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Therapeutic Activity of *Moringa Oleifera*

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***Abstract*: Moringa has long been used to treat infections and diseases namely the common cold and diabetes. Many of the steroidal, alkaloidal, glycosidic compounds along with lipids and varieties of protein were available as an important bioactive constituents in moringa. Rich sources of Vitamin A, Vitamin C and milk proteins, glucosinolate and isothiocyanate, terpene, anthocyanins and phenolic acids. It belongs to family Moringaceae and its genus consists of 13 species that are mainly cultivated in throughout Asia and Africa. Moringa plant parts are suitable for human and animal consumption. Although, Sahjana, Drumstick tree, and Horse-radish tree are all the names for the same plant.It offered various potential activities such as antiasthamatic, antidiabetic, hepatoprotective, antiinflammatory, antifertility, anticancer, antimicrobial, antioxidant, CVS and CNS activity. These plants possess various medicinal properties which can be found in every section of it. Study of this review is to discuss and conclude the knowledge domain on phytochemical composition, medicinal uses and pharmacological activities of moringa and main its ingredients.**

***Keywords*: Moringa Oleifera, pharmacological activity, phytochemical constituents.**

1. Introduction

Plants are used by almost 80% of the worldwide people for health and well-being, and aromatic and medicinal plants account for 25% of pharmaceuticals [1]. A synthetic revolution occurred over the last few decades, with chemical substances being incorporated into most foods, beverages, agriculture, and the environment. As the day by day new discoveries are adopted the dependency on chemical supplements and junk food is increasing and development of resistance to medicines increasing therefore human being tried to shift the attention towards the utilization of natural, herbal as well as organic farm based drugs.2 The traditional Ayurveda is still in practice. The Miracle tree or Moringa contains highest antioxidant in food and has remarkable medicinal uses and nutritional value. The Moringa has been utilized in traditional medicine. Moringa's taxonomic classification following as: Kingdom & Plantae. Tracheobionta is a sub-kingdom of Tracheobionta. Division – Magnoliophyta, Super Division – Spermatophyta, Order – Capparales and belongs to family respectively. Moringceae with the genus and species of moringa and oleifera, respectively [3, 7].


Fig. 1. Leaves of M. oleifera


Fig. 2. Flowers and leaves of *M. oleifera*

2. Flowers and leaves of *M. oleifera*

Botanical Description: It falls under the Moringaceae family, which is monogeneric .Tropical tree including a broad ways of hanging thin shafts, fluffy flowers with thrice-pinnate leaves, and strong thick branches with the bark of milky colour that grows to a height of 10 to 12 metres. It is indigenous to northwestern India and the Himalayan Mountains. It thrives in humid tropics and scorching arid areas, can flourish in nutrient-depleted soils, and is unaffected by drought. Rainfall conditions are estimated to be 250 mm minimum and 3000 mm maximum, with a pH of 5.0-9.0.Whreas, south Asia as well as Arabia includes number of species of moringaceae namely oleifera, hildebrandti and concanesis. While in the region of Madagascar well-known species called M. Drouhardi was found. Although, some of the other species i.e.,borziana, pygmaea and rivae are

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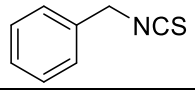
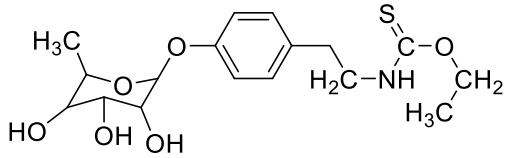
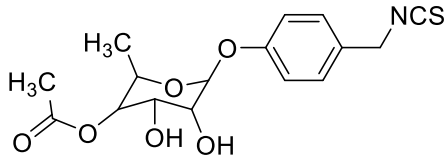
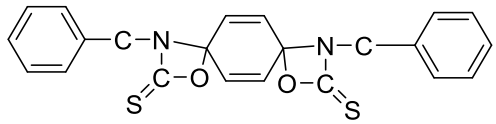
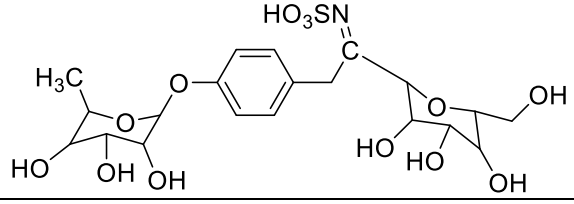
found in northeast and northwestern Africa.4 M. oleiferais the most widely used species of all over the Asian and African countries. The flower is zygomorphic, bisexual, 12 mm tall, white or cream in colour, and aromatic in nature. Fruit is a removable cover capsule with a length of 20-60 cm. Later pods turn brown or dry at maturation and split open into three sections when they are young. There are 12 to 35 spherical seeds in each pod. The seeds are spherical, 1 cm in diameter; three sided, and weigh about 0.3 g on average. Seeds have a mid-brown seed core with three pale wings Seed core can be dark brown or black in colour, although they can also be milky if the kernel viability is poor [5]. Phytochemical composition of Moringa :Number of bioactive categories i.e., Alkaloidal, steroidal, phenolic compounds along withglucosinolates, flavonoids, terpenes, zeatin, quercetin, kaempferom, various carbohydrates like as following L-arabinose, L-galactose, mannose, and xylose, among other phytonutrients, are all found in Moringa [3].

Nutrient composition: Moringa oleifera is being considered as a possible food source. It is abundant in proteins, meat, milk, and eggs, as well as fat, fibre, carbohydrate, vitamins, and vital amino acids [4, 10].

Table 1
Phytoconstituents & Biological activity of plant Moringa oleifera18-23

Parts of Plant	Phytochemical constituents	Biological activity
Leaves	Niazirin , Niazirinin, Niaziminin, Niazimicin A, Niazimicin B.	Anticonvulsant, Antioxidant, Antihypertensive , antibacterial ,anticancer
Seeds	Moringine, , niazimicin, niazirin	Acts against asthma,
Pods	Isothiocyanate, nitrites, beta- sitosterol.	Act against inflammation & helmintics
Bark	Benzylgiucosinolate derivatives.	Act against urolithiatic
Flowers	Present some chemical constituents like as quercetin, isoquercetin, kaempherol, kaempferitin,	Act against inflammation
Root	Some chemical constituents are extract from root are Moringine, moringinine, spirachin,also p-cymene	Antifertility
Stem	Chemical constituents are extracted from stem Vanillin , beta- sitosterone,	Act against inflammation

Table 2
Phytoconstituents & Chemical Structure

Phytoconstituents	Chemical Structure
Benzyl Isothiocyanate	
Niazimicin	
4-[(4'-O-acetylalpha-L-rhamnosyloxy) benzyl isothiocyanate	
Pterygospermin	
4-(alpha-L-rhamnopyranosyloxy) benzylgiucosinolate	

1) Antibacterial activity

It is very effective against bacterial species, since it show antibacterial activity effective against gram-negative and gram-

positive bacteria. Bacterial species Pseudomonas aeruginosaand Staphylococcus aureus against effective leaf extract of M.oleifera(Caceres, Cabrera, Morales, methanol leaf extract was evaluated in contrast to different bacterial species; such as E, coli, S.aureus and P. aeruginosa was evaluated using chloroform as well as ethanol extracts of seeds and leaves .Although, Brilhante and co-workers studied the effect of flower and pods via utilizing the extract of ethanol as well as chloroform against the species of V. vulnificus, cholera and mimicus. S. aureus, Citrobacterfreundii, B. megaterium, and P. fluoescens were all killed by an ethyl acetate extract of bark.8 chemical constuents are effective as antibacterial activity [5,6].

2) Antifungal activity

Because of the existence of numerous phytoconstituents ingredients, it has been utilised to suppress antifungal activities. It works against a variety of fungus species. Ethanolic extracts of seeds have been tested for against fungal activity against T. mentagrophyte, Pull (T. rubrum, E. xoccosum, M. canis).A fungicidal compound Griseofulvin has the ability to stop fungus from growing. It was extracted from the M. oleifera species of endophytic fungus [9].

3) Antiviral activity

As an indigenous herbal plant, it has been utilised to improve antiviral treatments. This is effective in number of viruses i.e., HSV bursal adenoviruses, foot as well as mouth and rhinovirus and seed extract against HSV-1 were all inhibited by ethanolic leaf extracts. The activity of aqueous seed extract against Newcastle disease virus was negative [13]. It can also be utilized as a medication for HIV infected individuals. Although, It has been used to treat HIV-related adverse effects and to fight the Hepatitis B virus [11].

4) Antidiabetic activity

Due to the general abundance of terpens as well as flavonins, those are essential in stimulating pancreatic cells and resulting in the production of insulin hormone, it is particularly helpful in diabetes mellitus, antihyperglycemic, and hypoglycemic. Active compounds such ofglucosinolates, flavonoids along with aschlorogenic acid are capable of possessinghypoglycemic action. Streptozocin induced cytotoxicity test was performed on diabetic Wistar rats, the study revealed that the ethanolic leaf extracts was reported to have hypoglycemic action discovered that benzylamine, which is derived from moringaolifera leaves extract, In elevated diet-induced rats, it lowers cholesterol levels, fat mass, diabetic reactions, and sugar levels .In diabetic animals, a watery extract of the leaves increased insulin levels. The leaves' methanolic extract showed protective against diabetic-induced kidney damage, and inflammation.

5) Antioxidant activity

Anti - oxidant chemicals present in Moringaolifera include ascorbic acid, carotene, qurecitin, kaempferol, and flavonoids. Whereas, in leaves portion it majorly include; myriceti, tocopherols, and lectins.8In seedsprocyanidinswas found. Although, in stem and root portion, the excess quantity ofpalmitic acid, phytosterols, and 9-octadecenamide was found Hydrophilic and alcoholic leaf extracts and roots (methanolic and ethanolic) have potent antioxidant and radical scavenging properties. Along with, Isoquercetin has the strongest antioxidant properties [14].

6) Anti-inflammatory activity

The involvement of 4 [(Lrhamnosyloxy) benzyl] isothiocyanate4(2OacetylLrhamnosyloxy)benzylisothiocyanate,4(3Oacetylrhamnosyloxy)benzylisothiocyanate,4(4Oacetylrhamnosyloxy)benzyl isothiocyanate, quercetin, quercetin3Oglucoside,crypto chlorogenic acid, aurantiamide acetate, 1,3-dibenzyl urea kaempferolglucosides may be responsible for the anti-inflammatory activity.Moringaoleifera root as well as bark methanolic and aqueous extracts, leaves and flowers methanol extraction , seeds ethanol extract have anti-inflammatory action. An ethanolic extract of the leaves was found to be anti-inflammatory by blocking the chemotactic oxidation of polymorphonuclear leukocytes, keratinocytes, and multiple sclerosis cascades [21].

Antihelmintic activity:Fresh and embroys eggs along with L1 and L2 larvae of H. contortus were evaluated with macerated and injected hydrophilic leaf extract as well as ethanolic extracts of Moringa oleifera.At 3.75 and 5 mg/mL, the efficiency was found to be efficient on eggs, inhibiting 60.3 percent 8.2 percent and 92.8 percent 6.2 percent egg embryonation, respectively [15].

Anti-urolithiatic activity: The bark of Moringaoleifera was tested for anti-urolithiatic action in both aqueous and alcoholic extracts. It results in a decrease in the weight of the stone caused by ethylene glycol-induced urothiasis. Moringaolifera has antiuothiatic activity that is both protective and healing properties.

Cardio protective activities:Each section of the plant is used to stimulate the cardiovascular system, as well as to reduced the cholesterol and blood pressure levels in our bodies. This is because presence of cardio stimulants such as N-α-L-rhamnopyranosylvincosamide, gossypetin, quercetagenin, proanthocyanidins and β-sitosterol.Moringaolifera fruits reduced the cholesterol level of hypercholesteremic rabbits' liver, heart, and arota.Because of the existence of multiple leaf additives such as niazinin, niazimicin, niaziminin, niazimin, 4(4′Oacetylrhamnosyloxy) benzyl isothiocyanate, ethanolic leaf extract exhibits significant antihypertensive and hypotensive properties. The hypotensive activity was tested in the heart of an animal and found that glycosidal compounds like thiocarbamate and isothiocyanate were identified to be responsible for this powerful hypotensive characteristics [16].

Anticancer and antitumor activities:Ethanolic extract of leaves possess chemoprotective, cytotoxic, antihepatocarcinoma, antimyelomic and antiproleferative activities. Moreover, in the leaves, eugenol and isopropyl isothiocynate and in the bark,palmitic acid was found [12].

Antiepileptic activity and anti-convulsant activity: At doses of 200/400 mg/kg injected IP, methanolic leaf extracts exhibits effective anti-convulsant property against pentylenetetrazole. The ethanolic extract of Moringaconcanensis leaves may exert anticonvulsant effects via different mechanism, as it inhibited MES-induced hind limb extension and abolished PTZ-induced seizures [17].

7) CNS activity

The extract of the leaves replenishes monoamine activity in

the brain tissues, which may be beneficial in contrast to Alzheimer treatment. The anti - convulsant activity of aqueous extracts of Moringaoleifera roots as well as ethanolicleaves extracts was investigated in vitro on seizures caused by penicillin, locomotor movement, and rates of serotonin, dopamine, and norepinephrine in the brain.Wound healing activity: In albino rats, an aqueous extract of the leaves increased wound healing properties. This is due to the presence of wound healing components like quercetin, kaempferol, phytosterol.

8) Anti –fertility activity

In the inclusion or exclusion of estradioldipropionate and progesterone, a hydrophilic abstract of roots was reported to be beneficial for an antifertility property.

9) Anti-asthmatic activity

A study found that the moringa plant can help asthmatic patients. For three weeks, they were given 3 g of finely powdered dried kernels. A spirometer was used to assess clinical effectiveness before and after the treatment. The percentage of patients exhibited higher haemoglobin (Hb) levels and lower platelet counts. After 3 weeks of therapy, by 32.97 ±6.03,percent, 30.05 ± 8.12 and 32.09 ±11.75 percent, the medication increased required pulse rate, pushed expiratory flow rate, and peak expiratory volume in 1second, respectively. In acetylcholine, histamine, Bacl2, and 5HT-induced bronchiospasm, alcohol extracts seed of kernels were found to be spasmolytic.18

3. Conclusion

Natural Phytochemical have major contributed to discovery and development of new chemical entities with pharmacological active potential against various diseases. It is most of the M.olifera had exhibited in various activites. The Phytochemical constituents are pharmacological active studies support its traditional uses and should convince be useful for clinical evaluation and development of economic drugs. M. oleifera seeds and oil are intriguing products due to their nutritional constituents and bioactive components materials.

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