



MORINGA OLEIFERA: ORIGIN, APPLICATIONS A COMPREHENSIVE REVIEW

Pallavi S. Tathe

Department of Chemistry, C.T. Bora College, Shirur Dist. Pune, MS, India

ABSTRACT:

Moringa oleifera, often referred to as the "miracle tree," is a highly valued plant native to the Indian subcontinent, renowned for its exceptional nutritional and medicinal properties. Its diverse applications range from food, pharmaceuticals, cosmetics, and water purification to agricultural and industrial uses. This review focuses on the origin, distribution, botanical features, nutritional value, traditional uses, and emerging industrial applications of Moringa oleifera, highlighting its significance as a sustainable resource for developing countries.

Keywords: *Moringa Oleifera, Origin, Medicinal Applications, Nutritional Value, Industrial Uses, Traditional Medicine.*

INTRODUCTION:

Natural resources have long provided essential components for human survival and development. Among these, *Moringa oleifera* Lam., a member of the Moringaceae family, has gained global attention due to its rich nutrient content and broad medicinal applications (Anwar et al., 2007). Traditionally used in South Asia and Africa, this plant has now found its way into modern pharmaceutical and nutritional industries.

ORIGIN AND GEOGRAPHICAL DISTRIBUTION:

1. Origin:

Moringa oleifera is indigenous to the foothills of the Himalayan regions of India, Pakistan, Bangladesh, and Afghanistan (Fahey, 2005). The earliest documentation of its use dates back to 150 B.C. in India, where it was consumed for health and medicinal purposes.

2. Global Spread:

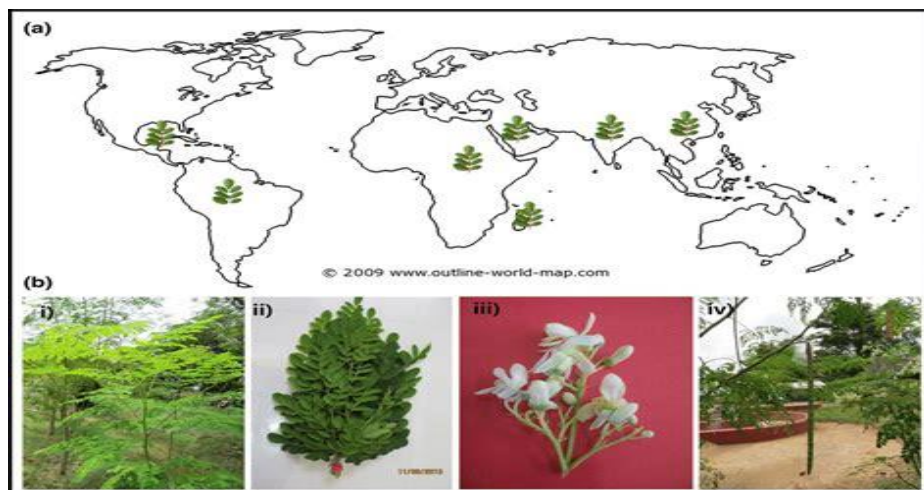
Due to its drought resistance and adaptability to poor soils, *Moringa oleifera* has been introduced to Africa, Southeast Asia, Central and South America, and the Caribbean (Leone et al., 2015).

BOTANICAL DESCRIPTION:

Characteristics	Description
Family	Moringaceae
Height	10–12 meters
Leaves	Tripinnate, rich in nutrients
Flowers	Fragrant, yellowish-white
Fruits	Long capsules (20–45 cm)
Seeds	Globular with winged structure

(Source: Fahey, 2005)

Figure 1: Global Distribution of *Moringa oleifera*



NUTRITIONAL PROFILE OF MORINGA OLEIFERA:

1. Nutritional Composition of Leaves (per 100 g dry weight):

Nutrient	Content
Protein	27.1 g
Calcium	2,003 mg
Iron	28.2 mg
Vitamin A	16,300 IU
Vitamin C	220 mg

(Source: Gopalakrishnan et al., 2016)

2. Seeds and Pods:

Seeds contain 35-40% edible oil (ben oil) rich in oleic acid (Tsaknis et al., 1999), while pods are rich in vitamin C and dietary fiber.

TRADITIONAL APPLICATIONS:

1. Medicinal Uses:

- Anti-inflammatory
- Antimicrobial
- Antioxidant
- Anti-diabetic
- Cardioprotective
- Hepatoprotective (Singh et al., 2009)

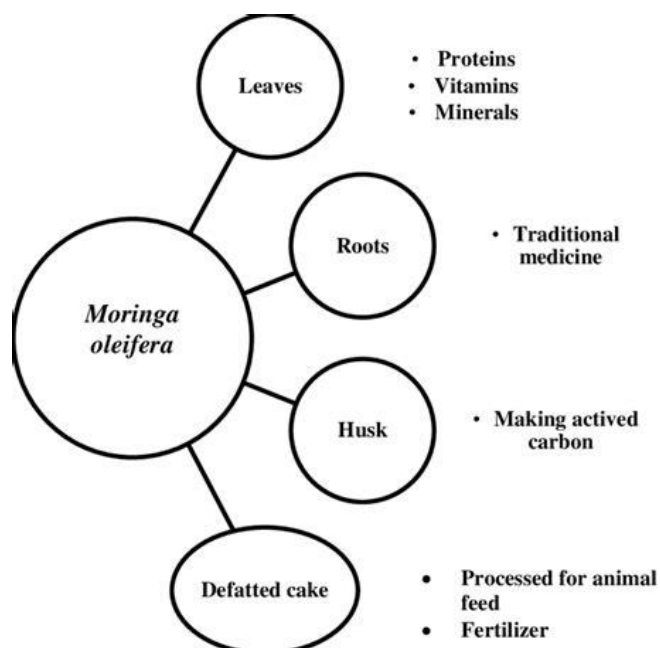
2. Water Purification:

Moringa seed powder contains positively charged proteins that bind to impurities, making it a natural coagulant (Ndabigengesere et al., 1995).

3. Culinary Uses:

- Leaves as vegetables or powdered supplements.
- Pods (drumsticks) in curries.
- Seeds roasted or pressed for oil.

Figure 2: Nutritional and Medicinal Applications of *Moringa oleifera*



INDUSTRIAL AND PHARMACEUTICAL APPLICATIONS:

Industry	Applications
Food Industry	Supplements, fortification, beverages
Pharmaceutical	Anti-cancer, antimicrobial formulations
Cosmetic	Skin and hair care, anti-aging
Agriculture	Natural fertilizer, pest repellent
Environmental	Water purification, heavy metal removal

(Source: Leone et al., 2015; Fahey, 2005)

PHARMACOLOGICAL ACTIVITIES:

Activity	Mechanism or Evidence
Antioxidant	Phenolics, flavonoids scavenging ROS
Antimicrobial	Inhibition of bacterial/fungal growth
Anti-cancer	Suppression of tumor cell proliferation
Anti-diabetic	Regulation of blood glucose levels
Anti-inflammatory	Reduction of pro-inflammatory mediators

(References: Saini et al., 2016; Gopalakrishnan et al., 2016)

CHALLENGES AND FUTURE PROSPECTS:

- Standardization of Moringa-based products.
- Clinical trials for therapeutic claims.
- Commercial-scale cultivation practices.
- Development of bio-nanotechnology using *Moringa* extracts.

CONCLUSION:

Moringa oleifera stands out as a multi-purpose plant of high nutritional and medicinal value. Its rich phytochemical profile makes it beneficial for human health, while its ability to purify water and enrich soils makes it valuable for sustainable agriculture. Future research and industrial innovations hold promise to unlock its full potential globally.

REFERENCES:

1. Anwar, F., Latif, S., Ashraf, M., & Gilani, A. H. (2007). Moringa oleifera: A food plant with multiple medicinal uses. *Phytotherapy Research*, 21(1), 17-25.
2. Fahey, J. W. (2005). Moringa oleifera: A review of the medical evidence for its nutritional, therapeutic, and prophylactic properties. *Part 1. Trees for Life Journal*, 1(5).
3. Gopalakrishnan, L., Doriya, K., & Kumar, D. S. (2016). Moringa oleifera: A review on nutritive importance and its medicinal application. *Food Science and Human Wellness*, 5(2), 49-56.
4. Leone, A., Spada, A., Battezzati, A., Schiraldi, A., Aristil, J., & Bertoli, S. (2015). Moringa oleifera seeds and oil: Characteristics and uses for human health. *International Journal of Molecular Sciences*, 16(12), 12791-12835.
5. Singh, B. N., Singh, B. R., Singh, R. L., Prakash, D., Dhakarey, R., Upadhyay, G., & Singh, H. B. (2009). Oxidative DNA damage protective activity, antioxidant and anti-quorum sensing potentials of Moringa oleifera. *Food and Chemical Toxicology*, 47(6), 1109-1116.
6. Tsaknis, J., Lalas, S., Gergis, V., Dourtoglou, V., & Spiliotis, V. (1999). Characterization of Moringa oleifera seed oil variety "Periyakulam 1". *Journal of Food Lipids*, 6(2), 123-132.
7. Ndabigengesere, A., Narasiah, K. S., & Talbot, B. G. (1995). Active agents and mechanism of coagulation of turbid waters using Moringa oleifera. *Water Research*, 29(2), 703-710.
8. Saini, R. K., Shetty, N. P., & Giridhar, P. (2016). Carotenoid content in vegetative and reproductive parts of commercially grown Moringa oleifera Lam. cultivars from India by LC–APCI–MS. *European Food Research and Technology*, 242(12), 1637-1644.