

Vitellaria paradoxa

shea oil, shea butter, beurre de karité

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Sapotaceae

LOCAL NAMES

Arabic (lulu); English (sheanut tree, shea-butter tree, shea tree, bambouk butter tree, galam butter tree); French (karité, arbre à beurre, beurre de galam, beurre/graisse de karité); Fula (balire, kareje); German (Schibutterbaum, Sheabutterbaum); Hausa (man ka'dai, k'wara, man ka'danya, dan káraye, kadanya); Igbo (okwuma); Spanish (tango); Temne (an-doni); Trade name (beurre de karité, shea butter, shea oil); Yoruba (akú malapa, emi-emi)

BOTANIC DESCRIPTION

Vitellaria paradoxa is a small to medium-sized tree (min. 7) 10-15 (max. 25) m high; much branched, dense, spreading, round to hemispherical crown. In mature trees the bole is short, usually 3-4 m but exceptionally 8 m, with a diameter ranging from 0.3 to 1 m, but most frequently 0.6 m. Bark conspicuously thick, corky, horizontally and longitudinally deeply fissured; protects older trees against bush fires. Slash pale pink, secreting white latex, as do broken twigs or petioles.

Leaves in dense clusters, spirally arranged at the end of stout twigs. They are covered by thick bark showing numerous leaf scars. Petioles 5-15 cm long, leaves oblong. Juvenile leaves rust-red and pubescent, later coriaceous, glabrous and dark green, shining, 12-25 cm long and 4-7 cm wide, leaf margin wavy and bent.

The flowers develop in the axils of scale leaves, at the extremities of dormant twigs, from buds formed 2 years previously. Inflorescence a dense fascicle 5-7.5 cm in diameter, at the end of a flowering twig, each usually containing 30-40 flowers, though 80-100 have been recorded. Individual flowers white or creamy-white, about 1.5 cm in diameter and subtended by scarious, brown, ovate or lanceolate bracteoles, which are abscised before flower opening.

Fruit 5-8 cm long and 3-4 cm wide, elliptic, a yellow-green or yellow berry with thick butter-like, mucous pericarp; generally containing only 1 oval or round red-brown seed (the shea nut), surrounded by a fragile shining shell with a large, round, rough hilum on a broad base.

The genus *Vitellaria* is considered by botanical authorities as monospecific, two subspecies are recognized *ssp. paradoxa* restricted to Western Africa and *ssp. nilotica* of Eastern Africa.

BIOLOGY

The hermaphroditic flowers are usually cross-pollinated, but can be self-pollinated. Insects, especially bees, are important for pollination. Flowering lasts 30-75 days and the fruit takes 4-6 months to develop, reaching maturity early in the rainy season.

The sugary pulp of the fruit makes it attractive to a wide range of animals. A large variety of birds, ungulates and primates, including humans, eat them, dispersing the seed in the process.



Trees in Parkland near Samanko, Mali (Anthony Simons)



Grafted plant in Mali (Anthony Simons)



In West Africa, fresh, de-pulped sheanuts are usually par-boiled (thought to destroy germination enzymes and fungal infections) prior to sun-drying and de-corticating. (Lovett)

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ECOLOGY

The shea tree is a light-demanding species of open sites and parkland savannah; forming extensive pure stands in some areas but often also associated with other trees, such as *Parkia biglobosa* (nere). Avoids swampy areas, those liable to flooding for any length of time, moist heavy loam soils or watercourses. The extensive root system is essential for survival in the 5-7-month dry seasons of savannah climates. Can withstand quite severe fires.

BIOPHYSICAL LIMITS

Altitude: 100-1 200 m, Mean annual temperature: 24-32 deg.C, Mean annual rainfall: 600-1 400 mm

Soil type: Prefers dry and sandy clay soils with a good humus cover but also tolerates stony sites and lateritic subsoil although reacting with lower yields.

DOCUMENTED SPECIES DISTRIBUTION

Native: Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Ghana, Guinea, Mali, Niger, Nigeria, Senegal, Sudan, Togo, Uganda

Exotic: Dominica, Honduras



The map above shows countries where the species has been planted. It does neither suggest that the species can be planted in every ecological zone within that country, nor that the species can not be planted in other countries than those depicted. Since some tree species are invasive, you need to follow biosafety procedures that apply to your planting site.

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PRODUCTS

Food: Shea butter extracted from the nuts is one of the most affordable and widely used vegetable fats in the Sahel. Today, shea nuts are important internationally and are sold to European and Japanese food industries. The refined fat is sold as baking fat, margarine and other fatty spreads under various trade names and finds increasing use in various foodstuffs. Shea butter has a fatty composition similar to that of cocoa butter, so is often used as a substitute for cocoa, and in pastry because it makes a highly pliable dough.

Traditionally prepared unpurified, shea butter is sold in 'loaves' in markets and, if properly prepared and wrapped in leaves, is resistant to oxidative rancidity and will keep for years if not exposed to air and heat. Nuts that have been cleaned and lightly sun dried without previous maceration yield a tasteless, odourless fat. Traditionally prepared shea butter, after refining, is also tasteless and odourless.

The edible fruit pulp constitutes 50-80% of the whole fruit. It is allowed to become slightly overripe before being eaten raw; it can also be eaten lightly cooked. Children eat the nuts raw, while the flowers are made into fritters by some ethnic groups.

Caterpillars of *Cirina butyrospermi* A. Vuilet, which feed exclusively on the leaves of the shea-butter tree, are dried and sold in markets in Nigeria and Senegal. They are rich in protein and sometimes eaten in a sauce.

Fodder: Shea-nut cake is increasingly used for livestock and poultry feed. Leaves and young sprouts serve as forage. Sheep and pigs eat the sugary pulp of ripe fruit that have fallen to the ground.

Apiculture: The tree is much sought after for placing hives in traditional apiculture. *Vitellaria* furnishes the bees with a great quantity of nectar and pollen.

Fuel: Excellent-quality firewood that burns with a fierce heat. The charcoal is not good quality, however; it burns rapidly and is friable and, although it provides enough heat for domestic use, is not suitable for iron-working. The sticky black residue from fat extraction can also be used as a substitute for kerosene when lighting firewood. Due to its value as a fruit tree, *V. paradoxa* is seldom cut for fuel.

Timber: Wood brownish-red, darkens readily on exposure; strong, hard, heavy, durable, resilient, and weathers and wears well. Despite its hardness, it saws and planes well, takes an excellent polish, and glues, nails and screws well, but preboring is advisable to prevent splitting. Wood is used in engineering structures, house posts and support poles, also in ship building, for shingles, stakes and fencing, sleepers, medium and heavy-duty flooring, joinery, seats, household utensils, durable platters and bowls, pestles and mortars and tool handles. It is termite resistant.

Latex or rubber: The latex is heated and mixed with palm oil to make a glue. Latex obtained from the bark of the trees could be used as a chewing-gum base, but it does not have a very pleasant taste. Washing improves the taste but detracts from the chewing quality of the gum. The sap has been used traditionally to prepare punctured drums.

Tannin or dyestuff: Ashes from burnt wood are commonly used as the dye.

Lipids: The shea-butter tree is an important oil-producing plant, especially as it occurs where other such plants are rare. It is also useful in soap making, but it is unique in having a high fraction of oil (8%) that does not convert into soap; this fraction has numerous medicinal qualities.

The sticky black residue that remains after the clarification of butter is used for filling cracks in hut walls.

Wax: The high melting point of the fat renders it especially suitable for candle manufacture.

Poison: Waste water from traditional shea-butter extraction is believed to keep white ants away. Traditionally, shea butter, at a rate of 5 ml oil/kg of seed, has been shown to protect *Vigna subterranea* against *Callosobruchus maculatus*. A root-bark extract (100 ppm) is effective against *Bulinus globosus*; when mixed with tobacco, the roots are used as a poison by the Jukun of northern Nigeria. Infusions of the bark have selective antimicrobial properties, being effective against *Sarcina lutea* and *Staphylococcus aureus*.

Medicine: Shea butter protects against sunburn, so is a useful ingredient in sun-protection or post-sun-exposure products. It also encourages wound healing and soothes skin irritation. Shea butter is stable and permits the fast release of medicaments; it can therefore be used as a base for suppositories and ointments.

Shea butter is traditionally used in medicines, particularly for the preparation of skin ointments, and is used to treat inflammation, rashes in children, dermatitis, sunburn, chapping, irritation, ulcers and as a rub for rheumatism. Leaf decoctions are used for stomach-ache, headache and as an eye lotion. Roots and root bark are ground to a paste and taken orally to cure jaundice, or are boiled and pounded to treat chronic sores and girth sores in horses. They are also used for the treatment of diarrhoea and stomach-ache.

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A bark decoction is used in a bath to facilitate childbirth in Cote d'Ivoire; it is drunk to encourage lactation after delivery, although in northern Nigeria such a concoction is said to be lethal. A bark infusion is used as an eyewash as a footbath to help extract jiggers, and to neutralize the venom of the spitting cobra. Infusions have been taken for the treatment of leprosy in Guinea-Bissau and for gastric problems as well as for diarrhoea and dysentery. Macerated with the bark of *Ceiba pentandra* and salt, infusions have been used to treat cattle with worms in Senegal and Guinea.

Tapinanthus globifera, one of the most common parasitic plants on *Vitellaria*, also has many medicinal uses.

Other products: Shea butter is used as a base for many commercial preparations. Increasingly, cosmetics, especially those that prevent skin drying and good-quality lipsticks, use shea butter. As a result, cosmetic industries in the Sahel and elsewhere market this ingredient in many soap, shampoo and skin-cream preparations. Today, *Vitellaria* is the 2nd most important oil crop in Africa, after oil palm, but it takes on primary importance in areas in West Africa where annual precipitation is less than 1000 mm and therefore unsuitable for oil palm.

The residual meal of the seed cake is applied to the exterior walls of mud huts, doors, windows and traditional beehives, in a similar way to shea butter, to provide a waterproof layer.

SERVICES

Erosion control: It regenerates well, and is traditionally favoured and protected by farmers. As a result, it has played a significant role in soil and water conservation and environmental protection in semi-arid West Africa.

Soil improver: The husks of the seeds make a good mulch and fertilizer.

Pollution control: Studies on the byproducts of shea-butter processing have shown that heavy-metal ions can be removed from aqueous solutions, for example waste water, using *Vitellaria* seed husks.

Intercropping: *V. paradoxa* can be combined well with many cereal crops.

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TREE MANAGEMENT

Wide spacing, site preparation and elimination of weed competition, as well as protection against fire and browsing, are essential. The tree grows relatively slowly at first; growth rates can be accelerated by adding compost and fertilizer. In the Sahel, successful cultivation can be attempted only on sites with a good water supply, for example, along seasonal watercourses. The 1st fruits are borne 3-4 years after flowering, and trees do not start to bear fruit until they are 15-20 years old.

Because of its value as a source of oil, *Vitellaria* has long been an integral component of wooded farmland agriculture. Often, it is the only tree to be spared when woodland is cleared for cultivation. These preserved specimens may be as much as 150-200 years old.

GERMPLASM MANAGEMENT

The seeds of *Vitellaria* are recalcitrant; viability falls rapidly a week after removal from the fruit and is lost completely within 3-6 weeks. Ripe fruit that falls directly to the ground germinates easily if the soil is moist, but many seedlings succumb to drought and bush fires. Germination is cryptogean; that is, the shoots arise from belowground even though the seed germinate on the surface.

PESTS AND DISEASES

The larvae of *Cirina butyrospermi*, *Loranthus* spp. and *Anarcridium moestum* var. *melanorgodon* cause damage to leaves; larvae of *Mussida nigrioella* and *Ceratitis silverstreei* infest the pulp of mature fruits. A plant parasite of the genus *Tapinanthus* (African mistletoe) is a major cause of tree mortality at the northern limit of the savannah in Burkina Faso and Mali. In general, the parasite reduces the growth of the distal ends of the branches, affects wood quality and increases susceptibility to attack by pathogens. Infestation is also reported to affect fruit production. *Pestalotia heterospora* and *Fusicladium butyrospermi* are microorganisms causing leaf-mosaic disease.

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SUGGESTED CITATION

Orwa C, A Mutua, Kindt R, Jamnadass R, S Anthony. 2009 *Agroforestry Database: a tree reference and selection guide version 4.0* (<http://www.worldagroforestry.org/sites/treedbs/treedatabases.asp>)