IAMJ

INTERNATIONAL
AYURVEDIC
MEDICAL JOURNAL

Review Article | ISSN: 2320-5091 | Impact Factor: 6.719

# A REVIEW ON NUTRITIONAL AND MEDICINAL IMPORTANCE OF SHIGRU LEAVES (Moringa oleifera Lam) AND PUNARNAVA (Boerhavia diffusa L. nom.cons.)

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https://doi.org/10.46607/iamj1509032021

**(Published online: March 2021)**



**Article Received:** 11/02/2021 - **Peer Reviewed:** 15/02/2021 - **Accepted for Publication:** 19/02/2021



## ABSTRACT

Across classical texts of Ayurveda detailed description of different vegetables are mentioned under *Shaka varga*. The nutritional properties, therapeutic uses and indications of *Patra* (Leafy vegetables), *Pushpa* (Flowering vegetables), *Phala* (Fruiting vegetables), *Nala* (Stalked vegetables), *Kanda* (Tuber vegetables) are delineated in *Shaka varga*. Only a few among these vegetables are being used in day-to-day practice, the reason might be due to the lack of availability or lack of awareness about the nutritional values and therapeutic potential. This article is focused to show the potentiality of *Shigru* (*Moringa oleifera Lam) patra* and *Punarnava* (*Boerhavia diffusa L. nom.cons.)* which are under-utilised in today's dietary practice even they are abundantly available.

**Keywords:** *Nala, Phala, Punarnava, Patra*, *Shigru*

## INTRODUCTION

The health and the unhealth are nothing but the outcome of *Ahara/Diet*[1]. Out of all the factors for maintenance of health, proper intake of food occupies the key role because *Ahara* or diet is the basic medicament other than any substance[2]. In classical texts of Ayurveda, the dietetics were described under *Ahara varga* among them Vegetables which are the key elements in diet were described as *Shaka varga.* The nutritional properties, therapeutic uses and indications of *Patra* (Leafy vegetables), *Pushpa* (Flowering

vegetables), *Phala* (Fruiting vegetables), *Nala* (Stalked vegetables), *Kanda* (Tuber vegetables) are delineated in *Shaka varga*. Even though acharyas mentioned various vegetable drugs under *Shaka varga,* this study targeted to enlighten the potentiality of *Shigru patra* (*Moringa oleifera Lam*) and *Punarnava* (*Boerhavia diffusa L. nom.cons*) which are ignored in daily dietetics though they are abundantly available and highly nutritive. As various medicinal plants are used as food as well as medicine, the worth of the plant can be evaluated by its nutritional significance and is an added advantage during its consumption. In addition to it being used as an herbal medicine, *Punarnava* (*Boerhavia diffusa L. nom.cons*) and *Shigru patra* (*Moringa oleifera Lam*) are consumed in some areas realising their benefits. *Moringa oleifera Lam* or *munaga* is one of the most important plant widely cultivated in India. It belongs to family Moringaceae. The leaves of this plant are highly nutritional and contains valuable pharmacological actions like anti-asthmatic, anti-diabetic, hepatoprotective, anti-inflammatory, anti- fertility, anticancer, anti-microbial, anti-oxidant, cardiovascular, anti-ulcer, CNS activity, anti-allergic, wound healing, analgesic, and antipyretic activity[3]. *Punarnava* (*Boerhavia diffusa L. nom.cons*) belonging to family Nyctaginaceae. Various ethnopharmacological reports emphasise *Punarnava* (*Boerhavia diffusa L. nom.cons)* role in disorders of the reproductive, gastrointestinal, respiratory, urinary, hepatic and cardiovascular system as well as in the treatment of cancer[4].

***Shigru Patra***

*Shigru patra* is mentioned under *Shaka varga* in classical texts of Ayurveda including *Susrutha samhitha*, *Raja Nighantu*, *Kaiyyadeva Nighantu*, *Bhavaprakasha Nighantu*. Here its properties are brought together. The *Shigru patra* is *Katu* (Pungent), *Ushna* (Hot in Potency), *Snigdam* (Unctuous), *Guru* (Heavy)[5,6] *Vata Kaphaapaham* (Subsides Vata and Kapha disorders), *Ruchyam* (Tasty), *Deepanam* (Carminative), *Pachanam* (Digestive), *Pathyam* (Wholesome), *Krimighnam* (cures worms), *Chakshusyam* (good for eyes), *Brimhanam* (strength promoting), *Medoharam(*body fat decreasing*)*. Beneficial in disorders like *Jwara (*fever*)*, *Swasa (*dyspnoea*)*, *Kasa (*cough*)*, *Krimi(*worms*)*, *Akshi roga (*eye disorders*)*, *Arshas* (hemorrhoids*)*, *Sadhyovrana (incised wound)*. Some of the Therapeutic uses of Moringa leaves mentioned in classics are compiled here –

a) Soup of the leaves of *Kasamarda* (*Senna occidentalis*) and *Shigru* and of dry radish alleviate hiccough and asthma.
b) Paste of the root and leaves of *Shigru* pounded with sour gruel and added with salt destroys guinea worm.
c) Juice of *Shigru* leaves rubbed well in a copper vessel and fumigated with ghee removes swelling, irritation, watering and pain in eyes.
d) Juice of *Shigru* leaves mixed with honey removes many diseases of eye caused by dosas separately or jointly.
e) Washing with the juice of *Shigru* leaves alleviates all diseases of eye
f) Bolus made of *Shigru* leaves is useful in conjunctivitis caused by *Kapha*.
g) In painful haemorrhoids, after proper unction tub bath with decoction of the leaves of *Agnimantha* (Clerodendrum phlomidis), *Shigru* and *Asmantaka* (Bauhinia variegata) removes pain.
h) In accidental wounds, one should apply paste of *Shigru* leaves and *Tila* mixed with ghee[7].

**Preparations** - Leaves can be used fresh or as dry powder. Fresh leaves are often used in the same way as spinach or to prepare salads, sauces and soups. Dried leaves are often milled and could be used to confer a spicy taste to dishes, also combined with other ingredients. The fruit of *Shigru* (*Moringa oleifera Lam*) especially popular ingredient in the Southern part of India using it for making curries, soups and stews since long. The leaves can be used for making tea, smoothies and other beverages and other preparations like Dals, bhurjis, pickles, curries, soups and more. Here are some reasons to include these nutritional leaves in regular diet.

**Table 1:** Nutrient compositions of fresh leaves, dry leaves and leaf powder. All values are in 100 g[8].

| Nutrients | Fresh leaves | Dry leaves | Leaf powder |
|---|---|---|---|
| Calories (cal) | 92 | 329 | 205 |
| Proteins (g) | 6.7 | 29.4 | 27.1 |
| Fats (g) | 1.7 | 5.2 | 2.3 |
| Carbohydrates (g) | 12.5 | 41.2 | 38.2 |
| Fibre (g) | 0.9 | 12.5 | 19.2 |
| Vitamin A | - | 1.51 | - |
| Vitamin B1 (mg) | 0.06 | 2.02 | 2.64 |
| Vitamin B2 (mg) | 0.05 | 21.3 | 20.5 |
| Vitamin B3 (mg) | 0.8 | 7.6 | 8.2 |
| Vitamin C (mg) | 220 | 15.8 | 17.3 |
| Vitamin E (mg) | 448 | 10.8 | 113 |
| Calcium (mg) | 440 | 2185 | 2003 |
| Magnesium (mg) | 42 | 448 | 368 |
| Phosphorus (mg) | 70 | 252 | 204 |
| Potassium (mg) | 259 | 1236 | 1324 |
| Copper (mg) | 0.07 | 0.49 | 0.57 |
| Iron (mg) | 0.85 | 25.6 | 28.2 |
| Sulphur (mg) | – | – | 870 |

**Leaf:** As mentioned above, many of the benefits attributed to moringa leaf are no doubt due to its stellar nutritional content. The fresh or dried leaves contain a wealth of important nutrients including a wide array of B vitamins, and vitamins K, E, D, C and A, the minerals manganese, copper, magnesium, zinc, phosphorus, iron, potassium, sodium and calcium, and a striking amount of some more common, but necessary compounds like protein and amino acids. Here it goes gram for gram, the relative nutritional value of moringa compared to common foods. **Fresh** moringa leaf contains about 4 times the calcium of milk, about 7 times the vitamin C of oranges, twice the protein of yogurt, 4 times the vitamin A found in carrots, and almost as much iron as spinach. The **dried** leaf contains about 15 times the amount of potassium found in a banana, about 10 times the amount of vitamin A as a carrot, 9 times the protein of yogurt, 17 times the calcium found in milk, and 25 times the amount of iron in spinach.

There are 9 amino acids which are necessary for health, but these cannot be synthesized from other molecules, so we need to include them in diet. All 9 of these "essential" amino acids are found in moringa leaf, along with several other non-essential amino acids[9]. A good dietary intake of Zinc is essential for proper growth of sperm cells and is also necessary for the synthesis of DNA and RNA. *Moringa oleifera* leaves show around 25.5–31.03 mg of Zinc/kg, which is the daily requirement of Zinc in the diets[10]. **Niazimicin -** Moringa contains niazimicin, which is a compound that suppresses the development of cancer cells. It contains high levels of antioxidants that might aid toxicity levels in the kidneys and presence of isothiocyanate and niazimicin, compounds help to stop arteries from thickening, which can cause blood pressure to rise.

**Anti-inflammatory** - The anti-inflammatory properties of moringa leaves are effective in preventing oedema. Components like calcium and phosphorous, help keep bones healthy and strong. Along with its anti-inflammatory properties moringa extract might help to treat conditions such as arthritis and may also heal damaged bones. The antibiotic antibacterial, antifungal and antimicrobial properties of moringa leaves helps inhibiting the growth of various pathogens consequently moringa extracts might combat infections caused by *Salmonella*, *Rhizopus*, and *E. coli*. Moringa leaves may stop the dilation of retinal vessels, prevent the thickening of capillary membranes, and inhibit retinal

dysfunction. **Cardiovascular System -** *M.oleifera* leaves contain a high quality of polyunsaturated fatty acids & low saturated fatty acids content, which combined with diuretic, lipid & blood pressure lowering properties from leaves Contribute to the maintenance of **Cardiovascular health.** *M. oleifera* has potent **hypocholesterolemic**, **hypolipidemic** and **antiatherosclerotic** activity. Several studies showed the hypocholesterolemic and hypolipidemic effect of oral consumption of *M. oleifera* extracts in the context of high-fat diet[11,12], prevention of liver inflammation[13,14] and improvement in liver alterations due to diabetic- induced damage[15]. Moreover, *Moringa* leaf extract has also been reported to reduce the formation of atherosclerotic plaques[16]. Although there are only a few studies in humans, the potential benefits of using *M. oleifer* for the treatment of **hyperglycemia** and **dyslipidaemia** have been demonstrated: type-2 diabetes patients treated with leaf powder for 40 days, showed glycemia, total cholesterol, triglycerides and low-density lipoprotein and very-low-density lipoprotein cholesterol reduction[16]. **Phytochemicals** - The HPLC analysis indicated the presence of phenolic acids (gallic, chlorogenic, ellagic and ferulic acid) and flavonoids (kaempferol, quercetin and rutin).

**Precautions while taking moringa-** People having Diabetes, Hypertension, hypothyroidism should take Moringa in limited quantities as excessive intake may remarkably lower the levels of glucose, thyroid and blood pressure which may end up in other complications.

*Punarnava- Punarnava* is described as *Swadu(sweet)*, *Tikta(bitter)*, *Ushna (hot)*, *Kaphavatahara*, *Deepanan (carminative)*, Beneficial in *Agnimandya (weekened digestion)*, *Paandu (aenemia)*, *Shopha (inflammation)*, *Vrana (wound)*, *Udara (ascites)*, *Gulma (tumours)*, *Pliha (enlarged spleen)*, *Shula (pricking pain)*, V*isha (poision), Hrudroga (cardiac disorders)*[18]. Herb is used as Diuretic, Expectorant, Stomachic, Treatment of jaundice, Loss of digestive power, Enlargement of spleen, used for relieving abdominal pains

**Therapeutic uses**

The vegetable of *Punarnava* is particularly efficacious in oedema (su.su.46.255). Red Sali rice cooked with *Punarnava* powder, sugar, juice of *draksha* (Vitis vinifera), milk and ghee should be taken by one suffering from haemoptysis. In cases of mild dropsy, a dish of the fresh herb boiled and salted gives much relief [19]. *Punarnava* is also valued in ophthalmic disorders, the *Sharangadharasamhita* recommending a *collyrium (anjana)* for itching, prepared by mixing the *churna* with milk; mixed with honey to treat ophthalmic discharges; with ghee for corneal wounds; with *Taila(oil)* for poor vision; and with rice water (*Kanjika*) for night blindness. The leaves are useful in dyspepsia, tumours, spleen enlargement, abdominal pains.

The various parts of the plant are used in the treatment of cancer, jaundice, dyspepsia, inflammation, ophthalmic disorders, enlargement of spleen, abdominal pain and as an anti-stress agent. In some parts of India like Assam and West Bengal the indigenous people cook leaves as a vegetable (Jana 2007).

**Nutritional Evaluation of *Punarnava* (*Boerhavia diffusa L. nom.cons*) -**

The vitamin analysis in *B. diffusa* revealed that it is rich in essential vitamins like vitamin A, B complex, C, D and E. The quantity obtained for Vitamin A is 0.91±0.01 mg/g and recommended dietary allowance for vitamin A is 1.5 mg/100g. Vitamin A is essential for vision process, bone and teeth formation. **Niacine (**Vitamin B3) the major vitamin present in the plant plays an important role in energy metabolism, and its daily recommended intake is 1.7 mg. **Thiamine** helps in maintaining healthy nerves thereby improving the mental ability. The daily intake of thiamine is 1.2 mg/gm. Thyroid functioning and wound healing need the vitamin riboflavin-vitamin B2 and the recommended dosage is 1.7 mg/gm.

**Ascorbic acid** prevents free radical damage and triggers the inflammatory responses. Daily recommended dose is 60 mg/gm. **Tocopherol** is a lipid soluble antioxidant, protecting cell membranes from oxidation and its recommended level is 25-37 mg. The major elements present in *B. diffusa* are Magnesium – 142.9mg/100g, Sodium – 75.9mg/100g, Potassium – 52.7mg/100g. The nutraceutical evaluation of the plant gives an insight into its value as a medicinal as well as highly nutritious one, safe for consumption both as a

medicine and as a natural source for antioxidant activities[20].

**Table 2:** Here are some important phytochemical constituents and mode of action of *Punarnava*

| Name | Mode of action |
|---|---|
| Eupalitin | Antioxidant |
| Boeravinone B | Antistress agent, Anti hepatotoxic agent |
| Boeravinone C, D, F, H | Immunostimulant |
| Boeravinone G | Antioxidant effects |
| Coccineone B, E | Spasmolytic effects |
| Rotenoids | Antioxidant, Diuretic, Antifibrinolytic |

The plant has proven pharmacological activities like Antibacterial, Antidiabetic, Antinociceptive, Hepatoprotective, Antiproliferative and Antiestrogenic activity, Anti-inflammatory, Anticonvulsant, Adaptogenic, Immunomodulatory[21].

## DISCUSSION

The phytochemistry of Moringa oleifera suggests that the plant is rich in compounds containing the simple sugar, rhamneae called glucosinulates and isothiocyanates through which it is found to be possessing diuretic activity and such components likely to play a complementary role in overall blood pressure lowering effect of this plant. Also, Moringa leaf juice is known to have a stabling effect on blood pressure. The Nitrile, mustard oil glycosides have been isolated from Moringa leaves, which were found to be responsible for the blood pressure lowering effect. The widespread combination of diuretic along with lipid and blood pressure lowering constituents makes this plant highly useful in cardiovascular disorders

**Anti-bacterial & Anti-fungal** – The active antibiotic principle Pterygospermin which has powerful antibacterial and fungicidal effects are been reported from roots of Moringa. The aglycone of deoxy – niazimicin is found responsible for anti-bacterial and fungicidal activities as it is form of ethanol extract. The potential antifungal activity is due to the presence of 4-α-L-rhamnosyloxyl benzyl isothiacyanate in its leaf extract. Thus, the krimighna property (especially both externally and internally) mentioned in Ayurvedic classics is clinically experienced with special reference to the present-day documentation.

**Wound healing properties** – are documented by the study of ethanolic and ethyl acetate extract of leaves which bears phytosterols & phenolic compounds. Thus, it acts as anti-microbial, fungicidal, promotes wound healing and regeneration of healthy tissues.

**Antioxidant activity -** Antioxidant activity of the leaf extract is due to the presence of Tocopheryl.

***Punarnava***

***Sothagni*** - Liridendrin, qurcetin, kaempferol are the potential anti-inflammatory compounds have been reported from various extracts from roots & leaves of the *Boerhavia diffusa L. nom.cons.* Quercetin inhibits production of inflammation producing enzymes cox & lipoxygenace, it limits LPS – induced inflammation. The active principle Punarnavine is a diuretic chiefly acting on the glomeruli of the kidneys through the heart, increasing the beats & strength & raising the peripheral BP in consequence. The plant also called *Sothagni* in Sanskrit i.e., which reduces inflammation.

**Poisoning** - Several reports showing the use of leaves either intact or in a formulation taken orally or applied locally in case of Scorpion & snake bite or for wound healing. The plant has gained lot of importance in the field of phytochemistry because of its various pharmacological and biological activities such as immunomodulatory effects, immunosuppressive activity, antimetastatic activity, antioxidant activity, antidiabetic activity antiproliferative and antiestrogenic activity, analgesic and anti-inflammatory activity, antibacterial activity, antistress and adoptogenic activity, antilymphoproliferative activity, nitric oxide scavenging

activity, hepatoprotective activity, anti-viral activity, bronchial asthma, anti-fibrinolytic activity, chemopreventive action, genetic diversity analysis, anticonvulsant activity. The plant has gained lot of importance in the field of phytochemistry because of its various pharmacological and biological activities such as immunomodulatory effects, immunosuppressive activity, antimetastatic activity, antioxidant activity, antidiabetic activity antiproliferative and antiestrogenic activity, analgesic and anti- inflammatory activity, antibacterial activity, antistress and adoptogenic activity, antilymphoproliferative activity, nitric oxide scavenging activity, hepatoprotective activity, anti-viral activity, bronchial asthma, anti-fibrinolytic activity, chemopreventive action, genetic diversity analysis, anticonvulsant activity. The plant has gained lot of importance in the field of phytochemistry because of its various pharmacological and biological activities such as immunomodulatory effects, immunosuppressive activity, antimetastatic activity, antioxidant activity, antidiabetic activity antiproliferative and antiestrogenic activity, analgesic and anti-inflammatory activity, antibacterial activity, antistress and apoptogenic activity, antilymphoproliferative activity, nitric oxide scavenging activity, hepatoprotective activity, anti-viral activity, bronchial asthma, anti-fibrinolytic activity, chemo preventive action, genetic diversity analysis, anticonvulsant activity.

## CONCLUSION

Both *Shigru* (*Moringa oleifera Lam) patra* and *Punarnava* (*Boerhavia diffusa L. nom.cons.)* are rich in Vitamins and Minerals which are essential for proper nutrition, growth & development and these mainly possess antioxidant, immunomodulatory activities which improve the immune system there by helps in prevention and management of diseases. The further scope of the study is to bring these highly nutritious vegetables described in classics in to the market so that the manifestation of the disease will be reduced & helps to maintain the health of the person.

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**Source of Support: Nil**
**Conflict of Interest: None Declared**

How to cite this URL: Lakshmi Divya. M et al: A Review On Nutritional And Medicinal Importance Of Shigru Leaves (Moringa Oleifera Lam) And Punarnava (Boerha-via Diffusa L. Nom.Cons.). International Ayurvedic Medical Journal {online} 2021 {cited March, 2021} Available from: http://www.iamj.in/posts/images/upload/608_614.pdf