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Benefits of *Moringa*

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ABSTRACT: *Moringa oleifera* is a fast-growing, drought-resistant tree of the family Moringaceae, native to the Indian subcontinent. Common names include moringa, drumstick tree (from the long, slender, triangular seed-pods), horseradish tree (from the taste of the roots, which resembles horseradish), and ben oil tree or benzolive tree. It is widely cultivated for its young seed pods and leaves, used as vegetables and for traditional herbal medicine. It is also used for water purification. Although listed as an invasive species in several countries, *M. oleifera* has "not been observed invading intact habitats or displacing native flora", so "should be regarded at present as a widely cultivated species with low invasive potential." *Moringa* is a plant native to India and other countries. It contains proteins, vitamins, and minerals, making it useful to fight malnutrition.*Moringa* is an important food source in some parts of the world. It can be grown cheaply and easily, and retains much of its nutritional value when dried. As an antioxidant, it seems to help protect cells from damage. *Moringa* might also help decrease inflammation and reduce pain.*Moringa* is used for asthma, diabetes, breast-feeding, and many other purposes, but there is no good scientific evidence to support these uses. *Moringa oleifera* is a plant that has been praised for its health benefits for thousands of years. It is very rich in healthy antioxidants and bioactive plant compounds. Here are six health benefits of *Moringa oleifera* supported by scientific research. *Moringa oleifera* is a plant that has been praised for its health benefits for thousands of years.It is very rich in healthy antioxidants and bioactive plant compounds.So far, scientists have only investigated a fraction of the many reputed health benefits.

KEYWORDS: Moringa, antioxidants, India, scientific, antioxidants, bioactive, health

I. INTRODUCTION

M. oleifera is a fast-growing, deciduous tree that can reach a height of 10–12 metres (33–39 feet) and trunk diameter of 45 centimetres (18 inches). The bark has a whitish-gray color and is surrounded by thick cork. Young shoots have purplish or greenish-white, hairy bark. The tree has an open crown of drooping, fragile branches, and the leaves build up a feathery foliage of tripinnate leaves.The flowers are fragrant and hermaphroditic, surrounded by five unequal, thinly veined, yellowish-white petals. The flowers are about 1–1.5 cm (⅜–⅝ in) long and 2 cm (¾ in) broad. They grow on slender, hairy stalks in spreading or drooping flower clusters, which have a length of 10–25 cm (4–10 in). Flowering begins within the first six months after planting. In seasonally cool regions, flowering only occurs once a year in late Spring and early Summer (northern hemisphere between April and June, southern hemisphere between October and December). In more constant seasonal temperatures and with constant rainfall, flowering can happen twice or even all year-round

Moringa oleifera

The fruit is a hanging, three-sided brown 20–45 cm (8–17+½ in) capsule, which holds dark brown, globular seeds with a diameter around 1 cm. The seeds have three whitish papery wings and are dispersed by wind and water. In cultivation, it is often cut back annually to 1–2 m (3–6 ft) and allowed to regrow so the pods and leaves remain within arm's reach. *Moringa oleifera* is a fairly large tree native to North India.It goes by a variety of names, such as drumstick tree, horseradish tree or ben oil tree.Almost all parts of the tree are eaten or used as ingredients in traditional herbal

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medicines.This especially applies to the leaves and pods, which are commonly eaten in parts of India and Africa . Moringa leaves are an excellent source of many vitamins and minerals. One cup of fresh, chopped leaves (21 grams) contains :

- Protein: 2 grams
- Vitamin B6: 19% of the RDA
- Vitamin C: 12% of the RDA
- Iron: 11% of the RDA
- Riboflavin (B2): 11% of the RDA
- Vitamin A (from beta-carotene): 9% of the RDA
- Magnesium: 8% of the RDA

In Western countries, the dried leaves are sold as dietary supplements, either in powder or capsule form. Compared to the leaves, the pods are generally lower in vitamins and minerals. However, they are exceptionally rich in vitamin C. One cup of fresh, sliced pods (100 grams) contains 157% of your daily requirement.The diet of people in developing nations sometimes lacks vitamins, minerals and protein. In these countries, *Moringa oleifera* can be an important source of many essential nutrients.However, there is one downside: Moringa leaves may also contain high levels of antinutrients, which can reduce the absorption of minerals and protein (3Trusted Source, 4).Another thing to keep in mind is that taking *Moringa oleifera* supplements in capsules won't supply a large number of nutrients.The amounts are negligible compared to what you consume if you eat a balanced diet based on whole foods.Antioxidants are compounds that act against free radicals in your body.High levels of free radicals may cause oxidative stress, which is associated with chronic diseases like heart disease and type 2 diabetes .Several antioxidant plant compounds have been found in the leaves of *Moringa oleifera* .

In addition to vitamin C and beta-carotene, these include (10, 11):Quercetin: This powerful antioxidant may help lower blood pressure .Chlorogenic acid: Also found in high amounts in coffee, chlorogenic acid may help moderate blood sugar levels after meals .One study in women found that taking 1.5 teaspoons (7 grams) of moringa leaf powder every day for three months significantly increased blood antioxidant levels (16).*Moringa* leaf extract may also be used as a food preservative. It increases the shelf life of meat by reducing oxidation (17). High blood sugar can be a serious health problem. In fact, it's the main characteristic of diabetes.Over time, high blood sugar levels raise the risk of many serious health problems, including heart disease. For this reason, it's important to keep your blood sugar within healthy limits.Interestingly, several studies have shown that *Moringa oleifera* may help lower blood sugar levels.However, most of the evidence is based on animal studies. Only a few human-based studies exist, and they're generally of low quality . One study in 30 women showed that taking 1.5 teaspoons (7 grams) of moringa leaf powder every day for three months reduced fasting blood sugar levels by 13.5%, on average (16).Another small study in six people with diabetes found that adding 50 grams of moringa leaves to a meal reduced the rise in blood sugar by 21% (21). Scientists believe these effects are caused by plant compounds such as isothiocyanates .

II. DISCUSSION

French botanist François Alexandre Pierre de Garsault described the species as *Balanus myrepsica*, but his names are not accepted as valid, as he did not always give his descriptions binomial names. French naturalist Jean-Baptiste Lamarck described the species in 1785. A combined analysis of morphology and DNA shows that *M. oleifera* is most closely related to *M. concanensis*, and the common ancestor of these two diverged from the lineage of *M. peregrina*. The genus name *Moringa* derives from the Tamil word, *murungai*, meaning "twisted pod", alludes to the young fruit. The species name *oleifera* is derived from the Latin words *oleum* "oil" and *ferre* "to bear".The plant has numerous common names across regions where it is cultivated, with *drumstick tree*, *horse radish tree* or simply *moringa* used in English. Inflammation is the body's natural response to infection or injury.It's an essential protective mechanism but may become a major health issue if it continues over a long period of time.In fact, sustained inflammation is linked to many chronic health problems, including heart disease and cancer . Most whole fruits, vegetables, herbs and spices have anti-inflammatory properties. However, the degree to which they can help depends on the types and amounts of

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anti-inflammatory compounds they contain.Scientists believe that isothiocyanates are the main anti-inflammatory compounds in moringa leaves, pods and seeds .But so far, research has been limited to test-tube and animal studies. It remains to be seen if *Moringa oleifera* has similar anti-inflammatory effects in humans.Having high cholesterol has been linked to an increased risk of heart disease.Fortunately, many plant foods can effectively reduce cholesterol. These include flaxseeds, oats and almonds.Both animal- and human-based studies have shown that *Moringa oleifera* may have similar cholesterol-lowering effects.Arsenic contamination of food and water is a problem in many parts of the world. Certain types of rice may contain particularly high levels .Long-term exposure to high levels of arsenic may lead to health problems over time.For instance, studies have linked long-term exposure to an increased risk of cancer and heart disease .Interestingly, several studies in mice and rats have shown that the leaves and seeds of *Moringa oleifera* may protect against some of the effects of arsenic toxicity .*Moringa oleifera* is an Indian tree that has been used in traditional medicine for thousands of years.However, only a few of its many reputed health benefits have been studied scientifically .To date, studies show that *Moringa oleifera* may lead to modest reductions in blood sugar and cholesterol. It may also have antioxidant and anti-inflammatory effects and protect against arsenic toxicity.Moringa leaves are also highly nutritious and should be beneficial for people who are lacking in essential nutrients.The moringa tree is not affected by any serious diseases in its native or introduced ranges. In India, several insect pests are seen, including various caterpillars such as the bark-eating caterpillar, the hairy caterpillar, or the green leaf caterpillar. The budworms Noctuidae are known to cause serious defoliation. Damaging agents can also be aphids, stem borers, and fruit flies. In some regions, termites can also cause minor damage. If termites are numerous in soils, insects management costs are not bearable. The moringa tree is a host to *Leveillula taurica*, a powdery mildew which causes damage in papaya crops in south India.The moringa tree is grown mainly in semiarid, tropical, and subtropical areas, corresponding in the United States to USDA hardiness zones 9 and 10. It tolerates a wide range of soil conditions, but prefers a neutral to slightly acidic (pH 6.3 to 7.0), well-drained, sandy or loamy soil. In waterlogged soil, the roots have a tendency to rot. Moringa is a sun- and heat-loving plant, and does not tolerate freezing or frost. Moringa is particularly suitable for dry regions, as it can be grown using rainwater without expensive irrigation techniques. India is the largest producer of moringa, with an annual production of 1.2 million tonnes of fruits from an area of 380 km^2.

Moringa is grown in home gardens and as living fences in South Asia and Southeast Asia, where it is commonly sold in local markets. In the Philippines and Indonesia, it is commonly grown for its leaves, which are used as food. Moringa is also actively cultivated by the World Vegetable Center in Taiwan, a center for vegetable research.More generally, moringa grows in the wild or is cultivated in Central America and the Caribbean, northern countries of South America, Africa, South and Southeast Asia, and various countries of Oceania.As of 2010, cultivation in Hawaii was in the early stages for commercial distribution in the United States

Parameter	Requirement/range
Climate	Grows best in tropical or subtropical
Altitude	0 – 2000 m
Rainfall	250 – 3000 mm Irrigation needed for leaf production if rainfall < 800 mm
Soil Type	Loamy, sandy, or sandy-loam
Soil pH	pH 5 – 9

III. RESULTS

Cultivation practice

Soil preparations

In tropical cultivation, soil erosion is a major problem, requiring soil treatment to be as shallow as possible. Plowing is required only for high planting densities. In low planting densities, digging pits and refilling them with soil is preferable to ensure good root system penetration without causing too much land erosion. Optimal pits are 30–50 cm (12–20 in) deep and 20–40 cm (8–15+½ in) wide.

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Propagation

Moringa can be propagated from seed or cuttings. Direct seeding is possible because the germination rate of *M. oleifera* is high. Moringa seeds can be germinated year-round in well-draining soil. Cuttings of 1 m length and at least 4 cm diameter can be used for vegetative propagation.

Breeding

In India, from where moringa most likely originated, the diversity of wild types gives a good basis for breeding programs. In countries where moringa has been introduced, the diversity is usually much smaller among the cultivar types. Locally well-adapted wild types, though, can be found in most regions.

Because moringa is cultivated and used in different ways, breeding aims for an annual or a perennial plant are obviously different. The yield stability of fruits is an important breeding aim for the commercial cultivation in India, where moringa is cultivated as an annual. On less favorable locations, perennial cultivation has big advantages, such as less erosion. In Pakistan, varieties have been tested for the nutritional composition of their leaves on different locations. India selects for a higher number of pods and dwarf or semidwarf varieties. Breeders in Tanzania, though, are selecting for higher oil content.

Yield and harvest

M. oleifera can be cultivated for its leaves, pods, and/or its kernels for oil extraction and water purification. The yields vary widely, depending on season, variety, fertilization, and irrigation regimen. Moringa yields best under warm, dry conditions with some supplemental fertilizer and irrigation. Harvest is done manually with knives, sickles, and stabs with hooks attached. Pollarding, coppicing, and lopping or pruning are recommended to promote branching, increase production, and facilitate harvesting.

Fruits

When the plant is grown from cuttings, the first harvest can take place 6–8 months after planting. Often, the fruits are not produced in the first year, and the yield is generally low during the first few years. By year two, it produces around 300 pods, by year three around 400–500. A good tree can yield 1,000 or more pods. In India, a hectare can produce 31 tons of pods per year. Under North Indian conditions, the fruits ripen during the summer. Sometimes, particularly in South India, flowers and fruit appear twice a year, so two harvests occur, in July to September and March to April.

Leaves

Average yields of 6 tons/ha/year in fresh matter can be achieved. The harvest differs strongly between the rainy and dry seasons, with 1120 kilogram/ha per harvest and 690 kg/ha per harvest, respectively. The leaves and stems can be harvested from the young plants 60 days after seeding and then another seven times in the year. At every harvest, the plants are cut back to within 60 cm of the ground. In some production systems, the leaves are harvested every 2 weeks.

The cultivation of *M. oleifera* can also be done intensively with irrigation and fertilization with suitable varieties. Trials in Nicaragua with 1 million plants per hectare and 9 cuttings/year over 4 years gave an average fresh matter production of 580 metric tons/ha/year, equivalent to about 174 metric tons of fresh leaves.

Oil

One estimate for yield of oil from kernels is 250 L/ha. The oil can be used as a food supplement, as a base for cosmetics, and for hair and the skin. Seeds of Moringa can also be used in production of biofuel.

IV. CONCLUSIONS

The bark, sap, roots, leaves, seeds and flowers are used in traditional medicine. Research has examined how it might affect blood lipid profiles and insulin secretion. Extracts from leaves contain various polyphenols, which are under basic research to determine their potential effects in humans. Despite considerable preliminary research to determine if moringa components have bioactive properties, there is no high-quality evidence to indicate that it has any effect on health or diseases. In developing countries, moringa has the potential to improve nutrition, boost food security, foster rural development, and support sustainable landcare. It may be used as forage for livestock, a micronutrient liquid, a natural anthelmintic, and possible adjuvant.Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers. Since moringa thrives in arid and semiarid environments, it may provide a versatile, nutritious food source throughout the year in various geographic regions. Some 140 organizations worldwide have initiated moringa cultivation programs to lessen malnutrition, purify water, and produce oils for cooking.*Moringa oleifera* leaf powder was as effective as soap for hand washing when

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wetted in advance to enable anti-septic and detergent properties from phytochemicals in the leaves. *Moringa oleifera* seeds and press cake have been implemented as wastewater conditioners for dewatering and drying fecal sludge.Moringa seed cake, obtained as a byproduct of pressing seeds to obtain oil, is used to filter water using flocculation to produce potable water for animal or human consumption. Moringa seeds contain dimeric cationic proteins which absorb and neutralize colloidal charges in turbid water, causing the colloidal particles to clump together, making the suspended particles easier to remove as sludge by either settling or filtration. Moringa seed cake removes most impurities from water. This use is of particular interest for being nontoxic and sustainable compared to other materials in moringa-growing regions where drinking water is affected by pollutants.

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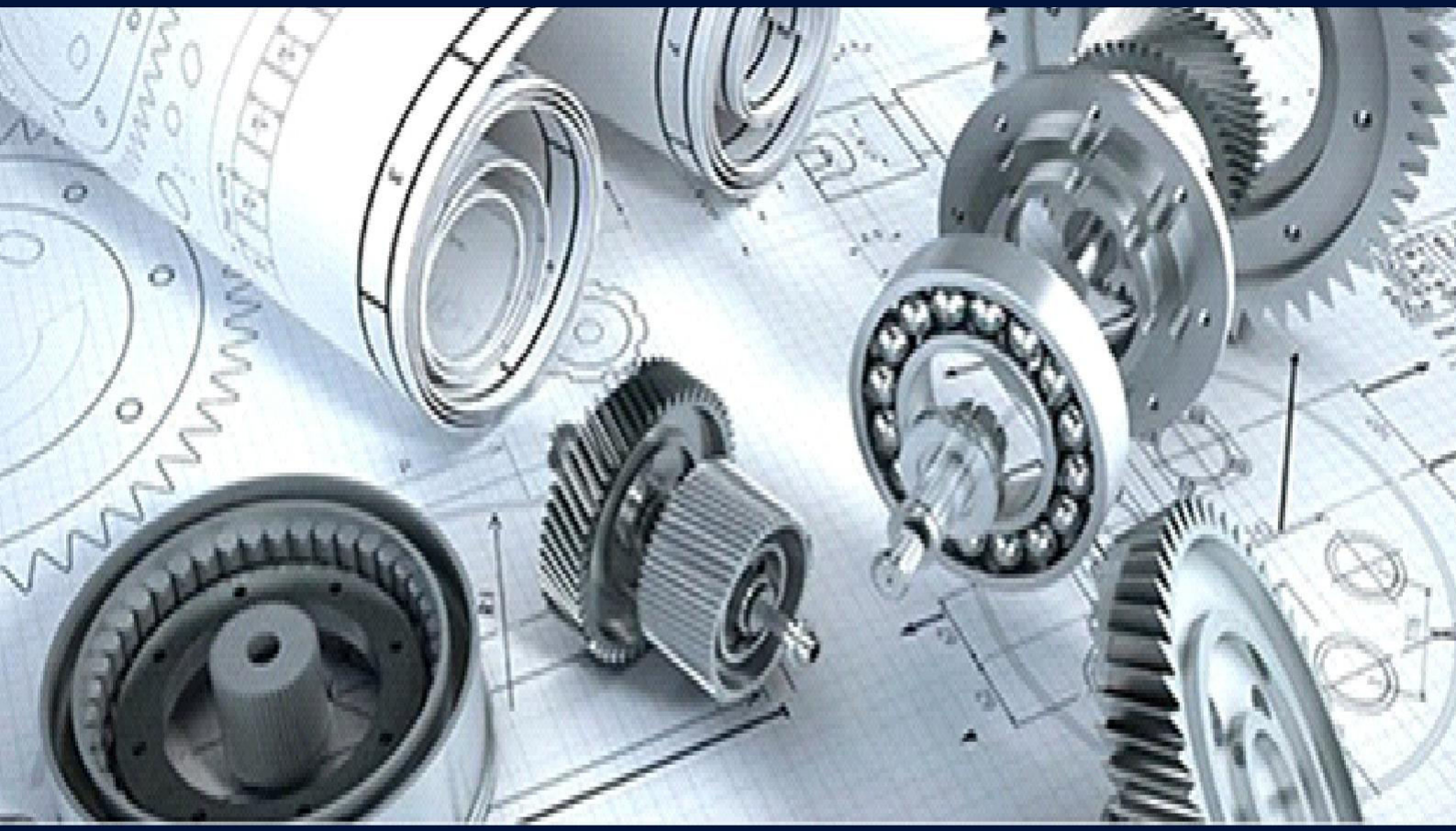

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