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MORINGA OLEIFERA: A POTENTIAL NATURAL NUTRACEUTICAL

Dr. Praveen Raghuwanshi[1*] and Damini Raghuwanshi[2]

[1]Assistant Professor, Dept. of RSBK, Pt.KLS Govt. Ayurved College, Bhopal.
[2]B.Sc./ DHNE Clinical Nutrition & Dietetics.

***Corresponding Author: Dr. Praveen Raghuwanshi**
Assistant Professor, Dept. of RSBK, Pt.KLS Govt. Ayurved College, Bhopal.

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ABSTRACT
Nutraceuticals are products derived from food sources that are purported to provide extra health Benefits, in addition to the basic nutritional value found in food and may be used to improve health, delay the aging process, prevent chronic diseases, increase life expectancy, or support the structure or function of the body. Nowadays, natural Nutraceuticals have received considerable interest due to potential nutritional, safety and therapeutic effects. Moringa oleifera Lam., also known as the 'Drumstick Tree' is recognized as a vibrant and affordable source of phytochemicals, having potential applications in medicines, functional food preparations, water purification, and biodiesel production.

Moringa oleifera are renewable sources of Tocopherols (γ and α), Phenolic compounds, β-carotene, Vitamin C and total Proteins, including the essential Sulfur Amino acids, Methionine and Cysteine. The seed protein and fat contents are higher than those reported for important grain legumes and soybean varieties, respectively. Unsaturated fatty acids, especially Oleic acid, Carbohydrates and Minerals are present in the seed in reasonable amounts. The nutritional content of 100 g of fresh M. oleifera leaves are Energy is 64 kcal, Protein 9.40 g, Carbohydrates 8.28 g, Dietary fiber 2.0 g, Fat 1.40 g, Vitamin A 378 ug, Vitamin B_1 0.257 mg, Vitamin B_5 0.125 mg, Vitamin B_6 1.200mg, Vitamin C 51.7 mg, Vitamin E had the highest concentration of 77 mg than Beta-carotene, which had 18.5 mg The predominant mineral elements like Potassium is 337 mg, Calcium 185 mg, Magnesium 147 mg, Phosphorus 112 mg, Sodium 9 mg, and Iron 4.00 mg. Taking into consideration the excellent nutritional properties, The Moringa have been used to combat malnutrition, especially among infants and nursing mothers and it can be an alternative to some leguminous seeds as a source of high-quality Protein, Multivitamin, Minerals and Antioxidant containing compound. Since M. oleifera thrives in arid and semiarid environments, so it may consider as a versatile, foodstuff (a fortified food or a dietary supplement) throughout the year**.**

INDEXING TERMS: Ben oil, Antioxidant, Malnutrition.

INTRODUCTION
Nutraceuticals are a group of products that are more than food but less than pharmaceuticals. Unfortunately there is still no internationally accepted definition of these products therefore their judgement varies country by country. In most countries Nutraceuticals are taken as part of dietary supplements. Frequency of Nutraceuticals use is 50%–70% in developed countries' population and this number is increasing by the age. Ladies use more Nutraceuticals than men. From a safety point of view Nutraceuticals are trusted products even if they are not approved by authorities like pharmaceuticals. With a lot of Nutraceuticals clinical studies have been carried out and results originating from these trials support their effectiveness as well as their general safety. Nutraceuticals represent however a certain risk if they were to be used without medical control as interactions with medication can be harmful, especially in vulnerable (old, very young, chronically sick) populations. Examples from fish oil preparations, prebiotics, and probiotics are reviewed.

Classification of nutraceuticlas
Nutraceuticals or functional foods can be classified on the basis of their natural sources, pharmacological conditions, or as per chemical constitution of the products. On the basis of natural source, it can be classified as the products obtained from plants, animals, minerals, or microbial sources.

Nutraceuticals as per the chemical groupings:

- Substances with established nutritional functions, such as vitamins, minerals, amino acids, and fatty acids–Nutrients.
- Herbs or botanical products as concentrates or extracts–Herbals.

- Reagents derived from other sources (e.g., pyruvate, chondroitin sulfate, steroid hormone precursors) serving specific functions, such as sports nutrition, weight-loss supplements, fortified conventional foods, and meal replacements–Dietary supplements.

Some of the most common ways of classifying Nutraceuticals can be based on food sources, mechanism of action, chemical nature, etc. The food sources used as Nutraceuticals are all natural and can be categorized as Dietary Fiber, Probiotics, Prebiotics, Polyunsaturated fatty acids, Antioxidant vitamins, Polyphenols and Spices.

Moringa oleifera

Moringa oleifera belonging to the family of Moringaceae is an effective remedy for malnutrition. Moringa is rich in nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. The fact that Moringa is easily cultivable makes it a sustainable remedy for malnutrition. Children deprived of breast milk tend to show symptoms of malnutrition. Lactogogues are generally prescribed to lactating mothers to augment milk production. The lactogogue, made of phytosterols, acts as a precursor for hormones required for reproductive growth. Moringa is rich in phytosterols like stigmasterol, sitosterol and kampesterol which are precursors for hormones. These compounds increase the estrogen production, which in turn stimulates the proliferation of the mammary gland ducts to produce milk. It is used to treat malnutrition in children younger than 3 years. About 6 spoonfuls of leaf powder can meet a woman's daily iron and calcium requirements, during pregnancy. This article an over viewing on the nutritional values, medicinal properties for commercial and therapeutic properties of Moringa.

The National Institute of Nutrition's 1989 book, "Nutritive Value of Indian Foods," shows a handful of Moringa leaves contains

- Seven times the amount of vitamin C in an orange
- Three times the amount of Iron in spinach
- Four times the amount of vitamin A in a carrot
- Four times the amount of Calcium in one glass of milk
- Three times the Potassium in one banana
- Two times the protein found in regular, plain yogurt

Moringa leaves can be eaten fresh, cooked or crushed, and they can be stored as dried powder for several months without loss of nutritional value.

Moringa leaves can be blended into fruit smoothies or used as a replacement for spinach in most recipes. Dried Moringa powder may be added to a curry recipe and served over rice. M. oleifera is a fast-growing, drought-resistant tree of the family Moringaceae, native to the Indian subcontinent. drumstick tree, horseradish tree and Ben oil tree or Benzolive tree It is widely cultivated for its young seed pods and leaves used as vegetables and for traditional herbal medicine. It is also used for water purification. Although listed as an invasive species in several countries, M. oleifera has "not been observed invading intact habitats or displacing native flora", and so "should be regarded at present as a widely cultivated species with low invasive potential.

Table No: 01. Showing scientific classification of Moringa oleifera Lam.

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Clade	Rosids
Order:	Brassicales
Family:	Moringaceae
Genus:	Moringa
Species:	M. oleifera

Almost all parts of Moringa are edible and have Nutrients parameters as follow.

Leaves

Nutritional content of 100 g of fresh M. oleifera leaves (about 5 cups) is shown in the table (right; USDA data), while other studies of nutrient values are available. The leaves are the most nutritious part of the plant, being a significant source of B vitamins, vitamin C, provitamin A as beta-carotene, vitamin K, manganese, and protein. When compared with common foods particularly high in certain nutrients per 100 g fresh weight, cooked Moringa leaves are considerable sources of these same nutrients. Some of the calcium in Moringa leaves is bound as crystals of calcium oxalate though at levels 1/25th to 1/45th of that found in spinach, which is a negligible amount. The leaves are cooked and used like spinach, and are commonly dried and crushed into a powder used in soups and sauces or as a supplement for pets.

Table No: 02. Showing the Nutritional value per 100 g (3.5 oz) of Moringa oleifera leaf, and M. oleifera pods, raw respectively.

Energy	**64 kcal (270 kJ)**	**37 kcal (150 kJ)**
Carbohydrates	8.28 g	8.53 g
Dietary fiber	2.0 g	3.2 g
Fat	1.40 g	0.20 g
Protein	9.40 g	2.10 g
Vitamin A equiv.	378 µg	4 µg
Thiamine (B1)	0.257 mg	0.0530 mg
Riboflavin (B2)	0.660 mg	0.074 mg
Niacin (B3)	2.220 mg	0.620 mg
Pantothenic acid (B5)	0.125 mg	0.794 mg
Vitamin B6	1.200 mg	0.120 mg
Folate (B9)	40 µg	44 µg
Vitamin C	51.7 mg	141.0 mg
Calcium	185 mg	30 mg
Iron	4.00 mg	0.36 mg
Magnesium	147 mg	45 mg
Manganese	0.36 mg	0.259 mg
Phosphorus	112 mg	50 mg
Potassium	337 mg	461 mg
Sodium	9 mg	42 mg
Zinc	0.6 mg	0.45 mg
Water	78.66 g	88.20 g
Units µg = micrograms • mg = milligrams IU = International units		

Drumsticks

The immature seed pods, called "drumsticks", are commonly consumed in South Asia. They are prepared by parboiling, and cooked in a curry until soft. The seed pods/fruits, even when cooked by boiling, remain particularly high in vitamin C (which may be degraded variably by cooking) and are also a good source of dietary fiber, potassium, magnesium, manganese. lipids, non-structural carbohydrates, protein and ash. Fatty acids like oleic acid, linoleic acid, palmitic acid and linolenic acid are also present. Thus Moringa pods are used to treat diarrhoea, liver and spleen problems, and joint pain.

Seeds and seeds oil

The seeds, sometimes removed from more mature pods and eaten like peas or roasted like nuts, contain high levels of vitamin C and moderate amounts of B vitamins and dietary minerals.Mature seeds yield 38–40% edible oil called Ben oil from its high concentration of behenic acid. The refined oil is clear and odorless, and resists rancidity. The seed cake remaining after oil extraction may be used as a fertilizer or as a flocculent to purify water. Moringa seed oil also has potential for use as a biofuel. Using the cold press method (under 132 degrees F) only yields 14% which is about the same amount of yield in a raw press using no heat whatsoever.

Roots

The roots are shredded and used as a condiment with sharp flavor qualities deriving from significant content of polyphenols, Alkaloids like morphine, moriginine, minerals like calcium, magnesium and sodium

Therapeutic and commercial applications of moringa

Moringa seeds are used to extract oil called the Ben oil. This oil is rich in oleic acid, tocopherols and sterols. It can also withstand oxidative rancidity. The oil can be used in cooking as a substitute for olive oil, as perfumes and also for lubrication, The pods can absorb organic pollutants and pesticides. Moringa seeds also have great coagulant properties and can precipitate organics and mineral particulates out of a solution. Chemical coagulants such as aluminum sulfate (Alum) and ferric sulfate or polymers removes suspended particles in waste water by neutralizing the electrical charges of particles in the water to form flocs making particles filterable. M. oleifera seed is a natural coagulant, containing a cationic protein that can clarify turbid water. This property of seeds is attracting much research as other coagulants such as alum, activated carbon and ferric chloride are expensive and rare. Moringa seed extract has the ability to eliminate heavy metals (such as Pb, Cu, Cd, Cr and Ar) from water. M. oleifera functionalized with magnetic nanoparticles such as iron oxide were found Beneficial in surface water treatment by lowering settling time. Seed extracts have antimicrobial properties that inhibit bacterial growth, which implies preventing waterborne diseases. These properties of M. oleifera seeds have wide

applicability in averting diseases and can enhance the quality of life in rural communities as it is highly abundant.

Moringa seeds can be used in cosmetics and are sources of biodiesel while the seedcakes, can be used as a green manure or a fertilizer. The flowers of Moringa are used to make tea with hypocholesterolemic properties. The flowers are great sources of nectar and are used by beekeepers. The root bark has medicinal values and is used for dyspepsia, eye diseases and heart complaints. The tap root of Moringa is used as a spice. The growth hormone from the leaves, called Zeatin is an excellent foliar and can increase the crop yield by 25%–30%. The cereal gruel with 65% popcorn and 35% Moringa leaves was blanched and fermented. The fermented ones showed higher protein and energy while the blanched cereal had higher mineral content. Moringa also used as a fortificant and produced cream and butter crackers with Moringa and Ipomoea batatas as fortificants, with the hope of adding additional nutrients to snacks.

CONCLUSION

Moringa oleifera tree contains a staggering 92 nutrients and 46 natural antioxidants and as it also holds a number of anti-inflammatory compounds. The sheer number of nutrients found in this tree brings it to the top of the super foods list and in its native locations it is said to have the ability to help **treat more than 300 diseases** and illnesses. Its high antioxidant levels can help fight free radicals, potentially slowing down the ageing process and promoting longevity. It is thought to be able to help lower cholesterol levels and regulate blood pressure, due to the high levels of niacin and vitamins B3 and B10. M. oleifera has great Anti-diabetic, Anti-cancer properties along with have multifunctional characteristics like Anti-nutritional factors, Antioxidant, Carotenoids, Abortifacient, Aphrodisiac, and Anti-infective etc. Thus Incorporation and fortification of Moringa can be significant to tackle nutrient deficiencies and malnutrition.

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