

Boscia senegalensis

Boscia senegalensis, or **hanza**, is a member of the family **Capparaceae**. The plant originated from **West Africa**. Still a traditional food plant in **Africa**, this little-known fruit has potential to improve nutrition, boost food security, foster rural development and support sustainable landcare.^[1]

B. senegalensis is a perennial woody plant species of the *Boscia* genus in the caper (Capparaceae) family.^[2] This plant is classified as a **dicot**. Native to the **Sahel** region in Africa, this evergreen shrub can grow anywhere from 2 to 4 m (6 ft 7 in to 13 ft 1 in) in height under favourable conditions. The leaves of the plant are small and leathery, reaching 12 cm × 4 cm (4.7 in × 1.6 in).^[2] *B. senegalensis* produces fruits, clustered in small bunches, in the form of yellow spherical berries, up to 1.5 cm (0.59 in) in diameter. These fruits contain 1–4 seeds, which are a greenish hue when mature.

B. senegalensis is recognized as a potential solution to hunger and a buffer against famine in the Sahel region due to the variety of useful products it yields. It produces products for consumption, household needs, and medicinal and agricultural uses.

Other common names include: *aizen* (Mauritania), *mukheit* (Arabic), *hanza* (Hausa), *bere* (Bambara), *ngigili* (Fulani), and *mandiarha* (Berber). The fruits are also known as *dilo* (Hausa), *bokkhelli* (Arabic), *gigile* (Fulani).^[1]

1 History, geography and ethnography

B. senegalensis is a wild species, native to the Sahel region in Africa. It has not yet been domesticated. It currently grows in: **Algeria, Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Ghana, Guinea, Kenya, Mali, Mauritania, Niger, Nigeria, Senegal, Somalia, Sudan, and Togo**.^[2]

Ethnobotanical indigenous knowledge contributes to the importance of this plant to the Hausa peoples of Niger and Fulani herders in West Africa. During the famine of 1984–1985, it was reported that *B. senegalensis* was the most widely consumed famine food in both Sudan and Darfur, relied on by over 94% of people in northern Darfur.^[1]

2 Growing conditions

B. senegalensis grows in altitudes of 60–1,450 m (200–4,760 ft), in temperatures between 22–30 °C (72–86 °F) and with rainfall conditions of 100–500 mm (3.9–19.7 in) annually. It can be found growing in marginal soils: rocky, lateritic, clay stony hills, sand dunes, and sand-clay plains.^[2] These characteristics make it a highly resilient species, able to grow without expensive inputs even in the extremely hot and dry desert region of the Sahel. Herein lies its significance for poor farmers – in times of severe drought and famine, when many other crops have failed, *B. senegalensis* can still survive and provide useful products.

3 Other farming issues



Boscia senegalensis - Occurrence in field

B. senegalensis can benefit farmers because it keeps soil from laying bare and thus prevents soil erosion and degradation. It also buffers against wind, stabilizes sand dunes, offers shade to surrounding plants and cycles nutrients.^[3] In Niger, the trees are often cut or burned down by farmers in the dry season, in order to make space on the field for staple crops as millet or sorghum. However, due to the strong surviving character of the tree, it reappears after the first rains and continues growing as a small bush.

4 How consumed and uses

Fruits are ready for human consumption at the beginning of the rainy season, when most crops are just being planted, and there is little other food available. Fruits can

be consumed raw and cooked. Raw fruits initially contain a sweet pulp that then dries out to a sugary solid, difficult to separate from seed. Fruits are often cooked prior to consumption. Juice can also be extracted and boiled down into a butter-like consistency that can be mixed with millet and milk to make cakes.^[1] In Sudan, the fruit is fermented into a beer.^[2]

The seeds of *B. senegalensis* are also important sources of nutrition, especially during times of famine.^[4] To gain access to the seeds, fruits are dried in the sun, pounded to remove the outer seed coat and soaked in water for several days, changing the water every day.^[5] The seed soaking process, also known as *debittering*, is essential to remove bitter and potentially toxic components. Seeds are usually cooked prior to consumption. Cooked seeds are texturally similar to a chickpea and can be used as a cereal substitute in stews, soups and porridges. Additionally, seeds can be re-dried and stored for later use or ground into a flour that can be used to make porridge. Roasted seeds can also serve as a substitute for coffee.^[1]



Hanza bread cookies and cooked hanza Zinder Republic of Niger

Modern uses of *B. senegalensis* seeds are being developed in Niger Republic. They include cakes, cookies, bread, canned and popped seeds. These products from natural, wild *B. senegalensis* were recognised with the innovation award at an international food fair in Niamey, Niger, 2012.^[6]

Leaf extracts contain carbohydrate hydrolase enzymes that are useful for the production of cereal-based flour and for reducing the bulk of cereal porridges.^[7] Due to their proven biocidal activities, leaves are also added to granaries to protect cereals against pathogens. Leaves have many medicinal properties, notably anti-parasitic, fungicidal, anti-inflammatory and wound healing properties.^[2] Leaves, although not pleasant to taste, can be used as emergency forage for animals.^[1]

Young roots can be ground and boiled down into a thick, sweet porridge.

Wood can be used for home construction as well as for cooking fuel in times of dire need.^[1]

B. senegalensis contains natural coagulants that can be used to clarify water sources. Components of the plant (bark, twigs, leaves, fruits) can be added to a bucket of murky water, and the natural coagulants will cause clay and other particulates to compact and sink the bottom, allowing clear water to be obtained from the top.^[1]

5 Nutritional information

Fruits are a significant source of carbohydrates, as they contain 66.8% carbohydrates.^[2]

The seeds are sufficiently nutritious, although they do lack some essential nutrients, notably lysine and threonine. The seeds have significant levels of protein (25% of dry matter) and carbohydrates (60%). In these regards, seeds outperform local staple cereals such as sorghum and millet. Additionally, seeds are rich in zinc, iron, methionine, tryptophan, B-vitamins and linoleic acid (essential fatty acid).^[5] Seeds contain 3.6 times the World Health Organization (WHO) ideal level of tryptophan.^[8]

Leaves have high antioxidant capacity (nearly 1.5 times that of spinach) and are high in calcium, potassium, manganese and iron.^[8] The bioavailability of these compounds, however, is not very well known.^[9]

6 Economics

Leaves, seeds and fruits of *B. senegalensis* are traded in many small markets in the Sahel region.^[1] Some opportunities to add value are: roasting seeds to be sold as a coffee bean substitute, fermenting fruit into beer, processing fruit and seeds into prepared food, or processing leaves into medicinal applications. It can help raise incomes of the poor by protecting their stored cereals from pests and by substituting for other purchases from the market.

7 Gender Issues

Women in rural areas usually have the responsibility of gathering and preparing *B. senegalensis* for consumption. This process can create an extra work burden for women, however, their dominion over this process may result in increased access to this food source and thus contribute to improving their nutritional status.^[10]

8 Constraints to wider adoption

A major constraint to the wider adoption of *B. senegalensis* is the recalcitrant nature of its seeds. Seeds of this type are not well suited for ex-situ conservation, as they

rapidly lose viability, and embryos are killed when seeds are dried.^[3] This creates a barrier to widespread growth, as it is difficult to propagate large numbers of plants for large-scale genetic selection and breeding. Other drawbacks to consumption include the issue of toxicity and the associated need to use scarce water resources and additional labour to leach out toxins during the debittering process.^[11]

9 Practical information

One intervention with the potential to help poor farmers is the creation of cool temperature storage facilities – as *B. senegalensis* seeds can be stored for up to 2 months at 15 °C (59 °F).^[11]

It is imperative to spread knowledge of the wide range of benefits that *B. senegalensis* provides, in order to encourage small farmers to plant it. New plantings would offer increased protection to the soil as well as provide food and other resources in times of famine.

It is recommended that the techniques of grafting and generating hybrids (wide-crosses) with related species be explored, as both techniques have the potential to increase harvests and/or improve the fruits.^[1] Promising preliminary research is being conducted using in vitro tissue culture technologies to propagate *B. senegalensis*.^[3] Additionally, direct seedling trials are recommended and being advanced by the Eden Foundation.^[12]

10 References

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11 External links

- Photograph of aizen fruit
- Activities based on *Boscia senegalensis* seeds
- *Boscia senegalensis* in West African plants – A Photo Guide.
- Crop of the Week: Hanza (*Boscia senegalensis*)
- TalTV report on the use of Hanza

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