Moringa oleifera Lam. is a powerful antioxidant, antimicrobial and natural energy booster of the 21st century

[Article ID: SIMM0325]

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Introduction

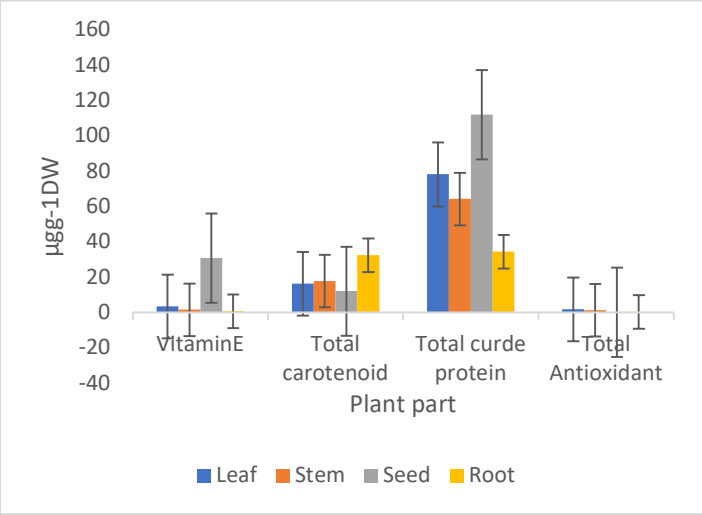
Moringa oleifera Lam. is a perennial softwood tree, known for its traditional medicinal and industrial uses. Native to the Indian subcontinent, it is a fast-growing drought-resistant tree belonging to the Moringaceae family, commonly known as 'sahajan' in Hindi, Horse radish in English. It is known as the drumstick tree based on the appearance of its immature seed pods, the horseradish tree based on the flavour of ground root preparations, and the ben oil tree from the oil obtained from the seeds. In some areas, the immature seed pods are eaten, while the leaves are widely used as a staple food due to their high nutritional content (Thurber and Fahey, 2009; Mbikay, 2012). Recently, i.e., in the 21st century, this tree has become an excellent indigenous source of highly digestible protein, calcium (Ca), iron (Fe), vitamin C and carotenoids. It is considered a very good supplement due to its high protein value. Apart from that, it is known as a miracle tree due to its diverse beneficial properties, for example, 10 times more vitamins than carrots, 7 times more vitamin C than oranges, 17 times more calcium than milk and 15 times more potassium than bananas. Seeds, leaves, oil, sap, bark, roots, and flowers are widely used in traditional medicine. Moringa leaves have been characterized to contain a desirable nutritional balance, containing vitamins, minerals, amino acids, and fatty acids (Moyo et al., 2011). Additionally, the leaves are reported to contain various types of antioxidant compounds such as ascorbic acid, flavonoids, phenolics, and carotenoids (Alhakmani et al., 2013). According to several commentaries (Anwar et al., 2007), various preparations of M. oleifera are used for their anti-inflammatory, antihypertensive, diuretic, antimicrobial, antioxidant, antidiabetic antihyperlipidemic, antineoplastic, antipyretic, antiulcer, cardio protectant, and hepatoprotection activities. The therapeutic potential of M. oleifera leaves in treating hyperglycaemia and dyslipidaemia was reviewed by Mbikay (2012).

Antimicrobial and Anthelmintic Activities: *Moringa oleifera* Lam. extracts from Moringa leaves, flower roots, and stem bark possess antimicrobial and anthelmintic properties, with pterygospermin showing strong fungicidal and antibacterial properties. The ethanolic extracts have been shown to be effective against various bacteria, including *Salmonella typhi A, Streptococcus, K. pneumoniae, E. coli, P. aeruginosa, Enterobacter species*, and *Candida albicans*, and suppress the Indian earthworm *Pheretima posthuma*.

Antioxidants: The human body typically keeps the ratio of antioxidants to oxidants in balance. Animal bodies constantly

develop reactive oxygen species as a result of the environmental pressures encountered in daily life (Hajhashem, 2010). The bodily cells produce antioxidants to help the body balance these free radicals. Oxidative stress is the term used to describe any imbalance in these systems. Numerous illnesses or imbalances in the regular physiological system might induce it (Pham-Huy et al., 2008). The Moringa tree is a wonderful source of antioxidants since its production capacity is higher than that of traditional plant-derived sources. The Moringa tree may yield a variety of components when its extracts are used. Moringa leaf extract and freeze-dried leaves exhibit antioxidant activity in vivo and in vitro, according to Uphadek et al. (2018). However, there is a need for naturally synthesized antioxidants due to increased consumer availability.

Figure-1 different parts of Moringa content vit.E, Total carotenoid, curd protein and antioxidant

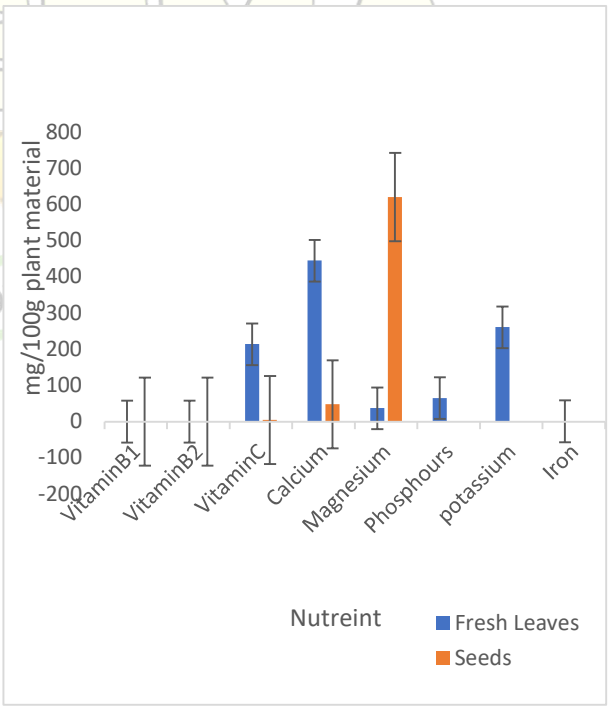


Vitamins and Minerals: Animal bodies need a variety of micronutrients in addition to macronutrients (proteins, carbs, and fats) in order to survive. These micronutrients play a crucial role in the body's breakdown process or as a transporter of macronutrients. Vitamins are essential because they are crucial to how the body processes energy in animals. Vitamin deficiencies are the cause of many prevalent illnesses, such as rickets, scurvy, and beriberi. *Moringa oleifera* Lam. contains many vitamins, including vitamin A (beta-carotene), vitamin B (folic acid, pyridoxine, and nicotinic acid), vitamin C, vitamin D, and vitamin E (Mbikay, 2012). Moringa-based processed foods are a rich source of vitamins, minerals, and which are essential for physiological growth and development. Dried Moringa powder is a significant calcium source, 17 times higher than milk, making it a vital mineral.

Tabe1 Fresh leave content nutrient g^{-1}100g plant material (Islam et al., 2021)

Nutrients	**fresh leaves g/100g plant material**
Protein(g)	7.1
Fats(g)	1.9
carbohydrate(g)	11.8
fibre(g)	0.9

Table-2 & figure-2*Moringa oleifera* Lam. of fresh leaves and seed content vitamins and nutrient



g/100g plant material

Vitamins	Fresh Leaves	Seeds
VitaminB1	0.07	0.06
Vitamin B2	0.05	0.06
Vitamin C	214	4.3
Calcium	445	48
Magnesium	37	621
Phosphorus	65	-
potassium	261	-
Iron	0.8	-

Medicinal uses:

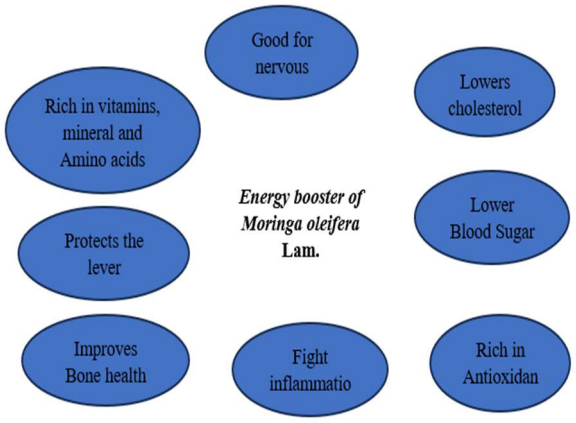
Table -3 Common medicinal uses of different parts of *Moringa oleifera* Lam.

Plant Parts	uses
Root	Antilithic, rubefacient, vesicant, carminative, antifertility, inflammations, articular pains and lower back or kidney pain
Leave	Purgative, rubbed on the temples for headaches, used for piles, fevers, sore throat, bronchitis, eye and ear infections leaf juice control glucose levels, blood pressure and cholesterol, malaria, pneumonia, diarrhoea
Stem bark	Rubefacient, vesicant and cure eye diseases, prevent enlargement of the spleen and formation of tuberculous glands of the neck, to destroy tumours and to heal ulcers. The juice from the root bark is put into ears to relieve earaches and also placed in a tooth cavity as a pain killer
Flower and Seed	Used as a hypocholesterolaemia, antiarthritic agents and can cure urinary problems and cold, diarrhoea, liver and spleen problems, and joint pain

Conclusion:

However, there`s still a huge gap in knowledge about the potential uses of moringa as food supplements and food fortifications. Moringa has huge potential but is very little studied. Identifying, isolating and standardizing plant extracts may call for detailed studies that can help in the development of promising food products that offer health benefits and provide nutrients to cure various life style related diseases and malnutrition.

Figure-3 Heath benefit of *Moringa oleifera* Lam.



Reference:

Alhakmani F, Kumar S, Khan SA. Estimation of total phenolic content, in–vitro antioxidant and anti–inflammatory activity of flowers of Moringa oleifera. Asian Pacific journal of tropical biomedicine. 2013 Aug 1;3(8):623-7.

Anwar F, Rashid U. Physico-chemical characteristics of Moringa oleifera seeds and seed oil from a wild provenance of Pakistan. Pak. J. Bot. 2007 Oct 1;39(5):1443-53.

Hajhashemi V, Vaseghi G, Pourfarzam M, Abdollahi A. Are antioxidants helpful for disease prevention? Research in pharmaceutical sciences. 2010 Jan;5(1):1.

Islam Z, Islam SM, Hossen F, Mahtab-ul-Islam K, Hasan MR, Karim R. Moringa oleifera is a prominent source of nutrients with potential health benefits. International Journal of Food Science. 2021 Aug 10;2021.

Mbikay M. Therapeutic potential of Moringa oleifera leaves in chronic hyperglycemia and dyslipidemia: a review. Frontiers in pharmacology. 2012 Mar 1; 3:24.

Moyo B, Masika PJ, Hugo A, Muchenje V. Nutritional characterization of Moringa (Moringa oleifera Lam.) leaves. African Journal of Biotechnology. 2011;10(60):12925-33.

Pham-Huy LA, He H, Pham-Huy C. Free radicals, antioxidants in disease and health. International journal of biomedical science: IJBS. 2008 Jun;4(2):89.

Thurber MD, Fahey JW. Adoption of Moringa oleifera to combat under-nutrition viewed through the lens of the "Diffusion of Innovations" theory. Ecology of food and nutrition. 2009 May 7;48(3):212-25.

Uphadek B, Shinkar DM, Patil PB, Saudagar RB. Moringa oleifera as a pharmaceutical excipient. Int J Curr Pharm Res. 2018;10(2):13-6.