

Adaptable uses and therapeutic attributes of astounding tree: Drumstick (*Moringa oleifera* Lam.)

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ABSTRACT

Popularly known as the “drumstick tree” in India, moringa was named the ‘plant of the year’ in 2008 by the “National Institute of Health”. Researchers found that every part of this deciduous tree starting from its leaves, fruits, seeds, pod, roots, flowers to bark have benefited man since ages in some way or the other which led the ancient Romans, Greeks and Egyptians highly value it mainly for its medicinal benefits. *Moringa oleifera* is the most well-known species of moringa genus that belongs to the Moringaceae family. It is native to India and is widely cultivated in the subtropical and tropical areas of Asia, South America and Africa. It has whitish-gray thick bark with fragile, droopy branches and large green oval leaflets. It can grow up to 10-12 cm in height with a diameter of around 45cm. Due to its high nutritious value, this plant helps in the general human wellbeing and hence is aptly called “The Miracle Tree” in many Asian, African and Caribbean countries. Rich in bioactive compounds—such as flavonoids, phenolic acids, alkaloids, glucosinolates/isothiocyanates, sterols, and unique proteins—this plant exhibits a wide spectrum of therapeutic properties.

Keywords: Therapeutic uses, Drumstick, *Moringa oleifera*, Phytochemicals, Water purification

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INTRODUCTION

Undoubtedly, the health benefits of moringa or drumstick make it the new superfood, which you can vouch on. It is good for our heart, liver, lung, kidney, eye, stomach and can also fight several diseases like cancer, diabetes, anemia etc. Hence, it is mandatory to include it in our diet chart. Often seen floating in our bowl of *sambhar*, Drumstick is scientifically known as *Moringa oleifera* Lam. It belongs to the family *Moringaceae*. It is a small, fast-growing, evergreen tree that grows in tropical regions. It is found in the Himalayan areas of India, Bangladesh, Afghanistan and Pakistan. Drumstick is also known as horseradish tree or drumstick tree (in English), Subhanjana (in Sanskrit), Haritashaaka or Akshiva (in Ayurveda) and Sainjna or Saguna (in Hindi). Every part of the drumstick might contain essential properties for human health; hence, it may be one of the crucial nutritional herbs. For many years, the drumstick has been used as traditional medicine. According to the Ayurvedic system of medicine, drumsticks may have potential use and be helpful for various diseases due to their high nutritional value, water retention and capacity for purification. All the parts of the moringa plant are good for humans in some way or the other and hence you can incorporate it in your food regime in several ways (Anwar et al. 2007; Berglund 2018). You can consume it in the form of tea, or use it in a shake or smoothie or can use it in various recipes (Mishra et al. 2012 ; Mane 2024). But, despite its good effects, you must never ignore the precautions. As you know nothing in excess is good, so try to eat them in moderate amounts and if you are pregnant, please consume only on doctor's advice. High levels of blood sugar are very dangerous and may cause various health complications. It may affect your heart and the other important organs of the body. Therefore, maintaining blood sugar levels is mandatory and with moringa, you can put your blood sugar levels easily at check. The chlorogenic acid content in moringa has been proved to regulate the blood sugar levels Until then, stay healthy, stay safe.

PHYTOCHEMICALS IN MORINGA

Drumstick provides large and rare varieties of vital minerals and nutrients. Pods, leaves, flowers, barks, roots and seeds of drumsticks also contain bioactive compounds (Moyo et al, 2011).

Flavonoids & Phenolic Acids

- Rich in quercetin, kaempferol, myricetin, apigenin, rutin, gallic, caffeic, chlorogenic, ferulic, and ellagic acids—potent antioxidants with anti-inflammatory and hepatoprotective properties.
- Total phenolic content is highest in ethanol leaf extracts (~7.2%), flavonoids ~23.5%.

Glucosinolates & Isothiocyanates

- Predominantly glucomoringin, which upon activation yields moringin (an isothiocyanate). These compounds exhibit anti-inflammatory, antimicrobial, hypotensive, and anticancer effects.

Carotenoids & Terpenoids

- Leaf carotenoids include lutein, β -carotene, zeaxanthin, and luteoxanthin; terpenoids such as lupeol acetate, α/β -amyrin offer antioxidant and anti-inflammatory benefits.

Alkaloids

- Pyrrole alkaloids like marumoside A/B and others present in leaves; roots contain spirochin and anthonine.

Sterols

- Contains β -sitosterol, β -sitosterol-3-O- β -D-galactopyranoside, campesterol, stigmasterol; implicated in anti-inflammatory and cholesterol-lowering actions.

Tannins, Saponins & Other Polyphenols

- Found throughout leaves, seeds, roots, bark—contribute to antimicrobial, antioxidant, and astringent properties.

Fatty Acids & Oils

- Seeds yield ben oil with ~66% oleic acid, palmitic, stearic, and behenic acids; seed extracts also contain cis-11-eicosenoic, linoleic acids with antibiofilm activity

POTENTIAL USES OF DRUMSTICK

Drumstick can be used in the following ways (Moyo et al. 2011): The entire plant might have potential use for muscle spasms or muscle cramps. It might also act as a cardiac and circulatory tonic and may act as an anti-septic and a diuretic. Juice of leaf of drumstick might help with hiccoughs (contractions of the diaphragm). Leaves of drumstick might be helpful for influenza (viral infection of the respiratory system). Juice of leaf of drumstick might help with hiccoughs (contractions of the diaphragm). Leaves contain antioxidants (Chumark 2008). The dried root bark of drumstick might help with piles, goitre (swelling of the thyroid gland) and internal abscess (formation of pus) (Mishra et al. 2011). The bark of the stem and flowers of the drumstick might be helpful to lower glucose levels in the blood. Charak Samhita mentioned use of *Moringa bark* when poured in ear releases from otorrhoea or ear problems (Saxena 2023 p.303). Gum obtained from moringa also helps in remedy of earache. Flowers of drumstick might stimulate gallbladder contraction and increase the flow of bile. Pods of drumstick might be helpful for high fever. The seeds of drumsticks are acidic and contain many stimulants that might be helpful for the central nervous system (CNS).

Uses in Diabetes

The leaf extract of drumstick might show potential anti-diabetic properties that might help lower blood glucose levels. An animal study (Gupta et al. 2012) showed that the extract of leaves of drumsticks might help reduce the progression of diabetes and may induce a reduction in serum glucose levels by increasing the production of protein and insulin hormone (Paikra et al. 2017). Another animal study (Ndong et al. 2007) showed that the extract of drumstick leaves might help control glucose levels, urinary sugar and protein levels, haemoglobin and total protein in the blood (Mishra et al. 2011). High levels of blood sugar is very dangerous and may cause various health complications. The chlorogenic acid content in moringa has been proved to regulate the blood sugar levels. Another study on 30 women also proved that by consuming moringa leaf powder for 3 months, there was significant reduction in blood sugar levels by 13.5%. Therefore, moringa became a natural cure for diabetes also, which occurs due to imbalance in blood sugar levels, and there were several studies to back the fact. “*International Journal of Food Science Technology*” also confirmed that diabetic patients when consumed moringa as a part of high carbohydrate diet showed positive results on insulin and blood glucose levels. In fact, not just blood sugar, the immunoglobulin and glycosylated hemoglobin, the other two markers of diabetes also lessen with moringa intake.

NEPHROPROTECTIVE USES

Barks, leaves, seeds, flowers and roots of drumsticks might have diuretic activity that may be helpful for urine formation in patients with kidney dysfunction. It might also help to lower the deposition of oxalate salts (stones forming units) in the kidneys. An animal study (Kamal 2008) found that the extract of drumstick root lowers the kidney retention of salts and excretion in the urine. Moreover, these extracts also reduce elevated serum uric acid and creatinine levels (Mishra et al. 2011). This information is insufficient as these studies were done on animals. However, more studies on humans are required to back this claim. Kidney diseases are serious and must be diagnosed and treated by a doctor, so kindly consult a doctor. We recommend do not use drumsticks to self-medicate yourselves before taking medical advice. Kidney failure or kidney problems can lead to many health problems, so the early you protect your kidney, the better and moringa will help you in it. Studies show that you can prevent nephrotoxicity, a kidney problem that mainly occurs due to the toxin or drug exposure with proper intake of moringa. Besides, the presence of antioxidants in moringa extracts gives protection against the renal injuries and also intensifies the recovery process in body. It is an ideal bio-absorbent that helps your body to wash off the harmful toxins and heavy metals that are bad for your kidneys.

Charak Samhita mentioned use of *Moringa* flowers when mixed with mishri in form of sweet drink helps in better release of urine (Saxena 2023 p.469).

USES IN DIGESTIVE SYSTEM

Moringa boosts your digestive health and since ancient times, it is considered the perfect remedy for treating stomach disorders as well as other digestive issues. Due to the presence of isothiocyanates in it, it has the ability to treat several abdominal issues like the problem of gastritis, constipation, diarrhea and ulcerative colitis. The anti-inflammatory properties of moringa enable it to fight various germs and make it the perfect detoxifying agent that flushes out the harmful metal toxins from your body. It inhibits the growth of disease-causing pathogens and cures various bacterial, yeast or fungal infections. The Vitamin B present in its leaves further aids in the digestive process and enables smooth conversion of food into energy instead of storing them as fats.

HEPATOPROTECTIVE EFFECTS

Moringa extract can protect the health of liver. Various studies have proved that moringa is highly beneficial and often recommended in case of the liver damages that are caused by the anti-tubular drugs. Phytochemicals like catechin, ferulic acid, epicatechin and vitamin C present in moringa helps your body speed up the recovery process. They facilitate the process of restoration of glutathione levels in your body as well as prevent hepatic lipid peroxidation induced by radiation.

CARDIOPROTECTIVE EFFECT

Heart is the most important organ in your body and with moringa, you can protect it and prevent the occurrence of several cardiovascular diseases. The various antioxidants present in it helps to check the risk of heart attacks and strokes that has taken innumerable lives in the recent past. Moringa helps to inhibit the lipid peroxidation to increase in the myocardial tissues and hence keeps our heart healthy. With adequate moringa intake, you can control high blood pressure, high cholesterol and hypertension, those that put your heart at risk largely.

- **Reduces cholesterol levels**– In order to keep your heart healthy, the cholesterol levels in body must be regulated. Moringa helps to lower the high levels of cholesterol in body and hence reduce the risk of strokes and heart attacks.
- **Controls your high blood pressure levels**– Having high blood pressure also puts your heart at risk but with moringa you may keep the pressure levels under control. The powerful antioxidant quercetin present in moringa reduces the levels of blood pressure in human body.
- **Reduces hypertension**– Excessive tension can affect your heart severely but moringa helps you to control it. The presence of bioactive components like niaziminin and isothiocyanate prevents the arteries from thickening and inhibits the development of pulmonary hypertension.

IMMUNOMODULATORY EFFECTS

It has number of health benefits with strengthening your immune system being one of them. The ethanolic content present in the leaves of moringa enhances the immune response of the cells. It also facilitates the functioning of other immune system values like antibodies, leucocyte count and hypersensitivity reaction. Moringa being a perfect antimicrobial agent prevents the growth of the disease-causing microbes. They also give protection against water-borne microorganisms and foodborne microorganisms as well. All these together boost the immune system and help to lead a healthy, diseases free life (Chumark, et al. 2008)..

USES IN PREVENTION OF CANCER

Studies show that the powder from the Moringa leaves register a higher ORAC (Oxygen Radical Absorbance Capacity) score than many any other foods. With an ORAC score of 157,000, *M. oleifera* tops other antioxidant superfoods, including Acaci berries, green tea, blueberries, dark chocolate, garlic, goji berries, pomegranates, etc. Herbal medicines have a vital role in the prevention and treatment of cancer and medicinal herbs are commonly available and comparatively economical. The *M. oleifera* extract shows high antioxidant activity, potent cancer cell anti-proliferation, and induction of quinonereductase (Chumark 2008). This deadly disease is currently topping the list of the life-threatening diseases that has been the cause of several deaths all over the world. However, researchers have found out that the moringa extracts are beneficial to prevent and cure cancer, which is one of the most important health benefits of moringa. The phenolic compounds like kaempferol and quercetin present in moringa possess chemo-preventive properties and hence moringa is widely used in tumor therapy. Niazimicin, the bioactive compound present in it has also been proved to restrain the growth and the development of cancer cells. In addition, the chemo-modulatory effects of moringa make it a perfect cure for various types of cancers like ovarian cancer, skin papillomagenesis and hepatic carcinogenesis. *Moringa* inhibits the rapid growth of malignant cancer cells and hence is safe for the cancer patients. It is also a cure for breast and colorectal cancer as well.

Uses in Eye cure

Moringa oleifera is good for the eyes. Several studies proved that moringa has retinoprotective ability and can aid your body to cure any retinal damage. Moringa prevents the retinal vessels to dilate, thereby facilitates the retinal vasculature to remain intact. Besides, moringa prevents the capillary membranes to thicken which in turn lessens the risk of retinal dysfunction. You can treat your problem of cataract with moringa as well.

Uses in Brain Functioning

An adequate intake of moringa contributes positively to cognitive function. It enhances memory retention and facilitates changes in brain monoamines, including norepinephrine, dopamine, and serotonin. Furthermore, it offers protective benefits against Alzheimer's disease and its associated monoaminergic deficiencies. Additionally, moringa, being abundant in protein and the amino acid tryptophan, stimulates the production of serotonin, which plays a crucial role in regulating mood swings, sustaining energy levels, and combating depression, fatigue, and insomnia.

Applications in Asthma Treatment

Individuals who experience asthma or have a predisposition to it may find relief through the use of moringa. Research indicates that it alleviates inflammation in the airways and provides relief from bronchial asthma. Numerous asthma treatments incorporate moringa due to its ability to decrease the frequency of asthmatic episodes and alleviate accompanying symptoms such as wheezing, dyspnea, cough, and chest tightness. Various studies have demonstrated the efficacy of moringa in addressing several allergic conditions, including anaphylaxis and allergic rhinitis. Moreover, it offers protection against bronchial constrictions and supports the optimal functioning of the lungs and respiratory system.

CERTAIN OTHER USES

The calcium and phosphorus contained within it play a significant role in promoting the health of bones and teeth, thereby preventing rapid breakage. Furthermore, owing to the anti-inflammatory properties of moringa, it can also be utilized to address arthritis issues. Additionally, various bone-related conditions, such as jawbone fractures or mandibular fractures, can be effectively treated with moringa extracts. Importantly, the magnesium content contributes to maintaining strong teeth and averting premature loss. Monera et al. (2017) discovered that the leaf extract of *M. oleifera* inhibits the 6 β -hydroxylation of testosterone by CYP3A4. Mahajan and Mehta (2009) reported the anti-arthritic effects of the hydroalcoholic extract of *M. oleifera* flowers in Wistar rats. Moringa extracts are beneficial in preventing the formation of kidney stones. Numerous studies have indicated that the roots of moringa exhibit certain anti-urolithiatic properties that can lower urinary oxalate levels in the body. Moreover, moringa extracts inhibit the development of stone deposits and regulate the synthesis of endogenous oxalate. Research has demonstrated that moringa enhances the absorption of iron in the body, which subsequently aids in increasing red blood cell levels and maintaining overall blood parameters. Moringa is also advantageous for pregnant women. The nutrients found in moringa have the potential to boost stamina and provide significant energy to expectant mothers. Additionally, moringa offers optimal prenatal nutrition, particularly in supplying iron and calcium, which are crucial during pregnancy. Furthermore, it supports lactation and breast milk production in mothers. *Moringa oleifera* is renowned for its remarkable wound healing properties, as it can reduce clotting time. In essence, it shortens the duration required for wounds

to cease bleeding. Moreover, it effectively diminishes the appearance of wounds and scars, resulting in clear, glowing skin.

Furthermore, it enhances the tensile strength of the skin and diminishes the size of scars. Moringa extracts are effective in addressing edema, a condition characterized by swelling caused by fluid retention in the tissues. However, moringa is thought to provide a remedy for this issue, and research indicates that the anti-inflammatory properties of moringa roots play a crucial role in preventing the onset of edema.

Methods to Use Drumstick

Moringa oleifera can be used in various ways to treat several health issues. Undoubtedly, the health benefits of moringa or drumstick make it the new superfood (Anwar *et al*, 2003),.

- Consume moringa in the form of tea. Steep the dried moringa leaves in hot water. Strain it and then drink it. Try to avoid boiling it in order to retain the maximum nutrients in it. The moringa tea is generally light and has an earthy taste.
- You may also add moringa powder to your smoothie and then drink it. This is one of the healthiest smoothies that taste good as well as is highly beneficial for health.
- You may also pop moringa seeds like popcorn with some butter. You can cook the seeds like peas and consume them along with other meals.
- The leaves can be eaten as salads or may be added to pasta, rice or some other dish. Moringa leaf powder may be sprinkled on soups or added to any other foods while cooking. However, try to add them at the end of cooking or just before you eat them in order to get the maximum nutrients.
- The moringa pods may be boiled, fried or steamed. You may consume them in any way just like green beans.
- Lastly, there are various moringa or drumstick recipes. You may include them in your diet chart in the way you want.

USE OF THE SEEDS IN WATER TREATMENT

Researchers from all around the world agree that *Moringa* seeds can give a more efficient purification process than conventional synthetic materials in use today. In many countries it is still difficult to obtain clean water. But not only Third World countries can benefit from Moring seeds as a water purifier. Even developed countries can benefit from a process that treats waste water without addition of further synthetic chemicals. Results from studies show that the clusters of material (flocs) that are produced with the protein are much more tightly packed than those formed with conventional flocculating agents. This is better for water purification as such flocs are more easily separated. Crushed Moringa seeds clarify and purify water to suit domestic use and lower the bacterial concentration in the water making it safe for drinking. Water purification: The study on the *Moringa oleifera* as a natural gift point out that, A billion people across world like; Latin America Africa, and Asia are assessed to depend on untreated water sources for their daily needs. Kumar and Sheeja (2013) used seeds of this plant for removal of heavy metals from waste water. Numerous research reports shown that, *Moringa* seed powdered can be used cleaning dirty water in simple and quick method simple. The *Moringa* seed powder joins with the solids in the dirty water and sinks to the bottom. This action can remove bacteria contained in water up to 90-99%. Rather than using $Al_2(SO_4)_3$, which are dangerous to people and the environment, using *Moringa* seed powder to purify water is cheap. Water can be purified by adding 2 g of *Moringa* seed powder to 20 l into a bottle and shake for 5 min. Dirty water that is to be treated can be filtered through a clean cloth into the container. Until the water becomes clear and the impurities have sunk to the bottom leave the bucket undisturbed for one hour then filter the water through a clean cloth boil the water before drinking.

CONCLUSION

Drumsticks might have a wide range of uses with high nutritional value. Various parts of this plant act as stimulants that might possess various activities employed to help with different diseases in the indigenous systems of medicine, particularly in South Asia. Some of the potential uses of drumstick are described as follows. which you can vouch on. It is good for your heart, liver, lung, kidney, eye, stomach and can also fight several diseases like cancer, diabetes, anemia etc.

Moringa oleifera contains over 100–200 bioactive compounds, spanning flavonoids, phenolics, glucosinolates/isothiocyanates, carotenoids, alkaloids, sterols, saponins, tannins, and fatty acids. These molecules confer a wide array of pharmacological properties, including antioxidant, anti-inflammatory, antimicrobial, anticancer, hepatoprotective, hypotensive, and metabolic effects .

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