

MORINGA OLEIFERA AS A PHARMACEUTICAL EXCIPIENT

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ABSTRACT

Plant gums and mucilages are being used due to their abundance in nature, safety and economy. Additives play an important role in pharmaceutical preparations like tablet, lotions, suspensions, syrups and ointments. Recent trends towards the use of the natural and nontoxic products which demand the replacement of synthetic excipients with natural ones. Moringaoleifera gum has good mucoadhesive polymer, disintegrating agent and binder. Moringa Oleiferagum show that it has high potential for industrial application especially in the food, textile and pharmaceutical industries.

Keywords: Gums, Mucilages, Additives, Mucoadhesive, Moringa Oleifera

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INTRODUCTION [1-3]

Nowdays Most of Researchers are trying to introduce new excipients for drug formulations to exhibit varied functions. The popularity of new excipient research is growing tremendously over the last few decades due to increasing demand for safe, economical and functionally reliable substitutes for the existing synthetic ones. There is almost all therapeutic formulations used for humans and others include excipients. Pharmaceutical excipients can be regarded as totally inert or inactive substance within the formulation, but are used to convert Active Pharmaceutical Ingredients into dosage forms suitable for administration to patient.

MoringaoleiferaLam belongs to family Moringaceae. It is also known as Drumstick in English, Saragvo in Gujarati, Soanj-na in Hindi, Sajna in Bengali, Nuge in Kannada, Sigru in Malyalam, Shevga in Marathi, Shobhanjana in Sanskrit and Munaga in Telugu. Moringa powder is sparingly soluble in water but swells in contact with water giving a highly viscous solution. In view of the easy availability of the plant, the ex-udates from the stem of the tree. The stem of the tree exudes a gum which is initially white in colour but changes to reddish brown to brownish black on exposure.

Moringa OleiferaLam. (Moringaceae) is one of the 14 species of the family moringaceae, native to India, Africa, Arabia, Southeast Asia, South America, and the Pacific and Caribbean Islands. Because M. oleiferahas been seen in many tropic and sub-tropic regions worldwide. The plant is referred to by a number of names such as horseradish tree, drumstick tree, ben oil tree, miracle tree, and "Mother's BestFriend". This plant grown and widely cultivated in the northern part of Nigeria and many countries in tropical Africa. Moeingaoleiferacanbe grown in a variety of soil conditions preferring well-drained sandy or loamy soilthat is slightly alkaline. Almost every part of M. oleiferacan be used for food and as aforage for livestock.

Moringa tree was introduced to Africa from India at the turn of the twentieth century where it was to be used as a health supplement. It is traditionally used for the treatment of a number of ailments including as fomentation to relieve spasm, diarrhea, as diuretic and stimulant in paralytic affliction, epilepsy ad hysteria. Study shows that, for centuriespeople in many countries have used Moringa leaves as traditional medicine forcommon ailments.

Nutritional Importance [3-5]

Moringa trees are very useful to combat malnutrition, especially among infants and nursing mothers. Three non-governmental organizations in particular-trees for Life, Church World Service and Educational Concerns for Hunger Organization-have advocated

Moringaas "natural nutrition for the tropics" Drumstick Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and reportedly without loss of nutritional value. Moringais especially promising as a food source in the tropics because the tree is in full leafat the end of the dry season when other foods are typically scarce. A large number of reports on the nutritional qualities of Moringanow exist in both the scientific and the popularliterature. Moringa Oleiferacontain Vitamin A, calcium, iron, vitamin C and potassium respectively more than carrots, milk, spinach, oranges, and bananas. That the protein quality of Moringaleaves rivals that of milk and eggs. The leaves are rich in ironand therefore highly recommended for expectant mothers. Since allessential amino acids are present Moringa may be rightly called acomplete food for total nutrition.



Fig. 1: Fruit of moringaoleifera

Pharmacological importance [3-11]

Analgesic activity

The experimental studies using hot plate and tail immersion method have shown thatalcoholic extract of leaves and seeds of Moringa oleifera possess marked analgesic activity and found to be equipotent to standard drug.

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.

Antipyretic activity

The antipyretic activity of ethanolic, petroleum ether, solvent ether and ethyl acetate extracts of seeds of moringa was screened using yeast induced hyperpyrexia method.

Wound healing properties

Three wound models viz excision wound, incision wound and dead space wound were selected for assessing wound healing activity of ethanolic and ethyl acetate extracts of leaves. 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, Phytosterols and phenolic compounds present in these extracts promote the wound healing activity.

Table 1: The nutrient composition of leaves, leaf powder, seeds and pods [1]

Nutrients	Fresh leaves	Dry leaves	Leaf powder	Seed	Pods
Calories (cal)	92	329	205	-	25
Protein (g)	6.7	29.4	27.1	35.97	2.5
Fat (g)	1.7	5.2	2.3	38.67	0.1
Carbohydrate (g)	12.5	41.2	38.2	8.67	3.7
Fibre (g)	0.9	12.5	19.2	2.87	4.8
Vitamin B1 (mg)	0.06	2.02	2.64	0.05	0.05
Vitamin B2 (mg)	0.05	21.3	20.5	0.06	0.07
Vitamin B3 (mg)	0.8	7.6	8.2	0.2	0.2
Vitamin C (mg)	220	15.8	17.3	4.5	120
Vitamin E (mg)	448	10.8	113	751.67	-
Calcium (mg)	440	2185	2003	45	30
Magnesium (mg)	42	448	368	635	24
Phosphorus (mg)	70	252	204	75	110
Potassium (mg)	259	1236	1324	-	259
Copper (mg)	0.07	0.49	0.57	5.20	3.1
Iron (mg)	0.85	25.6	28.2	-	5.3

All values are in 100 g per plant material

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.

Antidiabetic activity

An extract from the Moringa leaves has been shown to be effective in lowering blood sugar levels within 3 h ingestion, though less effectively than the standard hypoglycaemic drug.

Hepatoprotective activity

The methanolic and chloroform extracts of leaves of Moringa oleifera have shown very significant hepatoprotection against carbon tetrachloride induced hepatotoxicity in albino rats in reducing serum total bilirubin, direct bilirubin, Serum glutamic pyruvic transaminase, and serum glutamic oxaloacetic transaminase levels. 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.

Antitumor and anticancer activity

Some isolated bioactive compounds from the seeds of Moringa oleifera were tested for antitumor promoting activity using 7, 12-dimethylbenzanthracene as initiator and 12-O-tetra-decanoyl-phorbol-13-acetate as tumour promoter. Niazimicin, a thiocarbamate from the leaves of Moringa oleifera was found to be a potent chemo preventive agent in chemical carcinogenesis. The seed extracts have also been found to be effective on hepatic carcinogen metabolizing enzymes, antioxidant parameters and skin papilloma genesis in mice. 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.

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-rhamnosyloxybenzyl isothiocyanate. 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 Spirochloa 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. The antimicrobial activity of different Moringa oleifera seed extracts were tested against Scenedesmus obliquus (green algae), Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Bacillus stercorophilus (bacterial strains) and Herpes Simplex virus type 1 (HSV 1) and Polio virus type 1 (sabin vaccine). Although, P. aeruginosa was more resistant to all M. oleifera extracts, B. stercorophilus was more sensitive than other organisms to all extracts. The effect of aqueous methanolic extract and fixed oil on HSV 1 was highly similar, 52.22% and 45.20%.

Antihypertensive, diuretic and cholesterol lowering activities

Moringa leaf juice is known to have a stabilizing effect on blood pressure. Mustard oil glycosides and thiocarbamate glycosides have been isolated from Moringa leaves which were found to be responsible for the blood pressure lowering effect. Moringa roots, leaves, flowers, gum and the aqueous infusion of seeds have been found to possess diuretic activity. Moringa leaves extract (crude) shows 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. β -sitosterol.

Antispasmodic, Antiulcer and Anthelmintic activities

Moringa roots and leaves have been reported to possess antispasmodic activity. This activity of leaves has been attributed to the presence of 4 alpha-L-rhamnosyloxybenzyl-o-methyl thiocarbamate possibly through calcium channel blocker. The spasmolytic activity exhibited by different constituents provides pharmacological basis for traditional uses of this plant in gastrointestinal motility disorder. The methanolic extract of Moringa 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. The flower and leaves also are considered to be of high medicinal value with antihelminthic activity.

In blindness and eye infections

Though there are many causes of blindness, Vitamin A deficiency causes impaired dark adaptation and night blindness. Eating

Moringaleaves, pods and leaf powder which contain high proportion of Vitamin A can help to prevent night blindness and eye problems in children. Ingesting drumstickleaves (β -carotene and leutin) with oil helps in improving Vitamin A nutrition and perhaps delays the onset of cataract. 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.

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 driedleaves showed radical scavenging and antioxidant activities. The drumstick leaves are found to be a great source of natural antioxidants.

Antifertility activity

The aqueous extract of root and bark at a dose of 200 mg/kg and 400 mg/kg, respectively showed post-coital anti fertility effect in rat and also induced foetal resorption at late pregnancy. Aqueous extract of Moringaoleiferaroots was investigated for its estrogenic, anti-estrogenic, progestational and anti-progestational activities. Doses up to 600 mg/kg of the extract orally failed to induce a deciduas response in the traumatized uterus of ovariectomized rats.

Pharmaceutical application [2-3, 11-16]

Suspending agent

A comparative study of gums of Moringaoleifera and tracaganth was reported. Zinc oxide suspensions were prepared with gum of Moringaoleifera and tracaganth. Their sedimentation profile, redispersibility, degree of flocculation and rheological behaviour were compared. The results shows that the suspending properties of Moringaoleiferagum are comparable with that of gum tragacanth.

Surfactant behavior

A study on interfacial properties and fluorescence of a coagulating protein extracted from Moringaseeds and its interaction with sodium dodecyl sulphate (SDS) was carried out. The study reported that

- The protein extracted from Moring seeds has significant surfactant behavior.
- The coagulant protein interacts strongly with SDS and the protein might have specific binding sites for SDS.
- There is formation of protein-SDS complex.

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.

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 and M. orusindica showed stabilizing activity. In the present study effect of addition of phenolic extract from leaves of M. oleifera and M. indica on the shelf life of pineapple juice stored at 40 °C was investigated by monitoring the changes in titrable acidity and sensory parameters for 8 w. Results observed that the extracts of natural phenolics can be used to improve the quality and safety of foods.

Cosmetic use

Various parts of Moringaoleifera have cosmetic value. Cognis Laboratories Serobiologics team developed Puricare TM and Purisoft TM, two active ingredients based on botanical peptides from the seeds of Moringaoleiferatree that purify hair and skin and offer protection against the effects of pollution. Moringaseed oil,

known as Behen oil is widely used as a carrier oil in cosmetic preparations. The healing properties of Moringa oil were documented by ancient cultures. Moringa oil possesses exceptional oxidative stability which may explain why the Egyptians placed vases of Moringa oil in their tombs. It is high in oleic acid and similar in composition to olive oil. Moringa oil is light and spreads easily on the skin. It is good oil for use in massage and aromatherapy applications. It can be used in body and hair care as a moisturizer and skin conditioner. Other uses include soap making and for use in cosmetic preparations such as lip balm and creams. Moringaoleiferabutter, a semisolid fraction of Moringa oil, is used in baby products to contribute a free radical resistant emollient with exceptionally long lasting skin softening.

Detoxification/water purification

Moringa has the ability to remove hazardous materials from water. After oil extraction of Moringa seeds the left press cake contains water soluble proteins that act as effective coagulants for water purification. The charged protein molecules can serve as nontoxic natural polypeptides to settle mineral particles and organics in the purification of drinking water, vegetable oil, depositing juice and beer. Moringa seeds showed similar coagulation effects to alum. It is also reported that a recombinant protein in these seeds is able to flocculate gram positive and gram negative bacterial cells. Moringa seeds could be used as a biosorbent for the removal of cadmium from aqueous media. Thus water purifying attributes of Moringa seeds are as coagulant, microbial elimination and as a biosorbent.

Binder

In view of importance of binders in pharmaceuticals for the manufacture of tablets and capsules, gum extracted from the bark of Moringa Oleiferagum was evaluated its binding properties through assessment of various parameters essential for pharmaceutical formulation.

Starch

Starch is also one of the most widely used biomaterial in the food, textile, cosmetics, plastics, adhesives, paper and pharmaceutical industries. The diverse industrial usage of starch is based on its availability at low cost, high calorific value and inherent excellent physicochemical properties. The versatility of starch in industrial applications is clearly defined by its physicochemical properties; therefore, a thorough evaluation of the necessary parameters is important in elucidating its industrial uses. Moringa Oleiferastarch as a new starch feedstock for industrial use which can reduce the burden on other starch sources such as cassava, corn, yam, potatoes and other complex carbohydrates. And also to provide an inherent nutritional benefits for various industrial products that use starch as one of the raw material.

Disintegrant

Moringaoleifera isolated gum powder can be effectively used as disintegrant. The disintegration time for natural gum was found to be less when compared to synthetic gum tablet.

Future potential [18-20]

In coming decades, it is anticipated that natural polymers will be coming as additional derivatives for development of various novel drug delivery systems due to a number of actions such as coating agent, gel former, controlled-release matrix, in addition to inducing desirable properties such as mucoadhesion and permeation enhancement to improve oral bioavailability of a drug.

CONCLUSION

After survey of various literatures concluded that natural polymer like Moringaoleiferaplays a vital role in the development of Novel drug delivery systems. So in future these polymers may be used widely by the researcher for the development of NDDS because of its advantage over other synthetic polymer. We anticipate that more uses of natural polymer will be coming as additional derivatives are synthesized and newer formulations are developed. The natural polymers can serve a number of purposes, including as a coating

agent, gel former, controlled-release matrix, in addition to inducing desirable properties, such as mucoadhesion and permeation enhancement to improve oral bioavailability of a drug.

AUTHORS CONTRIBUTIONS

All the author have contributed equally

CONFLICT OF INTERESTS

Declared none

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