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"Medicinal and Economic Value of Moringa (*Moringa oleifera*): A Comprehensive Overview"

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Abstract: -

Moringa oleifera Lam. is a multipurpose plant with considerable nutritional, medicinal and economic value. Its leaves and pods provide important nutrients, while dried leaves offer a concentrated source of protein and minerals. Per 100 g, fresh leaves contain 9.40 g protein, 185.00 mg calcium and 51.70 mg vitamin C, whereas dried leaves contain 24.00 g protein, 1897.00 mg calcium and 172.00 mg vitamin C. The plant is also rich in glucosinolates, isothiocyanates, flavonoids and phenolic compounds associated with various biological activities. Its economic potential extends to fresh pods, leaf powder, seed oil, nutraceuticals, food products and cosmetics. Under suitable conditions, moringa may produce approximately 15-25 tonnes of fresh pods per hectare, depending on variety and production practices, while farm returns of about 2.0-5.5 lakh Rs. per hectare may vary according to yield, prevailing market prices and cultivation practices. This review examines the nutritional, medicinal and economic significance of moringa, with emphasis on value addition, income generation and livelihood opportunities.

Introduction:

Moringa oleifera Lam., commonly known as moringa or drumstick tree, is a multipurpose plant belonging to the family Moringaceae. It is widely valued for its nutritional, medicinal and economic importance. The plant is believed to have originated in the sub-Himalayan tracts of the Indian subcontinent and is now grown in many tropical and subtropical regions of Asia, Africa, Latin America and the Caribbean. India is the largest producer and exporter of drumstick in the world and the crop is cultivated in several states, including Tamil Nadu, Andhra Pradesh, Karnataka, Telangana

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and Maharashtra (Yadav et al., 2026). Published estimates of production vary, ranging from about 1.1-1.3 million tonnes of tender pods from nearly 38,000 hectares (Yadav et al., 2026) to about 2.6 million tonnes from nearly 43,600 hectares (Uikey et al., 2026). Tamil Nadu is the pioneering state, with a wide range of genotypes and has established a Moringa Export Zone centred at Madurai, where about 93 per cent of the state's 19,867 hectares under moringa is located . Nearly 70 per cent of the moringa area in India is reported to be under irrigation and the remaining 30 per cent under rainfed conditions (Yadav et al., 2026). Its ability to grow under warm and relatively dry conditions makes it

Table 1: Major Moringa Varieties Relevant to India and Chhattisgarh

S. No.	Variety	Type	Important characteristics / yield potential	Relevance
1	PKM-1 (Periyakulam-1)	Annual / improved	Early flowering, good pod quality; reported yield potential around 50–54 t/ha	Major variety in India; cultivated and evaluated in Chhattisgarh
2	PKM-2 (Periyakulam-2)	Annual / hybrid-derived	High-yielding; reported potential around 98 t/ha under suitable conditions	Major improved variety in India
3	PKM-3	Annual	Recently released by TNAU (2024); improved annual moringa	Emerging improved variety in India
4	Bhagya (Dhanraj / KDM-1)	Perennial	Good pod quality and suitable for perennial cultivation; performance reported under Indian conditions	Important perennial type; relevant to central India
5	Thar Harsha	Annual	About 53–54.7 t/ha yield potential; high nutritional quality reported	Improved variety for Indian conditions
6	Thar Tejas	Annual	Early flowering and maturity; long pods and good pod production	Improved variety for semi-arid/rainfed conditions
7	Local/Traditional genotypes	Perennial/local	Wide genetic variation; characteristics vary by location	Important genetic resource in Chhattisgarh and central India

suitable for cultivation in different agro-climatic environments, including arid and semi-arid regions.

Moringa oleifera is a fast-growing, small to medium-sized perennial tree with a slender stem, spreading branches and a well-developed taproot. Its leaves are compound and contain appreciable amounts of protein, vitamins, minerals, antioxidants and other bioactive compounds. The plant produces fragrant, whitish flowers and long, slender pods commonly known as drumsticks, which are widely consumed as a vegetable. The mature seeds are a valuable source of oil used in food, cosmetics and other products. Almost every part of the plant, including leaves, pods, flowers, seeds, roots and bark, has been used traditionally for various purposes. The presence of several bioactive compounds and reported antioxidant, anti-inflammatory and antimicrobial properties has increased interest in moringa. At the same time, its diverse products offer opportunities for value addition, rural employment and income generation, making moringa an important crop for sustainable agriculture and livelihood development.

The growing demand for natural, plant-based foods and health products has further increased the commercial importance of moringa in both domestic and international markets. Indian moringa products are exported to several countries, including Saudi Arabia, South Africa, Australia, France, the Netherlands, Thailand, Hong Kong and China (Yadav et al., 2026). Its versatility and relatively low production requirements make it particularly promising for small and marginal farmers seeking additional sources of farm income. This article reviews the nutritional composition, bioactive compounds, medicinal properties and economic importance of moringa, with emphasis on its production, value addition and income-generation potential.

Nutritional Composition of Moringa

Moringa oleifera is highly nutritious, particularly its leaves, which are rich in protein, dietary fibre, vitamins, minerals and bioactive compounds. The leaves provide important nutrients such as calcium, iron, potassium and vitamins A and C, while pods also contribute valuable nutrients to the diet. Its diverse nutritional profile makes moringa suitable for nutritional supplementation, functional foods and value-added products.

Medicinal and Pharmacological Properties

Moringa oleifera has received considerable attention because of its wide range of traditional and potential medicinal uses. Different parts of the plant, especially the leaves, seeds and pods, contain several biologically active compounds such as flavonoids, phenolic compounds,

glucosinolates and isothiocyanates. These compounds are associated with various beneficial biological activities, including antioxidant, anti-inflammatory, antidiabetic and antimicrobial effects. Studies have also indicated possible cardioprotective, hepatoprotective and anticancer properties of moringa. However, the available evidence is not equally strong for all these effects and many findings are based on laboratory and animal studies.

Table 2: Nutritional composition of *Moringa oleifera* leaves and pods per 100 g edible portion

Nutritional component	Fresh leaves	Dried leaves	Fresh pods
Energy (kcal)	64.00	304.00 ± 87.00	37.00
Water (g)	78.66	–	88.20
Protein (g)	9.40	24.00 ± 5.80	2.10
Total lipid/Fat (g)	1.40	6.00 ± 2.50	0.20
Carbohydrate (g)	8.28	36.00 ± 9.20	8.53
Dietary fibre (g)	2.00	20.60	3.20
Vitamin A (µg RAE)	378.00	3639.00 ± 1979.80	4.00
Vitamin C (mg)	51.70	172.00 ± 37.70	141.00
Vitamin B_1 (mg)	0.05	2.60	0.05
Vitamin B_2 (mg)	0.07	1.29	0.07
Vitamin B_3 (mg)	0.62	8.20	0.62
Calcium (mg)	185.00	1897.00 ± 748.40	30.00
Potassium (mg)	337.00	1467.00 ± 636.70	461.00
Phosphorus (mg)	112.00	297.00 ± 149.00	50.00
Magnesium (mg)	42.00	473.00 ± 429.40	45.00
Iron (mg)	4.00	32.50 ± 10.78	0.36
Zinc (mg)	0.60	2.40 ± 1.12	0.45
Copper (mg)	0.11	0.90 ± 0.48	0.08
Manganese (mg)	1.06	–	0.26
Selenium (µg)	0.90	–	0.70

Source: Adapted from published nutritional reviews based primarily on USDA nutrient data for Moringa oleifera.

⇨ **Antioxidant Activity:** Moringa leaves are a good source of phenolic compounds, flavonoids and carotenoids, which help protect cells from oxidative damage caused by free radicals. Extracts prepared from the leaves and other parts of the plant have shown antioxidant activity in several experimental studies. This property is one of the important reasons for the growing interest in moringa as a functional food and natural source of antioxidants.

- **Anti-inflammatory Activity:** Moringa contains several compounds that may help regulate inflammatory responses in the body. Flavonoids, phenolic compounds and isothiocyanates found in the plant have shown anti-inflammatory effects in experimental studies. These findings suggest that moringa may have potential in managing conditions associated with excessive or prolonged inflammation.
- **Antidiabetic Potential**: The possible role of moringa in maintaining healthy blood glucose levels has received increasing research attention. Studies using moringa leaf and seed extracts have reported reductions in blood glucose levels in experimental models. These effects may be related to the presence of bioactive compounds that influence glucose metabolism and carbohydrate digestion. However, more human studies are needed to establish its effectiveness and appropriate use.
- **Antimicrobial Activity:** Different parts of *Moringa oleifera* have demonstrated antimicrobial activity against certain bacteria and fungi. Compounds present in the leaves, seeds and other plant parts may interfere with the growth of microorganisms. This property has encouraged research into the possible use of moringa extracts as natural antimicrobial ingredients in food and other applications.
- **Cardioprotective Effects:** The antioxidant and anti-inflammatory properties of moringa may also contribute to cardiovascular health. Experimental studies have reported potential beneficial effects on lipid levels, oxidative stress and other factors associated with cardiovascular health. Nevertheless, further clinical research is necessary to determine the extent of these effects in humans.
- **Hepatoprotective Effects:** Moringa has also shown potential protective effects on the liver. In experimental studies, extracts from different parts of the plant have helped reduce biochemical and oxidative changes associated with experimentally induced liver damage. The antioxidant activity of its phytochemicals may play an important role in this protective effect.
- **Anticancer Potential:** Research on *Moringa oleifera* has also explored its potential anticancer properties. Certain compounds, particularly flavonoids, phenolic compounds and isothiocyanates, have shown the ability to influence cancer-related processes such as cell growth and programmed cell death in laboratory studies. Although these findings are promising, most of the available evidence comes from in-vitro and animal

experiments. Therefore, clinical studies are still needed before any therapeutic conclusions can be drawn.

Bioactive Compounds

Moringa oleifera contains a variety of naturally occurring compounds that are believed to contribute to its nutritional and health-related properties. The type and amount of these compounds can differ depending on the plant part, variety, stage of maturity, growing conditions and processing method. Among the important bioactive constituents of moringa are glucosinolates, isothiocyanates, flavonoids and phenolic compounds, along with several essential vitamins and minerals. Together, these components make moringa an important plant for nutritional and functional food applications.

- **Glucosinolates:** Glucosinolates are sulfur-containing compounds naturally present in different parts of the moringa plant. One of the major glucosinolates reported in *Moringa oleifera* is glucomoringin. These compounds are of particular interest because they can be converted into other biologically active substances when plant tissues are damaged or processed. Their concentration may vary with plant age and growing conditions.
- **Isothiocyanates:** Isothiocyanates are formed mainly from glucosinolates through enzymatic breakdown. They have received considerable research attention because of their potential antioxidant, antimicrobial and anti-inflammatory activities. Moringa-derived isothiocyanates are therefore considered important compounds when studying the possible health benefits of the plant.
- **Flavonoids:** Flavonoids are another important group of compounds found mainly in moringa leaves and seeds. Quercetin, kaempferol, catechin and isorhamnetin are among the flavonoids reported in the plant. These compounds are well known for their antioxidant properties and may also contribute to the anti-inflammatory effects associated with moringa.
- **Phenolic Compounds**: Moringa contains several phenolic compounds and phenolic acids, including gallic acid, caffeic acid, ferulic acid, chlorogenic acid and p-coumaric acid. These compounds can help neutralize free radicals and are considered important contributors to the antioxidant capacity of moringa. Their presence also adds to the potential value of moringa as a functional food ingredient.
- **Vitamins and Minerals:** Apart from its phytochemicals, moringa is a useful source of several essential nutrients. The leaves contain important amounts of provitamin A, vitamin C, calcium, iron, magnesium

and potassium. These nutrients play important roles in maintaining normal body functions, including immunity, bone development, blood formation and electrolyte balance. The combination of essential nutrients and bioactive compounds makes moringa particularly valuable for nutritional and dietary applications.

Economic Importance of Moringa

Moringa oleifera has considerable economic value because almost every part of the plant can be used for food, health, processing and industrial purposes. Its leaves, pods and seeds provide opportunities for both primary agricultural production and value-added enterprises. The increasing demand for natural foods, herbal products and plant-based ingredients has further expanded the commercial potential of moringa.

- **Leaves and Leaf Powder**: Fresh moringa leaves are consumed as a vegetable and are also used in soups, curries and other food preparations. Dried leaves can be processed into moringa leaf powder, which has a longer shelf life and can be incorporated into health foods, beverages and dietary supplements. Leaf powder provides an opportunity for farmers and small processors to add value to fresh produce.
- **Seeds and Oil:** Moringa seeds are economically important because they contain valuable oil, often known as ben oil. The oil is used in food, cosmetics, personal-care products and other applications. The remaining seed cake can also be explored for further uses, including water treatment, thereby improving the overall economic utilization of the crop.
- **Pods:** Young moringa pods, commonly called drumsticks, are widely consumed as a vegetable, particularly in South Asian countries. They have an established domestic market and provide regular income opportunities for growers. Fresh pods can also be processed into dried or other value-added products, helping to reduce losses during periods of high production.
- **Moringa-based Food Products:** The nutritional qualities of moringa have encouraged the development of several value-added products, including tea, biscuits, noodles, soups, beverages, bakery products, capsules and fortified foods. Such products can create additional income opportunities through small-scale processing, packaging and marketing.
- **Cosmetics and Nutraceuticals:** Moringa seed oil, leaf extracts and other plant-derived ingredients are increasingly used in cosmetic and personal-care products,

including skin-care and hair-care formulations. Similarly, moringa leaf powder and extracts are marketed as ingredients in nutraceutical and dietary products. These sectors offer opportunities for higher-value processing compared with the sale of raw plant material.

Employment and Income-Generation Potential

Moringa oleifera has good potential to support farm income and create employment, especially for small and marginal farmers. Employment opportunities are generated not only through cultivation but also through nursery raising, harvesting, grading, processing, packaging and marketing. Under suitable growing conditions, moringa can produce around 15-25 tonnes of fresh pods per hectare, although actual production depends on variety, plant population, management practices and local climate. Studies from India suggest that moringa cultivation can provide net returns of roughly 2.0 5.5 lakh Rs. per hectare, with benefit-cost ratios generally ranging from 1.6 to 2.5 under favourable conditions.

The income potential of moringa can be further improved through value addition. Leaves can be processed into leaf powder, tea, nutritional supplements and other food products, while seeds can be used for oil extraction. These activities create additional opportunities for rural households, self-help groups and small entrepreneurs. Therefore, better processing facilities, market linkages and local value chains can help farmers obtain greater returns while supporting rural employment, entrepreneurship, crop diversification and sustainable livelihoods.

Value Addition and Commercial Products

Moringa oleifera is a highly versatile crop because almost every part of the plant can be processed into food, nutraceutical, cosmetic, pharmaceutical and environmental

Table 3: Major Value-Added and Commercial Products from *Moringa oleifera* in India

Category	Major Products
Leaf-based Products	Fresh leaves, dried leaves, leaf powder, herbal tea, tea bags, juice, chutney, soup powder, seasoning powder
Pod-based Products	Fresh pods (drumsticks), dried pods, pod powder, pickle, canned and processed drumsticks
Seed-based Products	Seed powder, seed oil (Ben oil), cold-pressed oil, seed cake
Food and Bakery Products	Biscuits, cookies, bread, cakes, noodles, pasta, crackers, soup, beverages, fortified foods
Nutraceutical and Health Products	Capsules, tablets, dietary supplements, herbal extracts, functional foods, nutritional formulations
Cosmetic and Personal-Care Products	Hair oil, skin-care products, soap, cream, lotion, shampoo and other oil-based cosmetic products

products. Value addition helps extend shelf life, improve product quality and increase the economic returns from leaves, pods and seeds. The major products obtained from different parts of moringa include: **Table No 3.**

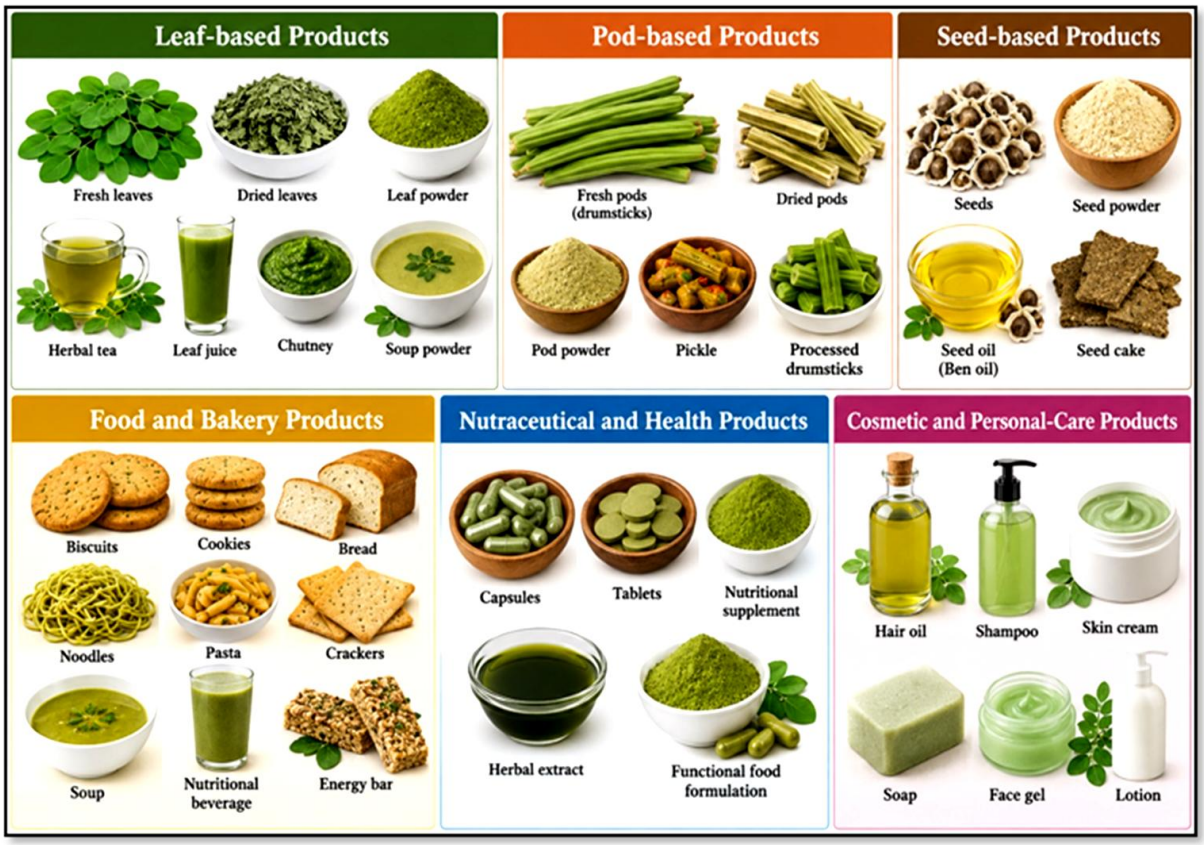


Figure 1. Major Value-Added and Commercial Products Derived from *Moringa oleifera*

Conclusion

Moringa oleifera is a highly versatile plant with substantial nutritional, medicinal and economic potential. Its leaves, pods and seeds provide valuable nutrients and bioactive compounds, while its diverse biological properties support its growing importance in food, health and wellness applications. Beyond nutritional and medicinal uses, moringa offers opportunities for value addition through leaf powder, seed oil, nutraceuticals, processed foods and cosmetic products. Its profitability, however, depends on variety, yield, production practices and prevailing market prices. Strengthening processing, product development, market linkages and small-scale enterprises can help convert this potential into sustainable farm income and rural employment. Overall, wider adoption of improved production and value-addition practices can enhance the commercial utilization of moringa and contribute to livelihood improvement and sustainable agricultural development.

References

1. Farooq, B., & Koul, B. (2020). Comparative analysis of the antioxidant, antibacterial and plant growth promoting potential of five Indian varieties of *Moringa oleifera* L. *South African Journal of Botany, 129*, 47–55.
2. Leone, A., Spada, A., Battezzati, A., Schiraldi, A., Aristil, J., & Bertoli, S. (2015). Cultivation, genetic, ethnopharmacology, phytochemistry and pharmacology of *Moringa oleifera* leaves: An overview. *International Journal of Molecular Sciences, 16*(6), 12791–12835.
3. Meireles, D., Gomes, J., Lopes, L., Hinzmann, M., & Machado, J. **(2020).** A review of properties, nutritional and pharmaceutical applications of *Moringa oleifera*: Integrative approach on conventional and traditional Asian medicine. *Advances in Traditional Medicine, 20*(4), 495–515.
4. Tamil Nadu Agricultural University. (n.d.). *Drumstick (Moringa oleifera): Varieties and production technologies*. Agricultural Technology Portal, TNAU.
5. Uikey, P., Singathiya, P., Sharma, N., & Dixit, G. (2026). Moringa: An underutilized multipurpose powerful vegetable for nutritional security. *Indian Horticulture, 71*(1), 14–17.
6. Yadav, L. P., Choudhary, B. R., & Singh, A. K. (2026). Cultivation of drumstick: A ray of hope for nutritional and socio-economic security in arid and semi-arid region. In *Harnessing the potential of underutilized horticultural crops of arid and semi-arid region for food, nutritional and economic security.*
7. Zhang et al. (2024). *Extraction, structural properties and bioactivities of Moringa (Moringa oleifera Lam.) isothiocyanates: A review*. *Food Bioscience, 57*, 103447.

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