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REVIEW ARTICLE ON MORINGA OLEIFERA

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ABSTRACT

Moringa oleifera, commonly known as moringa, has gained attention worldwide for its potential health benefits. This review examines its nutritional composition, medicinal properties, and therapeutic applications. From antioxidant and anti-inflammatory effects to antimicrobial and anticancer properties, moringa exhibits diverse pharmacological activities. Additionally, its nutritional profile rich in vitamins, minerals, and amino acids underscores its potential as a superfood. Despite promising findings, further research is needed to fully elucidate moringa's mechanisms of action and optimize its therapeutic use.

KEYWORDS: Moringa oleifera, traditional medicinal uses, pharmacological activity, phytochemistry, phytopharmaceutical formulation, toxicity.

INTRODUCTION[1],[2]

Moringa, often referred to as the "miracle tree," is a versatile plant known for its nutritional and medicinal properties. Originating from the Indian subcontinent, it has been traditionally used in Ayurvedic medicine for centuries. Recent scientific studies have corroborated its traditional uses, revealing a plethora of health benefits associated with its consumption. This review aims to consolidate the existing literature on moringa, highlighting its nutritional composition, medicinal properties, and therapeutic applications.

Plantation and Soil conditions[3]

Moringa, also known as Moringa oleifera, thrives in a variety of soil conditions but prefers well-drained sandy or loamy soils with a pH range of 6.3 to 7.0. It can tolerate drought conditions and grows well in areas with minimal rainfall. Moringa is typically propagated from seeds or cuttings and can be planted directly into the ground or in containers. It requires full sun exposure and regular watering during the establishment phase but becomes relatively drought-tolerant once established. Moringa is a fast-growing tree and can reach heights of up to 10 meters within the first year of growth. Proper soil preparation, adequate water supply, and sunlight are essential for successful moringa plantation and optimal growth.

Cultivation and Collection of moringa[4],[5],[6]

Cultivating and collecting moringa involves several steps:

1. **Propagation:** Moringa can be propagated from seeds, cuttings, or nursery-raised seedlings. Seeds are planted directly in the ground or in containers, while cuttings are taken from mature trees and rooted in a suitable medium before transplanting.
2. **Planting:** Moringa requires well-drained soil and full sun exposure. Seeds or seedlings should be planted at a spacing of 2-3 meters apart to allow for proper growth and development.
3. **Care:** Young moringa plants require regular watering to establish roots. Once established, moringa is relatively drought-tolerant and requires minimal maintenance. Pruning may be necessary to shape the tree and promote branching.
4. **Harvesting:** Moringa leaves, pods, and seeds can be harvested throughout the year. Leaves are typically harvested when young and tender, as they contain the highest nutritional content. Pods are harvested when they are still green and tender, before they become woody. Seeds are collected from mature pods and can be dried for storage or used for oil extraction.
5. **Processing:** Harvested moringa leaves, pods, and seeds can be processed into various products, including powder, tea, oil, and supplements. Leaves are commonly dried and ground into a fine powder, while seeds are cold-pressed to extract oil.
6. **Storage:** Moringa products should be stored in a cool, dry place away from direct sunlight to preserve their quality and nutritional content. Properly dried and processed moringa products have a long shelf life and can be stored for several months to a year.

Fig:- Moringa Tree

Nutritional composition[7],[8],[9],[10],[11]

Moringa leaves, pods, and seeds are rich sources of essential nutrients, including vitamins (A, C, E, and B-complex), minerals (Calcium, potassium, iron, and magnesium), and amino acids (Including all nine essential amino acids). Its impressive nutritional profile positions moringa as a valuable dietary supplement and potential solution to malnutrition in resource-limited settings.

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories (cal)	92	329	205	–	26
Protein (g)	6.7	29.4	27.1	35.97 ± 0.19	2.5
Fat (g)	1.7	5.2	2.3	38.67 ± 0.03	0.1
Carbohydrate (g)	12.5	41.2	38.2	8.67 ± 0.12	3.7
Fibre (g)	0.9	12.5	19.2	2.87 ± 0.03	4.8
Vitamin B1 (mg)	0.06	2.02	2.64	0.05	0.05
Vitamin B2 (mg)	0.05	21.3	20.5	0.06	0.07
Vitamin B3 (mg)	0.8	7.6	8.2	0.2	0.2
Vitamin C (mg)	220	15.8	17.3	4.5 ± 0.17	120
Vitamin E (mg)	448	10.8	113	751.67 ± 4.41	–
Calcium (mg)	440	2185	2003	45	30
Magnesium (mg)	42	448	368	635 ± 8.66	24

Phosphorus (mg)	70	252	204	75	110
Potassium (mg)	259	1236	1324	–	259

Pharmacognostic properties[12],[13],[14],[15]

Part of tree	Medicinal uses	Nutritive properties	Suggestion	References
Leaves	Moringa leaves treat asthma, hyperglycemia, Dyslipidemia, flu, heart burn, syphilis, malaria, pneumonia, diarrhea, headaches, scurvy, skin diseases, bronchitis, eye and ear infections. Also reduces, blood pressure and cholesterol and acts as an anticancer, antimicrobial, Antioxidant, antidiabetic and anti-atherosclerotic agents, neuroprotectant	Moringa leaves contain fiber, fat proteins and minerals like Ca, Mg, P, K, Cu, Fe, and S. Vitamins like Vitamin-A (Beta-carotene), vitamin B-choline, vitamin B1-thiamine, riboflavin, nicotinic acid and ascorbic acid are present. Various amino acids like Arg, His, Lys, Trp, Phe, Thr, Leu, Met, Ile, Val are present. Phytochemicals like tannins, sterols, saponins, trepenoids, phenolics, alkaloids and flavanoids like quercitin, isoquercitin, kaemfericitin, isothiocyanates and glycoside compounds are present	The presence of flavanoids gives leaves the antidiabetic and antioxidant properties. The isothiocyanates are anticancer agents. Flavanoids like quercitin and others are known for anti-proliferative, anticancer agent. The presence of minerals and vitamins help in boosting the immune system and cure a myriad of diseases	
Seeds	Seeds of moringa help in treating hyperthyroidism, Chrohn's disease, antiherpes-simplex virus arthritis, rheumatism, gout, cramp, epilepsy and sexually transmitted diseases, can act as antimicrobial and anti-inflammatory agents	Contains oleic acid (Ben oil), antibiotic called pterygospermin, and fatty acids like Linoleic acid, linolenic acid, behenic acid, Phytochemicals like tannins, saponin, phenolics, phytate, flavanoids, terpenoids and lectins. Apart from these, fats, fiber, proteins, minerals, vitamins like A, B, C and amino acids	The presence of flavanoids gives its anti-inflammatory property. The antibiotic pterygospermin is responsible for antimicrobial properties. The other phyto-chemicals help in treating various diseases	
Root Bark	Root bark acts as a cardiac stimulant,	Alkaloids like morphine, moriginine,	The alkaloid helps the bark to	

	anti-ulcer and anti-inflammatory agent	minerals like calcium, magnesium and sodium	be antiulcer, a cardiac stimulant and helps to relax the muscles	
Flower	Moringa flowers act as hypocholesterolemic, anti-arthritic agents can cure urinary problems and cold	It contains calcium and potassium and amino acids. They also contain nectar	The presence of nectar makes them viable for use by beekeepers.	
Pods	Moringa pods treat diarrhea, liver and spleen problems, and joint pain	Rich in fiber, lipids, non-structural carbohydrates, protein and ash. Fatty acids like oleic acid, linoleic acid, palmitic acid and linolenic acid are also present	The presence of PUFA in the pods can be used in the diet of obese	

Medicinal properties[16],[17],[18]

Moringa exhibits a wide range of medicinal properties attributed to its bioactive compounds, such as flavonoids, phenolic acids, and glucosinolates. These compounds contribute to its antioxidant, anti-inflammatory, antimicrobial, antidiabetic, and hepatoprotective effects. Additionally, moringa has demonstrated promising anticancer properties, with studies suggesting potential inhibitory effects on tumor growth and metastasis.

Antioxidant activity: Moringa is rich in antioxidants like flavonoids, polyphenols, and vitamin C, which help neutralize free radicals and reduce oxidative stress in the body.

Anti-inflammatory effects: Compounds found in moringa, such as isothiocyanates and flavonoids, exhibit potent anti-inflammatory properties, which may help alleviate inflammation-related conditions like arthritis and asthma.

Antimicrobial action: Moringa extracts have shown antimicrobial activity against a wide range of pathogens, including bacteria, viruses, and fungi, making it useful for treating infections and promoting wound healing.

Antidiabetic properties: Studies suggest that moringa may help regulate blood sugar levels by improving insulin sensitivity and reducing glucose absorption in the intestines, thus offering potential benefits for individuals with diabetes.

Cardiovascular support: Moringa has been shown to lower cholesterol levels and improve lipid profiles, reducing the risk of cardiovascular diseases like heart disease and stroke.

Hepatoprotective effects: Moringa extracts have hepatoprotective properties, helping to protect the liver from damage caused by toxins, drugs, and other harmful substances.

Neuroprotective potential: Compounds found in moringa leaves and seeds may have neuroprotective effects, offering potential benefits for cognitive function and neurological disorders like Alzheimer's disease.

Anti-cancer activity: Preliminary studies suggest that moringa extracts may possess anti-cancer properties, inhibiting the growth and spread of cancer cells and inducing apoptosis (programmed cell death) in certain types of cancer.

Therapeutic applications[19],[20]

The therapeutic potential of moringa extends to various health conditions, including diabetes, hypertension, hyperlipidemia, and inflammatory disorders. Its ability to modulate immune function, enhance wound healing, and promote cardiovascular health further expands its therapeutic applications. Moreover, moringa shows promise as a natural alternative for skin and hair care, with its moisturizing and anti-aging properties.

CONCLUSION

Moringa represents a valuable botanical resource with remarkable nutritional and medicinal properties. Its diverse pharmacological activities and therapeutic applications make it a promising candidate for addressing global health challenges. However, further research is warranted to elucidate its mechanisms of action, optimize dosage regimens, and evaluate long-term safety. Harnessing the full potential of moringa may pave the way for innovative interventions in nutrition, medicine, and beyond.

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