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## MORINGA: UTILITY AND ITS FUTURE PROSPECTS

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**M**oringa *oleifera*, commonly known as Moringa, are in high demand because they are nutritious and versatile. Because of its ability to adapt to different temperatures, it is perfect for sustainable agriculture. It is used for food, medication and industrial purposes. The main purpose of this article is to provide information about the various importance of this plant including nutritional importance as a human being. *Moringa oleifera* seeds are a promising resource for food and non-food applications. The leaves of the moringa tree are particularly beneficial since they are rich in protein, calcium, iron, and vitamin C, while the bark aids in the absorption of heavy metals. The moringa plant's leaf extracts have a number of beneficial effects, including anticancer, antibacterial, and antifungal characteristics. Having various medicinal and nutritional properties, it is also known as a miracle tree. Making fermented plant juice from leaves and seeds can be used as organic fertilizer in agriculture. In view of the above, the present article attempts to highlight the fulfillment of various human needs, including human nutritional potential.

Moringa (*Moringa oleifera*), also called the horseradish tree, drumstick tree, or sajna tree, is a tree native to tropical and subtropical climates around the world. The remarkable plant known by its common name, *Moringa oleifera*, is a prime example of nature's abundant creativity and nutritional capacity. This remarkable plant is known for its variety of applications and strong nutritional makeup, and now it has gained praise in functional foods, health drinks and dietary supplements. Because of its exceptional resilience and capacity to adapt to a wide range of climates, moringa is regarded as a keystone of sustainable

agriculture and is well-positioned to strengthen global resolve in the face of the complex web of climatic fluctuations. Moringa demand, echoing the symphony of symbiotic ecological and economic dynamics, enhances the socioeconomic fabric of smallholder farmers and rural economies. However, the symphony's melodic resonance in this booming crescendo depends on the unshakable dedication to maintaining high-caliber and sustainable practices. Within the reverberating halls of scientific inquiry, the remarkable voyage of Moringa transpires, shedding light on the complex fabric of its therapeutic possibilities and revealing the mysterious array of bioactive elements. As the discussion progresses, it reveals a plethora of unexplored opportunities that are revolutionizing nutritional and medicinal uses. This thorough symposium calls upon the transcendent potential of moringa to not only meet dietary needs but also to nurture the entire landscape of sustainable practices, paving the way for a future that is harmoniously nourished.

**Botany:** It is an evergreen-to-deciduous shrub or tree, reaches heights of 7 to 12 m and is 20-60 cm in diameter at chest height. It has the potential to be a fast-growing perennial tree. The stem is usually straight, reaching a height of 1.5 – 2.0 m before the branches begin and can sometimes reach 3.0 m. The leaves are alternate, twice or thrice pinnate leaves crowded at the end of the branches, long petiole with 8-10 pairs of pinnate leaves each bearing two pairs of opposite, elliptic or obovate, rounded or emarginated, entire, dull green on both sides, at first shortly grey, pubescent, glabrous. This little-known species can be distinguished from the former by its larger, bipinnately complex leaves and yellow flowers with pink or red streaks. In the tropics and subtropics, the tree is extensively grown and allowed to naturally occur all over the world. The other species *M. concanensis*, a small tree that resembles *M. oleifera* grows wild in India (Rajasthan, Madhya Pradesh, Gujarat, Maharashtra, Goa, Andhra Pradesh and Tamil Nadu). It is utilized locally for both medicinal and edible fruit purposes.

### Utility of *Moringa oleifera* for Various Purposes

**Human consumption:** *Moringa oleifera* tree has probably been one of the most underutilized tropical crops. This vegetable is a great way to gain nutrients for people of all ages. The tree is mostly prized for its soft, edible pods, which taste a lot like asparagus. These are consumed either cooked or pickled as a nutrient-dense vegetable. The leaves, which taste similar to watercress and are a wonderful source of vitamins and minerals, can be eaten raw or cooked with the blossoms. They are abundant in minerals, protein, riboflavin,

betacarotene, thiamin, and other vitamins, especially A and C. The Nutritional composition of moringa is presented in table 1.

**Table 1:** Nutritious composition of *Moringa oleifera* leaf per 1 cup

Nutrients	Quantity
<b>Vitamin B6</b>	19% of the RDA
<b>Vitamin C</b>	12% of the RDA
<b>Iron</b>	11% of the RDA
<b>Riboflavin (B2)</b>	11% of the RDA
<b>Vitamin A (from beta carotene)</b>	9% of the RDA
<b>Magnesium</b>	8% of the RDA
<b>Protein</b>	2 g

**RDA**-Recommended Dietary Allowance

**Source:** Sandeep *et. al.*, 2019

**Medicinal purpose:** Several tree parts are used medicinally in traditional Indian medicine to treat a variety of conditions, such as rheumatism, ascites, poisonous bites, and heart and circulatory stimulants. The root of young trees and also the root bark are considered rubefacient, vesicant carminative, stomachic and abortifacient; among other uses, they are commonly applied externally to cure inflammatory swellings. In addition, the blossoms are utilized as a cholagogue, diuretic, and tonic. The leaves are used as an emetic and are high in vitamins A and C, which are thought to be highly helpful in treating scurvy and respiratory conditions. There are potent antibacterial and antimalarial activities in the juice that is produced from the leaves.

**Economic purpose:** A significant amount of proteins are present in the press cake that is produced as a byproduct of the oil extraction process; roughly 1% of these proteins are active cationic polyelectrolytes, with molecular weights ranging from 7 to 17 Daltons. Since most colloids in gloomy or filthy water have a negative electric charge, the cationic polyelectrolyte neutralizes the colloids. Thus, this protein can be utilized as a naturally occurring, non-toxic polypeptide for organics and sedimentary mineral particles in drinking water purification, as well as for cleaning vegetables, oil, and sedimentary fibers in the juice and beer industries.

**Organic fertilizer (Foliar fertilizer application):** Several studies have shown that applying chelated fertilizer to leaves can boost its effectiveness while utilizing less fertilizer overall. If applied as a foliar spray on late-sown wheat, moringa leaf extract gives a yield 10% higher than control (Yasmeen *et al.*, 2012). The development and yield of common bean plants may

be less inhibited by the exogenous application of moringa leaf extract (MLE), which could protect the plants from the damaging effects of salt stress (Zaki & Rady., 2015).

**Livestock feed:** Farmers all throughout the world utilize a variety of trees and shrubs as supplements or feed for their animals. The nutritious content of moringa makes using it as feed a wise decision. The substantial iron, potassium, calcium, and multivitamins found in moringa leaves are essential for animal growth and milk production. Moringa is a well-known source of lipophilic antioxidants, such as tocopherols and carotenoids, and polyphenols, which makes it an excellent feed option for animals and potentially beneficial to their health.

**Crop disease management:** Moringa is applied to numerous crops to treat a variety of illnesses. Numerous studies have demonstrated its significance for managing crop diseases. Moringa contains bactericidal and antifungal properties against a variety of infections.

**Plant growth hormone:** Crop yields and growth can be increased by applying moringa leaf extract as a growth hormone (Mvumi *et al.*, 2013). The extract may have advantages for root growth and plant height in common beans and maize. The extract may have advantages for root growth and plant height in common beans and maize. Using a water extract of moringa leaves has greater potential to promote growth than using a water extract of moringa roots (Iqbal *et al.*, 2020). Zeitin is a growth hormone that is present in moringa leaf extract (MLE) and has been demonstrated to increase crop productivity by up to 45% (Maishanu *et al.*, 2017). For practically every group of plants, including melons, bell peppers, tomatoes, soy, onions, sorghum, tea, and coffee, fresh moringa leaf juice can be utilized to create potent growth hormones that raise output by 25–30% (Bashir *et al.*, 2016).

**Green manure:** Green manure (GM) is primarily used to enhance soil quality and supply nutrients for upcoming crops. Green manures produced on-site do not bear the handling and transportation costs associated with other organic inputs. The gradual release of nitrogen from GM residues that are breaking down may be more in line with plant absorption than nitrogen from inorganic sources, increasing crop productivity and N-uptake efficiency while reducing N-leaching losses.

**Pioneering advancements and future prospects:** The continuous increase in demand has spurred creativity and investigation into the therapeutic qualities, bioactive ingredients, and industrial uses of moringa. Given the growing global focus on sustainable practices and

holistic well-being, it is impossible to overestimate the influence of moringa on current trends and potential futures. This adaptable crop's appeal is expected to rise across industries as research reveals its full potential.

### Conclusion

The narrative of Moringa's rise from obscurity to fame is one of tenacity, flexibility, and lasting influence. It symbolizes the peaceful fusion of human creativity with the wonders of nature. Moringa's diverse rise is evidence of its revolutionary potential, ranging from correcting nutritional inadequacies to supporting sustainable practices, economic empowerment, and groundbreaking research. Its influence may be seen in the commercial and nutritional spheres as well as in the larger story of sustainable development and a better future for everybody. Because moringa seeds are lipid sources, removing them produces high-protein moringa seed flour that may be used in food technology and human nutrition. Moringa is an essential component of the agroforestry system because of its excellent green manure and fence ability. Moringa is a multipurpose tree as a result of its advantages for human health, the environment, and agriculture. Additionally, it's utilized in creative culinary projects and organic skincare goods. New applications for moringa have been made possible by ongoing studies on its therapeutic qualities and bioactive components. Ultimately, moringa has the ability to meet dietary requirements, encourage environmentally friendly behaviours, and help create a healthier future.

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