

Moringa oleifera Extract- "A Miracle Tree"

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| Received: 30.11.2021 | Accepted: 04.01.2022 | Published: 07.01.2022

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Abstract

Review Article

Moringa oleifera is a plant native to India that thrives in tropical and subtropical climates around the world. It's also called a 'drumstick tree' or a 'horseradish tree.' *Moringa* is commonly farmed around the world because it can resist both severe drought and moderate winter. Every portion of the tree is suitable for nutritional or economic applications due to its high nutritious contents. Minerals, vitamins, and other phytochemicals are abundant in the leaves. The extracts of tree are used to treat many diseases. It's been utilised as an antioxidant, anticancer, anti-inflammatory, anti-diabetic, and antibacterial agent in the past. *M. oleifera* seed, is widely utilised in water treatment. This review looks at how moringa has been used for therapeutic purposes throughout disciplines, as well as the cultivation, nutrition, commercial, and pharmacological qualities of this "miracle tree."

Keywords: *Moringa Oleifera*, Antioxidant, Anticancer, Anti-Inflammatory, Anti-Diabetic, And Antibacterial, Extract.

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1. INTRODUCTION

Moringa oleifera is a little tree with important nutritional and pharmacological characteristics, and traditional medicine uses preparations from practically all parts of the plant (leaves, fruit, stems, bark, and roots) to cure a variety of diseases. The leaves, seeds, bark, roots, sap, and blooms of *Moringa oleifera* are widely employed in traditional medicine, while the leaves and immature seed pods are used as food. Leaf extracts have the highest antioxidant activity, and aqueous leaf extracts have been shown to be safe in a variety of animal experiments. There have been no known side effects from human research. Five human investigations utilising powdered whole leaf preparations of *M. oleifera* have shown anti-hyperglycaemic (antidiabetic) and anti-dyslipidaemia effects. In animal investigations, extracts and leaf powders were used to corroborate these actions. A growing number of studies have found that aqueous, hydro alcohol, or alcohol extracts of *M. oleifera* leaves have a variety of additional biological activities, including antioxidant, tissue protective (liver, kidneys, heart, testes, and lungs), analgesic, antiulcer, antihypertensive, radioprotective, and

immunomodulatory properties. The reported effects are thought to be caused by a variety of polyphenols and phenolic acids, as well as flavonoids, glucosinolates, and possibly alkaloids. Product standardisation is a problem. The outcomes of published investigations utilising *M. oleifera*, on the other hand, are quite promising (Stohs and Hartman, 2015). *Moringa oleifera* Lam (Moringaceae), sometimes known as the drumstick tree, is an indigenous Indian shrub. Researchers have been interested in this species because its roots have traditionally been used to treat ulcerative colitis (UC). When *Citrus sinensis* Linn (Rutaceae) fruit rind is mixed with *M. oleifera*, it increase the therapeutic treatment of UC. A wide variety of therapeutic plants can be found all over the world. Many weeds in our environment are highly effective medicinal plants that can help with a variety of significant health issues (Parihar and Sharma, 2021; Chaudhary *et al.*, 2021; Telrandhe *et al.*, 2021). India has long been known as a great store of natural remedies among ancient cultures (Parihar and Sharma, 2021; Parihar and Sharma, 2021).

2. ANTI-INFLAMMATORY ACTION

An aqueous extract of root was tested in rats for its anti-inflammatory properties. The results show that a 750 mg/kg aqueous root extract of *Moringa oleifera* lowers carrageenin-induced oedema in the same way that the powerful anti-inflammatory medication indomethacin does. Furthermore, our findings add to the growing body of data that *Moringa oleifera* roots contain anti-inflammatory compounds that could be effective in the treatment of acute inflammatory diseases (Ndiyae *et al.*, 2002).

MRP-1 is a novel polysaccharide that was refined using a DEAE-Sephacrose Fast Flow column after being extracted from *Moringa oleifera* roots using a hot water extraction process followed by ethanol precipitation. This research could lead to new anti-inflammation applications for *Moringa oleifera* root polysaccharide (Cui *et al.*, 2019).

The anti-inflammatory effect of a crude methanol extract of the root of the plant *Moringa oleifera* Lam. was tested utilising the rat paw edema and rat 6-day air pouch inflammatory models. The findings imply that *Moringa oleifera* root includes anti-inflammatory properties that could be effective in the treatment of both acute and chronic inflammatory disorders (Ezeamuzie *et al.*, 1996).

3. ESTROGENIC, ANTI-ESTROGENIC, PROGESTATIONAL AND ANTIPROGESTATIONAL ACTIVITIES

The estrogenic, anti-estrogenic, progestational, and antiprogesterone properties of an aqueous extract of *Moringa oleifera* roots were examined. The uterine wet weight of bilaterally ovariectomized rats increased with oral treatment of extract. The extract's antifertility effect appears to be related to a number of factors (Shukla *et al.*, 1988).

4. ANTI-CANCER ACTION

Chlorogenic acid, rutin, quercetin glucoside, and kaempferol rhamno-glucoside were found in the methanol extract of *M. oleifera* leaves, whereas multiple procyanidin peaks were found in the root and stem barks. The roots, leaves, and stem bark extracts all had high in vitro antioxidant activity, with IC₅₀ values of 16, 30, and 38 L for the roots, leaves, and stem bark, respectively. The substantial antioxidant/radical scavenging activities discovered for several components of *M. oleifera* tend to justify their widespread therapeutic usage in traditional medicine around the globe (Atawode *et al.*, 2010).

In vitro activity of several extracts from *Moringa oleifera* leaves, nanocomposites, and root core (Rc) and outer (Ro) components against hepatocarcinoma, breast, and colorectal cells. *Moringa oleifera* nanocomposites could be used as a natural source of cancer-fighting chemicals (Abd-Rabou *et al.*, 2017).

5. HYPOGLYCAEMIC AND ANTIOXIDANT ACTIVITY

Using a soxhlet apparatus, the root was extracted with n-hexane, ethyl acetate, and methanol in that order. Alloxan-induced diabetes in rats was used to test the powder and methanol extracts for anti-diabetic effects over a 28-day period. The typical medication was glibenclamide. The methanol extract as well as the powdered root both exhibited a considerable reduction (Umar *et al.*, 2018).

6. ANTI-DIARRHOEA ACTION

The effect of a hydroalcoholic (50:50) root extract of *Moringa oleifera* Lam on castor oil-induced diarrhoea in rats. Its impact on intestinal transit, castor oil-induced intestinal fluid accumulation (enteropooling), and electrolyte content in small intestinal fluid were all investigated. *Moringa oleifera* Lam root extract could be beneficial in a variety of diarrheal conditions (Saralaya *et al.*, 2010).

7. ANALGESIC PROPERTIES

The analgesic efficacy of combined methanolic root and leaf extracts of *M. oleifera* (200 mg/kg) on Freund's adjuvant (CFA)-induced arthritis in rats was also investigated. Thermal hyperalgesia was significantly reduced when *M. oleifera* root and leaf extracts (200 mg/kg) were combined. Root and leaf extracts have a synergistic pain-relieving effect (Manajeji *et al.*, 2006).

8. ANTIBACTERIAL ACTIVITIES

Using the agar dilution method, the antibacterial activity of n-hexane extract of *Moringa oleifera* root bark on clinical isolates of methicillin resistant *Staphylococcus aureus* were assessed. HEF's antibacterial activity against MRSA was assessed, and the minimum inhibitory concentrations (MICs) and minimum bactericidal concentrations (MBCs) were recorded and compared to the findings of standard disc antimicrobial tests (Agboke and Attama, 2016).

The antimicrobial activities of *Moringa oleifera* (Lam.) root extracts extracted with petroleum ether, ethyl acetate, chloroform, ethanol, and aqueous extract were tested using the disc diffusion method against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Penicillium sp.*, *Mucor sp* (Raj *et al.*, 2010; Dewangan *et al.*, 2010).

9. TREAT CONTAMINATED WATER

Moringa root powder appears to be a feasible solution to contaminated water treatment. Roots were removed from seven-month-old plants cultivated in a greenhouse at random. The efficiency of moringa concentrations in decreasing *Escherichia coli* in water from a mixed animal farm pond was tested. *Moringa* root powder was found to have potent antibacterial properties against *E. coli* (Morgan *et al.*, 2020).

10. TREAT OVARY CANCER

Moringa oleifera Lam. root was suggested to have some implications in follicle stimulating hormone receptor (FSHR) dependent tumours like epithelial ovarian cancer based on its anticancer and abortifacient capabilities (Ghosh *et al.*, 2021; Bose, 2007).

11. CNS DEPRESSANT NATURE

ME from the root of *Moringa oleifera* was tested for sleeping time induced by pentobarbitone sodium, diazepam, and meprobamate, as well as analgesic properties and potentiation of morphine and pethidine analgesia. Strychnine and leptazol-induced convulsions were significantly reduced after ME pretreatment. Behavioral studies on mice show that ME has a CNS depressive effect (Gupta *et al.*, 1999).

In Holtzman strain adult albino rats, the effects of a standardised aqueous extract of *Moringa oleifera* (MO) root on penicillin (PCN) induced convulsions, locomotor behaviour, cerebral serotonin (5-HTT), dopamine (DA), and norepinephrine (NE) levels were investigated. In light of the altered balance between 5-HT, DA, and NE, the central inhibitory impact of MO is explored (Ray *et al.*, 2003)

12. ANTIULCER POTENTIAL

In albino Wistar rats, the antiulcer potential of an ethanolic root-bark extract of *Moringa oleifera* (MO) was investigated utilising two experimental models: ethanol-induced and pylorus ligation-induced stomach ulceration. This research reveals that MO has antiulcer, antisecretory, and cytoprotective properties. As a result, an ethanolic *Moringa oleifera* root-bark extract can be employed as a source for an antiulcer medication (Choudhary *et al.*, 2014).

13. ANTIMUTAGENIC AND ANTIOXIDANT POTENCY

The antimutagenic and antioxidant effectiveness of aqueous heat treated *Moringa oleifera* root (MRH) extract against sodium azide in TA100 *Salmonella typhimurium* tester strains and their prevention of microsomal lipid peroxidation (LPO) was demonstrated (Satish *et al.*, 2014).

Phytochemical and antioxidant components of *Moringa oleifera* root (dehydrated) powder, extracts - aqueous (WE), acetone (AE), and methanol (ME) were investigated using various *in vitro* assays. Phytochemicals such as glutathione, α -Tocopherol polyphenols, tannins, alkaloids, and saponins were discovered to be abundant in the root. The antioxidant activity of all three solvent extracts was dosage dependant. The antioxidant capabilities on free radicals, as well as its ability to decrease iron and FeSO₄-induced microsomal lipid peroxidation, were established. DNA was protected from oxidative damage by all three extracts. *Moringa oleifera*'s antioxidant

method of action appears to be scavenging reactive oxygen species (Satish *et al.*, 2013).

14. ANTIUROLITHIATIC PROPERTY

An experimentally produced urolithiatic rat model was used to examine the root bark of *Moringa oleifera* Lam. (Moringaceae) as an anti-urolithiatic agent. The solubility product of crystallising salts such as calcium oxalate and calcium phosphate is reduced by the reduction of stone-forming elements in urine and their decreased kidney retention, which could contribute to the anti-urolithiatic property of *M. oleifera* root bark (Karadi *et al.*, 2008)

15. ACUTE TOXICITY

The roots of *Moringa oleifera* were recognised qualitatively in both aqueous and ethanol extracts. Swiss albino mice were used to test its acute toxicity over a 24-hour period. *M. oleifera* is a plant that grows in the oleifera family. Acute toxicity was established by feeding Swiss albino mice a single oral dose and watching them for 24 hours. The probit tables were used to determine the LD₅₀. The ethanol extract had an LD₅₀ of 17.8 g/kg, while the aqueous extract had an LD₅₀ of 15.9 g/kg. Finally, when administered in a single dose, *M. oleifera* roots contain protective phytochemicals and are relatively non-toxic (Kasolo *et al.*, 2011).

Some alkaloids were discovered in a methanolic preparation of *M. oleifera* root (total alkaloid 0.2 percent). Multiple weekly (35,46,70 mg/kg) and daily therapeutic (3.5,4.6,7.0 mg/kg) ip dosages of the crude extract (CE) on liver and kidney functions, as well as haematological parameters, were investigated in mice. The findings show that it had no negative effects on the liver (Mazumder *et al.*, 1999).

16. ULCERATIVE COLITIS

In the treatment of UC, *M. oleifera* root was used alone and in conjunction with *C. sinensis* fruit rind. For their action on acetic acid-induced UC in mice, ethanol and aqueous extracts of *M. oleifera* roots (100 and 200 mg/kg, body weight) were tested alone and in equal combination with ethanol extract of *C. sinensis* fruit rind, i.e. 50 mg/kg each of *C. sinensis* and *M. oleifera*. The use of a combination of *M. oleifera* root extracts and *C. sinensis* fruit rind extract to treat UC is effective, with outcomes comparable to those of the conventional medicine prednisolone (Gholap *et al.*, 2011).

Moringa oleifera roots were lyophilized and extracted using increasing polarity solvents such as ethyl acetate, butanol, methanol, and water. By measuring total polyphenol, total flavonoid, total flavanol, antiradical activity, and reducing power, the extracts were evaluated for polyphenolic load and antioxidant properties. High levels of *M.oleifera* root phenolics, which have crucial antioxidant qualities, can

be recovered using polar solvents like water (Karagiorgou *et al.*, 2016).

17. CONCLUSIONS

M. oleifera research has yet to find traction in India. It's critical that the wonder tree's nutrients are used for a variety of uses. M. oleifera is a powerful anti-diabetic and anti-cancer herb. Double-blind studies, on the other hand, are less common in order to further substantiate moringa's benefits. This irony's specific mechanism has yet to be discovered. Environmental factors impacting the nutritional levels of M. oleifera leaves and other parts growing around the world need to be investigated further. More research is needed to confirm moringa's primary mechanisms as an anti-diabetic and anti-cancer drug. A number of perplexing questions remain unresolved. More research on the antioxidant properties of aqueous extracts on cancer cells is needed. If the potential for extremely nutritious food is tapped by the industries, the tree as a native of India can become a huge source of money for the country.

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