contains linoleic acid, palmitic acid, stearic acid and oleic acid. The oil of *Balanites aegyptiaca* also contains steroids such as saponins, sapogenins, diosgenins, which are used as raw material for industrial production of contraceptive pills, corticoids, anabolisants and other sexual hormones (Fregon and Shakak, 2016; Mutwali and Abdelgadir, 2016).

The fuel quality parameters such as the flash point and specific gravity of the *Balanites aegyptiaca* biodiesel are similar to those of D₂ diesel. Its biodiesel is “readily biodegradable” compared with the D₂ diesel, which is partially degradable. These suggest that *Balanites aegyptiaca* seed oil is a potential source of environmentally friendly biodiesel (Jauro and Adams, 2011).

The study by Kumawat *et al.* (2012) indicated that the leaf extract of *Balanites aegyptiaca* possesses antioxidant potential and its alcoholic extract could be a potential natural source of antioxidants and could have greater importance as therapeutic agent in preventing or slowing oxidative stress-related degenerative diseases. The results of the study by Chapagain and Wiesman (2005) also clearly showed that saponin fraction of the *Balanites aegyptiaca* fruit mesocarp is highly larvicidal against the *Aedes aegypti* mosquito larvae, compared to crude saponin and methanolic extracts. Moreover, ethanol extract of aerial part of *Balanites aegyptiaca* could be a potential new natural source as well as scientific proof of its ethnopharmacological use in inflammatory disorders (Suky *et al.*, 2011).

Generally, different scholars have confirmed antimicrobial activities (antibacterial and antifungal), insecticidal and heptoprotective activities of different extracts (fruit pulp, root, bark, leaves, fruit mesocarp, etc.) of *Balanites aegyptiaca* (Suky *et al.*, 2011; Chapagain and Wiesman, 2005; Kumawat *et al.*, 2012; Fregon and Shakak, 2016; Mutwali and Abdelgadir, 2016).

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