

**SHOBHANJANA (MORINGA OLEIFERA LAM.) FLOWER: A PHARMACOLOGICAL REVIEW**

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**ABSTRACT**

*Moringa oleifera* Lam. is, plant of the Moringaceae family, which is also known as drumstick tree, miracle tree due to its miraculous effects. It contains various macronutrients and micronutrients such as vitamins. It contains Bioactive Plant Compounds such as flavonoids, tannins, phenolic acids, sterols, etc. which directly or indirectly affects the organism consuming it. *Moringa oleifera* flowers possess antioxidant, anti-cancerous, anti-inflammatory, anti-microbial, chemo-protective activity. Along with its hepatoprotective action, it is used in splenic disorders also. Ayurveda mentions the *Moringa oleifera* Lam. in the treatment of various diseases such as *Gulma*, *Arbuda* (tumors) due to its intensive penetrative properties, in *Vidradhi* (abscess), in eye diseases, etc. It is well known *Ayurveda* drug for its capacity to act as mucolytic, fat metabolizer, aphrodisiac and cell nutritive. It lowers *Vata* and *Kapha* dosha, and lessens worms, edema, and abscesses. *Moringa oleifera* is able to treat obesity, lymphadenitis, tumors, thyroid enlargement and ulcers/wounds. *Moringa oleifera* flowers are included under *Pushpa shaka*. *Bhavprakash* emphasised the benefits of Moringa flowers for treating worm infestations, splenic

disorders, abscesses, *Kapha* and *Vata* conditions, and inflammation of the tendons, etc. In recent studies, *Moringa oleifera* Lam. flower extracts have shown cell proliferation activity in rat fibroblasts, MSCs and angiogenesis.

**Keywords:** *Ayurveda*, *Shigru*, *Shobhanjana*, *cell-proliferation*, *anti-microbial*, *flowers*, *Arbuda*, *Vidradhi*, *IMP-PAT Database*

## INTRODUCTION

The plant *Moringa oleifera* Lam., one of the important among 13 species viz., *M. arborea*, *M. borziana*, *M. concanensis*, *M. drouhardii*, *M. hildebrandtii*, *M. longituba*, *M. oleifera*, *M. ovalifolia*, *M. peregrina*, *M. pygmaea*, *M. rivae*, *M. ruspoliana*, and *M. stenopetala* of the family Moringaceae, is native to Southeast Asia and Africa.<sup>[1]</sup> It is also referred as the drumstick tree, or horseradish tree. It thrives in tropical and semi-arid climates. Numerous research studies have demonstrated the presence of various macronutrients and micronutrients, such as vitamins

in this plant. As each and every part of the plant possess some medicinal properties and its miraculous effects on health of human being, it is also referred to as ‘miracle tree’. Flowers and tender leaves are eaten as pot herbs. *Moringa oleifera* Lam. flowers contains traces of alkaloids: they also contain a wax, quercitin and kaempferol; ash is rich in potassium and calcium.<sup>[2]</sup> MOF also contains various essential amino acids, sucrose, D-galactose, flavonoids as well as known antioxidant vitamins.<sup>[1]</sup>

According to USDA, Taxonomic classification of *Moringa oleifera* Lam. is as follows,<sup>[3]</sup>

<b>Kingdom</b>	Plantae
<b>Subkingdom</b>	Tracheobionta – vascular plants
<b>Super division</b>	Spermatophyta – seed plants
<b>Division</b>	Magnoliophyta – flowering plants
<b>Class</b>	Magnoliopsida – Dicotyledons
<b>Subclass</b>	Dilleniidae
<b>Order</b>	Capparales
<b>Family</b>	Moringaceae
<b>Genus</b>	<i>Moringa</i>
<b>Species</b>	<i>oleifera</i>

*Moringa oleifera* is screened for various Bioactive compounds present in it. BPCs are any nutritive or non-nutritive component of plant that affects the organism that consumes them. BPC consists of chemicals that are found in traces or in huge amounts in plants and have the potential to improve human health. Typical BPCs are plant’s secondary metabolites that are not essential i.e. despite not contributing to plant growth, they are crucial to the life of the plant.<sup>[4]</sup>

### Aim

To study the different medicinal properties of present in the flower of *Shobhanjana* (*Moringa oleifera* Lam.) through *Ayurveda* perspective.

### Literature Review

According to WHO, 80% of world population uses traditional medicines to treat themselves.<sup>[5]</sup> In traditional medicine, *Moringa oleifera* Lam. is used for treating ulcers, wound healing, cancer, obesity, anemia and liver diseases as folk medicine.<sup>[6]</sup> Flowers of the *Moringa* are used as an aphrodisiac and also for the treatment of tumors, inflammation, hysteria, spleen enlargement, and muscle ailments.<sup>[7,8]</sup> Classical text of *Ayurveda*, *Bhāvprākāsh Nighaṇṭu* have mentioned properties of *Moringa oleifera* flowers in *Śākavarga*.<sup>[9]</sup> *Śākavarga* is included under *Āhāra varga* and is the group of herbs which are consumed as vegetables, soup and food material. This includes *patra Śāka* (leafy vegetables), *kāṇḍa Śāka* (stem),

*phala Śāka* (fruit vegetables), *puṣpa Śāka* (flower veggies), etc. Consumption of these vegetables helps to maintain the health in healthy individuals as well as helps in curing the diseased condition present in body. *Moringa oleifera* flower comes under *Puṣpa shaka*. *Bhāvprākāsh* emphasised the benefits of *Moringa* flowers for treating worm infestations, splenic disorders, abscesses, *Kapha* and *Vata* conditions, and inflammation of the tendons, tumour, etc.<sup>[9]</sup>

### Bioactive compounds present in Flowers of *Moringa oleifera*.

*Moringa oleifera* Lam. contains various types of BPCs such as flavonoids, phenolic acids, tannins, alkaloids, saponins, sterols, etc. Flavonoids provides protection against various chronic illnesses including cardiovascular diseases, diabetes, cancer and hepatic diseases. Main flavonoids found in *Moringa oleifera* Lam. are myricetin, quercetin, kaempferol.<sup>[10]</sup> Phenolic acids are another significant BPC found in *Moringa oleifera* having antioxidant, anti-inflammatory, anti-diabetic, anti-cancerous properties. Foremost phenolic acid found in *Moringa oleifera* Lam. is Chlorogenic acid (CGA).<sup>[10]</sup> Tannins are the water-soluble phenolic compounds have been reported to possess anti-inflammatory, anti-atherosclerotic, antidote, vasoconstrictor, anti-cancerous, and anti-hepatotoxic qualities.<sup>[10]</sup> Moringine, an alkaloid relaxes the bronchioles and has anti-asthmatic properties.<sup>[11]</sup>

$\beta$ -sitosterol, a sterol is known for its hepatoprotective effect.<sup>[12]</sup> Sharifudin SA et al reported that the flowers of *Moringa oleifera* contains various essential amino acids, sucrose. D-galactose, traces of alkaloids, flavonoids as well as antioxidants vitamins.<sup>[13]</sup> Monteiro et al reported presence of minerals such as Mg, Fe, Mn, Zn, Ca, Cu, S, P, K., fatty acids such as linoleic acid followed by linolenic acid and oleic acid. They also contain soluble sugars like glucose and fructose, traces of essential oils which were dominated by alkanes, fatty acids and some characteristic nitrogen and sulphur containing secondary metabolites. Majorly found essential oils in MOF are (E)-nerolidol (13.3%),  $\alpha$ -terpinol (7.8%) and benzyl-isothiocyanate (6.4), tetracosane 27, hexyl acetate 21, palmitic acid 12, nanocosane 10.<sup>[14]</sup>

Sankhalkar S et al reported that the moringa flowers are rich source of tannins, saponin, flavonoids, terpenoids, alkaloids, reducing sugars and anthraquinones.<sup>[15]</sup>

In many cultures flowers are used as food as it contains nutritional values in it such as total proteins 44%, lipid 3%, PUFA 42% and dietary fibres 32.5%.<sup>[16]</sup>

*Moringa oleifera* flowers are rich in polyphenol<sup>[17]</sup>, Calcium, potassium and antioxidants ( $\alpha$  and  $\gamma$  tocopherol).<sup>[18]</sup>

### Chemical compounds present in the *Moringa oleifera* Lam. as per IMPPAT Databse <sup>[19]</sup>

beta-Bisabolene	Isopropyl isothiocyanate	trans-2,cis-6-Nonadienal	Sabinene
Octanal	Hexanal	9-Octadecen-1-ol, (9Z)-	ar-Turmerone
Pinocarvone	2-Methyl-1-butanol	4-Carvomenthenol	Nerol
1-Butanol	Phenylacetone nitrile	(1R)-2-methyl-5-propan-2-ylbicyclo[3.1.0]hex-2-ene	2-Furanmethanol, 5-ethenyltetrahydro-alpha,alpha,5-trimethyl-, cis-
1-Hexadecanol	Decanal	2-Hexenal	(Z)-p-Menth-2-en-1-ol
Decanoic acid	Furfural	cis-3-Hexen-1-ol	(E,Z)-2,4-Decadienal
Myrcene	Perillene	alpha-Terpinene	alpha-Phellandrene
Nonana	1-Tetradecanol	Neryl acetate	Camphene
2-Heptenal	Heptanal	2-Hexen-1-OL	2-Cyclohexen-1-ol, 3-methyl-6-(1-methylethyl), (1R,6S)-rel-
2-Nonenal	Dodecanal	Anethole	D-Glucose

2-Decenal	Palmitic acid	cis-3-Hexenyl acetate	Geraniol
gamma-Terpinene	Ethyl acetate	(Z)-Methyl cinnamate	Limonene
Kaempferol	Phenylacetaldehyde	Sucrose	trans-Linalool oxide
Quercetin	1-Octanol	Linalool	Nerolidol
Benzyl isothiocyanate	Isobutyl isothiocyanate	alpha-Pinene	Oleyl alcohol
1-Octen-3-OL	1-Heptanol	Carvone	trans-Verbenol
2-Octenal	p-Tolyl acetate	beta-Pinene	Methyl nonanoate
Trigonelline	Benzaldehyde	alpha-Terpineol	1-Methoxy-4-methylbenzene

### Medicinal properties of MOF

Plants are a significant source of macronutrients and micronutrients that humans employ for both prevention of diseases and to acquire health benefits. *Moringa oleifera* Lam. has been utilizing since long by Indians and residents of other countries too which referred as panacea for treating more than 300 conditions as it encompasses antioxidant, anti-tumor, anti-cancerous, anti-inflammatory, anti-diabetic, anti-pyretic, anti-epileptic, anti-ulcer, anti-spasmodic, anti-bacterial, anti-fungal, immune-modulatory, anti-hyperglycemic, anti-dislipidemic, and anti-hypertensive activity.<sup>[8]</sup>

According to WHO, chronic diseases are the leading cause of morbidity and mortality nowadays. Most commonly found chronic diseases are cardiovascular diseases, cancer, chronic obstructive pulmonary disease (COPD) and type 2 DM. Both hereditary and environmental variables, such as diet and lifestyle, are significant markers of these disorders.<sup>[20]</sup> Therefore, adopting a good food including fruits and vegetables, proper nutrition and balanced routine can reduce the chance of occurrence of chronic diseases and adding medicinal plant chemicals that are well-known for their health benefits can help further with their prevention. *Moringa oleifera* has potent hypocholesterolemic, hypolipidemic and anti-atherosclerotic activity. In the context of a high-fat diet, numerous studies have demonstrated the hypocholesterolemic and hypolipidemic effects of oral *Moringa oleifera* extract consumption<sup>[21,22]</sup>, as well as the prevention of liver inflammation<sup>[23,34]</sup>, improvement in liver alterations due to diabetes induced damage.<sup>[25-27]</sup> Based on animal histopathological investigations, aqueous and alcoholic extracts of root, flower and leaf have been reported to reduce drug-induced

hepatic and renal damage.<sup>[13,28-29]</sup> The anti-inflammatory activity of *Moringa oleifera* has been observed after the treatment with extracts of roots, stem, leaves, flowers, pods and seeds in studies on paw oedema<sup>[30]</sup>, airway inflammation<sup>[31]</sup>, ulcerative colitis<sup>[32]</sup>, atopic dermatitis<sup>[33]</sup>, and in parkinsonism.<sup>[34]</sup> Extracts from the roots, stems, leaves, flowers, pods, and seeds have been shown to have antimicrobial properties against gram-positive (*Enterococcus faecalis*, methicillin-resistant *Staphylococcus aureus*, and *Staphylococcus epidermidis*) and gram-negative (*Salmonella enterica*, *Pseudomonas aeruginosa*, and *E. coli*) bacteria isolated from clinical samples.<sup>[35-42]</sup> Flowers are often added to cooked or fried vegetables or mixed in with other dishes.<sup>[43]</sup> There is a lot of research revealing the usage of *Moringa oleifera* as a food fortifier and for the production of bread<sup>[44]</sup>, cake<sup>[45]</sup>, yoghurt<sup>[46]</sup>, soups<sup>[47]</sup> and herbal biscuits.<sup>[48]</sup> Many herbs bears anti-cancerous properties by stimulating cancer cells to undergo necrosis or apoptosis.<sup>[49]</sup> Conversely, certain herbs possess a proliferative action.<sup>[50]</sup> A study evaluated and compared aqueous extracts of *Moringa oleifera* Lam. leaf and flower for cell proliferation activity. A prominent effect of flower extract to promote proliferation in rat fibroblast, MSCs and angiogenesis was analyzed while same effect on abnormal cancer cells is not seen. Extract from the leaves have shown strong cytotoxic effect on cancer cell types but less ability to promote proliferation.<sup>[51]</sup>

### DISCUSSION

1. According to *Ayurveda*, *Moringa oleifera* Lam. shows antioxidant activity due to presence of *dīpana*, *pāchana karma*, *uṣṇa* (exothermic nature) and *tikṣṇa* (intense force) *gūṇa* which gives rise to

the activation of exocrine and endocrine glands and formation of enzymes, hormones and digests *Āma* present in the body resulting in prevention of further breakdown of normal cells. Hence, antioxidant in nature.

## 2. Anti-tumor and Anti-cancerous Activity

*Arbuda* (tumor) is caused due to vitiating *Vata* and *Kapha dosha* in accordance with *Agnimāndya*. Increased *Vayu* and *Agni mandatā* results in hyperplasia i.e. increased in number of abnormal, immature cells. Moringa, because of its *uṣṇa guṇa* hyperactive forces become controlled so that maturation of cells takes place properly which ultimately results in formation of mature cells within time. And, because of *tikṣṇa guṇa*, it leads to destruction of already formed immature cells. In this way, Moringa acts as anti-tumor and anti-cancerous.

## 3. Anti-inflammatory

Inflammation is regarded as *Shotha* in *Ayurveda* which causes due to vitiated *tridosha*, predominantly *Kapha* and *Vata dosha*. Due to *tikṣṇa guṇa*, *shobhanjana* causes *chhedana* of *kapha* and due to *uṣṇa guṇa* it causes dissolution of *vikṛt Kapha*, vasodilatation and *anulomana* of *Vata* i.e. it gives proper momentum (*gati*) to *Vata dosha* physiologically which results in reduction and curing of inflammation.

## 4. Anti-diabetic

According to *Ayurveda*, *Prameha* (diabetes) is caused due to *Kleda vrddhi* in *dhatus* causing *dhatu shaithilya* and drawing out of *Ojas* from all over the body towards *basti* and its excretion through urine. Moringa, because of *uṣṇa* and *Rukṣa guṇa*, dissociates as well as utilize the water molecules and reduces *kledata* in body which results in solidification and stabilization of all the seven *dhatu*s, preventing their loss and cures *prameha*.

## 5. Anti-pyretic

Because of *dīpana*, *pāchana karma*, reduces *agnimāndya* and digests *Āma* resulting in sweating which ultimately results in reduction of hyperthermia. i.e. *jwaranāsha*.

## 6. Anti-epileptic

When *Vikṛt Vayu* takes *Mala* (waste material or excretory material to the higher centre i.e. Brain) to the

*Hridaya*, it exerts illusion of the mind and visual hallucination and seizures. *Shobhanjana* acts as anti-epileptic through proper digestion reducing number of *mala* in the body.

## 7. Anti-ulcer

When there is increased amount *Āma* in the body it results in *Antah Vidradhi* (peptic ulcer) because of its *amla* and *vidāhi guṇa*. By digesting *Āma*, reducing its *amla* and *uṣṇa guṇa*, *Shobhanjana* heals ulcers and wounds.

## 8. Anti-spasmodic

*Stambha* (spasm) is caused due to *shīta guṇa*. By providing heat moringa causes relaxation of muscles and acts as anti-spasmodic and helps in curing muscle ailments, inflammation in tendons.

## 9. Anti-bacterial, anti-fungal

Moringa acts as bacteriocidal due to *tikṣṇa guṇa*. It causes bacterial cell death causing breaking of the cell membrane, DNA breakdown and destruction of nucleus of the cell. And anti-fungal by reducing *kledata* in body as *kledata* (moisture) gives favorable environment to microbes for their growth.

## 10. Immune-modulatory

By proper digesting the ingested food material, it gives rise to formation of *Prākṛt kapha* results in increase in *bala* (strength) and *sāratā*, moringa performs immune-modulatory action.

## 11. Anti-dyslipidemia

*Āma Viṣa* (bad cholesterol) have *sthūla guṇa* because of this, it gets deposited in the body causing *srotas avarodha*. Moringa because of *uṣṇa*, *laghu*, *kaṭu vipāka* (digestive action) and *tikṣṇa guṇa*, digests *Āma* and formation of *sūkṣma guṇa Vasa* takes place which doesn't get deposit in the body.

## 12. Anti-hypertensive activity

Moringa shows anti-hypertensive activity by possessing *uṣṇa guṇa* i.e. exothermic in action which converts hardening of membranes, valves and pores of arteries, veins, channels, etc. into softening resulting in decrease in the blood pressure.

## CONCLUSION

*Moringa oleifera* is used in anemia and malnutrition, chronic illnesses, hepatic and renal damage. Moringa

flowers possess anti-inflammatory, anti-microbial, anti-cancerous, chemo-protective activity. Along with its hepatoprotective action, it is used in splenic disorders also. It has shown its activity in cell proliferation in rat fibroblasts, MSCs and angiogenesis. Further studies are needed to test if flower also possess anti-fertility action as like leaves causing faulty decidualization and to examine effect of flowers on estrogen, progesterone hormone.

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