

PHYTOASSEMBLY AND PHARMACOLOGICAL ACTIVITY ON *MORINGA OLEIFERA*: A REVIEW

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ABSTRACT

Moringa oleifera is a plant that has copious medicative properties and widely known as “drumstick plant” or “horseradish plant” and most widely vascular plant in India. This is a nutritional plant (herb) that consists of many pharmacological and biological exertion such as antiasthmatic, diuretic, antiepileptic, cardiovascular as well as antioxidants and also beneficial in wound healing enterprise. The anti-asthmatic action of *M. oleifera* seeds kernel ethanolic extract evoked by histamine and acetylcholine aerosol. Pre-treatment by ethanol gives the extract of *M. oleifera* also diminished carrageenan convincted rat paw edema that was comparable to standard diclofenac sodium. This review summarizes the biological exertion such as a cardiovascular, diuretic, and biological activities such as antimicrobial, antiepileptic, and anti-allergic activities and also provides pharmacological activities in essence anti-cancer, anti-diabetic, and anti-asthmatic activities.

Keywords: *Moringa oleifera*, Phytofactors, Pharmacological, Biological activities.

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INTRODUCTION

Moringa oleifera is one among those plants that have several medicative properties utilized in the cure for respiratory disease, polygenic disease, and chronic rheumatism within the presence of alkaloids in the seeds [1] and roots [2] of *M. oleifera*. The presence of terpenoids has been conjointly noted [3] and the respiratory disease may be a chronic respiratory disorder moving an outsized scale of the population across the globe. Now, natural herbs like Ayurveda have conjointly shown us several medications from indigenous herbal plants for the cure of respiratory disorder and lots of different connected biological activities. *M. oleifera* offers a prodigious and scarce mixture of zeatin, beta-sitosterol, kaempferol, and caffeoylquinic acid and lots of different vital species of *M. oleifera* plant are *Moringa arborea*, *Moringa drouhardii*, *Moringa ovalifolia*, *Moringa riva*, *Moringa borziana*, and *Moringa pygmaea*. Antioxidants and plant leaflets of *M. oleifera* contain multiple supplies of antioxidants elements together with carotene, Vitamin C as well as chlorogenic acid [4]. Moreover, one major impact noted is arsenic toxicity that is vital for contamination of H₂O and ends up in become a health concern issue across the globe [5].

M. oleifera is medicative herb and plant possesses several biological activities like antimicrobial activity [6] and seeds show medicinal drug and spasmodic activity [7]. In case of diagnostic application, the leaves and fruits are more beneficial in skin and higher tract infection. Moreover, this plant also beneficial in the cure of respiratory disease. Recent study unconcealed that the *M. oleifera* has numerous biological activities that help to cure the many disorders such as anti-asthmatic activity, antidiabetic activity as well as this plant have a major role in mast cell and drug production [8].

PHYTOASSEMBLY OF *M. OLEIFERA*

M. oleifera is also admitted as a repository of additives during which necessary ones are flavonoids and synthetic resins acid [9,10] and carotenoids (secondary metabolite) [11], tocopherols (Vitamin E) [12] as well as polyunsaturated fatty acid [13], and many diverse minerals [14]. Plant leaf compounds exposed by gas chromatography and mass spectrometry in which major compounds detached were n-hexadecanoic acid, gamma sitosterol, and octadecanoic acid [15]. In this case, E-lutein has noted most copious carotenoids in

leaflets [16] and further, spirochin and anthonine noted in roots show bacterial enterprise [17].

M. oleifera stem consists of alkaloids, octacosanoic acid, and 4-hydroxymellein [18,19], whereas seeds enclose more high concentrations of benzylglucosinolate, benzylisothiocyanate, and 4-(alpha-1-rhamnosyloxy) phenylacetone [20-23].

Phyto-factors of plant *M. oleifera* Lam.

In *Moringa oleifera*, each part of the plant have some phytofactors like leaves (Niaziminin A and B, pyrrole alkaloids, alpha, and gamma-tocopherol), seeds (Benzylglucosinolate, niazimicin, niazirin, methionine, cysteine), root (Alpha-phellandrene, p-cymene, moringine, moringinine, spirachin), stem (Vanillin, octacosanoic acid, beta-siosterone, 4-hydroxyl mullein), flowers (D-mannose and glucose, isoquercetin, kaempferol, ascorbic acid) [24,25].

Bio-exertion correlated with *M. oleifera* Lam.*Cardio-vascular*

Leaves of *M. oleifera* discovered clear antihypertensive enterprising activity. *In-vivo* enterprising was wiped out in the animal's heart and was found thiocarbamate and isothiocyanate glycosides and other chemical irritants were accountable for this type of harmful hypersensitivity [26].

Hepatoprotective

Ethanolic extract of *M. oleifera* leaves as well as alcoholic extract of seed in perspective of hepatoprotective (*in vivo*) was estimated contrary to the rifampicin and pyrazinamide evoked liver damage [27] and also hepatoprotective effect contrary to antitubercular medical pills and alloxan evoked liver damage noted in diabetic rats [28-33].

Diuretic

M. oleifera elements such as leaves, flowers, seeds, and bark extracts persuaded urine output in rats and campesterol and stigmasterol were conjointly in charge of also accountable for this biological exertion [34].

Wound healing enterprise

Hydroxyproline compound has shown within the extraction of the leaf, dried pulp, seeds, and decrease in scar area and skin breaking strength

in dead models in rats [35,36]. Moreover, recent studies reveal that the effect of wound healing of leaf extraction in diabetic animals showed higher tissue regeneration, and furthermore ascended the tube-shaped structure epithelium protein in wound tissue [37,38].

CNS exertion

Leaves extract of *M. oleifera* restores the capability of amine levels of the central nervous system which will be helpful in Alzheimer's sickness and *in-vitro* anticonvulsant enterprise from the liquid extract of *Moringa oleifera* roots [39].

BIOLOGICAL ACTIVITIES OF *M. OLEIFERA*

Antifertility activity

Roots of *M. oleifera* in the solvent extract were found to be adequate as antifertility in the presence or absence of estradiol dipropionate and progesterone. Throughout the *in vivo* antifertility activity was done victimization liquid extract to observe the causes on histoarchitecture of the womb throughout both pre- and post-implantation stages [40].

Anti-allergic activity

By liquid (ethanolic) extract of *M. oleifera* seeds inhibited cutaneous anaphylaxis convinced with hypersensitivity reaction (IgG) and unleash histamine from mast cells and also reduced scratching frequency in an ovalbumin sensitization model [41].

Antiepileptic activity

Leaves of *M. oleifera* (methanolic extract) illustrate dynamic anticonvulsant contrary to pentylenetetrazole and uppermost electric shock evoked convulsions at the optimum dose level interpretively and also the experiment was performed *in-vivo* anticonvulsant outcome of the ethanolic sample (leaves) of *Moringa concanensis*. Annulment of the convulsions was ascertained in Swiss albino mice and also doable that liquid (ethanolic) sample (leaves) of *M. concanensis* would possibly turn out anticonvulsant impact through varied actions [42].

Antiuro lithic activity

The antiuro lithic activity was exhibited insolvent and ethanolic extract of the bark of *M. oleifera* and additionally noted that the reduction of weight of the stone generated victimization ethylene glycol evoked urolithiasis activity [43].

Antihelminthic activity

The antihelminthic activity showed plant efficiency and it took a nominal period to analyze oligochaete worm, *Pheretima posthuma*, in the ovicidal course. Moreover, severally ethanolic and liquid extracts showed 90% and 81% egg hatch development [44,45].

Immunomodulatory and anti diarrheal activity

Both cellular and humoral immune response excited through a methanolic extract of the plant [46,47] and the extract demonstrates a rise in optical density and showing splenocyte proliferation [48].

According to anti diarrheal activity, the seed extracts demonstrate importantly reduction in canal motility and noted to be effective in aperient evoked diarrhea in male rats [49-51].

Antimicrobial activity

M. oleifera noted antimicrobial activities (ethanolic extract) contrary to any or all tested bacteria and also chloroform extract explicit activity against pathogens such as *Salmonella typhi*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Vibrio cholera* [26,40].

Flavonoids, tannins, and alkaloids check parts were additionally ascertained to be accountable for antimicrobial activity [52] wherever pterygospermin was noted to be chargeable for antifungal activity [43].

Anti-obesity activity

The actual mechanism of anti-obesity activity has momentous devaluation in mass and ascertained when lingual treatment with

leaf extract compared with that obese control [27]. Methanolic extract of *M. oleifera* leaf showed that a stimulating reduction in total cholesterol, liver biomarkers, organ weight, and triglycerides was also diminished [53,54]. Moreover, a debate proved that *M. oleifera* Lam. exhibits a reduction in inflammation and lipid accumulation [55].

Reproductive activity (*M. oleifera*)

The unsuccessful response on *M. oleifera* leaf extract on rats around 9–10 days' treatment after insemination and extract ascertained a synergistic and repressing impact with progesterone [56]. An ethanolic extract of *M. oleifera* leaf secure spermatogonial cells in albino mice where the conceivable elemental mechanism noted the expression of c-kit and oct-4 transcripts freelance in the p53 pathway [57].

Pharmacological activities

Antidiabetic

M. oleifera shows antidiabetic exertion in liquid extract and regulates polygenic disorder by exhibit glycemic management [58]. The *in-vitro* and *in-vivo* analyses of the antioxidants and antidiabetic effects of methanol extracts of *M. oleifera* in streptozotocin-induced diabetic albino rats were enforced. The progression of polygenic disorder was diminished after the test with the extract (test sample). The extract lured a shortened in serum glucose and nitric oxide with an increase in serum insulin and protein levels [59]. The polygenic disorder (diabetes) exertion displayed increased IL-6, inflated macromolecule peroxide, and decreased antioxidant protein within the serum and excretory organs like kidney tissue homogenate in comparison with that of the negative control group [60].

Anti-asthmatic

The previous study was started with the good thing *M. oleifera* seed kernel in the treatment of respiratory disease (asthma). And therefore, the clinical potency was assessed employing a spirometer in the whole treatment. The prevalence of patients exhibited the lead to increasing hemoprotein values and abatement in the erythrocytes rate. Alcoholic extract of *M. oleifera* seed kernel was found spasmolytic in acetylcholine, histamine as well as evoked bronchospasm [61].

Anticancer

Leaves and seeds of *M. oleifera* (ethanolic extract) show antitumor exertion and thiocarbamate further as isothiocyanate allied metabolites were isolated and act as the hindrance of tumor promoter. *In-vivo* antitumor efficacy was present by 3-thiocarbamate and isothiocyanate compounds that act as tumor promoter teleocidin B-4 evoked herpes virus [62].

Neuropharmacological activity

Leaves of *M. oleifera* (solvent extract) have shown stability contrary to Alzheimer's malady in an exceedingly colchicine-convinced Alzheimer's model with behavioral testing. Leaf extract contains Vitamins E and C that play a momentous role in modifying memory in patients with Alzheimer's malady [63,64].

CONCLUSION

The main objective of this review was to resolve the pharmacological and medicinal activities of *M. oleifera* that exposed plant possesses analgesic medication, anti-inflammatory, antipyretic, and antioxidant. These activities are commenced in its root, stem, leaf, and seeds. It states that any of the solvent either ethanolic or methanolic extracts is widely used for examination and identification purposes and in the future, principally *in-vivo* studies based on animal models may be considered for higher effective results.

AUTHORS' CONTRIBUTIONS

All the authors have contributed equally.

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CONFLICTS OF INTEREST

There are no conflicts of interest.

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