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Moringa oleifera Lam: A potential agroforestry tree species

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Abstract
Phytomedicines are gaining popularity, as they are thought to be more effective than traditional drugs. Moringa is well-known for its medicinal properties and a long list of health benefits. Antifungal, antiviral, anti-depressant, and anti-inflammatory properties all work together to prevent recurrence of the illness. The tree is native to India, but it may also be found in other parts of the world, including Asia, Africa, and South America. Moringa contains a wide range of proteins, vitamins, and minerals. *Moringa oleifera* few documented side effects are generally benign. It has a high nutritional value as well as promising medicinal potential. There are many different minerals present, and they are a good source of protein, vitamins, and antioxidants. *M. oleifera* is even more significant because of its considerable medicinal capabilities, which are especially vital due to the high nutritional content of *M. oleifera* sap. The leaves, roots, seed, bark, fruit, flowers, and immature pods of this plant are employed in the traditional medicinal system to cure a variety of ailments, including those in South Asia. This page discusses the phytochemical constitution, medicinal advantages, and pharmacological properties of this versatile tree.

Keywords: phyto-medicine, pharmaceutical, therapeutic application, phytochemical

Introduction

Moringa oleifera is a tiny, elegant deciduous tree with sparse leaves that looks a lot like a leguminous species from afar, especially when it's in flower, but is easily identified when it's in fruit. The tree reaches a height of 8 meters and a diameter of 60 centimeters. Bole is twisted and frequently forks around the base. Smooth, dark grey bark with a narrow, yellowish slash. Twigs and shoots are thickly hairy, but only for a brief time. Crown is broad, broad, umbrella-shaped, and normally has only one stem; it is frequently well rooted. The wood is delicate. Each leaf is huge (up to around 90 cm long) (Daba, 2016) [4] with opposed pinnae placed about 5 cm apart on the central stalk, and generally with a second set of pinnae, also opposed, bearing leaflets in opposite pairs, with a somewhat larger terminal leaflet. Leaflets are dark green on top and pale on the underside, with a wide range of sizes and shapes, though most are rounded-elliptic and seldom exceed 2.5 cm in length. Individual flower stalks up to 12 mm long and extremely thin; 5 pale green sepas 12 mm long, delicately hairy, 5 white petals, uneven, a little longer than the sepals; 5 stamens with anthers, 5 without; style thin, blooms extremely pleasant smelling. Large and unusual fruit, up to 90 cm long and 12 mm wide, somewhat constricted at intervals, gradually tapering to a tip, 3- (4-) angled, light brown, with two grooves on each face It breaks at each angle, revealing rows of spherical blackish oily seeds with three papery wings apiece. The moringa tree is a drought-tolerant, fast-growing, multi-purpose tree that is referred to as a "wonder tree" because of its medical and nutritional benefits (Fuglie, 2003; Ashfaq *et al.* 2012) [6, 3]. *Moringa oleifera* is a perennial, multifunctional tree that has been utilized for nutritional advantages, medicinal characteristics, environmental protection, and consumption. *Moringa oleifera* is also known as the "cabbage tree," "drumstick tree," or "horseradish tree," "benzoil tree," or "wonder tree" (Amaglo, 2006) [2]. Moringa is planted in private gardens, between agricultural crops/intercrops, and on the edges of agricultural fields as part of agroforestry operations. Instead of receiving so many benefits from this tree, it is less well-known in the field of agroforestry (Yogesh *et al.* 2017) [14]. The current research focuses on the tree's agroforestry potential, its societal advantages, and the techniques that can make it more suited as an agroforestry component.

Importance of Species

The Moringa tree is well-known for its therapeutic properties. Humans have traditionally consumed all portions of the Moringa tree because they are edible. In the developing world, it is commonly recognized as a vegetable, a medicinal plant, and a source of vegetable oil. Moringa contains several vitamins and minerals. The leaves contain seven times the vitamin C of oranges and fifteen times the potassium of bananas. It also contains calcium, protein, iron, and amino acids, all of which aid in the healing process. The leaves, fruits, immature pods, and flowers of *Moringa oleifera* are mixed into a traditional human meal. As a meal, *Moringa oleifera* In India, for example, dried Moringa leaves and fresh Moringa are used in meals (Stevens *et al.* 2013) [12]

Species type (www.healingmoringatree.com)

- *Moringa arborea* Verdc. (indigenous to Kenya)
- *Moringa borziana* Mattei (indigenous to Somalia)
- *Moringa concanensis* [sv] Nimmo (indigenous to northern India)

- *Moringa drouhardii* Jum. – bottle tree (indigenous to southwestern Madagascar)
- *Moringa hildebrandtii* Engl. – Hildebrandt's moringa (indigenous to southwestern Madagascar)
- *Moringa longituba* Engl. (indigenous to Ethiopia and Somalia)
- *Moringa oleifera* Lam. (syn. *M. pterygosperma*) – horseradish tree (indigenous to northwestern India. *Moringa ovalifolia* Dinter & Berger (indigenous to Namibia and Angola)
- *Moringa peregrina* (Forssk.) Fiori indigenous to Arabian Peninsula Horn of Africa and in the Southern Sinai, Egypt
- *Moringa pygmaea* Verdc. (indigenous to Somalia)
- *Moringa rivae* Chiov. (indigenous to Kenya and Ethiopia)
- *Moringa ruspoliana* Engl. (indigenous to Ethiopia)
- *Moringa stenopetala* (Baker f.) Cufod. (indigenous to Kenya and Ethiopia)

Morphological Description

It's a deciduous tree that grows rapidly. It may grow to be 10–12 m (32–40 ft) tall, with a trunk diameter of 45 cm (1.5 ft). The bark is a whitish-grey tint with thick cork around it. The bark of young shoots is purple or greenish-white, and it is hairy (Kuikman *et al*. 2015) [10].

Propagation

Seeds or cuttings can be used to grow Moringa. Because *M. oleifera* has a high germination rate, direct sowing is likely. In well-draining soil, moringa seeds can be germinated all year. Cuttings with a length of 1 m and a diameter of at least 4 cm can be utilized for vegetative growth (Khan *et al*. 2016; Kar *et al.* 2020) [9, 8].

Medicinal Properties (Farooq *et al*. 2012) [5]

- Protecting and beneficial for skin and hair
- Moringa seed oil protects hair from free radicals while also keeping it fresh and well. It is efficient in treating skin infections and sores.
- Moringa's anti-inflammatory effects may help to avoid the maturity of edema.
- Moringa appears to protect the liver from anti-tubercular medication damage and can speed up the healing process.
- Extracts have characteristics that may aid in the prevention of cancer. It also contains niazimicin, a chemical that inhibits the increase of cancerous cells.
- Moringa extracts may be useful in the treatment of gastrointestinal problems such constipation, gastritis, and ulcerative colitis.
- Moringa's antibiotic and antibacterial characteristics may aid in the prevention of pathogen development, and its high vitamin B concentration aids digestion.
- Moringa extracts may help to fight Salmonella, Rhizopus, and E. coli infections.
- Calcium and phosphorus are also found in moringa, which aid to maintain bones healthy and strong. Moringa extract, in addition to its anti-inflammatory effects, may aid in the treatment of illnesses such as arthritis and the healing of broken bones.
- Moringa has been shown to aid with sadness, anxiety, and exhaustion.
- Moringa extract contains potent antioxidants that have been established to help avoid cardiac damage and maintain a healthy heart.
- Its extract has been demonstrated to aid in the healing of wounds and the reduction of scarring.
- Moringa helps to lesser blood glucose levels as well as sugar and protein levels in the urine. The hemoglobin levels and total protein content of individuals who were examined improved as a consequence of this.
- Moringa has been shown to help lower the severity of asthma episodes and protect against bronchial constriction. It's also been well-known to help with lung function and breathing in general.
- People who consume moringa extract may be less prone to develop stones in their kidneys, bladder, or uterus. Moringa is plentiful in antioxidants, which may help decrease toxicity in the kidneys.
- Isothiocyanate and niaziminin are chemicals found in moringa that aid to prevent artery hardening, which can cause blood pressure to increase.
- Because of its strong antioxidant content, moringa has the ability to improve vision. Moringa has been shown to reduce retinal artery dilation, decrease capillary membrane thickening, and inhibit retinal malfunction.
- Moringa may aid in the absorption of iron, resulting in an increase in red blood cell count. The plant extract is regarded to be beneficial in the treatment and prevention of anemia and sickle cell disease.

Side effects

- Even though there have been few known negative effects with Moringa, it is recommended that anybody contemplating using it speak with a doctor first.
- Because moringa may have anti-fertility properties, it is not suggested for pregnant women.

Fertilizer

Sarwar *et al*.(2002) reported 120 kg ha^{-1} (NPK) produced plants of more height, stem girth, more number of leaves, maximum number of branches as compared to other treatments at week 8 with higher protein. Carbohydrate content was high in 50 + 50% (NPK + Compost) compared to others. Nitrogen (N), phosphorus (P), and potassium (K) are inorganic ions that play significant roles in plant processes.

Cultivation Practice

M. oleifera can be grown for its leaves, pods, and/or kernels, which may be used to extract oil and purify water. Season, variety, fertilizer, and irrigation regimen all have an impact on yield. With some supplementary fertilizer and irrigation, moringa yields best in warm, dry conditions.

Uses

Medicines, human food, water purification, animal feed, alley cropping, fertilizer, living fence, domestic cleaning agent, fuel wood, and other applications are all possible with the Moringa tree. Moringa increases physical energy - Tune up your body with naturally occurring nutrients to extend the life of your energy. Several studies have shown that different portions of the Moringa plant may be employed in various approaches. Because it contains a lot of leafy material, Moringa oleifera seed and leaves are a good source of nutrients, medications, and clean polluted water. It may

also be used for alley cropping. Fahey has clearly established the nutritional, industrial, medical, and agricultural benefits of Moringa oleifera. Moringa oleifera has a lot of promise for preventing illnesses including vitamin insufficiency, cancer, and anemia, as well as purifying unclean water. Moringa powder has an adequate number of vitamins, minerals, and chemicals. As a result, the tree can be used to treat a variety of ailments. The World Health Organization (WHO) has also recommended *Moringa oleifera* as an alternative to imported food sources for treating malnutrition (Agrawal *et al.* 2008; Kar *et al*. 2020).

Conclusion

Based on all of the scientific data to date, the *Moringa oleifera* tree is thought to have a wide range of medicinal and therapeutic characteristics. For instance, this study looks at the Moringa plant's multiple health advantages, such as its potential to reduce the detrimental effects of fibrosis, inflammation, and microbial infection, as well as its function in preventing oxidative stress, cancer, and diabetes. Additional study into the methods through which the Moringa plant functions might have huge implications for pharmaceutical research and development. The M. oleifera plant must be farmed extensively in most locations where sufficient climatic conditions are available to ensure optimal development, due to the several tasks it serves. If followed in this manner, it is possible to achieve a maximum yield of its usable components in order to extract the greatest amount of products for the greater welfare of mankind.

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