

Phytotherapeutic Functionality of *Moringa Oleifera* Lam for Health



Mehra M¹, Jakhar N², Joshi S³ and Meghwal M^{4*}

Department of Food Science and Technology, India

Submission: August 23, 2017; Published: September 27, 2017

*Corresponding author: Meghwal M, Department of Food Science and Technology, National Institute of Food Technology Entrepreneurship & Management, India, Email: murli.murthi@gmail.com

Abstract

Moringa is a multipurpose tree used in food preparation and for health. Almost all parts of Moringa serve as good source of nutrition. Its leaves, seeds, bark, roots, sap and flowers are widely used in traditional medicine and leaf extract exhibits high antioxidant activity. No adverse effects have been reported in association with human studies. Several studies have shown that Moringa and its components exhibit a wide range of additional biological activities including wound healing, antiinflammatory, antioxidant, tissue protective, analgesic, antiulcer, antihypertensive, radio protective and immune modulatory actions. It is also used to improve eyesight, mental alertness and bone strength. A wide variety of polyphenols, phenolic acids, flavonoids, Glucosinolates and alkaloids are believed to be responsible for the health benefit. This review highlights the health benefits of this "Miracle Tree", Moringa.

Introduction

Moringa oleifera Lam (Moringaceae) is grown in many countries of the tropics and subtropics [1]. Moringa is an edible plant and from ancient times our ancestors have been using it as a regular component of conventional eatables in India. It is commercially grown in India, Africa, Mexico, Hawaii, South and Central America and throughout Asia [2]. Different parts of this plant such as leaves, bark, roots, seeds, flowers, fruits and sap have various medicinal uses and high nutritional value [2].

Moringa has very important medicinal value. It possesses antibacterial, antifungal, antioxidant, antidiabetic, diuretic, antitumor, anti inflammatory and antipyretic activity. It also possesses hepato protective, antiulcer, antihypertensive and cholesterol lowering activities [1]. Various compounds such as polyphenols, flavonoids, alkaloids, phenolic acids and glucosinolates possess tissue protective, antiulcer, immune modulatory and analgesic activities [2]. The bioactive compounds that have been isolated from *M. oleifera* seeds, stems, leaves and flowers include glucosinolates, flavonoids, chlorogenic acid, phenolic acid, kaempferol, moringinine, rhamnoglucoside, rutin, myricetin, glycosides niaziminin and niazinin. Dried Moringa has very important medicinal value. It possesses antibacterial, antifungal, antioxidant, antidiabetic, diuretic, antitumor, anti-inflammatory and antipyretic activity. It also possesses hepato protective, antiulcer, antihypertensive and cholesterol lowering activities [1]. The plant can be best grown in dry sandy or

loamy soil that is slightly alkaline. It is adaptable to various soil conditions like varying pH but it cannot tolerate water logging, freezing or frosts conditions. It belongs to the Moringaceae family of perennial angiosperm. Moringa is a small native tree of the sub-Himalayan regions of North West India, which is now indigenous to many regions in Islands and South America. This esteemed tree was claimed to be 'the most nutrient rich plant yet discovered' by.

Nutritional Composition

The nutritional composition of this plant plays an essential role in nutritional, medicinal and therapeutic properties. It has essential nutrients such as omega 3 and omega 6 fatty acids. The leaves and pods of Moringa contains high amount of Calcium, Magnesium, Potassium, Manganese, Phosphorus, Zinc, Sodium, Copper, and Iron. Moringa has been found to contain a group of unique compounds which are uncommon sugar-modified glucosinolates [3]. These compounds show certain chemo preventive activity, by inducing apoptosis. Latest research shows that agro ecological zonation had no significant effect on the levels of most nutrients in Moringa leaves.

Medicinal properties of Moringa

Anti-inflammatory activity

Various studies on Moringa plant have been shown to possess antiinflammatory activity. The antiinflammatory

activity of the methanol leaf extract of Moringa was exhibited using carrageenan and histamine-induced tests [4]. Root extract of Moringa expressed antiinflammatory activity in carrageen an induced rat paw oedema [5]. Alcohol extract of the seeds of Moringa exhibited antiinflammatory activity in guinea pigs [6].

Antiasthmatic activity

The kernels of Moringa seed demonstrated potential effect in the treatment of bronchial asthma (Table 1). The patients showed markedly improved relief in the severity of asthma symptoms as well as in respiratory functions [7].

Table 1: Chemical constituents of Moringa and medicinal properties [30].

Chemical Constituents	Properties	Plant Part
Flavonoids: Quercetin, kaempferol	Inhibit psroduction of tumor necrosis factor; inhibit mutations and prevent carcinogenesis	Flowers
γ -tocopherol	Inhibit lipid peroxidation, metabolize peroxides, prevent atherosclerosis	Whole plant
Oleic acid	Prevent cardiovascular diseases	Seeds
Terpenoids	Hypoglycemic and anti-hyperglycemic activity	Whole plant
4-(α -L-rhamnosyloxy)benzyl isothiocyanate	Antitumour promoter, antimicrobial	Seeds
B-sitosterol-3-O- β -D-glucopyranoside	Antitumour promoter	Seeds
Glucomoringin	Anticolon carcinogenic activity	Leaves
Benzyl isothiocyanate	Anticancer activity	Leaves
Glucosinolates	Chemopreventive activity, by inducing apoptosis	Leaves
Niazimicin	Anticancer activity	Leaves
Pterygospermin	Hyperthyroidism, Chrohn's disease, antiherpessimplex virus arthritis, rheumatism, gout, cramp, epilepsy	Seed
Morphine, moriginine	antiulcer and antiinflammatory agent	Root bark

Antioxidant activity

Moringa has high antioxidant potential [8]. The antioxidant activity of Moringa tree leaves have been reported due to its high amount of polyphenols [9]. Aqueous extracts of leaf, fruit and seed of Moringa showed antioxidant activity [10]. Methanol and ethanol extracts of Indian origin Moringa exhibited highest antioxidant activity of 65.1% and 66.8%, respectively in a study carried out on freeze dried Moringa leaves [11,12]. Quercetin and Kaempferol showed good antioxidant activity on hepatocyte growth factor induced Met cell migration [13]. The meat exhibited highest efficiency in terms of radical scavenging activity when supplemented with Moringa leaves.

Antipyretic activity

A study was conducted on antipyretic effect of ethanol, petroleum ether, solvent ether and ethyl acetate extracts of Moringa seeds by yeast induced hyperpyrexia method in rats; where ethanol and ethyl acetate extracts of seeds exhibited significantly high antipyretic activity [14].

Cardio protective, antihypertensive and cholesterol lowering activities

Alkaloid 'moringinine' in Moringa root bark stimulated cardiac function through its effect on sympathetic nervous

system [15]. Moringa prevented hyper lipidemia due to iron deficiency in male wister rat [16]. Nitrile, mustard oil glycosides and thiocarbamate glycosides present in Moringa leaves showed blood pressure lowering effect [1].

Anticancer activity

Moringa has been shown to possess potential therapeutic activity to fight cancer. Niazimicin is a bioactive compound found in Moringa leaves, exhibited anticancer activity [17]. Moringa leaf extract showed potential cytotoxic effects on human multiple myeloma cell lines [18]. A study conducted by [19] showed that Moringa pod could be an effective chemo preventive agent.

Antimicrobial activity of moringa

The extracts of different morphological part of moringa tree, such as seeds' cotyledon, seeds' coat, stem bark, leaves, and root bark have been shown to exhibit antimicrobial activity [20]. Its leaves ethanolic extracts has also been reported to inhibit Indian earthworm *Pheritima posthuma* [21,22], reported antimicrobial activity of aquous extracts of pods' husks against gram negative pathogenic bacteria and yeast strains.

Antifibrotic/ ulcer effect

Moringa seed extract has been found to contain antifibrotic effects on liver fibrosis in rats [23].

Diuretic and antiurolithiatic activity

The parts of Moringa such as roots, leaves, flowers and gum exhibit diuretic activity [24]. Antiurolithiatic property from the aqueous and alcoholic extract of the root bark of Moringa was reported [25].

Antihepatotoxic activity

Various studies have shown hepato protective activity of Moringa. The root and flowers of Moringa possess strong hepato protective activity. A flavonoid named Quercetin has been found in Moringa flowers which may be responsible for its hepato protective activity [26].

Antidiabetic activity

Moringa leaves are good source of polyphenols which are responsible for hypoglycemic activity [16]. Moringa leaves reduce blood glucose concentration to a significant level in type 2 diabetic rats.

Wound healing properties

The leaf extract of Moringa has been tested for wound healing capacity [27-31]. Ethyl acetate extracts (10% in form of ointment) have shown significant activity [32-34]. Phenolic compounds and phytosterols found in these extracts show wound healing activity [14].

Antiarthritic effect

The methanolic extract of Moringa could be effective in the treatment of rheumatoid arthritis [8].

Conclusion

Moringa oleifera is having multidimensional properties and have large number of economic applications. Due to easy cultivation and world availability makes it an excellent potential for growth in economy and health & nutrition sector in a developing country like India. It is an inexpensive and good alternative to good nutrition as well as to prevention of a lot of diseases. We need to develop some strategies in order to explore and utilize full benefits of this miracle tree.

References

- Anwar F, Latif S, Ashraf M, Gilani AH (2007) Moringa oleifera: a food plant with multiple medicinal uses. *Phytother Res* 21: 17-25.
- Stohs SJ, Hartman MJ (2015) Review of the Safety and Efficacy of Moringa oleifera. *Phytother Res* 29(6): 796-804.
- Amaglo NK, Benett RN, Curto RBL, Rosa EAS, Turco VL, Giufridda A, et al. (2010) Profiling selected phytochemicals and nutrients in different tissues of the multipurpose tree Moringa oleifera L., grown in Ghana. *Food Chemistry* 122(4): 1047-1054.
- Adedapo, Adeolu, Falayi O, Oyagbemi A (2014) The anti-oxidant, anti-inflammatory and antinociceptive activities of the methanol leaf extract of Moringa oleifera in some laboratory animals (657.19). *The FASEB Journal* 28.1 Supplement 2014: 657-19.
- Ezeamuzie IC, Ambakederemo AW, Shode FO, Ekwebelem SC (1996) Antiinflammatory Effects of Moringa oleifera Root Extract. *Pharm. Biol* 34(3): 207-212.
- Mahajan SG, Banerjee A, Chauhan BF, Padh H, Nivsarkar M, et al. (2009) Inhibitory effect of n-butanol fraction of Moringa oleifera Lam. Seeds on ovalbumin-induced airway inflammation in a guinea pig model of asthma. *Int. J. Toxicol.* 28: 519-527.
- Agrawal B, Mehta A (2008) Antiasthmatic activity of Moringa oleifera Lam: A clinical study. *Indian J Pharmacol* 40(1): 28-31.
- Kumar GS, Kumar B, Srinivasan BP, Nag TC, Srivastava S, et al. (2013) Retinoprotective effects of Moringa oleifera via antioxidant, anti-inflammatory, and anti-angiogenic mechanisms in streptozotocin-induced diabetic rats. *J of Ocular Pharmacol and Therapeu* 29(4): 419-426.
- Verma AR, Vijayakumar M, Mathela CS (2009) In vitro and in vivo antioxidant properties of different fractions of Moringa oleifera leaves. *Food and Chem Toxicol* 47: 2196-2201.
- Singh BN, Singh BR, Singh RL, Prakash D, Dhakarey R, et al. (2009) Oxidative DNA damage protective activity, antioxidant and anti-quorum sensing potentials of Moringa oleifera. *Food Chem. Toxicol* 47: 1109-1116.
- Lalas S, Tsaknis J (2002) Extraction and identification of natural antioxidant from the seeds of the Moringa oleifera tree variety of Malawi. *JAOSC* 79: 677-683.
- Siddhuraju P, Becker K (2003) Antioxidant properties of various solvent extracts of total phenolic constituents from three different agroclimatic origins of drumstick tree (Moringa oleifera Lam.) leaves. *J Agric Food Chem* 51(8): 2144-2155.
- Labbe D, Provencal M, Lamy S, Boivin D, Gingras D, et al. (2009) The flavonols quercetin, kaempferol, and myricetin inhibit hepatocyte growth factor-induced medulloblastoma cell migration. *J Nutr* 139(4): 646-652.
- Hukkeri VI, Nagathan CV, Karadi RV, Patil BS (2006) Antipyretic and wound healing activities of Moringa oleifera Lam. in rats. *Ind.J. Pharm. Sci* 68: 124-126.
- Duke JA (2001) *Handbook of Nuts*. CRC Press. 214-217.
- Ndong M, Uehara M, Katsumata S, Suzuki K (2007) Effects of oral administration of Moringa oleifera Lam on glucose tolerance in gotokakizaki and wistar rats. *J Clin Biochem Nutr* 40(3): 229-233.
- Guevarra AP, Vargasa C, Sakuraib H, Fujiwarab Y, Hashimoto K, et al. (1999) An antitumor promoter from Moringa oleifera Lam. *Mutat Res* 440(2): 181-188.
- Parvathy MVS, Umamaheshwari A (2007) Cytotoxic effect of Moringa oleifera leaf extracts on human multiple myeloma cell lines. *Trends Med Res* 2(1): 44-50.
- Budda S, Butryee C, Tuntipopipat S (2011) Suppressive effects of Moringa oleifera Lam pod against mouse colon carcinogenesis induced by azoxymethane and dextran sodium sulphate. *Asian Pacific J Cancer Prev* 12(12): 3221-3228.
- Arora DS, Onsare JM, Kuar H (2013) Bioprospecting of Moringa (Moringaceae):microbiological perspective. *J Pharmacog Phytochem* 1(6): 193-215.
- Rastogi T, Bhutda V, Moon K, Aswar KB, Khadabadi SS, et al. (2009) Comparative studies on anthelmintic activity of Moringa and Vitex Negundo. *Asian J Res Chem* 2: 181-182.
- Onsare, JG, Kaur, H, Arora, DS (2013) Antimicrobial activity of Moringa oleifera from different locations against some human pathogens. *J Med Plants* 1(5): 80-91.
- Hamza AA (2010) Ameliorative effects of Moringa oleifera Lam seed extract on liver fibrosis in rats. *Food Chem. Toxicol* 48: 345-355.

24. Morton JF (1991) The horseradish tree, *Moringa pterygosperma* (Moringaceae)-A boon to arid lands? *Econ. Bot* 45(3): 318-333.
25. Karadi RV, Gadge NB, Alagawadi KR, Savadi RV (2006) Effect of *Moringa oleifera* Lam. root-wood on ethylene glycol induced urolithiasis in rats. *J Ethnopharmacol* 105(1-2): 306-311.
26. Ruckmani K, Kavimani S, Anandan R, Jaykar B (1998) Effect Of *Moringa Oleifera* Lam On Paracetamol-Induced Hepatotoxicity. *Ind J Pharm Sci* 60(1): 33-35.
27. Ramachandran C, Peter KV, Gopalakrishnan PK (1980) Drumstick (*Moringa oleifera*): A multipurpose Indian vegetable. *Economic Botany* (3): 276-283.
28. Mishra SP, Singh P, Singh S (2012) Processing of *Moringa oleifera* leaves for human consumption; *Bulletin of Environment. Pharmacology and Life Sciences* 2(1): 28-31.
29. Kirisattayakul W, Wattanathorn J, Tong-Un T, Muchimapura S, Wannanon P, et al. (2013) Cerebroprotective effect of *Moringa oleifera* against focal ischemic stroke induced by middle cerebral artery occlusion. *Oxid Med Cell Longev*: 951415.
30. Razis AFA, Ibrahim MD, Kntayya SB (2014) Health benefits of *Moringa oleifera*.
31. Stohs SJ, Hartman MJ (2015) Review of the Safety and Efficacy of *Moringa oleifera* 29(6): 796-804.
32. Kasolo JN, Bimenya GS, Ojok L, Ochieng J ,Ogwal OJW, et al. (2010) Phytochemicals and uses of *Moringa oleifera* leaves in Ugandan rural communities. *Journal of medicinal plants research* 4(9): 753-757.
33. Amaglo NK, Benett RN, Lo Curto RB, Rosa EAS, Turco VL, et al. (2010) Profiling selected phytochemicals and nutrients in different tissues of the multipurpose tree *Moringa oleifera* L., grown in Ghana. *Food Chemistry* 122(4): 1047-1054.
34. Onsare JG, Kaur H, Arora DS (2013) Antimicrobial activity of *Moringa oleifera* from different locations against some human pathogens. *J Med Plants* 1(5): 80-91.



This work is licensed under Creative Commons Attribution 4.0 License
DOI: [10.19080/IJCSMB.2017.03.555612](https://doi.org/10.19080/IJCSMB.2017.03.555612)

**Your next submission with Juniper Publishers
will reach you the below assets**

- Quality Editorial service
- Swift Peer Review
- Reprints availability
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats
(Pdf, E-pub, Full Text, Audio)
- Unceasing customer service

Track the below URL for one-step submission
<https://juniperpublishers.com/online-submission.php>