

## Moringa Oleifera: A Magical Tree: A Review

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### ABSTRACT

*Moringa oleifera* is an angiospermic plant commonly known as drumstick or sehjan. *Moringa oleifera* is also known as the miracle tree, which for centuries has been indicated for traditional medicine. With no reports of side effects, in doses achievable by ingestion, different parts of *M. oleifera* is used to treat several conditions, such as malnutrition, diabetes, blindness, anemia, hypertension, stress, depression, skin, arthritis, joints and kidney stones disorders. This plant also showed capacity of helping in maintenance of the cardiovascular system health, blood-glucose levels and providing anti-oxidant, anti-inflammatory and anti-cancer activity as well as the regulation of urinary tract and lactation in nursing women. The seed and leaves powder has water purification properties through flocculation. So, *M. oleifera* properties have also been applied to cosmetic and by products industries due to the high nutritive and protective properties of its seed oil. It has a lot of nutritional value and therapeutic activity that's why we say this is a magical tree.

**Keywords:** *Moringa oleifera*, Drumstick or Sehjan, Angiospermic Plant .

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### INTRODUCTION

*Moringa oleifera* is an Angiospermic plant commonly known as the 'drumstick' or horseradish' tree. It belongs to genus *Moringa* having 13 different species. Among them, *Moringa oleifera* is the most widely cultivated species native to tropical and sub-tropical region of world. *Moringa oleifera* is a tropical deciduous perennial dicotyledonous tree. It has different names in different countries like "Shiferaw" in Ethiopia and drumstick tree or horseradish tree in India and 'Sitalchini', Munga, Sahijan or Saijan in Nepal[1]. *Moringa oleifera* is one of the vegetables of the Brassica order and belongs to the family Moringaceae. The Moringaceae is a single genus family with 13 known species[2]. *Moringa* is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, *moringa* is said to provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach[3]. *Moringa* leaves have been reported to be a rich source of  $\beta$ -carotene, protein, vitamin C, calcium and potassium and act as a good source of natural antioxidants; and thus enhance the shelf-life of fat containing foods due to the presence of various types of antioxidant compounds such as ascorbic acid, flavonoids, phenolics and carotenoids [4&5]. Traditional Medicine; *Moringa* has been used in the traditional medicine passed down for centuries in many cultures around the world, for skin infections, anemia, anxiety, asthma, blackheads, blood impurities, bronchitis, catarrh, chest congestion, cholera, conjunctivitis, cough, diarrhea, eye and ear infections, fever, glandular, swelling, headaches, abnormal blood pressure, hysteria, pain in joints, pimples, psoriasis, respiratory disorders, scurvy, semen deficiency, sore throat, sprain, tuberculosis, for intestinal worms, lactation, diabetes and pregnancy. The present review is intended to create public awareness regarding benefit of an edible plant *Moringa* which is also known as miracle tree. The healing properties of *Moringa* oil, have been documented by ancient cultures. *Moringa* oil has tremendous cosmetic value and is used in body and hair care as a moisturizer and skin conditioner. *Moringa* oil has been used in skin preparations and ointments since Egyptian times[6].

#### 1. Part of moringa tree and its activity:

##### Leaf activity:

In India and the Philippines, village people use the fresh leaves to prepare fatty foods to increase the shelf life of these foods due to *Moringa* leaves being a good source of natural antioxidants [7]. *Moringa oleifera* leaves are clinically used to treat catarrh, bronchitis, sore throat, headaches, constipations, which corresponds to an excess of Kapha which causes the tendency to produce mucous and obstruction in the sinus and nasal passages, lungs and colon. flower pod activity[8]. *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, anti microbial, Antioxidant, anti diabetic and anti-atherosclerotic agents, neuro protectant. 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, terpenoids, phenolics, alkaloids and flavanoids like quercetin, isoquercetin, kaemfericetin, isothiocyanates and glycoside. Calcium builds healthy bones and teeth and assists in blood-clotting. The seasonal effects on calcium content were different. For winter sample, stalk has highest calcium content while the lowest was stem (Table 1). On the other hand, highest calcium content of Moringa for summer sample was leaf while the lowest was stalk. In Taiwan, the leaves and stems of Moringa are used as vegetables and the stalks are used for soup or stew[7]. The crude protein content (based on wet basis) of Moringa leaves (5.4%) is higher than protein content of alfalfa sprout (3.7%), sweet potato leaves (3.3%), and mung bean sprout. Incorporation of 0.1% extract of MOL (100 mg/ 100 g meat) could protect cooked goat meat patties against lipid oxidation during refrigerated storage. The MOL extract was more effective than BHT in maintaining low TBARS number of precooked chilled goat meat patties[9]. In conclusion, the activity from this study shows the potential value of Moringa oleifera leaf extracts in the management of haemonchosis, since inhibition of egg embryonation, egg hatch and mortality of L1 and L2 larvae, It is important in reducing pasture contamination thereby helping in the overall helminth control programme[10].

### **Flowers and pods activity:**

The flowers were believed to be beneficial and effective for helping to let go of traumatic memories that obstructed the mind, guilt, emotional wounds and phobias. *M. oleifera* flowers are said to encourage positive thinking and to renew the view on life, bringing light to the spirit[11]. The methanol extract of Moringa oleifera flower pods has vast potential as a nutraceutical and a natural substitute to synthetic food preservatives. Further research is necessary for real application of these extracts in food as extrapolation of results from in vitro studies to food products is not straight forward due to complex nature of food and different interconnecting environments[11]. A methanol extract of *M. oleifera* flowers revealed anti-cancer properties by inhibiting growth of PC3 cells (androgen-independent model of prostate cancer) in a dose-dependent manner, while not affecting the viability of normal cells[12]. 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. Moringa flowers act as hypocholesterolemic, anti-arthritis agents can cure urinary problems and cold. It contains calcium and potassium and amino acids. They also contain nectar[13].

### **Seeds activity:**

Seeds, collected from pods, can be eaten raw or cooked. From *M. oleifera* seeds, a rich vegetable oil can be produced. *M. oleifera* seed oil or Behen/Ben oil is produced through the cold pressing of the *M. oleifera* seeds. *M. oleifera* oil can be used to cook, as a source to prepare biodiesel, as a lubricant and in the cosmetic industry. It is also a good skin cleansing product[12]. Moringa oleifera seeds are clinically used to treat hypertension, neuralgia indicating an excess of Vata, and to treat constipation which belongs to an excess of kapha[12]. Seed powder showed capacity to purify water and remove heavy metals and organic compounds. The oil name comes from its high content on behenic acid, which confers more resistance to oxidative degradation comparing to other vegetable oils. Ben oil is rich in oleic acid (up to 76%), palmitic (6.54%), but also stearic (6%), behenic (7%), and arachidic (4%). It is used in various cosmetic formulations as emollient and confers nourishing, moisturizing, antioxidant and protective properties. Seeds of moringa help in treating hyperthyroidism, Crohn's disease, anti herpes-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[13].

### **Bark activity:**

The bark also has antimicrobial properties (Table 5). Root bark extracts by ethanol, methanol and distilled water showed antifungal activity against *Neurospora crassa* and *Aspergillus niger*, in which the higher the concentration, the higher mycelial inhibition, with a duration up to 96 h. Antibacterial activity was also verified in a study with methanol, chloroform, ethyl acetate and water bark extracts. *Staphylococcus aureus*, *Citrobacter freundii*, *Bacillus megaterium* and *Pseudomonas fluorescens* growth was inhibited by all extracts in different concentrations and in different degrees. In Ayurvedic Medicine tradition, *M. oleifera* roots are clinically used to treat epilepsy, hysteria, cardiac diseases, colic and flatulence, as well as anxiety. All these diseases correspond to an excess of Vatta, which force can cause nerve irritation, high blood pressure, flatulence and confusion[12]. Root Bark Root bark acts as a cardiac stimulant, anti-ulcer and anti-inflammatory agent. Alkaloids like morphine, moriginine, minerals like calcium, magnesium and sodium[13].

## **2. Nutritive properties:**

Every part of *M. oleifera* is a storehouse of important nutrients and antinutrients. The leaves of *M. oleifera* are rich in minerals like calcium, potassium, zinc, magnesium, iron and copper [14]. Vitamins like beta-carotene of vitamin A, vitamin B such as folic acid, pyridoxine and nicotinic acid, vitamin C, D and E also present in *M. oleifera* [15]. Phytochemicals such as tannins, sterols, terpenoids, flavonoids, saponins, anthraquinones, alkaloids and reducing sugar present along with anti-cancerous agents like glucosinolates, isothiocyanates, glycoside compounds and glycerol-1-9-octadecanoate [9]. Moringa leaves also have a low calorific value and can be used in the diet of the obese. The pods are fibrous and are valuable to treat digestive problems and thwart colon cancer [16], nutritional value of moringa:

Contents	PODS	LEAVES	LEAF POWDER
Moisture (%)	86.9	75.0	7.5
Calories	26.0	92.0	205.0
Protein (g)	2.5	6.7	27.1
Fat (g)	0.1	1.7	2.3
Carbohydrate (g)	3.7	13.4	38.2
Fiber (g)	4.8	0.9	19.2
Minerals (g)	2.0	2.3	-
Ca (mg)	30.0	440.0	2.003
Mg (mg)	24.0	24.0	368.0
P (mg)	110.0	70.0	204.0
Cu (mg)	3.1	1.1	0.57
Fe (mg)	5.3	7.0	28.2
S (mg)	137.0	137.0	870.0
Oxalic acid (mg)	10.0	101.0	1.6%
Vitamin A - B carotene (mg)	0.11	6.8	16.3
Vitamin B -choline (mg)	423.0	423.0	-
Vitamin B1 -thiamin (mg)	0.05	0.05	2.64
Vitamin B2 -riboflavin (mg)	0.07	0.05	20.5

### 3. Medicinal properties:

#### 3.1. Anti-inflammatory properties:

The most promising uses of Moringa extract is in the treatment of many types of chronic and acute inflammations. Inflammation can lead to chronic diseases like diabetes, respiratory problems, cardiovascular disease, arthritis, and obesity. Moringa reduces inflammation by suppressing inflammatory enzymes and proteins in the body, and leaf concentrate can significantly lower inflammation in the cells [17].

#### 3.2. Anticancer property:

*M. oleifera* can be used as an anticancer agent as it is natural, reliable and safe, at established concentrations. Studies have shown that moringa can be used as an anti-neoproliferative agent, thereby inhibiting the growth of cancer cells. Soluble and solvent extracts of leaves have been proven effective as anticancer agents. Furthermore, research papers suggest that the anti-proliferative effect of cancer may be due to its ability to induce reactive oxygen species in the cancer cells. Researches show that the reactive oxygen species induced in the cells leads to apoptosis. This is further proved by the up regulation of caspase 3 and caspase 9, which are part of the apoptotic pathway. Moreover, the ROS production by moringa is specific and targets only cancer cells, making it an ideal anticancer agent [13].

#### 3.3. Hepato protective properties:

Moringa play very crucial role to protect liver against damage, oxidation, toxicity due to high concentrations of polyphenols in its leaves and flowers. Moringa oil can also restore liver enzymes to normal levels, reducing oxidative stress, and increasing protein content in the liver. The liver is responsible for blood detoxification, bile production, fructose metabolism, fat metabolism, and nutrient processing, and it can only fulfil these functions with the aid of liver enzymes, so it's vital they stay at normal levels. For instance, lower levels of hepatic enzymes can impair its ability to filter the blood [17].

#### 3.4. Antihypertensive properties:

The widespread combination of diuretic along with lipid and blood pressure lowering constituents make this plant highly useful in cardiovascular disorders. Moringa leaf juice is known to have a stabilizing effect on blood pressure. Nitrile, mustard oil glycosides and thiocarbamate glycosides have been isolated from Moringa leaves, which were found to be responsible for the blood pressure lowering effect.

### 3.5. Cholesterol lowering:

Moringa fruit has been found to lower the serum cholesterol, phospholipids, triglycerides, low density lipoprotein (LDL), very low density lipoprotein (VLDL) cholesterol to phospholipid ratio, atherogenic index lipid and reduced the lipid profile of liver, heart and aorta in hypercholesteremic rabbits and increased the excretion of fecalcholesterol. It was recently discovered that the Moringa.

### 3.6. Antifibrotic/ulcer

*Oleifera* seed extract exhibited antifibrotic effects on liver fibrosis in rats, it show significant protective effect against cc14 induced liver fibrosis in rat which was confirmed by histological finding as well as biochemical analysis a marker of collagen position in liver known as hydroxyproline treatment with Moringa was found to stimulate hepatoprotective effects against hepato cellular injury by blocking the increase of two serums, Aspartate aminotransferase (AST) and alanine aminotransferase (ALT), which are indicators of liver health conditions[17].

### 4. Other activity:

It is good water purifier ,also have antioxidant property, it has antifungal antiviral ,and also hveantgibacterial activity. In a study result showed that treatment with Moringaoleifera leave extract restores mono amine levels of brain which may be useful in Alzheimer's disease. Methanolic extract of Moringaoleifera root bark was tested on frog and guinea pig and it shown local anaesthetic activity in both animal models.

### 5. The psychological and spiritual properties of M. oleifera

Concerning Ayurvedic ancient texts, is mentioned the psychological and spiritual properties of M. oleifera, which is described as powerful herb that penetrates the deep layers of body's tissues and particularly into the bone marrow, which is the deepest tissues of all. Moringa oleifera has a powerful action in purifying the blood, removing impurities, toxins, parasites and metabolic wastes, helping to rejuvenate cells. Moringa oleifera acts and influences at mental, emotional, energetic and spiritual level altogether, having a strong effect in the personality. In terms of influencing the mind, M. oleifera was tested by scientific research, which proved to have anti-depressive and anxiolytic effects, as well consideredan adaptogenic and anti-stress herb. Leaves The leaves remarkable nutritional properties, are said to restore self-confidence and address indecisiveness. Ancient ayurvedic physicians also used the leaves to bring clarity and restore the body at deep levels, which both contribute to a feeling of certainty, courage and fearless. Root The roots of the plant are said to be mildly calming and grounding, as is often the case with root medicines. The root is known to enhance feelings of serenity and balance as well as helping to keep one cantered in times of change or uncertainty[18].

### CONCLUSION & FUTURE ASPECT:

The *Moringa Oleifera* plant is the most inexpensive and credible alternative to not only providing good nutrition, but also the cure and prevention of a lot of diseases. *Moringa* tree could easily and cheaply be cultivated and grown in India. We need to design and develop strategy on war footing in order to explore and utilize full benefits of this miracle tree. The research project should be made for commercial production of food product, nutraceuticals, *Moringa* oil {edible as well as cosmetics}, fortified feed for cattle, biogas, and plant fertilizer. The plants for water purification by moringa should be designed. The clinical studies with human subjects should be taken to investigate: nutrient bio-availability and bio-toxicity, positive effects on the immune system in fighting diseases, such as: malnutrition, HIV/AIDS, and sexually transmitted infections tuberculosis effects claimed by traditional medicine in regard to diseases, such as: hypertension, diabetes and high blood pressure, antioxidant properties in fighting diseases, such as: heart disease, cancer and Alzheimer's disease. The poor countries should promote planting and use of *Moringa* instead of waiting for bounties of food relief from the rich west. Pakistan could easily fight against the problems of malnutrition, hunger, poverty, diseases, unemployment, and edible oil export by utilizing its full benefits. The lot foreign exchange could be earned by exporting product of *Moringa* instead spending foreign exchange on imports. *Moringa* truly appears to be a "Miracle" plant having countless benefits for humanity and thus should be taken as a high-quality gift of nature at very low price. Further research to isolate endophytic fungi and identify the enzymes or proteins from *M. oleifera* that are accountable for the anticancer and antidiabetic activity may lead to development of novel therapeutic compounds. Yet another focal area is to evaluate the commercial use of *M. oleifera* as a bio-coagulant. It might be a viable alternative for water purification. The demand for snacks in the market is huge. Hence Moringa fortification in snacks to eradicate malnutrition has a twin advantage. The tree as a native to India can become a great source of income for the nation if this potential for highly nutritional food is exploited by the industries and researchers by undertaking further research to corroborate earlier studies.

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