

An Overview of the Health Benefits of Drumstick Pods

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ABSTRACT

The "*Moringa*" (MO) (drumstick) is native to India and grows in the tropical and subtropical regions of the world. Due to its high nutritional value, each part of the tree is suitable for nutritional or commercial use. The seed of *Moringa oleifera* is a natural coagulant, widely used in water treatment. The scientific results of this research provide information on the use of *M. oleifera* as a treatment for diabetes and cancer and the strengthening of *M. oleifera* pods, leaves, and flowers in commercial products. This review explores the interdisciplinary medicinal value of MO and discusses the cultivation, nutrition, and commercial and exceptional pharmacological properties of this "miracle tree". MO is nature's first aid kit, widely used in the Indian Ayurvedic medical system, as a nutrient, natural energy stimulant and to increase defense against disease. It is a multi-purpose vegetable sources of trees, spices, cooking oils, and cosmetic oils and as medicinal plants.

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INTRODUCTION

Moringa oleifera belongs to the Moringaceae family of flowering plant. It is also known as "Miracle Tree or Tree of Life." Different names for *M. oleifera* are horseradish tree, drumstick tree, ben tree, soanjna, or saragvo. *Moringa* (MO) is actually Tamil name for *M. oleifera*.^[1] It is an effective remedy for malnutrition. Due to the presence of several essential phytochemicals in its leaves, pods, and seeds, it is rich in nutrients. In fact, MO is said to provide seven times more Vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, nine times more protein than yogurt, 15 times more potassium than bananas, and 25 times more iron than spinach.^[2]

It is a very valuable food crop not only because it is highly nutritive but also because it can grow in any harsh condition, weather it is drought or rain. It has capacity of growing faster than other plants and requires very minimal care. Even beyond food, it serves many benefits in third world countries such as particularly in India, Pakistan, Philippines, Hawaii, and many parts of Africa, having an ability to be used for some crafts (due to being a tree) and cleaning water.^[3] The pods (fruits) of the *M. oleifera* tree are one of the most nutritive, are also rich in proteins and different amino acids necessary for health. The proper physical function and are high in calcium and potassium and useful due to a excess of vitamins and micronutrients and is well known for promoting good health and helping to cure and prevent many ailments.^[3] MO pods contain complex chemical compounds with antibiotic and antioxidant properties that can boost the body's own natural immune system.^[4] It is used to relieve vitamin and mineral deficiencies in more than 80 countries. Drumstick pods also supports cardiovascular system, reduce malignancy by neutralizing free radicals, maintain blood-glucose levels, excellent support of anti-inflammatory and immune system.^[5] Above all, it is expected to benefit general weakness, mental alertness, improvement in eyesight, lactating mothers, bone strength, and menopause.^[5] The roots, bark, gum, leaf, fruit (pods), flowers, seed, and seed oil of drumsticks are reported to have various biological activities, including protection against gastric ulcers, antidiabetic, hypotensive, and anti-inflammatory effects.^[5] It has also been shown to improve liver and kidney function and the regulation of thyroid hormone status. Drumstick pods also protect against

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oxidative stress, inflammation, hepatic fibrosis, liver damage, hypercholesterolemia, bacterial activity, cancer, and liver injury.^[6]

METHODOLOGY

This is research based on food product development, relevant information have been collected from various publications in journals, articles, research papers, etc. Whatever relevant articles or studies were available in the electronics form were examined and put to review.

A brief review of the study involves opinions of different authors, scholars, etc., and also evaluates reports of research work related to actual research proposed to be undertaken.

HEALTH BENEFITS OF DRUMSTICK

Drumstick

Drumstick is an edible plant it has a variety of nutritional and medicinal effects due to its roots, bark, leaves, flowers, fruits, and seeds. *M. oleifera* is one of the vegetables of the Brassica order and belongs to the family Moringaceae.^[6] The Moringaceae is a single genus family with 13 known species.^[7] MO is rich in phytosterols, such as stigmasterol, sitosterol, and sorbosterol, which are the precursors of hormones. MO is used medicinally to treat problems such as skin infections, anemia, anxiety, asthma, blackheads, blood



impurities, bronchitis, catarrh, chest congestion, cholera, and many other illnesses.^[7]

Drumstick Leaves

The large alternately arranged leaves are borne on petioles 4–15 cm long.^[8] These leaves are triplex, usually 2560 cm long, but can sometimes be as small as 6.5 cm long and as large as 90 cm long. The leaves have 5–11 main branches that are pulvinate.^[4] MO leaves contain 45.38 g of carbohydrates, 25.42 g of protein, 2.91 g of fat and 23.33 mg of vitamin C. The leaves of *M. oleifera* are a good source of a natural antioxidant.^[9] Antioxidants can perform a variety of functions, including acting as free radical scavengers, enzyme inhibitors, and reducing damage caused by free radical activity and oxidation. It also has a significant role in preventing stress that might cause several degenerative diseases.^[4]



Drumstick Flower

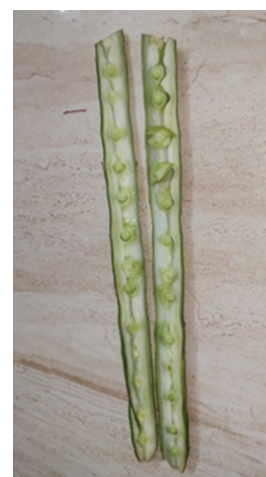
The fragrant *M. oleifera* flowers are creamy-white in color, with yellow stamens.^[9] The flowers average about one inch in diameter and they first bloom when the tree is eight months old, and after that, *M. oleifera* blooms every year from April to September.^[6] MO flower can lower cholesterol, and arthritis medications can treat



urinary problems and colds. It contains calcium and potassium and amino acids.^[6] They also contain nectar. The presence of nectar makes them viable for use by beekeepers.^[6]

Drumstick Pods

Drumstick pods are rich in fiber, lipids, non-structural carbohydrates, protein, and ash. Fatty acids such as oleic acid, linoleic acid, palmitic acid, and linolenic acid are also present.^[10] The participation of PUFA in pods is used in the diet of obese. Rich in fiber, lipids, non-structural carbohydrates, protein, and ash.^[9] Fatty acids such as oleic acid, linoleic acid, palmitic acid, and linolenic acid are also present. The pods are outstanding as a source of Vitamins A, when raw as a source of Vitamin C.^[10] They are good sources of vitamin B and are among the best plant sources of minerals. Drumstick pods have been consumed by Asian people for millennia as a healthy food product. Pods have immense nutritional value such as phytochemicals, vitamins, minerals, and amino acid.^[11] MO pods are known to have a high content of essential amino acids, proteins, minerals, and vitamins, hence an ideal nutritional supplement.^[7]



Drumstick Seeds

Seeds of MO help in treating hyperthyroidism, Crohn's disease, antiherpes-simplex virus arthritis, rheumatism, gout,

cramp, epilepsy, and sexually transmitted diseases, can act as antimicrobial and anti-inflammatory agents.^[11] The seeds are round with a brownish semi-permeable seed hull. The hull itself has three wings that run from top to the bottom at, 120° intervals. Each tree can produce between 15,000 and 25,000 seeds per year.^[12]

Drumstick Roots

Alkaloids such as morphine and moriginine, minerals such as calcium, magnesium, and sodium. Alkaloids help make the bark resistant to ulcers, cardiogenic and help relax muscles. Root bark acts as a cardiac stimulant, anti-ulcer, and anti-inflammatory agent.^[13]

DIABETES AND PODS

Diabetes, commonly known as diabetes, is a metabolic disease that causes high blood pressure. The hormone insulin transfers sugar from the blood to the cells to store or use it as energy. With diabetes, the body cannot produce enough insulin or cannot effectively use the insulin it does produce.

TYPES OF DIABETES ARE

Type 1 diabetes is an autoimmune disease. The immune system attacks and destroys the pancreatic cells that produce insulin. Type 2 diabetes occurs when the body develops resistance to insulin and sugar accumulates in the blood. Pre-diabetes occurs when your blood sugar is higher than normal, but not enough to diagnose type 2 diabetes. Gestational diabetes refers to high blood sugar during pregnancy. The insulin-blocking hormone produced by the placenta can cause this type of diabetes. It wears off as soon as the baby is born.

Diabetes leads to several complications such as retinopathy, nephropathy, and atherosclerosis. Drumstick can be used to prevent ailments. When there is hyperglycemia, the blood glucose reacts with proteins and causes advanced glycosylated end products.^[14] Drumstick is used as an anti-atherosclerotic agent. The anti-atherogenic nature can be accounted for by the antioxidant properties of drumstick. Drumstick has been used to control on both Type 1 and Type 2 diabetes. Type 1 diabetes is one where the patients suffer from non-production of insulin, which is a hormone that maintains the blood glucose level at the required normal value.^[14] Type 2 diabetes is one associated with insulin resistance.^[14] Study conducted on rats shows improved insulin function. Hence proving that MO of 11 g helps diabetics.^[11]

CANCER AND PODS

Cancer is a group of diseases involving abnormal cell growth with the potential to invade or spread to other parts of the body. These contrast with tumors, which do not spread. Paste of drumstick pods has been screened for its influence on the carcinogen detoxifying glutathione-S-transferase (GST) in Swiss mice.^[12] It increased GST activity by more than 80% in the stomach, liver, and esophagus and has shown protective activity against carcinogenesis. The crude ethanolic extract of seeds exhibited anti-tumor activity against Epstein-Barr virus-early antigen (EBV-EA).^[12] Niaziminin, a thiocarbamate from chicken feet pods, has been found to exhibit an inhibitory effect on tumor promoter-induced EBV activation. On the other hand, among the isothiocyanates, naturally occurring 4-[(4'-O-acetyl- α -rhamnosyloxy) benzyl], significantly inhibited

tumor-promoter-induced EBV activation, suggesting that the isothiocyanate group is a critical structural factor for activity.^[12]

CARDIOVASCULAR DISEASE (CVDs) AND PODS

CVD is a general term affecting the heart or blood vessels. It's usually associated with a build-up of fatty deposits inside the arteries (atherosclerosis) and an increased risk of blood clots. Risk Factors: Obesity; Tobacco smoking; Hypertension.

Biochemical study of 15 days for evaluation of cardiac activity of methanolic extract of *M. oleifera* pods on cardiac enzymes and cytosolic Ca²⁺ level was performed.^[15] Methanolic extract of *M. oleifera* showed significant increase in force of contraction and cardiac output in normal and hypo dynamic heart preparations.^[15] These activities are inhibited by propranolol, indicating that it has sympathomimetic activity.^[16] It significantly increased cytoplasmic Ca²⁺ level after 15 day treatment. The alkaloids obtained by fractionation of the water extract of the pods converted into their salt form were tested for their activity on the isolated frog heart.^[17] The total alkaloid salt was found to produce a negative inotropic effect on the isolated perfused frog heart. This activity was further characterized by testing it on the isolated guinea pig ileum.^[18]

OTHER DISEASES

Anti-inflammatory - Drumstick seeds of hydro-alcoholic extract (DSHE) and its chloroform fraction (MCF) were effective to reduce weight of the distal colon (8 cm) as a marker for inflammation and tissue edema.^[19] Three doses of DSHE and two greater doses of MCF (100 and 200 mg/kg) were effective to reduce ulcer severity, area, and index as well as mucosal inflammation severity.^[20] Hot water infusions of flowers, leaves, roots, seeds, and bark also showed anti-inflammatory activity against carrageenan-induced hind paw edema.^[21]

Antitumor activities - MO leaves to be a potential source for antitumor activity.^[22] O-Ethyl-4-(α -L-rhamnosyloxy) benzyl carbamate together with 4-(α -L-rhamnosyloxy)-benzyl isothiocyanate, niaziminin, and 3-O-(6'-O-oleoyl- β -D-glucopyranosyl)- β -sitosterol have been tested for their potential antitumor promoting activity using an in vitro assay which showed significant inhibitory effects on EBV-EA.

Antiulcer activities - The methanolic extract of pods showed antiulcerogenic activity against aspirin-induced gastric ulcer at a dosage of 4 g/kg body weight.^[23]

COMMERCIAL ASPECTS

MO seeds are used to extract an oil called the oil. This oil is rich in oleic acid, tocopherols, and sterols. It can also resist oxidative rancidity. The oil can be used in cooking as a substitute for olive oil, as perfumes, and also for lubrication.^[24] The pods can absorb organic pollutants and pesticides. MO seeds also have good clotting properties, which can precipitate organic matter and mineral particles from solution. Taking into account the opinions of several of these fortifications, it is suggested that this addition can also be made in other sandwiches. Addition of MO to the snacks can add nutritive value to the snacks.^[25] Most of the sandwiches are made from cornmeal. Some studies have shown that adding a little MO to cornmeal can increase the nutritional value of protein, energy, and minerals in snacks. However, further studies on MO as a fortified Indian snack are required before bringing commercialized MO to the market.^[26]

FOOD PRODUCT DEVELOPMENT

In a nutshell, food product development is a series of stages that every business goes through as it tries to bring a new food to market. Different food products can be developed by adding drumstick pods powder to it.^[27] One such food was developed. Instant soup powder was developed and it was a rich source of protein, crude fiber based on physicochemical properties. Analysis for the developed instant soup powder showed that prepared product contained high level of phenolic compounds and flavonoids.^[28] As a result, the developed instant drumstick pod soup powder can be used as rich source of nutrients and phytochemicals.^[29] It can also be used to defeat the problem of malnutrition and in lower cost.^[30] Many such products can be developed.

Mathri and Biscuits were also developed. The result of the Hedonic test showed that Biscuits were found acceptable by all panel members and overall acceptability was graded at 8 by 90% of panel members.^[31] This indicated that the drumstick biscuits were accepted by panel members. The mathri was accepted by all the panel members. Appearance and texture were acceptable by 70–80% of members. The overall acceptability score of 8 was given by 60% of members in Hedonic test.^[31] As in the above review, we came through that there are very few products of drumstick incorporated with pods available in the market. So awareness is to be created of its health benefits to the community and several researches must be focused more on pods as the healthy products are very limited.

FUTURE ASPECTS

The research on drumstick pods is yet to gain importance in India. The nutrients from this miracle tree must be used for multiple purposes. *M. oleifera* has great anti-diabetic and anti-cancer properties.^[29] Above revived article, we find lacuna that drumstick pods have been minimal used for enumerating various non-communicable disease and as we know that pods/seeds of many nutritive properties. So we can use mucilage and make a product. It is very important to work on these products as it is economical, it gets at cheaper rate, they are even grown in drought region and most important weaker section people can also use it and has enormous nutritive properties and are able to cure many diseases. NCDs it covers so we have to study them as it gives a way to choose us this topic.

M. oleifera possesses tremendous health benefits. It contains essential amino acids no other plant does. It is available all over India yet there are very less researches done on *M. oleifera* pods. The demand for healthy snack in market is huge, fortifying *M. oleifera* pods in different snacks can target health as well-being of an individual.

CONCLUSION

The research on drumstick pods is yet to gain importance in India. The nutrients from this miracle tree must be used for multiple purposes. *M. oleifera* has great anti-diabetic and anti-cancer properties^[29]. Above revived article we find lacuna that drumstick pods have been minimal used for enumerating various non-communicable disease and as we know that pods/seeds of many nutritive properties. So we can use mucilage and make a product. It is very important to work on these product as it is economical, it gets at cheaper rate, they are even grown in drought region and most important weaker section

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