

Novel Evidence-Based Benefits of *Portulaca oleracea*: A Comprehensive Review

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ABSTRACT

Portulaca grandiflora, a juicy from the purslane family (Portulacaceae), is natural to southern Brazil, Argentina, and Uruguay, and is popular in gardens. It is also known as moss-rose purslane, Mexican rose, sun rose, table rose, rock rose, eleven o'clock, and rose moss.. Despite these rose-like names and flower appearances, it is not a true rose. In fact, it is more closely related to carnations and cacti than to the rose family or rosid group.

In this review, different varieties of Purslane also justified with their biological name and their uses in various disease. *Portulaca grandiflora* may be used for various disease prevention and treatment such as antidiabetic, antioxidant, anticancer, neoplastic agent, antibacterial, neuropathy and anti-inflammatory disorder. Apart from disease it is also used as folk medicine in the Indian system of medicine. In ornamental garden, it is cultivated as for designing purpose in house, balcony, and other areas.

Keywords: Anti-inflammatory, neoplastic, folk medicine, antidiabetic, antioxidant

INTRODUCTION

Portulaca oleracea (purslane) is a widely recognized medicinal and edible plant, commonly found in tropical and subtropical regions. It has been traditionally used in folk medicine for treating various ailments, including infections, inflammation, and digestive disorders. Recent studies have shown a variety of bioactive substances in *P. oleracea*, such as flavonoids, alkaloids, polysaccharides, and omega-3 fatty acids, which contribute to its pharmacological properties. This review aims to summarize the latest scientific findings regarding the health benefits of *P. oleracea* and its potential therapeutic applications.

Portulaceae Grandiflora

About 200 species of herbaceous plants belonging to the *Portulaca* (Moss Rose) genus, practically all of which are succulent and have fleshy stems and leaves that are more or less dark green in color.

Synonyms are *Portulaca hilaireana* G. Don, *Portulaca immersostellulata* Poelln, *Portulaca mendocinensis* Gillies ex Hook, *Portulaca multistaminata* Poelln. *Portulaca grandiflora* is possibly a small non-woody annual plant in the Caryophyllaceae family. Often grown in gardens, *Portulaca grandiflora* is a succulent blooming plant that belongs to the Portulacaceae family of purslanes and is indigenous to southern Brazil, Argentina, and Uruguay. (Huxley, A. et al., 199, "Portulaca grandiflora", 2018) Rose moss, [4] eleven o'clock, [3] Mexican rose, [3] moss rose, [3] sun rose, [4] table rose, rock rose, [4, 5] and moss-rose purslane are some of its numerous common names. Notwithstanding these names and the apparent similarity of certain varieties' blossoms to roses, it is not a real rose and is not even a member of the rosid group or the rose family; rather, it is much more closely related to cacti and carnations.

It may also be found in South Asia and is extensively distributed across the majority

of Balkan cities with historic 18th and 19th-century architecture.



Fig.1:-*Portulaca grandiflora*

DESCRIPTION

Although it generally grows to a height of 30 cm, this annual plant is modest but grows quickly. Nonetheless, it may readily grow to this height with the right cultivation. Thick and meaty, the leaves can grow up to 2.5 cm long and can be found in small clusters or alternately. The blooms, which vary in colour from red to orange to pink to white to yellow, have five petals and a diameter of 2.5 to 3 cm.[2] Typically, their tall, erect branches fork close to the root. The spreading leaves are 2 to 3 millimetres broad and 20 to 25 millimetres long. They taper towards the tip and are nearly or entirely stalk-shaped. The axillary leaves are often shorter than the sheets and feature a few to several white, fuzzy hairs. There are eight to ten leaves around the crushed inflorescences. The big blossoms have a maximum diameter of 4 centimetres. The five oblong petals are 15–26 millimetres long and have a vivid magenta hue. About 50 stamens surround the ovary, which has four to nine white scars. There are no visible capsules or seeds.[6]

P. grandiflora is one of the few plants that is a C₄/CAM intermediate, utilizing both C₄ carbon fixation and Crassulacean acid metabolism pathways in different cells for photosynthesis.[7] .

CULTIVATION AND USES

For their double blooms with extra petals and their plain or variegated flower colour diversity, several varieties have been chosen.[2] In temperate climes, it is commonly planted as a container plant or as a decorative plant for annual bedding. It needs soils that drain properly and lots of sunshine. It spreads quite easily and needs very little maintenance. It can develop between the stones of a pavement or road in areas with historic buildings. Mixtures, like Double Flowering Mixture (see images), are sometimes offered for sale as seeds. Sandy soils are ideal for it. In nations where frost doesn't occur, it is crazy.[8] [9]

Unlike *P. oleracea* and *P. umbraticola* , it is not edible because of its bitter taste. There are hybrids of *P. grandiflora* with *P. oleracea*, *umbraticola* and *villosa*.

It is visited by honeybees for its pollen and nectar.[10]

Various Names of *Portulaca grandiflora*:

English- Eleven o'clock, Moss-rose, Rose moss, Sun plant;

Sanskrit- Paciri, Paviri;

Telugu- gaddi roja, Goddu Pavelli;

Hindi – luaniya;

Kannada- kaama sakkare;

Marathi- chinigulab;

Malayalam-Neelakeera;

Manipuri - Pung mapan satpi;

Urdu: Gul-e shama.

Taxonomy of *Portulaca grandiflora*

Table 1:-Taxonomical Classification [5-8]

Kingdom	Plantae
-Clade	Tracheophytes
Order	Caryophyllales
Family	Portulacaceae
Genus	Portulaca
Species	<i>P. grandiflora</i>

Varieties of *Portulaca* Species

Species of <i>Portulaca</i> plant	
Common Name	Botanical Name
Moss Rose	<i>Portulaca grandiflora</i>
Margarita Rosita	<i>Portulaca grandiflora</i> 'Margarita Rosita'
Sundance	<i>Portulaca grandiflora</i> 'Sundance'
Rio Rose	<i>Portulaca grandiflora</i> 'Rio Rose'
Wingpod Purslane	<i>Portulaca umbraticola</i>
Mojave Pink	<i>Portulaca umbraticola</i> 'Mojave Pink'
Mojave Tangerine	<i>Portulaca umbraticola</i> 'Mojave Tangerine'
Rio Grande Scarlet	<i>Portulaca oleracea</i> 'Rio Grande Scarlet'
Fairytale Cinderella	<i>Portulaca oleracea</i> 'Fairytale Cinderella'
Tequila Sunrise	<i>Portulaca oleracea</i> 'Tequila Sunrise'
Fairytale Sleeping Beauty	<i>Portulaca oleracea</i> 'Fairytale Sleeping Beauty'

Happy Hour Deep Red	<u>Portulaca oleracea</u> 'Happy Hour Series'
Calypso	<u>Portulaca</u> 'Calypso Mixed'
Happy Trails Deep Red	<u>Portulaca oleracea</u> 'Happy Trails Deep Red'
Happy Trails Fuchsia	<u>Portulaca oleracea</u> 'Happy Trails Fuchsia'
Happy Trails Pink	<u>Portulaca oleracea</u> 'Happy Trails Pink'
Happy Trails Yellow	<u>Portulaca oleracea</u> 'Happy Trails Yellow'
<u>Sambha</u> Pink	<u>Portulaca oleracea</u> 'Samba Pink'
Rio Apricot	<u>Portulaca oleracea</u> Rio Series
Sundial Peach	<u>Portulaca oleracea</u> 'Sundial Peach'
Sundial Peppermint	<u>Portulaca oleracea</u> 'Sundial Series'
<u>Sunseeker</u> white	<u>Portulaca oleracea</u> 'Sunseeker Light'
<u>Sunseeker</u> Orange	<u>Portulaca oleracea</u> 'Sunseeker Orange'
<u>Sambha</u> Red	<u>Portulaca oleracea</u> 'Sunseeker Red'
Cherry	<u>Portulaca oleracea</u> 'Cherry'
Duet	<u>Portulaca oleracea</u> 'Duet'
Lemon	<u>Portulaca oleracea</u> 'Lemon'
Pink Ice	<u>Portulaca oleracea</u> 'Pink Ice'

Fig.2:- Various species of *Portulaca* plant and their botanical name

Pharmacological Properties

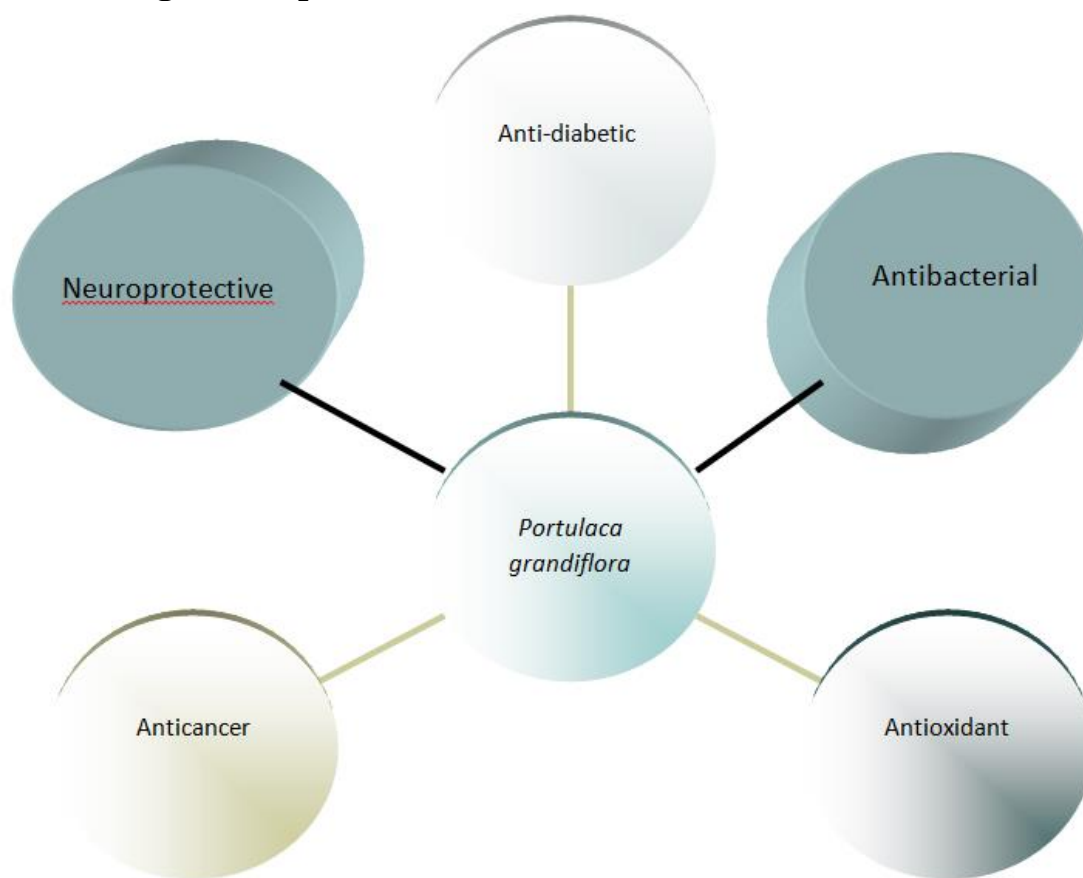


Fig.3:-Pharmacological properties of *Portulaca grandiflora*

MEDICINAL PROPERTIES

Portulaca grandiflora is used for soothing the sore throat, for skin rashes and also for “detoxification” reason. It appears that neither clinical trials nor non-clinical models have ever evaluated these claims. However, there aren't many scientific research on *Portulaca grandiflora*'s anti-mutagenic properties, in vitro lymphocyte activation, and analgesic properties. (Khandare R, Kabra A et al, 2013)

Edible purslane plants are frequently used as green side dishes, soups, and salads (Uddin et al., 2010). According to Chan et al. (2000) and Zidan et al. (2014), *P. oleracea* L. is used in traditional medicine to treat intestinal worms, dermatitis, inflammation, headaches, stomach discomfort, and dysentery. The plant juice is advised for internal bleeding, urinary tract issues, fever therapy, and diaphoretic

effects. Additionally, *P. oleracea* L. contains a wide range of compounds that have hepatoprotective, neuroprotective, anti-inflammatory, antiviral, antifungal, antioxidant, anticancer, antiulcerogenic, antidiabetic, and neuroprotective qualities (Rashed et al., 2003; Gong et al., 2009; Wang et al., 2012; Lee et al., 2012).

Numerous active components, including fatty acids, polysaccharides, vitamins, sterols, terpenoids, alkaloids, and flavonoids, modulate the biological activities of *P. oleracea* L. (Mohamed and Hussein, 1994; Palaniswamy et al., 2001). A terrestrial source of omega-3 fatty acids, *P. oleracea* L. lowers lipid and blood pressure levels (Simopoulos et al., 2005). Plant stems, leaves, and roots were used to isolate a variety of flavonoids, including kaempferol, myricetin, luteolin, apigenin, quercetin, and genistein (Yan et al., 2012). Furthermore, *P. oleracea* is known to

accumulate alkaloids, including betalains, dopamine, and noradrenaline (Xiang et al., 2005; Yue et al., 2005). In *P. oleracea*, betalain pigments include the water-soluble nitrogen-containing red, violet, and yellow betacyanins and betaxanthins that are unique to the Caryophyllales order of plants (Zhao et al., 2014).

The work of Ilakkiya V. D. et al. is meant to come before the purslane (*P. oleracea* and *P. grandiflora*) phytochemical characterisation from aqueous extract and antioxidant activity investigation. The total phenolic content of crude extracts from the whole *Portulaca oleracea* and *Portulaca grandiflora* plants was screened. The plant with the highest antioxidant activity is *Portulaca grandiflora*. They might serve as a natural antioxidant source.[9]

ANTIOXIDANT ACTIVITY

Ilakkiya V. D. et al., The purpose of the study is to examine the antioxidant activity of purslane (*P. oleracea* and *P. grandiflora*) before its phytochemical characterisation using aqueous extracts. The total phenolic content of crude extracts from *Portulaca oleracea* and *Portulaca grandiflora* plants was measured. *Portulaca grandiflora* exhibited the highest antioxidant activity among the plants tested. These plants could serve as a source of natural antioxidants.(Ilakkiya V et al ,2021)

Choon Kiat Lim et al., the total phenolic content and antioxidant activity of different colour varieties of *P. grandiflora*. Total phenolic content in lots of solvent extracts assorted widely, ranging from 46.39-82.19 mg GAE/100 g in methanol extracts; acetone extracts from 36.72-56.45 mg GAE/100 g and ethanol extracts from 41.46-85.70 mg GAE/100 g in all varieties assessed. Only crude extracts were used in this study, so the higher yield might be contributed by other polar ingredients besides phenolics, specifically polysaccharides, plant dirt and so on. This

study suggests that *P. grandiflora* could be used as a source of natural antioxidant. The phenolic compounds that contributed to the antioxidant activity of this plant can be characterised in future.(Lim C, Tiong W et al,2014)

EVALUATION OF DIABETIC NEPHROPATHY:

Pradeep Kumar et al., the study indicates that nephropathy can be prevented through the antioxidant activity of the endogenous plant extract *Portulaca grandiflora* in alloxan-induced diabetic rats. Nephropathy was confirmed by measuring levels of urea, creatinine, glucose, and uric acid in the blood one week after alloxan administration. The animals were then euthanized, and a histopathological examination of the kidney tissue from the control group was performed. Alloxan causes diabetes and serious kidney damage by raising blood glucose levels. The results showed that oral administration of *Portulaca grandiflora* extracts significantly reduced glucose, uric acid, creatinine, and urea levels in diabetic rats. (Kumar P, Sandhya Rani et al , 2019)

Antibacterial Activity

Shinde P. R et al., The zones of inhibition were measured during the antimicrobial test using the Agar well diffusion method. It was observed that all tested samples of the alcoholic extract of *P. grandiflora* Linn exhibited broad-spectrum antimicrobial activities against both gram-positive and gram-negative bacteria, as well as the fungi used in the study. (Shinde P, Wagh K et al, 2014)

Antidiabetic Activity

Devi M et al., A study concluded that the ethanol extract of the whole aerial plant *Portulaca grandiflora* Hook demonstrated antidiabetic activity in rats with streptozotocin-induced diabetes mellitus. In the control diabetic rats treated with STZ, blood glucose levels significantly

increased, and weight loss was observed. The results indicated that the aerial parts of *P. grandiflora* Hook possess potent antidiabetic activity.

In Vitro Antidiabetic Effect: The ethanolic extract of *P. grandiflora* Hook was evaluated for its antidiabetic properties using a glucose diffusion assay. According to the data, the ethanolic extract significantly reduced the amount of glucose that moved over the membrane when compared to the control.

In Vivo Antidiabetic Effect: The study investigated the effects of whole plant extracts of *P. grandiflora* Hook and metformin on diabetic rats. The ethanolic extract of *P. grandiflora* Hook was administered to streptozotocin-induced diabetic rats, resulting in a significant increase in blood glucose levels. (Devi M, Komal S, et al, 2019)

Cytotoxic effect against cancer cells

T. Ashok kumar *et al.*, demonstrated an eco-friendly method for synthesizing gold nanoparticles has been demonstrated using components from an environmentally friendly roof plant. Extracts from the leaves and stems of *P. grandiflora* served as both reducing and stabilizing agents. The biosynthesized gold nanoparticles were systematically characterized using various analytical techniques. The cytotoxic effects of these synthesized nanoparticles were evaluated against human C6 glioma cancer cell lines. In summary, this investigation provides valuable insights into the biosynthesis process of gold nanoparticles and their potential as anti-cancer therapeutics. (Ashok kumar T, et al, 2016)

Nutritional and Medicinal Significance

Purslane leaves and stems can be eaten raw or cooked. Young leaves are often used in salads and can also be consumed as a vegetable or pickled, while more mature leaves are used as a potherb. The

leaves have a somewhat tangy flavor. The seeds can be ground into a powder and mixed with cereals for bread, gruels, pancakes, and similar foods. Additionally, the ash from burnt plants can serve as a salt substitute. Agriculturalists and nutritionists should pay more attention to purslane because of its high nutritional value, particularly in areas where malnutrition is common. Field crops and turfgrass regions are frequent habitats for it. (Uddin et al. 2014, 2010) and doesn't need any extra care to flourish.

Potassium is the most abundant electrolyte present in Purslane (494 mg per 100 g fresh weight). It is very much useful for the heart. It was reported by Roger *et al.* (2012), that high potassium consumption would diminish the rate of hypertension in Americans by 17% and would build lifespan by 5.1 years. It has been reported that a high intake of fruits and vegetables has been beneficial to the bone. This effect is due to the presence of potassium in fruits and vegetables.

Purslane can also be used as a chief and alternate source of potassium for good bone health and helps in the prevention of bone diseases like osteoporosis and kidney injuries (Chen *et al.* 2006). [21-33]

CONCLUSION AND FUTURE PROSPECTIVE

In this review, different varieties of Purslane also justified with their biological name and their uses in various disease. *Portulaca grandiflora* may be used for various disease prevention and treatment such as antidiabetic, antioxidant, anticancer, neoplastic agent, antibacterial, neuropathy and anti-inflammatory disorder. Apart from disease it is also used as folk medicine in the Indian system of medicine. In ornamental garden, it is cultivated as for designing purpose in house, balcony, and other areas. The novel evidence-based benefits of *Portulaca oleracea* underscore its potential as a multifunctional medicinal and nutritional

plant. Future research should focus on clinical trials to further validate its therapeutic applications and explore its integration into conventional medical practice.

Portulaca grandiflora, a succulent from the purslane family (Portulacaceae), is native to southern Brazil, Argentina, and Uruguay, and is popular in gardens. There are several names for it, such as moss-rose purslane, Mexican rose, sun rose, table rose, rock rose, eleven o'clock, and rose moss. Even though it has names and looks like a rose, it is not a real rose. In fact, it is more closely related to carnations and cacti than to the rose family or rosid group.

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