



## Unveiling the Potential of *Portulaca Pilosa*: A Review of its Pharmacological Properties

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### ABSTRACT

*Portulaca pilosa* L., a member of the Portulacaceae family, is commonly referred to as Balibalua in Odia, Lunia in Hindi, Nunia sag in Bengali, Peddapavilikari in Telugu, and kiss me quick in English. It is an herbaceous succulent annual weed thriving in warm climates, with a widespread distribution globally. This plant is widely consumed as a potherb and is frequently included in soups and salads across the Mediterranean and tropical Asian regions. Additionally, it has a history of use in traditional medicine in various countries.

A range of compounds has been identified in *P. pilosa*, including flavonoids, alkaloids, polysaccharides, fatty acids, terpenoids, sterols, proteins, vitamins, and minerals. Its pharmacological properties encompass antibacterial, anti-ulcerogenic, anti-inflammatory, antioxidant, diuretic, analgesic, and wound-healing effects. Despite its extensive traditional use and recognized pharmacological effects, the specific molecular mechanisms of action remain largely unexplored. This review offers an overview of the phytochemistry and pharmacological effects of *Portulaca pilosa*, shedding light on its potential therapeutic benefits.

Keywords: Medicinal herb, Traditional and modern medicine, *Portulaca pilosa*, Symptomatic management

### 1.Introduction

Traditional medicine remains the cornerstone of primary healthcare in numerous communities, offering an affordable and readily accessible form of treatment. Across various cultures, local populations have a deep-rooted tradition of utilizing plants for medicinal purposes, dating back thousands of years. [1]The historical use of plants for therapeutic purposes is evidenced by writings dating as far back as 4000 - 5000 B.C. In India, early references to the medicinal use of plants can be found in the Rig-Veda, estimated to have been written between 1600 - 3500 B.C. Subsequently, ancient physicians systematically studied the properties and therapeutic applications of medicinal plants, laying the groundwork for India's ancient medical science.

Medicinal plants hold significant importance in indigenous medical systems worldwide, offering a rich repository for natural drug research and development. The field of ethnobotany provides valuable insights into traditional medicinal practices, guiding contemporary efforts in medicinal plant exploration.

The term "traditional" usage of herbal medicines implies a longstanding history of use, a characteristic shared by many products classified as "traditional herbal medicines." Particularly in developing countries, a considerable portion of the population relies on traditional practitioners and their recommended medicinal plants to address daily healthcare needs.[2]

In recent years, there has been a resurgence of interest in harnessing traditional medicinal knowledge for plant research. Concurrently, there has been a noticeable uptick in research focusing on natural products and organic chemistry. [3]This renewed enthusiasm can be attributed to various factors, including the pressing need for effective therapeutics, the vast diversity found in both the chemical structures and biological activities of naturally occurring secondary metabolites, the potential of novel bioactive compounds for use as biochemical tools, advancements in techniques for detecting biologically active natural products, as well as improvements in isolating, purifying, and characterizing these active constituents. Furthermore, there have been notable strides in addressing the demand for a stable supply of complex and essential herbal products



Fig.1 a



Fig.1b

### 1.1 Plant Profile

*Portulaca pilosa* L. is a herbaceous succulent annual weed thriving in warm climates and boasting a widespread distribution across the globe within the Portulacaceae family. Known by various names such as Balibalua in Odia, Lunia in Hindi, Nunia sag in Bengali, Peddapavilikari in Telugu, and kiss me quick in English, this plant is prevalent in tropical and subtropical regions, including many parts of India[4]. It is commonly consumed as a potherb and incorporated into soups and salads in Mediterranean and tropical Asian cuisines.

Beyond its culinary uses, *P. pilosa* offers nutritional benefits due to its abundance in omega-3 fatty acids and antioxidants. Moreover, it holds a longstanding history as a traditional folk medicine in various regions, where it has been utilized for its anti-rheumatic, febrifuge, antiseptic, and vermifuge properties.

Extensive research has unveiled a myriad of pharmacological effects associated with *P. pilosa*, including antibacterial, anti-ulcerogenic, anti-inflammatory, antioxidant, diuretic, analgesic, and wound-healing properties.[5] Recognizing its therapeutic potential, the World Health Organization has listed *P. pilosa* as one of the most utilized medicinal weeds.

### 1.2 Description

*Portulaca pilosa* is characterized by its succulent, trailing stems and vibrant pink or purplish flowers. Its small, cylindrical leaves and prostrate growth habit make it an attractive addition to garden borders, rock gardens, and hanging baskets.

**Habitat:** *Portulaca pilosa* is typically found in sandy or gravelly soils in open, sunny habitats, such as roadsides, fields, and disturbed areas.[6] It is drought-tolerant and well-adapted to dry, arid conditions.

**Stems and Leaves:** The stems of *Portulaca pilosa* are succulent and prostrate, meaning they trail along the ground. The leaves are small, cylindrical, and fleshy, arranged alternately along the stems.

**Flowers:** The flowers of *Portulaca pilosa* are showy and attractive, with five petals arranged in a star-like shape. They are typically pink, purplish, or reddish in color, although white-flowered varieties also exist. The flowers open during the day and close at night.

**Reproduction:** *Portulaca pilosa* reproduces primarily by seed, which are dispersed by wind, water, or animals. The plant can also spread vegetatively through its trailing stems, which root at the nodes when they come into contact with the soil.

## 2. Pharmacology

Over the past decades, numerous researchers have investigated the pharmacological activities of *P. pilosa*. This review provides a comprehensive summary of the main pharmacological properties which are presented below.

### 2.1 Antioxidant activity

The plant contains flavonoids, phenolic acids, and other antioxidants that help neutralize harmful free radicals in the body, potentially reducing oxidative stress and lowering the risk of chronic diseases. antioxidant properties due to the presence of various bioactive compounds such as flavonoids, phenolic acids, and betalains.[8] These antioxidants help neutralize harmful free radicals in the body, thereby reducing oxidative stress and protecting cells from damage. Here are some ways in which the antioxidant actions of *Portulaca pilosa* may benefit health.

## 2.2 Scavenging Free Radicals

Antioxidants in *Portulaca pilosa* scavenge reactive oxygen species (ROS) and other free radicals, preventing them from causing cellular damage and oxidative stress. [9] This helps protect cells, tissues, and organs from oxidative damage associated with aging, inflammation, and chronic diseases.

## 2.3 Protecting Against Chronic Diseases

By reducing oxidative stress and inflammation, the antioxidant properties of *Portulaca pilosa* may help lower the risk of chronic diseases such as cardiovascular disease, diabetes, and cancer. [10] Antioxidants help mitigate the damage caused by oxidative stress, which is implicated in the development and progression of these diseases.

## 2.4 Enhancing Skin Health

Antioxidants in *Portulaca pilosa* can help protect the skin from oxidative damage caused by UV radiation, pollution, and other environmental factors. This may help prevent premature aging, wrinkles, and skin disorders associated with oxidative stress.

## 2.5 Supporting Brain Health

Oxidative stress is implicated in neurodegenerative diseases such as Alzheimer's and Parkinson's disease. [11] The antioxidant properties of *Portulaca pilosa* may help protect brain cells from oxidative damage and support cognitive function and neurological health.

## 2.6 Boosting Immune Function

Antioxidants play a role in supporting immune function by protecting immune cells from oxidative damage and enhancing their ability to fight infections and pathogens. Consuming antioxidants from *Portulaca pilosa* may help strengthen the immune system and improve overall health and resilience.

It's important to note that while *Portulaca pilosa* exhibits antioxidant properties, further research is needed to fully understand its mechanisms of action and potential health benefits. Incorporating *Portulaca pilosa* into a balanced diet rich in fruits, vegetables, and other antioxidant-rich foods may contribute to overall health and well-being. [12]

## 2.7 Anti-inflammatory

*Portulaca pilosa* contains compounds with anti-inflammatory properties, which may help alleviate inflammation-related conditions such as arthritis and skin irritations.

Anti-inflammatory properties, which are attributed to its bioactive compounds such as flavonoids, phenolic acids, and alkaloids. Here are some ways in which the anti-inflammatory actions of *Portulaca pilosa* may benefit health.

## 2.8 Inhibition of Inflammatory Mediators

*Portulaca pilosa* extracts have been shown to inhibit the production of pro-inflammatory mediators such as cytokines, prostaglandins, and leukotrienes. By reducing the production of these inflammatory molecules, *Portulaca pilosa* may help alleviate inflammation and associated symptoms.

## 2.9 Suppression of Inflammatory Pathways

The bioactive compounds in *Portulaca pilosa* have been found to modulate signaling pathways involved in inflammation, such as NF- $\kappa$ B (nuclear factor kappa-light-chain-enhancer of activated B cells) and MAPK (mitogen-activated protein kinase) pathways. By inhibiting these pathways, *Portulaca pilosa* may help suppress the inflammatory response.

## 2.10 Reduction of Oxidative Stress

Inflammation is often associated with oxidative stress, which can exacerbate tissue damage and inflammation. The antioxidant properties of *Portulaca pilosa* help neutralize reactive oxygen species (ROS) and reduce oxidative stress, thereby mitigating inflammation and protecting cells from damage.

## 2.11 Alleviation of Inflammatory Conditions:

*Portulaca pilosa* has been traditionally used in herbal medicine to treat inflammatory conditions such as arthritis, dermatitis, and gastritis. [13] Its anti-inflammatory properties may help reduce pain, swelling, and redness associated with these conditions.

### 2.12 Protection Against Chronic Diseases

Chronic inflammation is linked to the development of various chronic diseases, including cardiovascular disease, diabetes, and cancer. By modulating the inflammatory response, *Portulaca pilosa* may help lower the risk of these diseases and improve overall health outcomes.

It's important to note that while *Portulaca pilosa* shows promise as an anti-inflammatory agent, more research is needed to fully understand its mechanisms of action and potential therapeutic applications. As with any herbal remedy, it's advisable to consult with a healthcare professional before using *Portulaca pilosa* for inflammatory conditions, especially if you have underlying health conditions or are taking medications.

### 2.13 Antimicrobial

Some studies suggest that *Portulaca pilosa* extracts exhibit antimicrobial activity against certain bacteria and fungi, indicating potential applications in the treatment of infections antimicrobial properties, which are attributed to its bioactive compounds such as flavonoids, alkaloids, and phenolic acids. Here are some ways in which the antimicrobial actions of *Portulaca pilosa* may benefit health:

#### 2.14 Antibacterial Activity

*Portulaca pilosa* extracts have demonstrated antibacterial activity against various pathogenic bacteria, including *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Salmonella typhi*. These antimicrobial properties may help inhibit the growth and proliferation of harmful bacteria and reduce the risk of bacterial infections.

#### 2.15 Antifungal Activity

Studies have shown that *Portulaca pilosa* exhibits antifungal activity against fungal pathogens such as *Candida albicans* and *Aspergillus niger*. [14] Antifungal compounds in *Portulaca pilosa* may help prevent the growth and spread of fungal infections, particularly in the skin, nails, and mucous membranes.

#### 2.16 Antiviral Activity

Some research suggests that *Portulaca pilosa* extracts may possess antiviral activity against certain viruses, although further studies are needed to elucidate its mechanisms and efficacy. Antiviral compounds in *Portulaca pilosa* may help inhibit viral replication and reduce the severity and duration of viral infections.

#### 2.17 Wound Healing

The antimicrobial properties of *Portulaca pilosa* may contribute to its traditional use in promoting wound healing [15]. By inhibiting the growth of bacteria and fungi in wounds, *Portulaca pilosa* extracts may help prevent infection and facilitate the healing process.

#### 2.18 Dermatological Conditions

[16] *Portulaca pilosa* has been used in traditional medicine to treat various dermatological conditions such as acne, eczema, and fungal skin infections. Its antimicrobial properties may help alleviate symptoms and improve skin health in these conditions.

It's important to note that while *Portulaca pilosa* shows promise as an antimicrobial agent, more research is needed to fully understand its mechanisms of action and potential therapeutic applications. [17] As with any herbal remedy, it's advisable to consult with a healthcare professional before using *Portulaca pilosa* for antimicrobial purposes, especially if you have underlying health conditions or are taking medications.

#### 2.19 Diuretics

they promote increased urine production. These compounds, such as alkaloids and flavonoids, can stimulate the kidneys to filter and excrete more water and electrolytes from the body. [18] As a result, consuming *Portulaca pilosa* may help with conditions like water retention and edema by promoting fluid elimination through urination. However, it's essential to consult with a healthcare professional before using any herbal remedy for medicinal purposes.

#### 2.20 Anti bacterial

*Portulaca pilosa* exhibits antibacterial properties due to the presence of bioactive compounds such as alkaloids, flavonoids, and phenolic compounds. [19] These compounds have been shown to interfere with bacterial cell walls, inhibit bacterial enzyme activity, and disrupt bacterial cell processes, ultimately leading to the inhibition of bacterial growth and replication. [20] Additionally, *Portulaca pilosa* may also stimulate the immune system, enhancing the body's ability to fight off bacterial infections. However, more research is needed to fully understand the spectrum of antibacterial activity and mechanisms of action of *Portulaca pilosa* against different bacterial strains.

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### 3. Conclusion

While extensive historical usage in traditional settings may serve as evidence of the efficacy and safety of certain herbal ingredients, several challenges arise when integrating them into modern practices. One such challenge is the shift from using these ingredients for symptomatic relief in traditional healing to their incorporation into health promotion and disease prevention strategies in developed countries, leading to chronic rather than acute exposure. Consequently, claims of safety based on millennia of traditional use may not hold true in the modern context, necessitating a cautious approach. Another challenge is the lack of evidence regarding the efficacy and effectiveness of these ingredients through rigorous scientific investigations. Although efforts to adopt an evidence-based approach are underway, significant knowledge gaps persist, particularly regarding herbal products' efficacy. *Portulaca pilosa*, valued by the food industry and known for its diverse pharmacological properties, presents a case in point. Despite substantiated bioactivities through in vitro and in vivo studies, including animal models and cell culture experiments, its mechanisms of action remain poorly understood. Therefore, further mechanistic studies are imperative before considering *P. pilosa* for broader clinical applications. In conclusion, while *P. pilosa* holds promise as an edible and medicinally significant plant, its full potential in primary healthcare awaits thorough investigation through adequate research.

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