Plant Archives Vol. 25, Supplement 1, 2025 pp. 1-5 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.001

MORINGA OLEIFERA: A NUTRITION RICH VEGETABLE

Gokulapriya T.[1]*, M. C. Divyabharathi[1], Gadha Sreekumar[2] and Sundarrajan R.V.[3]
[1]Department of Horticulture in Vegetable Science, Central University of Tamil Nadu, Thiruvarur-610005, Tamil Nadu, India
[2]Department of Horticulture in Vegetable Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam-625604, Tamil Nadu, India
[3]Department of Horticulture in Fruit Science, Horticultural College and Research Institute, Tamil Nadu Agricultural University, Periyakulam-625604, Tamil Nadu, India
* Corresponding author Email: gokulapriyathangarasu@gmail.com
(Date of Receiving-10-06-2024; Date of Acceptance-17-09-2024)

ABSTRACT

Moringa (*Moringa oleifera)* belongs to the Moringaceae family. It's considered to be among the most beneficial trees in the world is *Moringa oleifera*, often known as the "Drumstick tree" or "Horseradish tree," and is native to India. It is a highly beneficial plant that is also known as "The Mother's Best Friend" because of its capacity to increase nursing mothers' milk production. The extremely valuable medicinal plant *Moringa oleifera* Lam lives in the tropics and subtropics. Other names include "Muringa" in Konkani, "Nuggekai" in Canada, "Sonjna" in Marathi, "Murungai" in Tamil, and "Mashinga Sanga" in Malayalam. However, studies have revealed that almost every portion of the plant includes various kinds of chemicals with important biological activities. Some of them work as antioxidants, they defend the body from oxidative stress and cancer by scavenging free radicals. Some of them are diuretic, antibacterial, antiviral, antifungal, anti-inflammatory, and anti-spasmodic. By looking at recent literature, this review provides information about its description, nutrient content, dietary, medicinal, and general usage.

Keywords: *Moringa oleifera*, description, nutrient content, medicinal and general usage

Introduction

Moringa oleifera is a native of India; it is a common tree in South Africa, the Caribbean, the Philippines, Ethiopia, the Pacific Islands, Florida, Sudan, Asia, and Latin America. Different nations refer to the moringa tree called different names, such as "Shiferaw" in Ethiopia and "Drumstick tree" or "Horseradish tree" in India. Other names include "Muringa" in Konkani, "Nuggekai" in Canada, "Sonjna" in Marathi, "Murungai" in Tamil, and "Mashinga Sanga" in Malayalam (Olagbemide, 2014). Due to the plant's vast climate adaption in different tropic and sub-tropical parts of the world, it has many names, including "Mother's Best Friend," "Horseradish Tree," "Drumstick Tree," "Ben Oil Tree," and "Miracle Tree" (Fagbohun *et al.,* 2013). There were approximately 33 species of Moringaceae, according to *M. arborea, M. borziana, M. concanensis, M. drouhardi, M. hildebrandtii, M. longituba, M. oleifera, M. ovalifolia, M. peregrina, M. pygmaea, M. rivae, M. ruspoliana* and *M. stenopetala* are among the best known of the thirteen species and Recent studies have proved its beneficial uses for both nutrition and medicine (Dahot *et al.,*1988; Anwar *et al.,* 2007).

The most promising tree is *Moringa oleifera*, a perennial that has numerous applications in the fields of food production, medicine, and conservation of the environment. Because of its nutritional and medicinal properties, the moringa tree is regarded as one of the most beneficial trees on the world. Due to its quick growth and resistance to drought, it is known as a "wonder tree" (Fuglie, 2003; Amaglo, 2006). *Moringa oleifera* is a plant that has various distinctive properties, as many studies have observed. According to Demeulenaer (2001) and Palada *et al.* (2003), they include the preservation of soil and water, the

production of animal feed, green manure, drinking water, medication, fuel wood, dye, and water purification. Because moringa has so many uses in the fields of nutrition, industry sector, and medical treatment, it is widely used, highly versatile, and economically substantial (Dawit *et al.,* 2016). Although it may grow in various types of soil, sandy or loamy soil that has been well-drained and almost alkaline. In addition, it can prosper in arid, hot climates, the rainy tropics, and less fertile soils and droughts (Anwar, 2007). Hsu (2006) suggests that this tree could boost agricultural production, nutrition, and security of food.

Morphological characters of the Moringa tree

Moringa is a fast-growing, deciduous, evergreen tree with a height of 10-12 meters, has a straight trunk, and also has corky, pale bark (Parotta *et al.,* 1993). The tree has a corky bark on its brittle stem and a tuberous taproot. The leaves are 30-60 cm (11.8 to 23.6 in) long, complex, tripinnate, and have so many small leaflets (Roloff *et al.,* 2009). The terminal leaflet is obovate and slightly larger than the lateral ones, while the lateral ones are elliptic in shape. The flowers were also fragrant and bisexual, surrounded by five unevenly thin layers of veined yellowish-white petals. Flowering starts, within the first six months after the planting. In areas where the seasons are cool, blossoming only happens once a year between April and June. Flowering can begin twice or even all year round in climates with more regular seasonal temperatures and sufficient rainfall (Parotta *et al.,* 1993). The fruits are linear, three-sided, pendulous (hanging), pods with nine longitudinal ridges that are commonly 20 to 50 cm long but can occasionally attain 1 m or longer and 2.0 to 2.5 cm wide (Roloff *et al.,* 2009). The pods, which generally have up to 26 seeds per pod, are dark green during development and require about three months to reach maturity after flowering (Palanisamy *et al.,* 1985). The bark when cut, emits a gum that is initially white but turns reddish brown or brownish black when exposed. Trees established from seeds have a deep, vigorous taproot and a network of thick, tuberous lateral roots that spread widely. Trees that are grown from cuttings don't get taproots (Lahjie *et al.,* 1987).

Nutrition content of *Moringa oleifera*

The *moringa oleifera* plant has enormous potential for preventing various illnesses, including cancer, anemia, and vitamin deficiencies, as well as for purifying contaminated water. Moringa powder is rich in chemical substances, vitamins, and nutrients. As a result, a variety of issues can be treated with the tree as a therapy (Gedefaw, 2015). The World Health Organisation (WHO) has advised adding *Moringa oleifera* to imported food supplies as a preventative measure against malnourishment (Duke, 1987). *Moringa oleifera* has a wide range of beneficial properties, including galactagogic, rubefacient, antiscorbutic, diuretic, stimulant, purgative, antibiotic, antifungal, antimicrobial, anti-aging, anti-tumor, anti-oxidant, anti-aging, estrogenic, anti-progestational, hypoglycemic, anti-hypertension, anti-ulcer, antispasmodic, lowering blood pressure, reducing migraines and headaches *etc.* Moringa leaves are rich in nutrients and devoid of anti-nutrients like tannins, phenols, and saponins. They also include vitamins, minerals, carotenoids, and other nutrients (Fugile, 2000; Sabale *et al.,* 2008; Sharma *et al.,* 2012). Moringa leaves contain a variety of flavonoids, such as kaempferol, B "-oMe quercetin, and glycoflavane 4-oMe vitexin. Nambiar *et al.* (2005) report that among the phenolic acids detected were melodic acid, p-coumaric acid, and vanillic acid. Researchers have discovered that moringa leaves contain seven times the vitamin C of oranges, four times the calcium of milk, four times the vitamin A of carrots, three times the potassium of bananas, and twice the protein of yogurt (Fuglie, 1999) (Table 1).

Table 1 : Nutrition of Moringa fresh and dry leaves with common foods per 100 grams

Nutrients	Common food	Fresh Leaves	Dry Leaves
Vitamin A	1.8 mg/100 g Carrot	6.8 mg/100 g	18.9 mg/100 g
Calcium	120 mg/100 g Milk	440 mg/100 g	2003 mg/100 g
Potassium	88 mg/100 g Banana	259 mg/100 g	1324 mg/100 g
Protein	3.1 g/100 g Yogurt	6.7 g/100 g	27.1 g/100 g
Vitamin C	30 mg/100 g Orange	220 mg/100 g	7.3 mg/100 g

Health benefits for *Moringa oleifera*

The moringa tree has many therapeutic uses, both curative and prophylactic. In conventional medicine, many nations employ its bark, sap, roots, leaves, seeds, oil, and flowers. In addition to strengthening the liver, eyes, brain, gallbladder, digestive, respiratory, and immune systems, this traditional medicine is utilized to treat stomachaches, catarrh, cancer, gastric ulcers, skin conditions, nervous disorders, diabetes, fatigue, increased lactation, impotence, edema, cramps,

hemorrhoids, headaches, sore gums and so on. Additionally, it can both create and cleanse blood (Makonnen *et al.,* 1997; Murakami *et al.,* 1998). Drumstick leaf infusion is eaten as soup; the patient might add salt, pepper, and lime juice for more flavor. For both men and women with functional infertility, a decoction prepared with fresh drumstick flowers and cow milk is unquestionably effective. An all-natural remedy for stomach issues is a drumstick.

A mixture consisting of one glass of fresh coconut water, one teaspoon of honey, and fresh leaf extract is a very effective herbal remedy for colitis, cholera, diarrhea, and dysentery. Ramachandran *et al.* (1980) found that moringa leaves or leaf powder can be used effectively as a complex nourishment supplement for young children, pregnant women, and nursing mothers as a treatment for malnutrition since it includes significant amounts of vitamins A, B, C, calcium, iron and protein. Moringa leaves are widely used throughout India to treat fevers, bronchitis, ear, eye and complications with women's milk production (Abdul Razis *et al.,* 2014). Traditional medicine continues to use other tree parts to treat ailments like lumbago, high blood pressure, liver illnesses, and sore throats. Moreover, it works well as an antibiotic to treat bacteria and fungi (Fahey, 2005). *Moringa oleifera* has been used to treat malnutrition in nursing mothers and children.

Uses of *Moringa oleifera* and their parts

Flower:

Recent studies have reported that moringa flowers have anti-arthritic properties and that hypocholesterolemic medications can treat urinary and respiratory difficulties (Fuglie, 2005). When cooked, the flowers are edible and are believed to taste like mushrooms. Honey infused with flowers is used as a cough treatment.

Fig. 1: Flowers of Moringa

Seed

Moringa seeds remedy for, Crohn's illness, hyperthyroidism, rheumatism, antiheroes-simplex virus arthritis, cramps, epilepsy, and sexually transmitted infections be which also have antibacterial and anti-inflammatory properties (Rockwood *et al.,* 2013; Thurber *et al.,* 2010; Kasolo *et al.,* 2010).

Fig. 2: Seeds of Moringa

Roots:

Root bark has anti-ulcer, anti-inflammatory, and stimulating effects on the heart functions (Choudhary *et al.,* 2013; Adeyemi *et al.,* 2014).

Leaf:

The leaves of *Moringa oleifera* are incredibly nutrient-dense and a strong source of potassium, iron, vitamin C, beta-carotene, and protein. After being cooked, the leaves are eaten, much like spinach. It also acts as an antioxidant, neuroprotective, antibacterial, anti-diabetic, blood pressure-lowering, and atherosclerotic agent (Fuglie, 2005; Ijarotimi *et al.,* 2013). It also decreases cholesterol and blood pressure. Because the leaves contain a variety of antioxidant chemicals, including ascorbic acid, flavonoids, phenolics, and carotenoids, they are a strong source of natural antioxidants and extend the shelf life of goods containing fat. The leaves are rich in ß carotene, potassium, calcium, iron, phosphorus, and vitamins A and C. They also include a high protein content of 27 percent.

Fig. 3 : Leaves of Moringa

Pod:

Moringa pods are used to cure joint aches, and liver and spleen disorders (Rockwood *et al.,* 2013; Kasolo *et al.,* 2010). The Moringa fruit is a drumstick-shaped, long, thin pod. It is used to make various curries, sambars, and korms in South India. Additionally, it is exported globally and canned for preservation. It can be added with coconut, poppy seeds, and mustard to create a variety of curry meals. Drumsticks can be easily cooked once it's are semi-soft and then eaten without further preparation or cooking.

Fig. 4 : Pods of Moringa

Ben oil:

The edible oil found in 38-40% of Moringa seeds is referred to as "ben oil" due to its high behenic acid content. The refined oil is translucent, odorless, and at least as resistant to rancidity as any other plant oil. The seed oil, referred to as "oil of ben," is used topically to relieve earaches and skin conditions. To prevent mosquito bites, apply oil to your skin (Tsaknis *et al.,* 1999).

Conclusions

In the current struggle against climate change, it is difficult to resist *Moringa oleifera,* a multipurpose, quickly-growing tree that is also well suited to growing in poor climate circumstances. A single moringa plant can provide practically all the nutrients that an individual requires. Because *Moringa oleifera* meets so many needs for humans, it is regarded as a low-cost gift from nature and goes by the name "Miracle tree." They provide additional nutrients in addition to the most crucial ones. The nutritional and medicinal benefits of moringa should be the primary focus of all healthcare groups, particularly in rural areas where cases of malnutrition are far more prevalent. Moringa should be encouraged to be consumed in greater amounts to improve nutrition and medicinal qualities. One medication that can help lower the occurrence of waterborne diseases, which are known to be one of the main reasons of rising death rates in underdeveloped countries, is *moringa oleifera*. While many studies have been conducted on different components of *Moringa oleifera* thus far, it is imperative to separate and discover other chemicals from different regions of the tree that may serve as both inhibitory and promoters. Overall, *moringa oleifera* offers very exciting opportunities to smallholder farmers in the fields of nutritional supplements, medicine, water purification, livestock feed, vegetables, oil, foliar sprays, green manures, natural agricultural inputs, cosmetics, care products, soil and water conservation and greenhouse gas emissions reduction.

Acknowledgement

The authors acknowledge the colleague for helping in collecting data.

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