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Review Article

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Moringa Oleifera, Phyto Constituents and its Therapeutic Actions: A Review

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ABSTRACT

Moringa oleifera mentioned in literature as Moringa, is a natural as well as cultivated variety of the genus Moringa belonging to family Moringaceae. It is one of the richest plant sources of Vitamins A, B, C, D, E and K. The vital minerals present in Moringa include Calcium, Copper, Iron, Potassium, Magnesium, Manganese and Zinc. It has more than 40 natural antioxidants. The leaves, pods, seeds, gums, bark and flowers of Moringa are used in many countries to relieve mineral and vitamin deficiencies, support a healthy cardiovascular system, promote normal blood-glucose levels, neutralize free radicals {thereby reducing malignancy}, provide excellent support of the body's anti-inflammatory mechanisms, enrich anemic blood and support immune system. It also improves eyesight, mental alertness and bone strength. It has potential benefit in malnutrition, general weakness, lactating mothers, menopause, depression and osteoporosis. It is also used to make an efficient fuel, fertilizer and livestock feed. Moringa is an edible extremely safe plant. We need to explore therapeutic, nutritional and benefit of Moringa to be one of the world's most useful trees.

Keywords: Moringa, Phytochemical profile, nutritional value, therapeutic use

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1. Introduction

Moringa, native to parts of Africa and Asia, is the sole genus in the flowering plant family Moringaceae. The name is derived from the word Drumstick or murungai. It contains 13 species from tropical and subtropical climates that range in size from tiny herbs to massive trees. The most widely cultivated species is *Moringa oleifera*, a multipurpose tree native to the foothills of the Himalayas in northwestern India and cultivated throughout the tropics. Traditionally its roots are applied as plaster to reduce the swelling and rheumatism. The root, flower, fruit and leaf have analgesic and anti-inflammatory activity. *Moringa* grows more rapidly, reaching higher heights, when found in well-drained soils with ample water, but tolerates sandy soils, heavier clay soils and water limited conditions.

2. Description

Moringa oleifera is a short, slender, deciduous, perennial tree, grows to about 10 m tall, rather slender with drooping branches; branches and stem are brittle, with corky bark; leaves are feathery, pale green, compound, trip innate, (30-60 cm long), with many small leaflets, 1.3-2 cm long, 0.6-0.3 cm wide, lateral ones somewhat elliptic, terminal ones obovate and slightly larger than the lateral ones; flowers are fragrant, white or creamy-white, (2.5 cm in diameter), borne in sprays, with five(5) at the top of the flower; stamens are yellow; pods are pendulous, brown, triangular, splitting lengthwise into 3 parts when dry, (30-120 cm long, 1.8 cm wide), containing about 20 seeds embedded in the pith. The pod is tapering at both ends, nine (9) ribbed; seeds are dark brown, with 3 papery wings [10].

Others Species:

- *Moringa arborea* Verdc. (Kenya)
- *Moringa borziana* Mattei
- *Moringa concanensis* Nimmo
- *Moringa drouhardii* Jum–bottle tree (southwestern Madagascar)
- *Moringa hildebrandtii* Engl. – Hildebrandt's moringa (southwestern Madagascar)
- *Moringa longituba* Engl.
- *Moringa oleifera* Lam. (syn. *M. pterygosperma*)–horseradish tree (northwestern India)
- *Moringa ovalifolia* Dinter & Berger
- *Moringa peregrina* (Forssk.) Fiori [2].
- *Moringa pygmaea* Verdc.
- *Moringa rivae* Chiov.
- *Moringa ruspoliana* Engl.
- *Moringa stenopetala* (Baker f.) Cufod [3,4].

Active Principles

Plants like *Moringa oleifera* are in high demand for their nutritional and medicinal value. *Moringa* leaves and seeds are used by humans as a good source of vitamins (B and C) and amino acids [5,6]. *Moringa oleifera* was also claimed to boost immune systems [7]. It has relatively high crude protein, low anti-nutritional factors and antimicrobial activity [8,9]. Gum Arabic is a secondary metabolite or natural secretion from trees (such as *Acacia nilotica* and *Acacia Senegal*), which is widely used as an additive in food materials. Out of the 13 species of *Moringa*, *Moringa*

oleifera has been given much publicity including its phytoconstituents. A few others such as *M. stenopetala*, *M. peregrina*, *M. concanensis* have been reported. Nevertheless, the various studies reported are not exhaustive and much work is needed to establish the comprehensive phytoconstituents of these and other *Moringa* species, and further explore and exploit their antimicrobial properties not forgetting to ascertain the safety of the active principles. [11]

Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers. Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and reportedly without loss of nutritional value. A large number of reports on the nutritional qualities of *Moringa* now exist in most of the scientific and the popular literature. *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 [12].

3. Pharmacological Activities

Analgesic activity: The experimental studies using hot plate and tail immersion method have shown that alcoholic extract of leaves and seeds of *Moringa oleifera* possess marked analgesic activity [12] and found to be equipotent to standard drug (Aspirin 25mg/kg.).

Anti-inflammatory activity: Poultice of leaves is beneficial in glandular swellings. The root extract exhibited significant anti-inflammatory activity in Carrageen induced rat paw edema [13].

Antipyretic activity: The antipyretic activity of ethanolic, petroleum ether, solvent ether and ethyl acetate extracts of seeds was screened using yeast induced hyperpyrexia method. Paracetamol I.P (200mg/kg) was used as standard for comparison [14].

Wound healing properties: Ethanolic and Ethyl acetate extracts (10% w/w extract in the form of ointment) showed significant wound healing activity that is comparable with the standard vicco turmeric cream (Vicco Laboratories). Phytosterols and phenolic compounds present in these extracts promote the wound healing activity [14].

Anti asthmatic activity: A study was carried out to investigate the efficacy and safety of seed kernels of *Moringa oleifera* in the treatment of bronchial asthma. The results showed an appreciable decrease in severity of symptoms of asthma and also simultaneous improvement in respiratory tract functions [15].

Antidiabetic activity:

An extract from the *Moringa* leaf has been shown to be effective in lowering blood sugar levels within 3 hours ingestion, though less effectively than the standard hypoglycaemic drug, glibenclamide [16].

Hepatoprotective activity:

The methanolic and chloroform extracts of leaves of *Moringa oleifera* have shown very significant hepatoprotection against carbon tetrachloride induced hepatotoxicity. *Moringa* roots have been reported to possess

hepatoprotective activity. The aqueous and alcoholic extracts from Moringa flowers were also found as hepatoprotective effect, due to the presence of quercetin, a well known flavonoid [17].

Antitumor and anticancer activity: Some isolated bioactive compounds from the seeds of Moringa oleifera were tested for antitumor promoting activity using 7, 12-dimethylbenzanthracene (DMBA) as initiator and 12-O-tetra-decanoyl-phorbol-13-acetate (TPA) as tumour promoter. Niazimicin, a thiocarbamate from the leaves of Moringa oleifera was found to be a potent chemo preventive agent in chemical carcinogenesis [18]. A seed ointment had similar effect to neomycin against Staphylococcus aureus pyoderma in mice. It has been found that niazimicin exhibits inhibition of tumour promoter induced Epstein - Barr virus activation [19,20].

Antimicrobial activity:

Moringa roots are reported to be rich powerful antibacterial and antifungal effects. The root extract also showed antimicrobial property due to the presence of 4 alpha-L-rhamnosyl oxy benzyl isothiocyanate [21]. An aqueous extract made from seeds was found to be effective against P. aeruginosa, S.aureus and E.coli. An extract from leaves was found to be effective at inhibiting the growth of fungi Basidiobolus haptosporus, B. ranarums and Spirochin found in root, is effective against both Gram positive and Gram negative bacteria. M. oleifera root contains Anthonine was found highly toxic to the cholera bacterium [22].

Antihypertensive, Diuretic and cholesterol lowering activities: Moringa leaf juice is known to have a stabilizing effect on blood pressure. [19]. Moringa roots, leaves, flowers, gum and the aqueous infusion of seeds have been found to possess diuretic activity [24]. The crude extract of Moringa leaves has a significant cholesterol lowering action in the blood serum of high fat diet fed rats which might be attributed to the presence of a bioactive phytoconstituent i.e. -sitosterol [25].

Antispasmodic, Antiulcer and Anthelmintic activities:

Moringa roots and leaves have been reported to possess antispasmodic activity. [26]. The methanolic extract was found to possess significant protective actions in acetylsalicylic acid; serotonin and indomethacin induced gastric lesions in experimental rats. A significant enhancement of the healing process in acetic acid-induced chronic gastric lesions was also observed with the extract-treated animals [27]. The flower and leaves also are considered to be of high medicinal value with anthelmintic activity [28].

In blindness and eye infections:

Though there are many causes of blindness, Vitamin A deficiency causes impaired dark adaption and night blindness. Eating Moringa leaves, pods and leaf powder which contain high proportion of Vitamin A can help to prevent night blindness and eye problems in children. Ingesting drumstick leaves (-carotene and leutin) with oil helps in improving Vitamin A nutrition and perhaps delays the onset of cataract [29]. Also the juice can be instilled into eyes in cases of conjunctivitis.

Cardiac and circulatory stimulant: All parts of the tree are reported to be used as cardiac and circulatory stimulant.

Moringinine acts on the sympathetic nervous system and acts as a cardiac stimulant [30].

Antioxidant activity: Antioxidant activity reported in oil from the dried seeds is higher than BHT (Butylated Hydroxy Toluene) and alpha-tocopherol. Aqueous methanol (80%) and ethanol (70%) extracts of freeze dried leaves showed radical scavenging and antioxidant activities [31,32].

Antifertility activity: The aqueous extract of root and bark at a dose of 200mg/kg and 400mg/kg, respectively showed post-coital anti fertility effect and also induced foetal resorption at late pregnancy [33]. An aqueous extract of Moringa oleifera roots was investigated for its estrogenic, anti-estrogenic, progestational and anti -progestational activities [34].

4. Pharmaceutical Application

Gelling agent: A study was carried out to find the gelling potential of gum exudates from the stem of Moringa oleifera [35].

Suspending agent: A comparative study of gums of Moringa oleifera and tracaganth was reported. Zinc oxide suspensions were prepared with gum of Moringa oleifera and tracaganth. The results revealed that the suspending properties of Moringa oleifera gum are comparable with that of gum tragacanth [36].

Surfactant behavior: A study on interfacial properties and fluorescence of a coagulating protein extracted from Moringa seeds and its interaction with sodium dodecyl sulphate (SDS) was carried out. The study reported that; a) the protein extracted from Moringa seeds has significant surfactant behavior; b) the coagulant protein interacts strongly with SDS and the protein might have specific binding sites for SDS; c) there is formation of protein-SDS complex [37].

Film forming property: Studies reported that gum of M. oleifera has enormous potential for use in the preparation of polymeric films as drug delivery systems [38].

As stabilizer: Plant phenolics have gained considerable interest in recent years for their potential effects against food related microorganisms. Phenolic extract obtained from the leaves of M. oleifera & M. orusindica showed stabilizing activity [39].

Cosmetic use: Various parts of Moringa oleifera have cosmetic value. 40 Moringa seed oil is widely used as a carrier, lip balm and creams in cosmetic preparations [41].

5. Conclusion

After survey of various literatures I have concluded that plant like Moringa oleifera plays a vital role as film former, gelling agent, suspending agent and stabilizer etc in the development of Novel drug delivery systems and Moringa Oleifera plant is the most inexpensive and credible alternative to not only providing good nutrition, but also cure and prevention of a lot of diseases like diabetes, asthma, cancer, hypertension and ulcer etc. The poor countries should promote planting and use of Moringa as it appears to be a "Miracle" plant having more benefits for humanity and thus should be considered as a gift of nature at very low price.

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