

Moringa oleifera Lam.

Moringaceae

Horseradish-tree, Ben-oil tree, Drumstick-tree



Source: James A. Duke. 1983. Handbook of Energy Crops. unpublished.

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Uses

Almost every part of plant is of value for food. Seed is said to be eaten like a peanut in Malaya. Thickened root used as substitute for horseradish. Foliage eaten as greens, in salads, in vegetable curries, as pickles and for seasoning. Leaves pounded up and used for scrubbing utensils and for cleaning walls. Seeds yield 38–40% of a non-drying oil, known as Ben Oil, used in arts and for lubricating watches and other delicate machinery. Oil is clear, sweet and odorless, never becoming rancid; consequently it is edible and useful in the manufacture of perfumes and hairdressings. Wood yields blue dye. Leaves and young branches are relished by livestock. Commonly planted in Africa as a living fence (Hausa) tree. Trees planted on graves are believed to keep away hyenas and its branches are used as charms against witchcraft. Bark can serve for tanning; it also yields a coarse fiber.

Folk Medicine

According to Hartwell (1967–1971), the flowers, leaves, and roots are used in folk remedies for tumors, the seed for abdominal tumors. The root decoction is used in Nicaragua for dropsy. Root juice is applied externally as rubefacient or counter-irritant. Leaves applied as poultice to sores, rubbed on the temples for headaches, and said to have purgative properties. Bark, leaves and roots are acrid and pungent, and are taken to promote digestion. Oil is somewhat dangerous if taken internally, but is applied externally for skin diseases. Bark regarded as antiscorbic, and exudes a reddish gum with properties of tragacanth; sometimes used for diarrhea. Roots are bitter, act as a tonic to the body and lungs, and are emmenagogue, expectorant, mild diuretic and stimulant in paralytic afflictions, epilepsy and hysteria.

Chemistry

Per 100 g, the pod is reported to contain 86.9 g H₂O, 2.5 g protein, 0.1 g fat, 8.5 g total carbohydrate, 4.8 g fiber, 2.0 g ash, 30 mg Ca, 110 mg P, 5.3 mg Fe, 184 IU vit. A, 0.2 mg niacin, and 120 mg ascorbic acid, 310 µg Cu, 1.8 µg I. Leaves contain 7.5 g H₂O, 6.7 g protein, 1.7 g fat, 14.3 g total carbohydrate, 0.9 g fiber, 2.3 g ash, 440 mg Ca, 70 mg P, 7 mg Fe, 110 µg Cu, 5.1 µg I, 11,300 IU vit. A, 120 µg vit. B, 0.8 mg nicotinic acid, 220 mg ascorbic acid, and 7.4 mg tocopherol per 100 g. Estrogenic substances, including the anti-tumor compound, β-sitosterol, and a pectinesterase are also reported. Leaf amino acids include 6.0 g arginine/16 g N, 2.1 histidine, 4.3 lysine, 1.9 tryptophane, 6.4 phenylalanine, 2.0 methionine, 4.9 threonine, 9.3 leucine, 6.3 isoleucine, and 7.1 valine. Pod amino acids include 3.6 g arginine/16 g N, 1.1 g histidine, 1.5 g lysine, 0.8 g tryptophane, 4.3 g phenylalanine, 1.4 g methionine, 3.9 g threonine, 6.5 g leucine, 4.4 g isoleucine, and 5.4 valine. Seed kernel (70–74% of seed) contains 4.08 H₂O, 38.4 g crude protein, 34.7% fatty oil, 16.4 g N free extract, 3.5 g fiber, and 3.2 g ash. The seed oil contains 9.3% palmitic, 7.4% stearic, 8.6% behenic, and 65.7% oleic acids among the fatty acids. Myristic and lignoceric acids have also been reported. The cake left after oil extraction contains 58.9% crude protein, 0.4% CaO, 1.1% P₂O₅ and 0.8% K₂O. Pterygospermin, a bactericidal and fungicidal compound, isolated from Moringa has an LD₅₀ subcutaneously injected in mice and rats of 350 to 400 mg/kg body weight. Root-bark yields two alkaloids: moringine and moringinine. Moringinine acts as cardiac stimulant, produces rise of blood-pressure, acts on sympathetic nerve-endings as well as smooth muscles all over the body, and depresses the sympathetic motor fibers of vessels in large doses only.

Description

Short, slender, deciduous, perennial tree, to about 10 m tall; rather slender with drooping branches; branches and stems brittle, with corky bark; leaves feathery, pale green, compound, tripinnate, 30–60 cm long, with many small leaflets, 1.3–2 cm long, 0.6–0.3 cm wide, lateral ones somewhat elliptic, terminal one obovate and slightly larger than the lateral ones; flowers fragrant, white or creamy-white, 2.5 cm in diameter, borne in sprays, with 5 at the top of the flower; stamens yellow; pods pendulous, brown, triangular, splitting lengthwise into 3 parts when dry, 30–120 cm long, 1.8 cm wide, containing about 20 seeds embedded in the pith, pod tapering at both ends, 9-ribbed; seeds dark brown, with 3 papery wings. Main root thick. Fruit production in March and April in Sri Lanka.

Germplasm

Reported from the African and Hindustani Centers of Diversity, Moringa or cvs thereof is reported to tolerate bacteria, drought, fungus, laterite, mycobacteria, and sand (Duke, 1978). Several cvs are grown: 'Bombay' is considered one of the best, with curly fruits. Others have the fruits 3-angled or about round in cross-section. In India, 'Jaffna' is noted for having fruits 60–90 cm, 'Chavakacheri murunga' 90–120 cm long. ($2n = 28$)

Distribution

Native to India, Arabia, and possibly Africa and the East Indies; widely cultivated and naturalized in tropical Africa, tropical America, Sri Lanka, India, Mexico, Malabar, Malaysia and the Philippine Islands.

Ecology

Ranging from Subtropical Dry to Moist through Tropical Very Dry to Moist Forest Life Zones, Moringa is reported to tolerate annual precipitation of 4.8 to 40.3 dm (mean of 53 cases = 14.1) annual temperature of 18.7 to 28.5°C (mean of 48 cases = 25.4) and pH of 4.5 to 8. (mean of 12 cases = 6.5). Thrives in subtropical and tropical climates, flowering and fruiting freely and continuously. Grows best on a dry sandy soil. Drought resistant.

Cultivation

In India, the plant is propagated by planting limb cuttings 1–2 m long, from June to August, preferably. The plant starts bearing pods 6–8 months after planting but regular bearing commenced after the second year. The tree bears for several years.

Harvesting

Fruit or other parts of plant usually harvested as desired according to some authors, but in India, fruiting may peak between March and April and again in September and October. Seed gathered in March and April and oil expressed.

Yields and Economics

While I have not located specific yield figures for Moringa, I feel, from personal observations, that its biomass and pod production should approach that of *Prosopis* growing in the same habitat. Hence, I would suggest a target yield of about 10 MT pods per hectare. Horseradish-tree is grown locally in India, Sri Lanka and elsewhere, and is consumed as a local product, either ripe or unripe. No commercial data are available.

Energy

According to Verma et al. (1976), "saijan" is a fast growing tree being planted in India on a large scale as a potential source of wood for the paper industry. It seems doubtful that the wood and seed oil could both be viewed as fountains of energy. According to Burkill (1966), "The seeds yield a clear inodorous oil to the extent of 22 to 38.5 percent. It burns with a clear light and without smoke. It is an excellent salad oil, and gives a good soap... It can be used for oiling machinery, and indeed has a reputation for this purpose as watch oil, but is now superseded by sperm oil." Sharing rather similar habitat requirements with the jojoba under certain circumstances, it might be investigated as a substitute for sperm whale oil like jojoba. Growing readily from cuttings, the ben oil could be readily produced where jojoba grows. Coming into bearing within two years, it could easily be compared to jojoba in head-on trials. I recommend such.

Biotic Factors

Fruitflies (*Gitona* spp.) have infested the fruits which then dried out at the tip and rotted. Leaves of young plants and freshly planted stumps are attacked by several species of weevils (*Myloccerus discolor* var. *variegatus*, *M. 11-pustulatus*, *M. tenuiclavis*, *M. viridanus* and *Ptochus ovulum*). Also parasitized by the flowering plant, *Dendrophthoe flacata*. Fungi which attack the horseradish-tree include: *Cercospora moringicola* (Leaf-spot), *Sphaceloma morindae* (Spot anthracnose), *Puccinia moringae* (rust), *Oidium* sp., *Polyporus gilvus*.

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[Complete list of references for Duke, Handbook of Energy Crops](#)

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