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SHORT REVIEW

Loni Shaka (*Portulaca oleracea* Linn.): A Potential Ethno-Medicinal Vegan Herb

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Abstract

Ghol bhaji, a commonly used vegetable in Maharashtra, which is known as *Loni shaka* (*Portulaca oleracea* Linn.; family: Portulacaceae) in *Ayurveda* has high nutritious value containing potassium, magnesium, calcium etc, in good amounts. It is also a good source of omega-3 fatty acids. Different pre-clinical studies proved its activities anti-inflammatory (leaf), and antimicrobial (leaf, seed, and root tuber), also whole plant extract proved to be having estrogenic activity in female rats. Ethanol is medicinally used in different ailments i.e. diarrhoea, asthma, dysentery, obesity, jaundice, throat infections, ulcers, snake bites, toothache and diabetes. Clinically, the herb has proved effective in diabetes, Perimenopausal syndrome, PCOD Wound healing etc. *Loni shaka* is the best antioxidant having good nutritional value. It demonstrated the herb's enormous nutritional potential and suggested possible uses in the future. It is mentioned in *Ayurvedic* texts in *Shaka Varga* with the name of *Lonika*. Traditionally used as a vegetable having amla rasa which is responsible for its vatahar property and shows the effect on *jarajanya vyadhi* (geriatric diseases). It blooms in the summer season, especially in the morning hours.

Keywords: *Ghol Bhaji, Loni Shaka, Portualaca oleracea, Purslane*

1. Introduction

In *Ayurveda* medicine *Loni shaka a* (*Kozuppa*), botanically *P. oleracea* Linn from Portulacaceae family (Table 1). It is frequently referred to as *Purslane*. Although the *P. oleracea* plant's origin is unknown, archeobotanical evidence indicates that it was widespread at numerous prehistoric sites. Before this time, it was consumed as food, but at least 2000 years ago, it was utilized as a medicine. The bigger type of *Loni shaka* (*Purslane)* is known as *P. oleracea*, while the smaller type is known as *Portulaca quadrifida*. There are several fleshy plants in the *Purslane* family[1]. There are two kinds of the *P. oleracea* species. The first one is the *P. oleracea* variation *sylvestris*, which is a common wild variant. The second type is the cultivated form, or var. *sativa*, also referred to as kitchen *Garden Purslane*[2]. An annual herbaceous succulent plant called *P. oleracea* (*Purslane*) is a good source of minerals and vitamins and is being used as a vegetable source of omega-3 fatty acids[2].

The term "*Loni shaka*" is used in the Ayurvedic system of medicine. Irrespective of having so many effects, still this plant is not explored much in clinical practices. Purslane (*P. oleracea*) is one such plant[3] which should be extensively studied. Along with its well-known English names of purslane and pigweed, it is also referred to as *ntioke*, *ntilimoke*, *ntiike*, and *idiridi* in the Igbo language. Additionally, it is known as *Ghol bhaji* in Maharashtra and *papasan* in Yoruba and *babajibji* in Hausa[4] (Table 2).

More than 120 different species make up the Portulacaceae family, which includes *P. oleracea*. The ancient Egyptians utilised this plant as a vegetable, spice, and medicinal. It was also popular in England during the Middle Ages[5]. Incredibly, a plant that is so widespread throughout the globe has gained almost universal recognition for its health benefits[6]. Since the

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time of the ancient Egyptians, people have used this plant as a food source, spice, and medicinal. It was also widely used in England in the middle ages[7]. Hence the current study was carried out to explore the ethno-medicinal, nutritional, antioxidant and therapeutic potential of *Loni shaka* (*P. oleracae*) and also to explain the possible mode of action with relevant references available in the classical texts of *Ayurveda* and recent research works.

2. Materials and Methods

Data was collected from *Ayurvedic* texts, *samhitas*, *nighantus* and research portals like PubMed, Google Scholar, and Scopus. Data was arranged, analysed, and interpreted as per references.

3. Literature Review

Kozuppa or *Loni shaka a (P. oleracea* Linn*)* has been also quoted in the name of *Lonika* in *shakavarga (patrashaka)* of *bhavaprakash nighantu* which is a part of *Bhavaprakash samhita* and it is also mentioned in *kaideva nighantu*[8]. Also quoted in *sahasrayoga* as the content of *marmagutika*[9].

3.1 *Rasa Panchak* of *Loni Shaka*[10]

Rasa - Amla
Guna - Guru, Ruksha, Sara
Veerya - Ushna
Vipaka - Amla
Karma - Kaphahara, pittahara, vatahara, caksusya, vanidoshara
Part used - Whole plant

3.2 Therapeutic Uses

It has been used as a folk medicine for many years; some of its medicinal uses are:

- *Basti shoth*
- *Arsha*
- *Atisara*
- *Vanidoshhara*
- *Netraroga*

In Charak it is mentioned in *shaka varga sutra sthan* 27 as *lonika shaka*[11].

In Sushruth it is mentioned in *shaka varga* only with the name of *lonika*[12].

3.3 As an Ethnic Food

Loni shaka is used as a vegetable in many regions of India especially in Maharashtra with the name *ghol bhaji* in the summer season it has a specific effect on diarrhoea in the summers.

3.4 Classification of *Portulaca oleracea*[13]

Loni shaka (*Kozuppa*), botanically *P. oleracea* Linn from the Portulacaceae family. It is frequently referred to as *Purslane* and its taxonomic classification is explained (Table 1).

3.5 Origin

In Massachusetts in 1672, it was first discovered in the United States[14]. The Latin words "Porto" (meaning "to carry") and "lac" (meaning "milk") are supposed to have contributed to the name Portulaca[15].

3.6 Vernacular names of *Portulaca oleracea*

It is a well-known plant used by many countries for various medical purposes with different vernacular names given in (Table 2).

3.7 Propagation and Distribution

The *Loni shaka* (*P. oleracea* Linn) is an annual herbaceous vegetable that is native to many regions of East and West Indies as well as Europe, China, Ascension Island and Japan[7]. *Loni shaka* is a herb found mostly in summer season and dry areas and invades agricultural regions, vegetable gardens, barren spots, low-maintenance lawns,

Table 1. Taxonomic classification

Kingdom	**Plantae**
Subkingdom	Tracheobionta
Super-division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Caryophyllidae
Order	Caryophyllales
Family	Portulacaceae
Genus	*Portulaca*
Species	*Portulaca oleracea*

Table 2. Vernacular names of *Portulaca oleracea* Linn.

Arabic	*Baqlat-ul-humqa*[16]
Unani	*Rijla*[17]
Urdu	*Kulfaa*[18]
Sanskrit	*Lonika, Brihalloni, Lonamla, Luni, Ghotika, Lonaa, Loni, Gholika, Upodika*[2]
Hindi	*Khursa, Khulfa, Khurfa, Badi Lona*[18]
Assami	*Dudagorai, Doddagoni Sappu*
Vietnam	*Rau sam*[19]
Australia	*Common pigweed, common purslane*[20]
Tamil	*Pasalai, Pulikkirai, Paruppukkeerai, Kozhuppu*[21]
Arabic	*Baqlat-ul-humqa*[21]
Marathi	*Ghol bhaji,lal bhaji*[21]

and ornamental plants. It thrives in warm, humid environments[22].

Since the middle ages, it has been grown in India and the Middle East and is well-liked in Europe. In milder, southern desert regions of California, common purslane germinates from February to March until late spring when the soil temperature reaches about 60°F. For an early yield, it is better to sow the seed in early spring under cover so that it can be planted outside in late April. From late spring to late summer, outdoor sowings in situ are made, with successional sowings, which occur every two to three if a continuous supply is required[23].

After irrigation or rain, it germinates in great numbers extremely close to or at the soil surface. Most of the small seedlings perish, but the ones that survive grow quickly and can start to bloom within a few weeks. When gardens or fields are irrigated, common purslane's fleshy stems can stay moist and alive for several days after cultivation[24].

Common purslane can produce a lot of seeds, which allows it to quickly colonise any warm, moist place. It needs a sunny location with moist, light-rich, well-drained soil. In dry conditions, plants won't produce leaves of high quality[25]. The plants can be harvested using the cut-and-come-again concept after they have taken roughly six to eight weeks to produce a crop, giving edible leaves for most of the summer. The low-growing common purslane grows in dense mats[26]. These vegetative mats make use of the moisture and nutrients that are available and block light from reaching the soil surface, which delays the emergence of additional seedlings. Common purslane reduces aesthetic value.

4. Chemical Constituents[27]

Loni shaka (P. oleracea) or Purslane contains specifically alpha-linolenic acid (EPA), which is found in purslane than any leafy vegetable and omega-3 fatty acids. For a vegetable source that comes from the ground, this is a remarkable source of EPA[28].

Fish, certain algae, and flax seeds are the main sources of EPA, an Omega-3 fatty acid. Additionally, it includes dietary minerals including magnesium, calcium, potassium, and iron as well as vitamins, primarily vitamins A, and C, and some vitamin B and carotenoids[29]. Two different types of betalain alkaloid pigments are also present, including the yellow betaxanthins and the reddish betacyanins, which can be seen in the flowers and the somewhat yellowish cast of the leaves[30].

These two forms of pigment are both strong antioxidants and have been shown in tests to be antimutagenic. It contains a lot of nutritional value (Carbohydrates, Protein Fat etc.) also has vitamin A, (B1 vitamin) thiamine, (vitamin B2) riboflavin, Niacin (vitamin B6), folate (vitamin B9), vitamin C, calcium, iron, magnesium, potassium, zinc Mucilage, which consists of an acidic and a neutral proportion with a specified structure, is another component[31].

A new monoterpene glucoside called portuloside A was found in the *P. oleracea* aerial parts MeOH extract (collected in Japan) (Table 3).

This delicious vegetable is especially nutrient-dense, ranking in the top percentile of daily recommended consumption for beta-carotene, tocopherol, magnesium, potassium, and linolenic acid. Glutathione, coenzyme Q10, and pectin are abundant in *P. oleracea*[32].

5. Pharmacognstical Study

5.1 Macroscopy[33]

- Stem: The stem is green or reddish cylindrical, up to 32 cm long, 1-2 mm in diameter, swollen nodes, smooth surface and glabrous, and diffusely

Table 3. Chemical constituents

Group	Chemical constituents
Flavonoids present are of 7 types	1. Kaempferol 2. Myricetin 3. Luteolin 4. Apigenin 5. Quercetin 6. Genistein 7. Genistin
Other chemicals present are	1. Dopa 2. Dopamine 3. Noradrenalin 4. Omega 3 fatty acid (plays an important role in the prevention and treatment of hypertension) 5. Inolenic acid 6. Linoleic acid (necessary for good growth and prevention from disease)
Minerals present are	1. Phosphorus 2. Magnese 3. Iron 4. Calcium 5. Selenium
Amino acids present are	1. Isoleucine 2. Leucine 3. Proline 4. Lysine 5. Cystine 6. Valine 7. Threonine 8. Tyrosine
Other constituents present are	1. Beta carotene 2. Glutathione 3. Melatonin 4. Bergapten 5. Ethanol

branching, except the leaf axils. Internodes are between 1.0 and 3.0 cm long.

- Leaf: The leaves of *Loni shaka* are alternate or opposite, waxy on the upper surface, flat, fleshy, obovate, 1-5 cm long, 0.5-1.5 cm wide, Inconspicuous stipules, an entire edge, and a cluster of hairs up to 1 mm long are present on the underside of this plant tapering at the base, sessile or somewhat petiolate plant. The leaves have reddish edges, are succulent, egg- or spatula-shaped, very short (5-30 mm), or stalkless. The leaves are green or have a reddish colour border (Figure 1).
- Seedling: Cotyledons (seed leaves) are 2–5 mm long, succulent, hairless, egg-shaped to rectangular, and occasionally tinged crimson.
- Flower: Flowering starts in May and lasts until September. At the terminals of stalks, flowers begin as solitary or in clusters of two to five. Flowers will bloom only in the early morning, five-petalled flowers, which are orange, yellow, purple, or white, open (Figure 2).
- Fruit: Almost spherical to egg-like in shape capsules that are 4-8 mm long and tear apart in the middle to release the seeds that makeup fruit. Flattened, round to egg-like shaped, dark black seeds with a white point of joint that is not more than less 1 mm in diameter.

5.2 Microscop[34]

- Root: The root displays five to fifteen layers of cork, the inner half of which is composed of elliptical cells with thin walls and intercellular spaces, and patches are filled with a reddish-brown fluid. The

Figure 1. Leaves of *Portulaca oleracea* Linn.

Figure 2. Flower of *Portulaca oleracea* Linn.

secondary cortex is made up of pericycle fibre patches, thin-walled, oval cells with intercellular spaces, sieve tubes for the secondary phloem, parenchymatous cells for the secondary xylem, and vasculature.

- Stem: Vessels, tracheids, and parenchyma make up the secondary xylem; tracheids are thick-wedged, and vessels feature simple pits and spiral thickening. Mostly made up of sieve tubes and parenchyma cells, secondary phloem. A wavy shape and five to ten layers of cork with thin walls, some of which contain reddish-brown colour, characterise the secondary cortex.
- Leaf Midrib: The remaining tissues between the vascular bundle and the epidermal cells are composed of thin-walled, oval parenchymatous cells, paracytic type stomata, and rosette calcium oxalate and starch grains, both simple and compound, measuring 6-14 n. A sheath made of palisade cells encircles the collateral vascular bundle.
- Powder: It is greyish brown; have clusters of oval to polygonal, rosette crystals of calcium oxalate, pitted and spiral capillaries, cork cell fragments, thin-walled parenchymatous cells, and simple and compound starch grains, measuring 6-14 in diameter and made up of 2-3 components.

6. Pharmacological Activity

6.1 Estrogenic Activity

Flavonoid extract of *P. oleracea* administrated orally altered the estrous cycle significantly characterized by a prolongation of the diestrous it shows significance in female rats[35].

6.2 Hypoglycemic Activity

Whole plant powder was given intra-gastrically to rabbits at doses of 1.5 and 2.0 g/kg after 8 and 12 hours, respectively, and a significant effect was seen[36].

6.3 Anti-fertility Effect

Male albino mice's reproductive organs were subjected to the alcohol extract of *P. oleracea* seeds spermatogenic elements that had widespread shrinkage because of the treatment. Spermatozoa were absent from epididymal lumina, or debris was present. The absolute weights of the testis, seminal vesicles, epididymis and vas deferens. Significantly decreased because of the treatment. The protein content of the testes, epididymides, and seminal vesicles significantly decreased after 30 doses of administration, but the testes' sialic acid level significantly decreased[37].

6.4 Antioxidant Activity

The subcutaneous administration of *P. oleracea* seed extract substantially inhibited spermatogenesis. The 1,1-diphenyl-2-picryl-hydrazyl (DPPH) free radical scavenging activity, the reducing power of FeCl, the nitric oxide free radical scavenging activity, and the superoxide scavenging activity using the alkaline DMSO technique were used to test the in-vitro antioxidant capacity of the *P. oleracea* methanolic extract[38].

6.5 Anti-tumour Activity

The cytotoxic and antiproliferative effects of *P. oleracea* ethanolic extraction on the Helacell line were studied by Shiva Khatibi *et al.* In this work, Hela cells were raised and subjected to ethanolic extract from *P. oleracea* at different concentrations for 24 and 48 hours. Using MTT (3-(4,5-dimethylthiazole-2yl)-2,5-diphenyltetrazolium bromide) and trypan blue, respectively, cytotoxicity and cell viability were assessed. However, the results showed that *Portulaca oleracea's* ethanolic extract efficiently reduced hela cell proliferation and decreased the viability of tumour cells[39].

6.6 Analgesic Activity

The analgesic effect of natural Allantoin from *P. oleracea* seed was assessed by Heng-Zhi and Chuan-Jin Wang. The analgesic activity of allantoin was assessed in acetic acid-induced abdominal constriction experiments in mice with intraperitoneal injection after it was originally isolated from *P. oleracea* seed. The outcome showed that allantoin had analgesic effects that were almost as potent as aspirin. The examined mice did not show any signs of addiction to allantoin, and it was found to be analgesic with dosage dependence proliferation. These findings suggested that allatoin would make a good candidate for a new analgesic[40].

6.7 Anticonvulsant Activity

In healthy albino mice, the aqueous extract of *P. oleracea* leaves was tested for its anticonvulsant properties. The

duration of tonic hind limb extension was dramatically shortened by maximal electroshock extract[41].

6.8 Anti-inflammatory Effect

Mice were given 50.0 g of an ethanol (95%) extract of dried seeds subcutaneously, and the extract was effective in anti-inflammatory effect when compared to the synthetic medicine diclofenac sodium as a positive control, the aerial portions' 10% ethanol extract, applied intraperitoneally and topically, produced considerable action[42].

6.9 Bronchodilator Effect

When compared to theophylline, a boiled and aqueous extract of *P. oleracea* had a comparatively strong relaxing effect on the guinea pig tracheal chain. These outcomes were also superior to theophylline at various concentrations[43].

6.10 Hepatoprotective Activity

To test the liver-protective properties of the *P. oleracea* whole plant extract suspended in methanolic and petroleum ether, Wister albino rats were given 400 mg/kg of D-galactosamine to cause hepatic damage. Comparing the 400 mg/kg and 200 mg/kg treated groups to the D-galactosamine and silymarin treated groups, altered biochemical parameters were significantly restored at both doses[44]. Hepatic cells with well-preserved cellular architecture demonstrated another histologically substantial defence against D-galactosamine toxicity in albino rats. Plant extract's hepatoprotective properties have been verified by histological and biochemical evidence[45].

Portulaca oleracea causes a significant increase in serum levels of the hepatic marker enzymes as well as total bilirubin. It significantly reduces the rise in hepatic marker enzymes and total bilirubin levels by administering a *P. oleracea* 70% alcohol extract. This development demonstrates Portulaca *oleracea*'s hepatoprotective properties[46].

6.11 Anti-microbial Activity

Portulaca oleracea aerial portions were tested using the agar diffusion method for phytochemical and anti-microbial activity against three fungi and five bacteria (bacteria like *Klebsiella pneumonia*, *Nerospora crassa*, *Staphylococcus aureus*, *Aspergillus niger*, and *Bacillus cereus*)[47,48].

Another study on the anti-microbial activity of *P. oleracea* confirmed the use of the plant in folklore and suggested that its extract contains components that are antimicrobial agents in medicines for the treatment of infectious disorders brought on by pathogens[49]. *P. oleracea* extracts do not change the intestinal Ph but considerably change the bacterial community in the cecum[50].

7. Discussion

Loni shaka is a widely used drug by ancient physicians because of its therapeutic potential. It is most commonly available in different parts of India commonly in the summer season. Much research has been conducted to study this widely used drug. Traditionally it is used as *shaka* (vegetable) to increase the nutritional value in the body, and it helps in preventing dehydration. Different study shows that it has a good effect on dysentery, intestinal worms, headaches, and stomach aches. The plant itself has around 60 therapeutic indications and about 30 different biological activities. According to much research work, *P. oleracea* has a variety of phytochemical components, including alkaloids, flavonoids, terpenoids, organic acids, vitamins, minerals, and a high concentration of nutrients. Due to its wide range of pharmacological properties, which include fewer side effects when compared to synthetic drugs, such as its neuroprotective, anti-diabetic, antioxidant, anti-ulcerogenic, anti-microbial, analgesic, and antitussive effects. Since ancient times, *Loni shaka* has been used in Unani treatments to cure a variety of conditions, including skin illnesses, fever, dysentery, bleeding piles, and spleen problems[39].

Portulaca oleracea have anti-inflammatory qualities and balance the innate and adaptive immune systems, which may be due to the presence of Polysaccharides which regulate the inflammatory cytokines[51]. Due to the higher concentration of K^+ ions, it shows neuromuscular activities and muscle relaxant properties[51]. When used as a whole, *P. oleracea* is recognised as an immuno-modulatory and antioxidant medicinal plant that can be used to treat a variety of illnesses on an immunological basis. Additionally, it might serve as a component in food and cosmetics and serve as a replacement for synthetic antioxidants in food preservation[52]. In

the meanwhile, oxidative stress can lead to hypersensitivities, hence *P. oleracea* is expected to have an effect in treating and preventing their symptoms. Due to its high omega-3 fatty acid concentration, *P. oleracea* should exhibit superior antioxidant activity and anti-tumor benefits. Consequently, it is a strong contender for both a nutritious dietary item and a cosmetic ingredient. Due to the presence of flavonoids and phytoestrogens, it shows an effect on estrogenic activity in female Wistar rats which will be helpful for females in perimenopausal syndrome, PCOS and fertility cases[53].

Loni shaka has been widely used for thousands of years in India as medicine and food. However, there are many challenges due to its unavailability in particular zones and its indication in clinical practices. It is mentioned in *Ayurveda samhitas* in *Shaka varga* and it has many therapeutic effects.

8. Conclusion

The herb *Loni shaka* (*P. oleracea*) has been used from time immorally, being known since 2000 years ago. It possesses the various phytochemical constituents known for being responsible for its pharmacological activities. It is an abundant source of nutritious elements and phytoestrogen.

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