

# The Nutritional and Therapeutic Potency of Shigru (*Moringa Oleifera* Lam.): A Comprehensive Review

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**Abstract--** Shigru (*Moringa oleifera* Lam.) is a widely recognized herbal medicine with impressive nutritional value and medicinal uses. This fast-growing and widely cultivated species is found in many tropical and subtropical countries. Various parts of the Shigru plant, including leaves, fruit, flowers, seeds, bark, and root bark, are utilized both as Aushadi (medicine) and Ahara (food). Known for its extensive range of therapeutic properties, Shigru is particularly effective in treating malnutrition in a cost-effective manner. The plant parts are rich in vitamins (especially A, B, and C), minerals (calcium, iron), and protein, making them valuable in traditional medicine for addressing various ailments. Shigru exhibits antibacterial, antifungal, anti-gastric, analgesic, anti-inflammatory, cardioprotective, and wound-healing properties, among others. It serves as an antioxidant, protecting against numerous infections and shielding the body from free radicals. By maintaining the balance of the body and promoting overall health, Shigru offers multiple health benefits, such as treating high blood pressure, diabetes, arthritis, joint diseases, and malnutrition. Ayurveda prioritizes maintaining health before treating diseases, focusing on holistic well-being. It emphasizes the importance of diet, sleep, and brahmacharya (abstinence) as the three sub-pillars of health. In this context, Ahara (diet) plays a crucial role in sustaining both physical and mental health. This review discusses the various health advantages of Shigru and its use as Ahara, highlighting its significant contribution to promoting total health and age protection (ayu).

**Keywords--** Shigru, Ayurveda, Nutritional Value, rasa-panchaka, antibacterial, anticancer

## I. INTRODUCTION

*Moringa oleifera*, or Shigru, is a fast-growing tropical tree often called the "Miracle Tree" due to its impressive nutritional and medicinal properties. Widely cultivated for its various parts—leaves, fruits, flowers, seeds, bark, and roots—*Moringa* serves both as a food and medicine. It's rich in vitamins A, B, and C, calcium, iron, and protein, making it valuable in traditional medicine and a cost-effective solution for malnutrition.<sup>1</sup> *Moringa* boasts multiple therapeutic properties, including antibacterial, antifungal, anti-inflammatory, and cardioprotective effects.

It helps manage high blood pressure, diabetes, arthritis, and malnutrition. The leaves contain 18 amino acids, including all essential ones, making it a rare complete protein source for plants, perfect for vegetarians and vegans. Its high calcium and magnesium content support strong bones and teeth.<sup>ii</sup> Renowned for skin-nourishing properties, *Moringa* leaves are used in cosmetics and have benefits like reducing blood pressure, improving digestion, enhancing mood, and boosting immunity. The root bark and roots contain compounds with antifungal, antibacterial, and nerve-affecting properties.<sup>iii</sup>

*Moringa oleifera* leaves are rich in calcium and magnesium, with one serving providing about 125% of the recommended daily intake (RDI) for calcium and 61% for magnesium. These two minerals work synergistically, making *Moringa* effective in preventing bone diseases like osteoporosis. Additionally, *Moringa* leaves nourish the skin due to their high trace mineral content, leading to their incorporation into various cosmetic products. Applying creams and lotions made from *Moringa* can rejuvenate the skin by allowing nutrients to penetrate it. Furthermore, *Moringa* leaves, being high in fiber and low in fat and calories, are linked to health benefits such as reduced blood pressure, improved digestion, enhanced mood, and boosted immunity.<sup>iv</sup> *Moringa oleifera* root bark contains two alkaloids, known as "Moringine," which affect the nervous system, while the root itself contains pterygospermin, an antibiotic with antifungal and antibacterial properties. Various *Moringa* species are rich in phytoconstituents like alkaloids, saponins, tannins, steroids, flavonoids, and terpenes. *Moringa* is used to enhance breast milk production by boosting prolactin levels and providing essential nutrients. Shigru's components include alkaloids, saponins, tannins, steroids, flavonoids, and terpenes, with notable anti-cancer properties. It is used in treating conditions like tumors and cancer, proving essential in alternative, cost-effective cancer treatments. The tree exhibits anti-inflammatory, anti-microbial, cardiovascular, anti-cancer, antipyretic, antioxidant, and anti-ulcer activities.<sup>v</sup>



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In Ayurveda, Shigru (Moringa) is utilized for treating conditions such as Krimi (worm infestations), Kustha (skin problems), Kandu (itching), Ashmari (stones), and Sopha (inflammation). The plant has a pungent and bitter taste (katuvipaka) after digestion, hot potency (ushnavirya), and qualities of lightness (laghu), dryness (rooksha), and strong piercing (teekshna), which help balance the kapha and vata doshas.<sup>vi</sup>

## II. MATERIALS AND METHODS

Information about Moringa oleifera was gathered from various classical Ayurvedic texts, including Bhavprakash Nighantu, Dhanvantri Nighantu, Nighantu Aadarsha, and Kaiyadeva Nighantu, along with other traditional Ayurvedic literature, textbooks, and numerous scientific journals. Relevant content was also sourced from the commentaries on Ayurvedic Samhitas.

### *Nutritional Value*

Shigru is renowned for its high nutritional content, making it a valuable food source in regions affected by malnutrition. The leaves of the Moringa tree are particularly rich in vitamins A, B, and C, as well as minerals such as calcium, iron, and potassium<sup>1</sup>. The plant also contains essential amino acids, making it a complete protein source. Studies have shown that Shigru provides 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, and 17 times more calcium than milk.

Moringa oleifera is a powerhouse of nutrients and phytochemicals, with every part of the plant contributing significantly to its impressive nutritional profile. The leaves of Moringa oleifera are abundant in essential minerals such as calcium, potassium, zinc, magnesium, iron, and copper. These minerals play crucial roles in maintaining various bodily functions, including bone health, fluid balance, immune function, and oxygen transport.

Moreover, Moringa leaves are rich in vitamins, including beta-carotene (vitamin A), B vitamins (such as folic acid, pyridoxine, and nicotinic acid), vitamins C, D, and E. These vitamins support the immune system, aid in cell repair, and help prevent oxidative stress.

In addition to its mineral and vitamin content, Moringa oleifera is packed with beneficial phytochemicals such as tannins, sterols, terpenoids, flavonoids, saponins, anthraquinones, alkaloids, and reducing sugars. These compounds have various health benefits, including antioxidant, anti-inflammatory, and anti-cancer properties. Moringa also contains glucosinolates and isothiocyanates, known for their anti-cancer effects. The plant is an excellent protein source, with research indicating that immature pods contain approximately 46.78% fiber and 20.66% protein. The pods, leaves, and flowers have significant amino acid content, with the leaves containing 44% protein. This makes Moringa a rare complete protein source in the plant kingdom.

Furthermore, Moringa oleifera is rich in beneficial fatty acids, such as palmitic, linolenic, linoleic, and oleic acids, essential for maintaining healthy cell membranes and supporting brain function. The nutrient composition of Moringa can vary based on location, climate, and environmental factors. For instance, vitamin A is more abundant during the hot-wet season, while vitamin C and iron levels are higher in the cool-dry season. Moringa leaves are particularly noted for their high calcium content, significantly more so than milk, making Moringa powder an excellent alternative to iron tablets, especially for treating anemia, as it contains more iron than spinach.

Moringa leaves also provide a significant amount of zinc, essential for proper sperm cell growth and DNA and RNA synthesis. The leaves contain around 25.5–31.03 mg of zinc per kilogram, meeting the daily dietary requirement for zinc. Overall, Moringa oleifera's nutritional value and health benefits make it a highly valuable plant in both traditional and modern medicine.<sup>vii</sup>

**Table no. 1 :**  
**Nutrient Compositions of Moringa Oleifera<sup>viiiix</sup>**

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories (cal)	91	330	206	-	25
Protein (g)	6.6	29.3	27.2	35.98 ± 0.18	2.4
Fat (g)	1.6	5.1	2.2	38.68 ± 0.02	0.2
Carbohydrate (g)	12.4	41.3	38.1	8.68 ± 0.13	3.6
Fibre (g)	0.8	12.6	19.1	2.88 ± 0.02	4.7
Vitamin B1 (mg)	0.07	2.03	2.65	0.06	0.04
Vitamin B2 (mg)	0.06	21.2	20.4	0.05	0.08
Vitamin B3 (mg)	0.9	7.5	8.1	0.1	0.3
Vitamin C (mg)	221	15.9	17.4	4.6 ± 0.16	119
Vitamin E (mg)	447	10.7	114	751.68 ± 4.42	-
Calcium (mg)	441	2184	2002	44	29
Magnesium (mg)	41	449	367	635 ± 8.67	23
Phosphorus (mg)	71	251	203	74	111
Potassium (mg)	260	1235	1325	-	258
Copper (mg)	0.08	0.50	0.56	5.19 ± 0.16	3.0
Iron (mg)	0.84	25.5	28.1	-	5.2
Sulphur (mg)	-	-	871	0.06	136

#### *Phytoconstituents of plant moringa oleifera<sup>xxixixiii</sup>*

The plant's leaves contain a high concentration of phenolic acids and flavonoids, including quercetin, kaempferol, and myricetin, which are known for their therapeutic efficacy. The leaves also possess compounds such as bis (isothiocyanatomethyl) benzene, hexadecanoic acid, 3-hydroxy- $\beta$ -ionone, and essential oils. Additionally, the most abundant glucosinolate in *M. oleifera*, known as glucomoringin, is found in the leaves and seeds.<sup>xiv</sup>

The seeds and leaves of *M. oleifera* contain  $\beta$ -sitosterol, quercetin-3-O glucoside, bis (isothiocyanatomethyl) benzene, hexadecanoic acid, 3-hydroxy- $\beta$ -ionone, essential oils, and niaziminin A & B. These compounds are responsible for the plant's medicinal properties.  $\beta$ -sitosterol-3-O- $\beta$ -D-galactopyranoside, a type of sterol glycoside, is extracted from the bark of *M. oleifera*.

*Moringa oleifera* leaves also contain an interesting group of terpenes and their derivatives, such as linalool oxide, farnesylacetone, and isolongifolene. Researchers have isolated novel compounds like niazirin and niazirin from the plant. The ethanolic extracts of *M. oleifera* seeds have revealed new compounds, including O-ethyl-4-( $\alpha$ -L-rhamnosyloxy) benzyl carbamate and other known compounds like 4( $\alpha$ -L-rhamnosyloxy)-benzyl isothiocyanate, niazimicin, niazirin,  $\beta$ -sitosterol, glycerol-1-(9-octadecanoate), and 3-O-(6'-O oleoyl-beta-D-glucopyranosyl)- $\beta$ -sitosterol.

Additionally, two new compounds, O-[2'-hydroxy-3'-(2"-heptenyloxy)]-propyl undecanoate and O-ethyl-4-[( $\alpha$ -L-rhamnosyloxy)-benzyl] carbamate, were isolated from the ethanolic extract of *M. oleifera* pods along with other known substances like methyl phydroxybenzoate and  $\beta$ -sitosterol. The leaves of *Moringa oleifera* also contain niazirin, a thiocarbamate.

#### *Rasa-Panchaka:<sup>xv</sup>*

- Rasa: Katu, Tikta
- Guna: Laghu, Ruksha, Teekshna
- Veerya: Ushna
- Vipaka: Katu
- Doshaghnata: Vaata - Kaphaghan
- Karma: Deepana, Hrudya, Vishgna, Shukrala, Vidahakruta, Chakushya, Vaataghna

#### III. MEDICINAL USES:<sup>xvixvii</sup>

##### *External uses:*

The bark and leaf paste of the plant is known to cause a burning sensation but also has anti-inflammatory properties and is effective on abscesses. When inflammation occurs, it can be applied topically to the affected area and abscesses. For relieving headaches and head heaviness caused by kapha, seed powder, which is administered nasally, is considered the best shirovirechannasya.

Additionally, seed oil is analgesic and is used to alleviate pain associated with conditions like rheumatoid arthritis.

*Internal Uses:<sup>xviii</sup>*

1. *Nervous System:* Moringa oleifera has stimulating effects on the nerves due to its sharp and hot properties. The non-crystalline part of the bark activates afferent neurons, leading to blood vessel contractions, hypertension, and an increased heartbeat. It has a stronger effect on the digestive and respiratory systems compared to other muscles, and it can dilate the pupils similarly to ephedrine and adrenaline. Tender plant roots can be beneficial for epilepsy.
2. *Digestive System:* Moringa oleifera has various digestive properties, including causing a burning sensation, aiding in digestion, providing pain relief, antibacterial effects, and deworming capabilities due to its pungent and sharp character. Madhu Shigru acts as a purgative because it is thick and sweet, and it can alleviate conditions like ascites, abdominal tumors, tastelessness, loss of appetite, and worms.
3. *Circulatory System:* The hot property (Ushna guna) of Moringa oleifera promotes hypertension, stimulates the heart, and has anti-inflammatory qualities. It helps reduce inflammation and prevents heart deterioration.
4. *Respiratory System:* The plant's seed powder is beneficial for respiratory issues caused by excess kapha, and it is advantageous for Shodhan Nasya (nasal purification).
5. *Reproductive System:* Moringa oleifera accelerates menstruation and helps with dysmenorrhea and blocked menstruation due to its hot and anti-inflammatory properties.
6. *Urinary System:* The hot and sharp properties of Moringa oleifera stimulate the kidneys and increase urine production, alleviating dysuria. Its decoction can help with kidney stones but is not used in cases of hydronephrosis due to its irritating and inflammatory effects on the kidneys.
7. *Skin:* The hot and sharp properties cause sweating, making it useful for treating skin problems with a hot infusion. Fresh bark paste is applied to incisions with maggots, which initially smell bad but are treated effectively.

IV. THERAPEUTIC APPLICATIONS<sup>xix</sup>(AAMAYIKA PRAYOGA):

- *Acharya Charaka:* Shigru decoction is helpful for tub baths in treating haemorrhoids. It also benefits granthivisarpa (a type of inflammation) and treats respiratory illnesses with shigru leaf decoction.
- *Acharya Sushruta:* Shigru oil is used for leprosy, and powdered moringa seed is used for nasya.
- *Acharya Vagbhata:* Madhu Shigru is used externally and in food and beverages.
- *Acharya Harita:* Jaggeri and moringa root juice can relieve headaches.
- Shigru decoction with honey helps in treating microbial illnesses quickly.
- Shigrumooltwak is applied externally for skin disorders.

*Internal Uses:*

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#### VI. PHARMACEUTICAL EFFECTS

- *Antiepileptic Activity:* Methanolic extract of Moringa oleifera leaves has shown effective anti-convulsant efficacy against pentylenetetrazole and maximum electroshock-induced convulsions. It reduced limb extension duration and slowed the onset of seizures due to its alkaloids, flavonoids, and tannins content. <sup>xxii</sup>
- *Antioxidant Activity:* Aqueous and alcoholic extracts of Moringa oleifera leaves and roots demonstrated significant in-vitro antioxidant and radical scavenging activities. The leaves, rich in antioxidant compounds, protect against oxidative stress-induced illnesses. Extract from the leaves appears to prevent oxidative damage caused by a high-fat diet. <sup>xxiii</sup>

- *Anticonvulsant Activity:* Study on Swiss Albino Mice: An ethanolic extract of Moringa concanensis leaves (200 mg/kg, intraperitoneally) was tested for its anticonvulsant effects on Swiss albino mice. The results showed inhibition of tonic limb extension and MES (maximal electroshock) seizures. Additionally, in PTZ (pentylenetetrazole) seizures, the convulsions disappeared. This suggests that the ethanolic extract of Moringa concanensis leaves may exert its anticonvulsant actions through multiple pathways. <sup>xxiv</sup>
- *Anti-diabetic Activity:* Aqueous Extract of Moringa oleifera: The extract exhibits glycemic control and anti-diabetic properties. In a study with streptozotocin (STZ)-induced diabetic albino rats, methanol extracts of Moringa oleifera pods were administered at doses of 150 and 300 mg/kg for 21 days. The results showed significant antidiabetic effects, including decreased levels of serum glucose and increased levels of serum insulin and protein. <sup>xxv</sup>
- *Anti-fertility Activity:* Aqueous Extract of Moringa oleifera Roots: This extract was studied for its antifertility effects both alone and in combination with estradiol dipropionate and progesterone. It was observed to affect the uterine histoarchitecture before and after implantation. <sup>xxvi</sup>
- *Cardiovascular Activity:* Ethanolic Extract of Moringa oleifera Leaves: This extract exhibited strong antihypertensive or hypotensive action. Thiocarbamate and isothiocyanate glycosides were identified as responsible for this potent hypotensive effect during in-vivo testing on animal hearts. <sup>xxvii</sup>
- *Anti-urolithiatic Activity:* Moringa oleifera Bark Extract: In in-vitro studies, this extract demonstrated a decrease in the weight of stones created by glycol-induced urolithiasis. It showed both curative and preventative properties. <sup>xxviii</sup>
- *Anti-asthmatic Activity:* Moringa oleifera Seed Kernel: In a study involving bronchial asthma patients, three grams of finely powdered dried seed kernels were administered to patients with mild-to-moderate asthma for three weeks. Clinical efficacy was measured using a spirometer before and after treatment. The majority of patients showed improvements in hemoglobin levels, erythrocyte sedimentation rate (ESR), and symptom scores. Lung function parameters like forced capacity, forced expiratory volume in one second, and peak expiratory flow rate also improved significantly. <sup>xxix</sup>

- **Hepatoprotective Activity-** Ethanolic Leaf Extract and Alcoholic Seed Extract: These extracts were tested in vivo for their ability to prevent liver damage caused by drugs such as isoniazid, rifampicin, and pyrazinamide. The crude extract (CE) was observed to positively affect liver and kidney functions, as well as hematological and hepato-renal functions in treated animals.<sup>xxx</sup>
- **Anti-inflammatory Activity-** Various Extracts of Moringa oleifera: Methanolic and aqueous extracts of the root and bark, methanolic extract of the leaves and flowers, and ethanolic extract of the seeds showed significant anti-inflammatory effects in pharmacological testing and in-vitro studies.
- **Anti-cancer Activity-** Ethanolic Extracts of Moringa oleifera: These extracts from leaves and seeds demonstrated strong anti-tumor action. Isolated thiocarbamate and isothiocyanate compounds were identified as tumor promoter inhibitors, contributing to the in-vivo anticancer potential.<sup>xxxi</sup>
- **CNS Activity-** Leaf Extracts: Moringa oleifera leaf extract raises monoamine levels in the brain, beneficial for treating Alzheimer's disease. Extracts were tested for their anticonvulsant efficacy on penicillin-induced convulsions, locomotor behavior, and levels of serotonin (5-HT), dopamine, and norepinephrine.<sup>xxxii</sup>
- **Anti-bacterial and Anti-fungal Activity-** Disc-diffusion Method: Moringa oleifera seeds, roots, bark, and leaves showed in-vitro action against bacteria, yeast, dermatophytes, and helminths. It was found effective against *Pseudomonas aeruginosa* and *Staphylococcus aureus*.<sup>xxxiii</sup>
- **Anthelmintic Activity-** Ethanolic Extracts: An in-vitro study evaluated the effectiveness of Moringa oleifera against *Haemonchus contortus* eggs and larvae at various concentrations. The extract inhibited egg embryonation effectively.<sup>xxxiv</sup>

*Useful part of Moringa-*

- Immature Seed Pods: Often referred to as "drumsticks."
- Leaves
- Mature Seeds
- Flowers
- Roots

## VII. DISCUSSION

Moringa oleifera, or "Shigru," is a plant praised for its exceptional nutritional and medicinal properties. The various parts of this plant, including leaves, seeds, pods, and roots, are rich in essential nutrients and bioactive compounds.

**Nutritional Value:** The leaves are notably high in vitamins A, B, and C, as well as minerals like calcium, iron, and potassium. They provide more vitamin C than oranges, more vitamin A than carrots, and more calcium than milk. Immature seed pods, known as "drumsticks," are high in fiber and protein, while mature seeds contain beneficial fatty acids essential for cell health and brain function.

**Health Benefits:** Moringa oleifera is packed with phytochemicals, including tannins, flavonoids, and saponins, which have antioxidant, anti-inflammatory, and anti-cancer properties. The plant also contains glucosinolates and isothiocyanates that contribute to its anti-cancer effects. Environmental factors can influence the nutrient composition, with certain vitamins peaking during different seasons.

**Phytoconstituents:** The leaves of Moringa contain phenolic acids and flavonoids such as quercetin and kaempferol, along with various other compounds. Seeds also have  $\beta$ -sitosterol and niaziminin, while the bark contains  $\beta$ -sitosterol-3-O- $\beta$ -D-galactopyranoside.

**Medicinal Uses:** Externally, Moringa's bark and leaf paste are anti-inflammatory and useful for treating abscesses, while seed oil relieves pain in conditions like rheumatoid arthritis. Internally, the plant supports various bodily systems. It stimulates nerves, aids digestion, reduces inflammation, and improves respiratory and reproductive health.

**Ayurvedic Perspective:** Moringa balances Vata and Kapha doshas and has multiple therapeutic actions, including enhancing digestion, supporting heart health, and acting as an antitoxic and spermatogenic agent.

**Pharmaceutical Effects:** Moringa demonstrates a wide range of pharmaceutical effects, including antiepileptic, antioxidant, anticonvulsant, anti-diabetic, anti-fertility, cardiovascular, anti-urolithiatic, anti-asthmatic, hepatoprotective, anti-inflammatory, anti-cancer, CNS, anti-bacterial, and anthelmintic activities.

### VIII. CONCLUSION

Moringa oleifera is a remarkable plant known for its extensive medicinal properties and nutritional value. Its leaves, seeds, bark, and pods are rich in bioactive compounds, offering a wide range of health benefits. This plant has significant therapeutic potential in areas such as inflammation, pain relief, digestive health, respiratory issues, reproductive health, and skin conditions. From an Ayurvedic perspective, Moringa oleifera balances doshas and promotes overall health. Its diverse applications in both internal and external treatments highlight its importance as a natural remedy. The pharmaceutical effects of Moringa oleifera are impressive, providing therapeutic benefits for various health conditions due to its rich bioactive compound content. Its versatility and efficacy make it a valuable natural remedy in traditional and modern medicine, contributing significantly to health and well-being.

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