

REVIEW ARTICLE

Indigenous Use of the Incredible Tree - *Moringa Oleifera*: A Review

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The art of healing comes from nature and not from the physician.

Therefore, the physician must start from nature with an open mind.

Paracelsus

ABSTRACT

Moringa oleifera (MO) is a gift from the mind of God to the hands of man. This 4000-year-old herbal panacea plant has a magnificent diet therapy. This healing plant is an incredibly energizing product which helps in medical prevention. The fact that *Moringa* grows rapidly and easily makes it especially appealing for impoverished areas. Although its therapeutic properties are well known, its use for the well-being of humanity is less prevalent. The aim of this paper is to catalyze the efficacy of the miracle tree "MO." Our search included the English terms such as diet therapy, healing plants, MO, therapeutic use in Google search engine, PubMed, and Medline from 1973 to 2016. We found very few articles showing the use of this plant in the treating dental diseases. We concluded that clinical benefits of *in vivo* studies were very little, thereby appealing for meticulous research of this nature's marvel for the betterment of humankind.

Keywords: Diet therapy, Healing plants, *Moringa oleifera*.

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INTRODUCTION

A major subject for worldwide scientific investigation is the importance of various herbal constituents and plant derivatives in immunomodulation.^[1] For this reason, many herbal plant preparations are prescribed to increase host resistance.^[2,3] According to reports of the dietary or medicinal value of a natural product, there is an alarming number of sources of "wholesome" food who are now sponsoring them. *Moringa oleifera* (MO) or the horseradish tree is a pantropical species that is known by regional names such as benzolive, drumstick tree, kelor, marango, mlonge, mulangay, nébéday, saijhan, and sajna.^[4]

It is a recurrent softwood tree with timber of low quality, but for centuries, it has been advocated for traditional medicinal and industrial uses. *Moringa* is an important crop in India, Ethiopia, the Philippines, and the Sudan and is being grown in West, East and South Africa, tropical Asia, Latin America, the Caribbean, Florida, and the Pacific Islands. Differentiation between food and medicinal uses of plants (e.g., bark, fruit, leaves, nuts, seeds, tubers, roots, and flowers) becomes a very difficult task since plant uses span both categories, and this is deep rooted in the traditions and the fabric of the community.^[5]

METHODOLOGY

A wide search was done for the international literature using PubMed and Google, and MedLine using the English words; diet therapy, healing plants, MO, and therapeutic from 1973 to 2016. The search included the articles written in English, published research done in both *in vivo* and *in vitro*, and recent literature from textbooks. We found very less articles on therapeutic benefits of MO in treating the patients with dental diseases. The search mainly focused on the literature of MO and its usage in the amelioration of humankind. All other literature that did not obey the inclusion criteria was excluded from writing this narrative review.

Chronicle

The indigenous knowledge and use of *Moringa* are widespread in more than 80 countries including Pakistan and are known in over 200 local languages, which date back

to 150 B.C *Moringa* has been used by various societies (Roman, Greek, Egyptian, and Indian to mention a few) for thousands of years with writings dating as far back as 150 AD.

History witnesses the use of *Moringa* leaves and fruit in the diet of kings and queens to maintain mental alertness and healthy skin. The leaf extract proved to be an Elixir for the Maurians in the warfront as it provided them with extra energy and relieved them of the stress and pain incurred during war. These valiant combatants were the ones who defeated "Alexander the Great."^[6,7]

Nutritional Value

Moringa is especially auspicious as a food source in the tropics because the tree is in full leaf at the end of the dry season when foods are typically scarce at that time.^[4] Eventually, *Moringa* is advocated as "natural nutrition for the tropics." By certain non-governmental organizations,^[4] *Moringa* leaves contain "more Vitamin A than carrots, more calcium than milk, more iron than spinach, more Vitamin C than oranges, and more potassium than bananas" and that the protein quality of *Moringa* leaves rivals that of milk and eggs. The oral histories recorded by Lowell Fuglie in Senegal and throughout West Africa were well recognized, and countless instances of lifesaving nutritional rescue were attributed to *Moringa*.^[8,9]

The following Table 1 shows the common names of MO in India.

Organic Chemistry/Phytochemistry

Specific chemicals produced by plants have proved to be life savior for humanity. *Moringa* species is a hub of fairly unique compounds. Precisely, this plant family is rich in compounds containing the simple sugar, rhamnose, and it is rich in a fairly unique group of compounds called glucosinolates and isothiocyanates.^[11,12] Certain components of *Moringa* preparations that have been reported to have hypotensive, anticancer, and antibacterial activity include 4-(4'-O-acetyl- α -L-rhamnopyranosyloxy)benzyl isothiocyanate, 4-(α -L-rhamnopyranosyloxy)benzyl isothiocyanate, niazimicin, pterygospermin, benzyl isothiocyanate, and 4-(α -L-rhamnopyranosyloxy) benzyl glucosinolate. Nature has enriched *Moringa* family, in a number of vitamins and minerals as well as other more commonly recognized phytochemicals such as the carotenoids (including β -carotene or pro-Vitamin A).^[4,8]

Table 2 is the scientific classification of MO.

Commercial Use of *Moringa*

The multipurpose *Moringa* tree is edible and has long been by humans for different purposes.^[6] The following

Table 3 is the different parts of *Moringa* and its usage in our day-to-day life.

Moringa seed oil (yield 30–40% by weight), also known as Ben oil, is a sweet non-sticking, non-drying oil that resists rancidity. Its usage varies from salads to fine machine lubrication and also in the manufacture of perfume and hair care products.^[14] In the west, one of the best-known uses of *Moringa* is the use of powdered seeds to flocculate contaminants and purify drinking water. The seeds are also eaten green, roasted, powdered, and steeped for tea or used in curries.^[4]

Palatable Uses

In the nook and corner of our country India, *Moringa's* parts are considered to be an important ingredient of food. It is used in curries, sambars, dals, kormas, etc., although it is used to add flavors to cutlets.^[15] *Moringa* leaves are used as salads or as seasonal pickles. Its flowers are used to make pakodas.^[16]

Table 1: Common names of *Moringa oleifera*^[10]

Hindi	Mungna, saijna, shajna
Assamese	Saijna, sohjna
English	Drumstick tree, ben tree
Gujarati	Midhosaragavo, saragavo
Sanskrit	Shobhanjana
Punjabi	Sainjna, soanjna
Tamil	<i>Moringa</i> , murungai
Telugu	Mulaga, munaga, tellamunaga

Table 2: Scientific classification^[13]

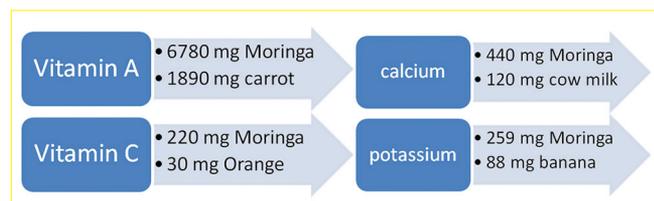
Kingdom	Plantae
Division	Magnoliophyta
Class	Viales
Order	Moringaceae
Genus	<i>Moringa</i>
Species	Oleifera
Family (ayurvedic)	Shobhanja Kul

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Table 3: Different uses of *Moringa*

Parts of <i>Moringa</i>	Usage
Leaves and treated seed cake	Animal forage
Wood	Blue dye
Living trees	Fencing
Seed cake	Fertilizer
Juice expressed from the leaves	Foliar nutrient
Leaves	Green manure, biogas
Tree trunks	Gum
Powdered seeds	Honey- and sugar cane juice-clarifier
Nectar	Honey
Soil incorporation of leaves to prevent seedling damping off	Biopesticide
Bark	Rope
Bark and gum	Tannin for tanning hides

Nutritional Value of *Moringa* Compared With Other Foods^[17]



Medicinal Purposes

Parts of this incredible plant, including root, bark, gum, leaf, fruit (pods), flowers, seed, and seed oil have been used for various ailments in the indigenous medicine (Odebiyi and Sofowora, 1999), but recent research is also indicating about several active constituents for accepting its applicability in modern medicine.^[18]

Antimicrobial Effects

Inhibitory activity against several microorganisms of MO has been validated due to its antimicrobial components. Saadabi *et al.* concluded in a recent study that the aqueous extracts of MO are found to be inhibitory against many pathogenic bacteria including *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, and *Pseudomonas aeruginosa* in dose-dependent manner.^[19] Antihelmintic activity of MO flower and leaves is also capable of controlling parasitic worms.^[20] Furthermore, it has also been reported to inhibit Indian earthworm *Pheretima posthuma* with MO leaves ethanolic extracts.^[21]

Anti-inflammatory Activity

Moringa plant parts have potential anti-inflammatory activity. Furthermore, n-butanol extract of the seeds of MO shows anti-inflammatory activity against ovalbumin-induced airway inflammation in guinea pigs.^[22] Amelioration of inflammation-associated chronic diseases can be possible with the substantial anti-inflammatory activity of MO bioactive compounds.^[23] Considering potent anti-inflammatory activity of *Moringa* plant, it can be surmised that this plant shows profound influence on inflammation-associated diseases and resultant symptoms. Eventually, this plant shows beneficial effects on asthma, pain, and other resultant symptoms.^[18]

Analgesic Activity

The analgesic activity of *Moringa* has been unveiled in several *Moringa* species. Rao *et al.*^[24] conducted a study using ethanolic extracts of *Moringa concanensis*, tender pod-like fruits in experimental animals, enormous amount of analgesic activity was observed. Sutar *et al.*^[25] reported that the alcoholic extract of its leaves and seeds

possesses marked analgesic activity as evidenced through hot plate and tail immersion method.

Antioxidant Activity

It is a rich source of antioxidant.^[26] Aqueous extracts of leaf, fruit, and its seed have been reported to act as an antioxidant.^[27] Siddhuraju *et al.*^[28] evaluated the antioxidant property of freeze-dried *Moringa* leaves from different extraction procedures, a study was conducted and it was found that methanol and ethanol extracts of Indian origin *Moringa* have the highest antioxidant activity with 65.1 and 66.8%, respectively. Ogbunugafor *et al.*^[29] proved that the seeds to be superior for radical scavenging when a recent study was conducted comparing with palm oil for their antioxidant potential.

Antipyretic Activity

Due to anti-inflammatory action of *Moringa* bioactive constituents, the antipyretic activity can be hypothesized. Hukkeri *et al.* conducted a study to appraise the antipyretic effect of ethanol, petroleum ether, solvent ether, and ethyl acetate extracts of the seeds using yeast-induced hyperpyrexia method. Paracetamol was used as control during the study. Not surprisingly, ethanol and ethyl acetate extracts of seeds showed significant antipyretic activity in rats.^[30]

ETHNODENTISTRY FOR COMMON DENTAL PROBLEMS

Of all the major health problems worldwide, dental caries and periodontal diseases are much of concern. Besides the functions of the craniofacial complex, oral health is integrated to the general quality of life too. Since bygone, traditional medicine can treat various infections and chronic conditions. Deformities of the oral cavity and oral infections were cured in ancient India. Scientific validations of the Ayurveda in dental health practices could justify their incorporation into modern dental care.^[31] As most of the oral diseases are due to bacterial infections, and it has been well documented that medicinal plants confer considerable antibacterial activity against various microorganisms.^[32]

Dental Caries

Root of *Moringa pterygosperma* is highly preached in the treatment of soreness of mouth and throat and pain in gums due to dental caries.^[31]

As a Mouthwash Substituting Chlorhexidine Gluconate

Alsaraf *et al.* reported that when antibacterial and antifungal activities of aqueous extracts of plant MO

competed with the efficacy of chlorhexidine gluconate, it was determined that the aqueous extract showed maximum zone of inhibition against *S. aureus*.^[33]

To Prevent Dental and Skeletal Fluorosis

Since ages, MO, the natural anticoagulant, has been advocated to the use of inorganic and synthetic coagulants. Its seed contain a coagulant which is a protein which acts as a cationic polyelectrolyte. Ravikumar *et al.* concluded that best coagulation condition was reached using MO coagulant. 92% of fluoride reduction in the treated water was achieved.^[34] Acid extract of natural polyelectrolyte MO seed is very effective as a coagulant for removal of fluoride from water.^[35]

CONCLUSION

Therapeutic effects of MO are magnificent, and this article is an attempt to provide glimpses its applications for performing appraisal of this promising nutrition and medicinal plant. Although many bioactive compounds have been discovered from *Moringa*, still the knowledge is in infancy, in terms of its total reserve. Perhaps, future rigorous studies directed toward the detection, and commercialization of its bioactive compounds can lead to the development of remedies for several ailments. Thus, it can also prove the validity of traditional utility of this tree in various folklores.

“Until man duplicates a blade of grass, nature can laugh at his so-called scientific knowledge. Remedies from chemicals will never stand in favor compared with the products of nature, the living cell of the plant, the final result of the rays of the sun, the mother of all life.” - T.A. Edison.

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