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Balanites aegyptiaca

Nature's Resilient Gift to Arid Lands

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Introduction

Balanites aegyptiaca, commonly known as the desert date or soapberry tree, is a plant species native to various regions in Africa, the Middle East, and the Indian subcontinent. It belongs to the family Zygophyllaceae and is a resilient and adaptable tree that plays a significant role in the ecosystems of arid and semi-arid regions. It is a small to medium-sized tree that can reach heights of up to 10 meters (33 feet). The tree has a distinctive greyish-brown bark and an irregular, spreading crown. Its leaves are pinnately compound, consisting of several pairs of leaflets, and they are typically dark green and leathery in texture. The tree produces fragrant, small, greenish-white flowers that are either male or female and are borne on separate trees.

Taxonomic classification

Domain	Eukaryota	Order	Geraniales
Kingdom	Plantae	Family	Balanitaceae
Phylum	Spermatophyta	Genus	Balanites
Subphylum	Angiospermae	Species	*Balanites aegyptiaca*
Class	Dicotyledonae		

Distribution

B. aegyptiacus is native to African forests along the Sahara's southern edge. It is distributed in a vast ecological range, including the Saharan, Sahelian, and Sudanian zones, as well as further south in Katanga and Tanzania. It is prevalent in Israel, Jordan, the Arabian Peninsula, and the arid areas of Pakistan and India. It is grown in Cape Verde, the Dominican Republic, and Puerto Rico. It is drought resilient and survives with an annual rainfall of 200 mm or less when there is an additional water supply (e.g., Nile banks in Sudan). With up to 900 mm of annual rainfall, it spans from the desert's edge to the woodland savannahs. It favors deep sandy loam soils with continuous water availability, such as valley bottoms, riverbanks, or the foot of rocky slopes (Orwa *et al.,* 2009).

Vegetative Biology

Leaves

a) **Arrangement:** The leaves of *Balanites aegyptiaca* are alternately arranged along the stems.
b) **Shape:** Each leaf is compound, meaning it consists of multiple smaller leaflets. The leaflets are typically lanceolate (long and narrow) or elliptical in shape.
c) **Venation:** The leaves have pinnate venation, with prominent, straight veins running parallel to the midrib.
d) **Margin:** The leaf margins are typically entire (smooth), although they may have some serrations or irregularities.

Stems

a) **Bark:** The bark of *Balanites aegyptiaca* is gray-brown and corky in texture. It is deeply furrowed and may have fissures.
b) **Thorns:** One of the distinctive features of this tree is the presence of sharp thorns along its branches and trunk, serving as a defense mechanism against herbivores.
c) **Roots:** *Balanites aegyptiaca* typically has a deep and extensive root system that enables it to access water and nutrients from the soil in arid and semi-arid environments.
d) **Hairs and Glands:** The vegetative parts of the tree, including the leaves and stems, may have small, fine hairs or glandular structures, contributing to the tree's drought resistance and protection against herbivores. (Booth and Wickens, 1988).

Note. It's important to note that the specific characteristics of the vegetative parts can vary somewhat depending on environmental conditions and the age of the tree. This botanical description provides a general overview of the typical features of Balanites aegyptiaca's vegetative parts.

Reproductive biology

Reproductive parts are essential for the tree's reproduction and play a crucial role in the propagation of the species in its natural habitat.

Flowers

a) **Inflorescence:** *Balanites aegyptiaca* produces small, greenish-yellow flowers typically arranged in clusters or racemes.
b) **Symmetry:** The flowers are usually radially symmetrical, divided into similar parts around a central axis.
c) **Calyx (Sepals):** The calyx consists of five sepals, usually small and green.
d) **Corolla (Petals):** The corolla consists of five greenish-yellow, narrow, and elongated petals.
e) **Androecium (Stamens):** Typically, five stamens, the male reproductive parts, are located in the center of the flower, bearing the pollen-producing anthers.
f) **Gynoecium (Carpels):** The female reproductive part consists of a single pistil, which may have three to five carpels. The pistil is located in the center of the flower and contains the ovules, which develop into seeds after fertilization.
g) **Nectar:** *Balanites aegyptiaca* flowers may produce nectar to attract pollinators.

Fruits

a) **Type:** The fruit of *Balanites aegyptiaca* is a drupe, a fleshy fruit with a hard, woody pit or stone inside.
b) **Shape and Size:** The drupes are typically spherical or ovoid, ranging from 2 to 4 centimeters in diameter.
c) **Color:** When ripe, the drupes turn from green to yellow.
d) **Texture:** The outer flesh of the drupe is often sweet when fully ripe.

Seeds

a) **Size and Shape:** The seeds are typically ellipsoid or ovoid, varying in size but generally several centimeters in length.
b) **Color:** The seed coat can range from light brown to dark brown.
c) **Endosperm:** The seed contains a nutritious endosperm, serving as a source of food for animals and humans.
d) **Seed Dispersal:** *Balanites aegyptiaca* seeds are often dispersed by animals that consume the sweet, outer flesh of the ripe drupes. The hard seed coat helps protect

e) the seed during digestion and aids in its dispersal. (Ndoye*et al*., 2004).

Nursery management

Seeds

This is the most common method of propagating Balanites aegyptiaca. The tree produces seeds within its fruit. Here's how to propagate it from seeds:

- Collect ripe fruits with seeds.
- Extract the seeds from the fruit pulp and clean them.
- Scarify the seeds by gently nicking or scratching the hard seed coat. This helps improve germination rates.
- Soak the scarified seeds in water for about 24 hours.
- Plant the seeds in well-draining soil, either in pots or directly in the ground, with a planting depth of about 2-3 cm.
- Keep the soil consistently moist, and the seeds should germinate within a few weeks to a few months, depending on conditions.

Root Cuttings

Balanitesaegyptiaca can also be propagated from root cuttings. Here's how:

- Dig up a healthy, mature root from an established tree during the dormant season (usually in the winter).
- Cut the root into sections, each about 15-20 cm long, making sure to include at least one bud or growing point.
- Plant the root cuttings horizontally in well-draining soil, burying them about 5-10 cm deep.
- Keep the soil consistently moist, and new shoots should emerge from the cuttings in a few months.

Suckers

The tree can produce suckers or shoots from its base. These can be dug up and transplanted to propagate new trees. Here's how:

- Identify healthy suckers growing near the base of a mature tree.
- Dig carefully around the sucker, ensuring you don't damage its roots.
- Transplant the sucker to the desired location, ensuring it is planted at the same depth it was growing before.
- Water the transplanted sucker well and provide appropriate care.

Air Layering

Air layering is a more advanced propagation method. It involves encouraging roots to develop on a branch of the tree before detaching it to plant as a new tree. Here's how to do it:

- Select a healthy, mature branch.
- Make a small cut through the bark and cambium layer, typically in a ring shape.
- Apply rooting hormone to the cut area.
- Wrap the cut section with moist sphagnum moss and cover it with plastic wrap.
- Secure the moss and plastic wrap in place with twine or tape.
- Keep the moss consistently moist, and roots should develop in a few months.
- Once roots are well-developed, cut the branch below the new root system and plant it in soil. (Arap Sang *et al.,* 1985)

Pollination Mechanisms

Balanites aegyptiaca is primarily pollinated by insects, and it is considered to be an entomophilous plant, which means that it relies on the activity of various insects for the transfer of pollen between flowers.

Insects, such as bees and beetles, are attracted to the flowers of *Balanitesaegyptiaca* by their nectar and scent. As they visit the flowers in search of nectar, they come into contact with the flower's reproductive structures, transferring pollen from the male parts (anthers) to the female part (stigma) of the same or different flowers, facilitating pollination. This process is essential for the production of fruit and seeds in the plant. (Flora Zambesiaca, 2016).

Economic Utilization

Food

Both unripe and ripe fruit have edible fleshy pulp that can be eaten dried or fresh. In Ghana, the fruit is made into a drink and sweetmeats, an alcoholic beverage in Nigeria, and a soup ingredient in Sudan. Young leaves and fragile shoots are prepared as a vegetable by boiling, pounding, then frying or adding fat. In West Africa, the blooms are used as a complement to food and as a flavoring in 'dawadawa' in Nigeria. To obtain nectar, flowers are licked (Prota, 2016).

Fodder

Livestock consumes the fresh and dried leaves, fruit, and sprouts as fodder. In a Burkina Faso trial, *B. aegyptiaca* contributed up to 38% of the dry-matter intake of goats during the dry season. Kernel meal, the waste left behind after oil extraction, is commonly utilized as a stock feed in Senegal, Sudan, and Uganda. In India (Maharashtra, Madhya Pradesh, Tamil Nadu, and Rajasthan), the tree is lopped for fodder.

Fuel

The wood is great for interior use since it produces a lot of heat while emitting very little smoke. It yields high-quality charcoal, and it has been argued that the nutshell is appropriate for industrial activated charcoal. The calculated calorific value is 4600 kcal/kg.

Timber

The wood is pale yellow or yellowish-brown in color. Heartwood and sapwood are difficult to distinguish. The wood is firm and sturdy, and it may be easily crafted into yokes, wooden spoons, pestles, mortars, handles, stools, and combs.

Gum or resin

The stems produce a greenish-yellow to orange-red resin. When it is fresh, it is sucked and chewed. It is used as an adhesive to adhere feathers to arrow shafts and spearheads, as well as to repair handle cracks and arrows.

Lipids

The kernels yield edible oil, which is used in cooking. Because the oil is stable when heated and has a high smoking point, its free fatty acid content is minimal. It has a pleasant aroma and taste.

Alcohol

The fruit of *B. aegyptiaca* can be used to make an alcoholic beverage.

Poison

An emulsion prepared from the fruit or bark is fatal to freshwater snails that house the miracidia and cercaria stages of bilharzia, as well as a water flea that hosts the guinea worm. The fruit, root, and bark can be used to make a fish poison. Saponin is the active ingredient in the toxin. The substance is poisonous to fish but not to mammals and quickly degrades, making the retrieved fish edible. However, in the Fada region of Cote d'Ivoire, the poison is said to impair fishermen's vision after 5-6 years of use.

Medicine

Malaria is treated using a decoction of the root. Oedema and stomach aches are treated with boiling roots in soup. The roots are used as an emetic, while an infusion of the bark is used to cure heartburn. To cure chest symptoms, wood gum combined with maize meal porridge is utilized. In Rajasthan, the bark is used to deworm livestock. The thorns are utilized in leprosy treatment. Plant leaves are used to treat anthrax, as antihelminthic agents, and to clear cancerous sores. The fruit has the ability to treat oral ulcers, whooping cough, sleeping sickness, and skin problems. Fruit kernel has been discovered to be a moderate laxative, an antidote to arrow poison, and a vermifuge (Yadav and Panghal, 2010).

Pest and disease management

Cultural Practices

Proper spacing and pruning to improve air circulation and reduce disease spread. Remove and destroy infected plant parts to prevent the spread of diseases. Maintain good soil health and proper irrigation to keep the tree vigorous.

Pest Management

Inspect the tree regularly for signs of insect infestations, such as chewed leaves or visible pests. Apply neem oil or insecticidal soap as a natural remedy for common pests like aphids or mealybugs.

Disease Management

Common diseases in *Balanites aegyptiaca* include fungal infections like powdery mildew and rust. Apply appropriate fungicides when necessary. Ensure proper drainage to prevent root rot. Avoid overhead watering, as wet foliage can promote fungal diseases.

Biological Control

Encourage beneficial insects like ladybugs and parasitic wasps that can help control pest populations naturally.

Pruning and Sanitation

Regularly prune dead or diseased branches to improve tree health. Collect and dispose of fallen leaves and fruit to reduce disease reservoirs.

Monitoring

Keep a close eye on your tree's health, as early detection of pests and diseases is key to effective management.(Janick and Paull, 2008).

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