

BAOBAB LEAVES

Adansonia digitata L.

Malvaceae

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Description

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Adansonia digitata is a succulent, deciduous tree that can grow up to around 20 meters tall, often with a very sparse crown, especially in the drier parts of its range. The swollen, urn-shaped bole eventually becomes very wide, often exceeding the *diameter* of the crown, and can be up to 10 meters across. The stem is covered with a bark layer, which may be 50-100 mm thick (Fern, 2021). **Bark;** is greyish brown and usually smooth but can often be variously folded and seamed from years of growth. **Leaves;** are hand-sized and divided into 5-7 finger-like leaflets. **Flowers;** The flowers are large, white, or yellow, with prominent stamen protruding over crinkled petals and sweetly scented. They emerge in the late afternoon from large round buds on long drooping stalks in early summer. Large, egg-shaped Baobab fruits develop at the early stages of growth. **Fruits;** are green in color, turning brownish-grey as the fruit ripens. Unlike the flowers, the fruits hang pendulously off the branches on long pedicels (Hankey, 2004).

The mature fruit consists of a hard, woody outer shell covered with yellowish-brown hairs that feel velvety. They exhibit different forms; small and big, tapered and rounded, and even the fruit skin hair hue. The fruit contains red-brown and coarse fiber that crisscross the fruits and holds creamy powdery fruit pulp. The fine pulp covers large kidney-shaped seeds. **Roots;** Baobab tree produces an extensive network of *lateral* roots that end in tubers. The seedlings produce prominent taproot, which is quickly replaced by laterals. Roots of mature trees rarely extend beyond 2 meters and are relatively shallow, which is one reason why old trees frequently fall over.

Origin

Angola: Mbondo, Mukua (Kimbundu), Imbondeiro (Portuguese) (Bossard, 1996); Kibaba (Kikongo) (Göhre et al., 2016).

Benin: Sonnan (Bariba), Kadara (Kotokoli), Fonla (Boko), Butuobu, Tituokari (Gourmantché), Gatongaboi (Anii), Kôô (Dendi), Kutunga (Zerman), Kpèborè (Waama), Mutorumu, Titookanti, Yètookpèrè (Otamari), Zinzoun (Cotafon), Kpassa (Fon, Mahi, Aïzo), Otché (Tchabè, Idatcha, Ifè), Holly (Achigan et al., 2010); Donwo (Bariba); Boboli (Peuhl), Kpassagoto (Fon) (Adjanohoun et al., 1989).

Burkina Faso: Poo-Qô (Bissa) (Sita, 1978); Kôon (Sanan) Zerbo et al., 2011); Tohega (Moore) (Belem et al., 2007); Trega, Twega, Toayga (More), Ngigne (Senufo) (Sidibe & Williams., 2002).

Cameroon: Boko; Boki (Foufouldé) (Ngene, 2015)

Chad: Hamar, Hamaraya (Sidibe & Williams, 2002)

Cote d'Ivoire: Fromdo (Baule), Ngigne (Senufo) (Sidibe & Williams, 2002), Sirra (Dioula) (Ambé, 2001); Bu ba (Dioula), Boki (Malinké), Frondo (Baoulé), Ngigué (Sénoufo), Zizon (Fon), Toéga (Mossi), Baobab (French) (Aké-Assi, 1992).

DRC: Nkondo (Kongo); Pain de singe (French) (Latham and Mbuta., 2006)

Egypt: Habhab (Sidibe & Williams., 2002)

Eritrea: Tebeldi (Arabic), Asa (Kunama), Himeret (Tigre), Dim (Bilen), Dira (Bilen), Dari (Nara), Duma (Tigrigna) (Bein et al., 1996)

Ethiopia: Bamba (Amargna), Ba'obaab, Humaar (Oromugna), Yag (Somaligna), Dima (Guragigna), Hermer banba, Kommer, Momret (Tigrigna) (Tesemma et al., 2007); Hemmer, Dumma (Tigre), Bamba (Amhara) (Sidibe & Williams, 2002).

Ghana: Tùá (Dagomba) (Blench & Dendo, 2006); Odadie (Twi, in the South), Tua (Nankani, In the North) (National Academies of Sciences, 2006).

Guinea Bissau: Sito, Sira (Mandinka) (Orwa et al., 2009); Látè, Àtè (Balanta), Buàs (Biafada), Uáto, Uvato (Bijagó), Cabaceira, Cabacera, Calabacera, (Guinean Creole), Baobab, Pain De Singe (Fruit) (French), Bóè (Fula), Bedom-Hal, Burungule-Burúnque (Mancanha), Citô (Mandinga), Bebáque, Bedom-Hal, Brungal (Manjaco), M'béke (Nalu), Burungule (Pepel), Cabaceira, Calabaceira, Imbondeiro (Portugese), Kiri (Sosso) (Catarino et al., 2016).

Guinea: Séda, Sira (Malinké), Boki (Poular, Malinke), Kiri (Soussou), Bohe (Foula du Fouta-Djallon) (Carrière, 1994).

Kenya: Muyu (Bajun), Jah (Boni), Muyu (Chonyi), Muuyu (Digo), Musemba (Embu), Muuyu, Mauyu {Fruit} (Giriama), Muamba, Mwaamba, Namba {Fruit} (Kamba), Olmesera (Masai), Mubuyu (Malakote), Muramba (Mbeere), Muiramba, Muramba (Meru), Yak (Orma), Lamai (Samburu), Yak (Sanya), Yak, Yaaq (Somali), Mbuyu, Muuyu (Swahili), Mlamba (Taita), Muguna Kiriindi (meaning-that which helps the masses), Muramba (Tharaka) (Maundu & Tengnas, 2005)

Madagascar: Reniala (Malagasy), Bozo (Sakalava dialect) (National Academies of Sciences, 2006); Baobaba, Baovola, Bozobe, Boy, Boringy, Mboio, Mboy, Rainiala, Reniala, Ringy, Sefo, Vanoa, Vontana (Malagasy) (Porcher Michel et al. 1995). Note: Some of the names may refer to other species of baobab.

Malawi: Bu ba (Dioula), Boki (Malinké), Frondo (Baoulé), Ngigué (Sénoufo), Zizon (Fon), Toéga (Mossi) (Aké-Assi, 1992); Mlonje (Yao), Mnambe, Mlambe (Chichewa), Mbuye (Nkonde) (Sidibe & Williams, 2002).

Mali: Sira, Nsira (Bambara), Zige (Minyanka), Zenge (Senoufo), 'Iya, 'Ile (Bwa), Pii (Bobo-Fing), Oro (Dogon) (Malgras, D., 1992); Idal (Sidiyenne, E. A., 1996); Oro (Dogon) Konian, Ko (Sonrai), Konian (Dierma), Babbe, boki, Olohi (Peulh), Sira, Sito (Madinke), Ngigne (Senufo) (Sidibe, M., & Williams, J. T., 2002).

Mauritania: Teidoum (Arabic), Gokki (Pulaar) (Tall, 1994).

Mauritius: Ros Mapon, (Creole), Anai Pouliya, Koye (Tamoul) (Daruty, 2018).

Mozambique: Mulambe, Malambe, Ximuwa, Ximuhu, Ximuvo (Changana) (Ribeiro, A., 2010)

Namibia: Mubuyu (Lozi) (Chinsebu & Hedimbi 2010).

Niger: Kuka (Hausa), Koo Mya (Zarma), Bokki (Peuhl), Taedrumpt (Tamacheck), Bulu Kuwa (Beriberi) (Adjanohoun, 1988).

Nigeria: Igi ose (Yoruba), Boki, Bokchi (Fula) (Orwa et al., 2009); Ose (Yoruba), Igi-Ose, Kuka (Hausa) (Ainslie, 1937); Kulambali, Gorakh-imli (Green institute, 2018); Kuka, Kouka (Hausa), Boki, Bokki (Fulani) (Sidibe & Williams, 2002).

Rwanda: Igiti cya bawoba (Kinyarwanda)

Senegal: Baak (Seereer), Bokki (Pulaar), Kommer, Hermer Banba, Momret, Duma (Tigrigna), Bui, Buee, Goui, Gui, Gwi (Wolof) (Orwa et al., 2009); Boki (Peul, Tocolor), Boi (Fouladou), Gui (Pour L'arbre), Lalo (Pour La Feuille) (Wolof), Sira, Sito (Bambara), Boy, Boiô, Boki (Peuhl) (Pordié & Magaud, M, 2001); Bubak (Diola) (Le Grand, & Wondergem., 1987); Ibak, Bak (Niominka), Sito (Socé) (Kerharo & Adam, 1964); Boubakakou (Dirla fogny), Boui (Wolof) (Sidibe & Williams, 2002).

Somalia: Yak (Somali) (Orwa et al., 2009)

South Africa: Mowana (Tswana), IsiMuku, Isimuhu, UmShimulu (Zulu) (Orwa et al., 2009); Ximuwu (Tsonga), Muvhuyu (Venda) (Andrew Hankey., 2004); Motsoo (Pedi) (Mongalo, & Makhafola., 2018); Shimuwu (Tsonga), Muvuhuyu (Tswana), Mayuy, Muuyu, Tsongoro (Seeds) (Shona) (National Academies of Sciences, 2006); Kremetart, Kremetartboom, Mubuyu, Muyu, Mbuyu, Mkulukumba, Mlambe (Afrikaans) (Sidibe & Williams, 2002); Umkomo (Ndebele) (National Academies of Sciences, 2006)

Sudan: Tabaldi (Gongoleis) (El-Kamali, 2009); Humeira (National Academies of Sciences., 2006); Dungwol (Dinka); Gunguleiz, Tebeldi, Humr, Homeira, Dungwol (Sidibe & Williams, 2002)

Tanzania: Mesera (Arusha), Mpela (Gogo), Dakaumo (Goro), Mkondo (Hehe), Gendaryandi (Iraqw), Mpela (Lugu), Olmesera (Masai), Muwiye (Mbug), Mramba (Pare), Mwiwi (Rangi), Gele (Sand), Mkondo (Sangu), Mwanda, Mwandu, Ngwandu (Suku), Mbuyu (Swah) (Mbuya et al, 1994); Nonji (Kingindo) (Haerdi, F., 1964); Moandu (Sukuma) (Kokwaro, 1993).

Togo: Todí (Nawdem), Tokala, Tuéleg, Kankanssio (Moba) (Adjanohoun, E et al., 1986)

Zambia: Mubuyu (Bemba), Mubuyu, Muyu (Lozi), Mbuyu, Mkulukumba, Mlambe (Nyanja) (Orwa et al., 2009)

Zimbabwe: Mbuyu, Muuyu (Shona), Umkhomo (Ndebele) (Hyde, M.A.,2021)

Uses

Baobab leaves are harvested fresh and cooked as a potherb in some areas, while in others, they are dried and crushed for later use. These leaves have a unique taste that is slightly sour, tangy, and sweet, with hints of nuttiness or earthiness. When cooked, their flavour becomes mild and reminiscent of spinach. They have a slightly tough and fibrous texture, and the mucilage released during cooking gives them a slightly slippery and slimy consistency. Baobab leaves are commonly added to soups, stews, sauces, and relishes, enhancing the flavour and nutritional value of the dishes while also thickening them. They are frequently served as a side dish, similar to spinach, and poured over various staple foods such as yam, cassava, maize, millet, sorghum, etc., to complete the main meal.

Baobab leaves have also been found to possess various medicinal properties. In traditional African communities, powdered baobab leaves are commonly used by traditional healers to treat ailments such as asthma, fever, malaria, smallpox, and diarrhoea. Studies have demonstrated their potential as anti-inflammatory, antipyretic, anti-diarrheal, and antiplasmodial agents. Furthermore, these leaves exhibit remarkable antioxidant properties, further adding to their therapeutic potential. Further research is necessary to determine the safety and effectiveness of using baobab leaves for medicinal purposes in humans.

During the rainy season, baobab leaves serve as a vital source of sustenance for domestic livestock and wild animals, including elephants and impalas, especially when grazing lands are depleted and new growth has yet to emerge. Furthermore, the baobab leaves are a significant source of food for animals, and the tree itself provides habitats for many wild animals, contributing to the preservation of biodiversity in the region. Additionally, the tree provides other ecosystem services such as carbon sequestration, soil enrichment, air and water quality improvement, and biodiversity conservation (Hankey, 2004).

(National Academies of Sciences, 2006, Hankey, 2004, Alao et al., 2016, Maundu & Tengnas, 2005).

Cultivation

Annual rainfall: Baobabs are most common, where mean annual rainfall is 200-1,200 mm. However, they are also found in locations with as little as 90 mm or as much as 2,000 mm of mean annual rainfall.

Altitude: The Baobab is usually found in elevations ranging from 0-1,300 m above sea level.

Soil type: The tree grows on a wide range of soils; however, *A digitata* shows a preference for acidic, well-drained soils (pH <6.5), preferably with sandy topsoil's overlaying loamy substrates (Orwa et al., 2009).

Temperature: Baobab thrives where the mean annual temperature is 20-30°C. It succumbs to frost. Reportedly, germination is achieved only when soil temperature exceeds 28°C (National Research Council, 2006).

Natural propagation

The Baobab tree's natural regeneration process is impeded by multiple factors, including browsing animals, prolonged drought, and uncontrolled bushfires. Furthermore, the seeds exhibit low germination rates, with the process naturally taking several years to initiate, often requiring fire to break dormancy. In addition to this, the digestive tract of mammals such as elephants and baboons can facilitate seed dormancy breakage, thereby contributing to the Baobab's natural propagation (Maundu & Tengnas, 2005)

Growing Baobabs from seeds

The propagation of African baobabs is predominantly achieved through seed germination, which requires specific conditions to be effective. Mechanical *scarification* is a crucial step for successful germination, as the seeds have a hard and thick seed coat that hinders water absorption, resulting in a prolonged emergence period of up to several years.

According to Maundu and Bo Tengnas (2005), seed germination of Baobab trees can be induced by fire, as the heat softens the seed coat, thus allowing water to penetrate the seed. Other methods of *scarification* include soaking the seeds in hot water, cutting or sanding the seed coat, or exposing them to sulfuric acid. These methods have been found to increase germination rates and shorten the time required for seedling emergence. It is important to note that seedling growth can be slow, and seedlings require a well-draining substrate to thrive. Once the seedlings have developed into saplings, they can be transplanted into their permanent locations. Air layering, grafting, and cuttings also been successfully utilized and are considered less costly but less effective. (Sidibe & Williams, 2002; Arum, 1989).

Harvesting and Seed Production

To collect Baobab seeds, one can either retrieve them from fruits that have fallen off the tree or use poles and sticks to dislodge fruits from the tree's canopy. Once collected, the seeds should be air-dried and stored in clean, dry, and labelled containers in cool, dry places to prevent damage from moisture, insects, fungal infections, rats, and mice. However, collecting seeds from fallen fruits may not be effective as the seeds may have lost viability or become infected. For shorter trees, seeds can be harvested from the ground or by climbing up a ladder. It is important to note that the collection method can affect the seed's quality, and careful selection of seeds is necessary for successful propagation (Sidibe & Williams, 2002; Arum, 1989).

Seed pre-treatment is a crucial process that can significantly impact the germination rate of baobab seeds. *Scarification* with concentrated sulphuric acid for 6-12 hours is a common pre-treatment method that has been shown to result in a germination rate of over 90%. However, in rural areas, manual *scarification* or boiling seeds in water for 15 minutes can be used as an alternative.

Direct seeding into the field has not proven to be very successful, so it is recommended to raise seedlings in a nursery potting mixture of topsoil, sand, and compost. (3 parts topsoil, 1 part sand, and 1 part compost); they can be sown in beds, pots, or polybags. The germination of baobab seeds can be sporadic and take up to a month. Once seedlings emerge, they should be shaded for 8 days, given half shade for 4-7 days, and then exposed to full light after 12-15 days.

Baobab seedlings should be transplanted at the beginning of the rainy season when they are at least 3-4 months old and have reached a height of 40-50cm. Seeds should be sown 1 to 2 inches deep, and soil temperature should be maintained at a minimum of 15 degrees Celsius. Soil should be kept evenly moist but not wet. Planting should be done at a spacing of 10m x 10m. After *transplanting*, it is crucial to protect the baobab trees from game, livestock, and fire until they are well established. (Sidibe & Williams, 2002, Arum, 1989).