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A Review on Nutritional and Medicinal Health Benefits of Miracle Tree (Moringa Oleifera)

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Abstract
Moringa oleifera also known as drumstick, it is a perennial tree that belongs to the moringaceae family of plants. *M. oleifera* is a multi-purpose herbal plants that has vital nutritional properties which is used as foods and an alternative for medicinal purposes worldwide. The leaves and pods of moringa are commonly eaten in India. All parts of this plant including roots, leaf, fruits, flower, seeds, and seed oil of the moringa have been used as ingredients in traditional herbal medicines. *M. oleifera* is rich in essential nutrients, including vitamins, minerals, and antioxidants, making it a valuable dietary supplement. Various research studies has demonstrated its ant-inflammatory, antimicrobial, and anti-cancer properties, suggesting its potential in preventing and treating a wide range of diseases. The present paper is review of nutritional and medicinal health benefits of miracle tree (*Moringa oleifera).*

Keywords: *Moringa oleifera*, nutritional properties, dietary supplement, antioxidant, medicinal uses, anti-cancer.

Introduction

Drumstick (*Moringa oleifera*) is a multipurpose tree belonging to family moringaceae. The tree is mainly native to Sub Himalayan region of north India. But also grown all over the India because they rich source of protein, vitamins and minerals.[1] *Moringa* tree is known from 150 B.C. research studies have revealed that there is evidence of *Moringa* consumption in eighty countries and is known in 200 languages. Not only in India, *Moringa* is widely used in many other cultures including Roman, Greek, Egyptian etc. In ancient times there is reference that the Maurian warriors of India were given the Drumstick leaf juice also known as the Elixer drink. They believed that this juice adds extra energy and used as stress releaser along with a pain reliever which was occurred during the war.[2] *Moringa* has approximately 46 antioxidants and is one of the most powerful sources of natural anti-oxidants. Anti-oxidants supply the free atoms needed by the human body and mitigate the effect of free radicals. *M. oleifera* contains active compounds such as flavonoids, tannins, saponins, alkaloids, phenolics, and triterpenoids which possess antibacterial effects.[3]

Nutritional values

Table 1: Nutrient composition of root, leaf and seeds of *M. oleifera* (Igwilo *et al*., 2017)[4]

S.N	***Nutrient Value per 100g)***	***Root***	***Leaf***	***Seed***
1	Energy (Kcal)	284.05	426.12	426.12
2	Crude proteins (%)	5.02	27.60	28.02

3	Crude lipids (%)	6.33	20.00	33.78
4	Carbohydrates (%)	76.75	33.93	28.77
5	Ash (%)	4.97	11.60	3.03
6	Thiamine B1 (mg)	-	18.47	-
7	Riboflavin B12 (mg)	-	14.82	-
8	Pyridoxine B6 (mg)	-	57.29	-
9	Ascorbic acid (mg)	48.13	773.30	94.74
10	Niacin B3 (mg)	-	50.35	-
11	Calcium (mg)	3.99	13.45	2.84
12	Sodium (mg)	514.80	104.06	129.03
13	Potassium (mg)	15.4	20.81	-

Table: 2 some reported Nutritional properties of *Moringa Oleifera*

S.N	Author	Nutritional Properties
1	Chelliah R, et al 2017	Calcium and potassium are rich in leaves, and the grains are rich in copper. Leaves and seeds also contain high levels of vitamin E and C.[5]
2	Aktar S, et al 2019	The leaves, fruits, flowers, and pods of this tree are used as highly nutritive vegetables. Different parts of this plant contain a profile of important minerals and are a good source of protein, vitamins, beta-carotene, amino acids, and various phenolics.[6]
3	Fakir MSA, et al 2017	All plant parts, especially the leaves and pods of the Moringa tree, are rich in protein, vitamins, minerals, antioxidants, and phytochemicals of nutritional and medicinal value.[7]
4	Ahmed KS, et al 2018	All parts of Moringa are a good source of nutritionally essential minerals Ca, P, Mn, Zn, and Cr, and the leaves and flowers might be potential sources of Fe supplements for humans and livestock.[8]
5	Basuny AM, et al 2016	*Moringa oleifera* oil contains a high level of oleic acid (65.00%), palmitic acid (12.31%), linoleic acid (16.00%), palmitoleic acid (2.10%), and stearic acid (5.10%), respectively.[9]
6	Sanchez-Machado DI, et al 2010	The chemical composition ranged from 19.34% to 22.42% for protein; 1.28% to 4.96% for lipids; 7.62% to 14.60% for ash; and 30.97% to 46.78% for dietary fiber.[10]
7	Islam MA, et al 2020	Leaves contained more than two times as much protein (29–36%) compared to pods (11–15%). Similarly, nutrients including calcium and iron are significantly higher in leaves (2314-3487 ppm and 276-418 ppm, respectively) than in pods (2017-2032 ppm and 61-68 ppm, respectively). Potassium content was found to be higher in both leaves and pods, but

		pods contained more than four times as much phosphorus (1.5-1.7%) as leaves (0.34-0.38%).[11]
8	Busami M, et al 2011	The ability of moringa to address nutritional deficiencies is based on the abundance of vitamins, minerals, and protein found in the leaves and pods. These include vital nutrients such as beta-carotene, iron, zinc, vitamin C, and all essential amino acids.[12]
9	Islam Z, et al 2021 Paikra BK, et al 2017	Moringa is rich in macro and micronutrients and other bioactive compounds that are important for the normal regulatory functioning of the body, developing the immune system and preventing certain diseases.[13] It contains a rich source of vitamin A, vitamin C, and milk protein. Different types of active phyto constituents like alkaloids, protein, quinine, saponins, flavonoids, tannin, steroids, glycosides, fixed oil, and fats are present.[14]
10	Islam Z, et al 2021	Mechanically dried leaf powder is a good-quality natural food product with potential industrial prospects for Bangladesh. There is a certain amount of calcium is found (2 g 100 g-1), with a considerable amount of magnesium (0.368 g 100 g-1) and beta-carotene (50269.29 µg 100g-1).[15]
11	Soderberg PG, 1990 Karadi RV, et al 2006	Glutathione (GSH) plays a leading role in preserving lens pellucidity. It also acts as an antioxidant and stabilizes proteins in minimized form.[16,17]

Medicinal uses

Table: 3 some reports of medicinal health benefits of *Moringa Oleifera*

Parts	Author	Medicinal uses
Seed	Anwar F, et al 2007 Fugile LJ, 2005	Seed extract exerts its protective effect by decreasing liver lipid peroxides. The antihypertensive compounds thiocarbamate and isothiocyanate glycosides have been isolated from the acetate phase of the ethanolic extract of Moringa pods. Moringa oil is extracted from seeds, and seeds contain around 35-40% oil. The healing properties of the oil are well known.[18] The pods have a potential role in the treatment of diarrhoea, liver and spleen problems, and joint pain.[19]
Leaf	Caceres A, et al 1991 Caceres A, and Lopez S, 1991	The fresh leaf juice and aqueous extract of seeds inhibited the growth of *Pseudomonas aeruginosa* and *Staphylococcus aureus.*[20] The seed extract exhibited significant antibacterial activity against the pyoderma (skin infection with pus) causing bacterium, *S. aureus* in experimental mice.[21]
Root	Fahey JW, et al 2001 Monera TG,et al 2014	Moringa roots have antibacterial activity and are reported to be rich in antimicrobial agents. These are reported to contain

	Adeyemi OS, et al 2014	an active antibiotic principle, pterygospermin, which has powerful antibacterial and fungicidal effects.[22] It is used as a cardiac stimulant, anti-ulcer, and anti-inflammatory agent.[23,24]
Flower	Anwar F, et al 2007 Sutalangka C, et al 2013	It has high medicinal values as a stimulant, aphrodisiac, abortifacient, and cholagogue, used to cure inflammations, muscle diseases, hysteria, tumors, and enlargement of the spleen; lower the serum cholesterol, phospholipid, triglyceride, VLDL, LDL cholesterol to phospholipid ratio, and atherogenic index; decrease the lipid profile of the liver, heart, and aorta in hcholesterol.[18] used as hypocholesterolemic and antiarthritic agents and can cure urinary problems and common colds.[25]
Stem bark	Anwar F, et al 2007 Qi L, et al 2019	Rubefacients and vesicants are used to cure eye diseases and for the treatment of delirious patients, to prevent enlargement of the spleen and the formation of tuberculous glands in the neck, to destroy tumors and heal ulcers. The juice from the root bark is put into ears to relieve earaches and is also placed in a tooth cavity as a pain killer and has anti-tubercular activity.[18] Stem extract alleviates oxidative stress-induced cataract formation, and the mechanism of the effect is mainly related to its amelioration of the endogenous antioxidant system in the lens.[26]

Conclusion

The nutritive value and medicinal benefits of *Moringa oleifera* has several bioactive compounds (phytochemicals) such as flavonoids, tannins, alkaloids, phenolics, and saponins which possess antibacterial effects. Hence it can be used as safe plant for antimicrobial agent. *M. oleifera* leaf extract contains of high concentration of minerals and proteins. This review summarized the recent research advances for the use and applications of *M. oleifera* extracts in different areas of biosciences and the versatility of this plant. *M. oleifera* is an inexpensive plant that can be socially beneficial especially for the neglected population suffering from malnutrition and poverty.

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