

**“MORINGA OLEIFERA: A NATURAL HOPE FOR THE FUTURE OF AYURVEDA”**Deepali Chandaliya^{1*}, Yoginee Patil²**AFFILIATIONS:**

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ABSTRACT

Moringa oleifera Lam. (Drumstick Tree) is a multipurpose potential tree that is nutritionally rich and possesses functional and phytomedicine properties. It is a multipurpose plant, used as food as well as medicine due to its nutraceutical properties. Leaf, seed, seed oil, fruit, bark, root, flower, and buds are used as food in India as they are rich sources of nutrients. It is beneficial to eradicate malnutrition among children and pregnant women. Some functional components found in *Moringa oleifera* have antimicrobial, antitumor, antioxidant, anti-inflammatory, cardioprotective, hepatoprotective, and other health benefits. In Ayurveda, *Moringa oleifera* has been used as shothahara (to decrease oedema), cures skin diseases, and has anti-infection properties. The review emphasized the nutritional and nutraceutical properties of *Moringa oleifera*; each part of the tree contains phytochemicals that are beneficial for health. The study revealed the ethnomedicine properties and traditional use of Ayurveda in the treatment of many diseases. Every edible part of moringa contains high nutritional value and functional components. This tree is used as folk medicine in the management of various diseases. Its edible part can be used in the food industry as the development of a novel value-added product.

Keywords: Moringa oleifera; Traditional uses; Ethanopharmacology; Ayurveda.



INTRODUCTION

Herbal drugs make up a significant portion of the officially recognized health systems in India, including Ayurveda, Yoga, Unani, Siddha, Homeopathy, and Naturopathy, with the exception of allopathy.¹ Over 70% of India's 1.1 billion populations continues to rely on non-allopathic systems of medicine. Ancient practitioners and their use of medicinal plants are crucial for meeting health care needs in many developing countries.² Even with the presence of modern medicines, herbal remedies continue to be popular due to their historical and cultural significance. These products are now more readily accessible for purchase, particularly in developed nations. Herbal medicine usage has significantly increased in developed countries during the latter part of the 20th century. Herbal drugs play a crucial role in the Indian System of Healthcare (Ayurveda), an ancient and widely practiced system in India³.

Exploring different plant products based on their ancient uses and medicinal properties can result in the development of new drugs to treat a variety of ailments¹. This fact serves as the foundation for creating new medications derived from different plant sources. One plant with medicinal properties is *Moringa oleifera* from the Moringaceae family, known as 'sahajan' in Hindi and horseradish as in English⁴. This tree is typically small, fast-growing, and can reach heights of 10 to 12 meters⁵. It can be either evergreen or deciduous. It is found in the sub-Himalayan regions of Assam, Bengal, and the

peninsula of India. It is associated with various properties, such as antispasmodic, diuretic, expectorant, and abortifacient⁶.

Moringa oleifera is a member of the monogeneric family Moringaceae and is commonly referred to as the sahjana, drumstick, and horseradish tree. Moringa comes from a Tamil word, murungai, which means "twisted pod," referring to the young fruit (Figure 1).

This species is commonly found in the arid tropical forests of north-west India and the foothills of the Himalaya⁷. Ultimately, this comprehensive review aims to provide healthcare professionals and individuals with the necessary information to utilize moringa as a potent tool for promoting overall health and well-being.



Figure 1: Plant of *Moringa oleifera*

Herbal medicine

Herbal medications include active ingredients derived from plant parts like leaves, roots, or flowers. With global pharmacology research, several

natural medications have been improved upon and transformed into modern remedies to treat a variety of disorders⁸. Traditional systems of medicine have long played an essential part in satisfying the world's health-care needs. They still continue to do so and will play an important role in the future. Six recognized medical systems fall within this category, with India holding the honor⁹. These include Ayurveda, Siddha, Unani, Naturopathy, Homoeopathy, and Yoga. The majority of people in India (about 80%) who live in both rural and urban regions rely on plants for a variety of needs, including food, medicine, healthcare, shelter, and agriculture. It is the most readily available and reasonably priced form of treatment¹⁰. India has one of the most historic herbal medical knowledge systems in Asia, and it uses a diverse range of plant species, including Siddha (1121 species), Ayurveda (2000 species), Unani (751 species), and Tibetan (337 species). India is recognized as the "Emporium of Medicinal Plants" due to its high quantity of medicinal plants spread across several bioclimatic zones¹¹. The Thirteen species in the family Moringaceae show in table 1.

Table 1: Thirteen species in the family Moringaceae

S. No.	Species name	Properties
1.	<i>Moringa hildebrandtii</i>	Medicinal
2.	<i>Moringa drouhardii</i>	Medicinal
3.	<i>Moringa stenopetala</i>	Edible delicious leafs
4.	<i>Moringa ovalifolia</i> "aka ghost tree"	Medicinal

5.	<i>Moringa peregrina</i>	Edible
6.	<i>Moringa oleifera</i>	Edible delicious leaves
7.	<i>Moringa concanensis</i>	Edible leaves
8.	<i>Moringa rivae</i>	Medicinal
9.	<i>Moringa ruspoliana</i>	Medicinal
10.	<i>Moringa arborea</i>	Medicinal
11.	<i>Moringa borziana</i>	Medicinal
12.	<i>Moringa pygmaea</i>	Medicinal
13.	<i>Moringa longituba</i>	Medicinal

Several researches on the nutritional content of *Moringa oleifera* have been carried out in various geographical regions. In DM, the leaves of *Moringa oleifera* contain 99.1mg of calcium (Ca), 70.8mg of phosphorus (P), 35.1mg of magnesium (Mg), 1.3mg of iron (Fe), 0.85mg of zinc (Zn), 70mg of sodium (Na), 0.119mg of manganese (Mn), and 471mg of potassium (K)¹².

TRADITIONAL USES OF MORINGA OLEIFERA

Plants like this one are traditionally used to treat skin infections, burns, helminthic infections, abdominal tumors, ulcers, prostate problems, scurvy, hysteria, and paralytic attacks. They also have seeds, fruits, leaves, bark, and roots¹³. A poultice of *Moringa* leaves is a fast cure for inflammatory disorders such as glandular irritation, headache, and bronchitis¹⁴. The pods treat hepatitis and reduce pain in the joints⁷. The roots are traditionally used as treatments



for kidney stones¹⁵, liver problems¹⁶, inflammation¹⁷, ulcers¹⁸, and pain in the ear and teeth¹⁹. The bark of the stem can be used to treat wounds and skin infections²⁰. The plant's seeds work as a laxative and are used to treat cancers, prostate and bladder disorders²¹. Similar to when it was used to make dermatological ointments in ancient Egypt, moringa is currently utilized extremely widely in the cosmetics business²². In addition to being an abundant supply of mineral nutrients, *Moringa oleifera* also has several amino acids and trace elements that are essential for human health. It has the same nutritional value as spirulina²³. The leaves, fruits, blossoms, and immature pods of this tree are eaten in India, Pakistan, the Philippines, Hawaii, and certain African nations, including Nigeria^{24,25}. While young leaves of *Moringa oleifera* are used in salads, vegetable curries, or as spices for everyday usage, the seeds are ingested directly in Malaysia²⁵.

ETHANOPHARMACOLOGY

Many different biological effects are exhibited by the plant of *Moringa oleifera*.

Antibacterial activity

The use of plant extracts and metabolites with antibacterial characteristics has significant value in therapeutic interventions. *Moringa oleifera* has demonstrated substantial antibacterial efficacy in some components. The antibacterial activity can be attributed to the abundance of saponins, tannins, phenols, and alkaloid plant compounds. According to Napoleon et al. study, ethanol, chloroform, and aqueous extracts of *Moringa oleifera* leaves at a

concentration of 200 mg/L showed sensitivity against *Enterobacter spp.*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Salmonella typhi*, and *Escherichia coli*²⁶.

Hepatoprotective activity

In a study by Buraimoh et al. conducted a study on the hepatoprotective properties of the ethanolic leaf extract of *Moringa oleifera*. They examined its impact on the histology of liver damage induced by paracetamol. The rats treated with 500 mg/kg of the extracts exhibited a decrease in necrotic cell damage and an expansion of sinusoidal spaces, in contrast to the negative control group. The negative control group displayed severely distorted hepatic cords, necrotic cells, and blocked sinusoids²⁷.

Central nervous system (CNS) activity

The central nervous system (CNS) is an essential organ system in the human body. Neurodegenerative disorders, like Alzheimer's disease, impact several bodily functions, including equilibrium, mobility, cognition, memory, and cardiac performance. These disorders are untreatable and frequently pose a risk to one's life. Pharmacological drugs that affect the central nervous system are extensively utilized. The precise processes via which different medications exert their effects on the central nervous system (CNS) haven't always been thoroughly understood. Several plants for medicinal purposes have been documented to exhibit efficacy against illnesses of the central nervous system and serve as valuable therapies for pain relief and discomfort. There is a growing need to find medications that have

demonstrated enhanced efficacy and reduced side effects for the treatment of various illnesses.

According to liuet al., methanolic root extract has been found to have notable sedative effects on the central nervous system (CNS) in mice when induced by pentobarbital sodium and diazepam. It has been observed to improve sleep duration. In adult albino rats, the epileptic seizures induced by penicillin were effectively blocked by the aqueous extract of *Moringa oleifera* roots. The extract of *Moringa oleifera* leaves has been found to restore levels of monoamine in the brain, making it beneficial for individuals with Alzheimer's disease. Studies have also shown that the ethanolic extract of the leaves has an anticonvulsant effect on dopamine and norepinephrine levels, locomotor activity, and serotonin (5HT) in the brain during penicillin-induced convulsions²⁸.

Antidiabetic activity

Al-Malki and El Rabey assessed the effectiveness of two small dosages of *Moringa oleifera* seed powder (50 and 100 mg/kg body weight in the diet) in treating streptozotocin-induced diabetes (Type I) in male rats. The diabetic rats exhibited a considerable decrease in lipid peroxide levels compared to the positive control group. The smaller dosage of *Moringa oleifera* seeds had a more noticeable impact²⁹.

Immunomodulatory activity

According to Anudeep et al. assessed the immunomodulatory properties of soluble dietary fiber derived from *Moringa oleifera* seeds, which is

identified as a resistance protein (MSRP). The stimulation of murine splenocyte proliferation and the induction of nitric oxide production by macrophages served to evaluate the immunostimulatory efficacy of MSRP. At low doses (0.01 µg/well), the minimum suggested retail price (MSRP) significantly enhanced the growth of splenocytes and stimulated a six-fold rise in nitric oxide (NO) generation compared to the control group, suggesting an induction of macrophages³⁰.

Anti-inflammatory activity

Cheenpracha et al. conducted a study on the anti-inflammatory properties of four phenolic glucosides found in the ethyl acetate extract of *Moringa oleifera* fruits. They focused on their effects on the lipopolysaccharide (LPS)-induced murine macrophage RAW 264.7 cell line. Bacterial endotoxins, like LPS, stimulate macrophages, leading to the generation of various molecules involved in the process of inflammation. One of these is nitric oxide (NO), which plays a crucial role as a proinflammatory mediator in the activation of T lymphocytes and the heightened vascular permeability seen in inflammatory processes³¹.

Anticancer and antitumor activity

Medicinal plants have long been recognized as significant contributors to the development of potent conventional drugs used in the treatment of various types of cancer.

According to reports, Bharali et al. conducted a study that revealed the potential of drumstick (*Moringa oleifera* seedpod) extracts in preventing skin tumors.

The results were quite remarkable, showing a significant decrease in skin papillomas in a mouse model. The gum of *Moringa oleifera* was assessed by Singhal et al. as a potential carrier for drug delivery, specifically targeting the colon. The efficacy of methanol and dichloromethane extracts of *Moringa oleifera* leaves on three types of human cancer cell lines: hepatocarcinoma (HepG2), colorectal adenocarcinoma (Caco-2), and breast adenocarcinoma (MCF-7) was assessed using the 3-(4,5-dimethylthiazol-yl)-2,5-diphenyl tetrazolium bromide (MTT) reduction assay. The established technique, the quinone reductase (QR) induction assay, was used to investigate the in vitro cancer chemopreventive properties. The dichloromethane extracts showed IC₅₀ values ranging from 112 to 133 µg/mL for HepG2, Caco-2, and MCF-7 cancer cells in the MTT assay. The concentration of the methanol extract exceeded 250 µg/mL³².

Ayurvedic properties of *Moringa oleifera*

In classical Ayurvedic texts *Moringa oleifera* refer to the plant by a number of names, including Shigru, Akshiva, Mochaka, Shobhanjana, Krishnagandha, Tikshnagandha, Ghanachchhada, Bahalapallava, Tikshnamula, Bahumula, Murangi, Mulakaparni, Vidradhighna, and Haritashak. Based on the characteristics of this plant, it helps alleviate and control diseases caused by Vata and Kapha Dosha (humors). Ayurvedic classics provide detailed information about Shigru in various forms and how it should be administered³³.

There has been a surge in the popularity of

medicinal plants, natural products, and sustainable agriculture due to the rise in the use of chemical supplements and junk food. Additionally, the negative effects of chemicals and the onset of resistance against traditional medications have further fueled this trend. India continues to embrace the practice of Ayurveda, a form of traditional knowledge that blends seamlessly with scientific advancements⁷.

The combination of ancient wisdom and modern scientific discoveries has resulted in the creation of new herbal medicines and sustainable farming techniques. Ayurveda, with its focus on a comprehensive approach to health and wellness, has gained recognition not just in India but around the world. There has been a growing interest in natural remedies and organic farming practices due to the increasing awareness of the negative impacts of chemicals on both our health and the environment. In addition, the success stories of individuals who have experienced positive results from Ayurvedic treatments have contributed to its growing popularity. Consequently, Ayurvedic clinics and wellness centers have emerged nationwide, providing a variety of treatments and therapies³⁴.

DISCUSSION

The medicinal use of this remarkable tree requires further exploration and careful assessment to fully harness its benefits and enable communities in need to take advantage of its exceptional value. Various sections of *Moringa oleifera*, including the leaf, seed, flower, bark, pod, and root, exhibit

toxicological characteristics.

CONCLUSION

Ayurvedic medicine recognizes the significant role of *Moringa oleifera*. This review of *Moringa oleifera* includes detailed information on its traditional uses, pharmacology, and medicinal use. The literature review reveals a wide range of beneficial uses for the extract and extracted molecules of this plant, including antihypertensive, diuretic, antibacterial, antifungal, antitumor, anticancer, antiasthmatic, antipyretic, antihyperglycemic, wound healing, CNS depressant, uterotonic, antiparasitic, antiulcer, hepatoprotective, antispasmodic, cholesterol lowering, anti-inflammatory, antiarthritic, analgesic, antithyroid, antianaphylactic, radioprotective, antifertility, abortifacient, and antioxidant and antiperoxidative activities, all achieved without any toxic effects. In addition to its various traditional applications, this review also outlines its pharmacological benefits, providing valuable insights for upcoming researchers.

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