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Chemical Composition of Portulaca quadrifida and Its Applications in Traditional Medical Sector as Well as in Kitchen as Tasty Vegetables Cooking: A Brief Study

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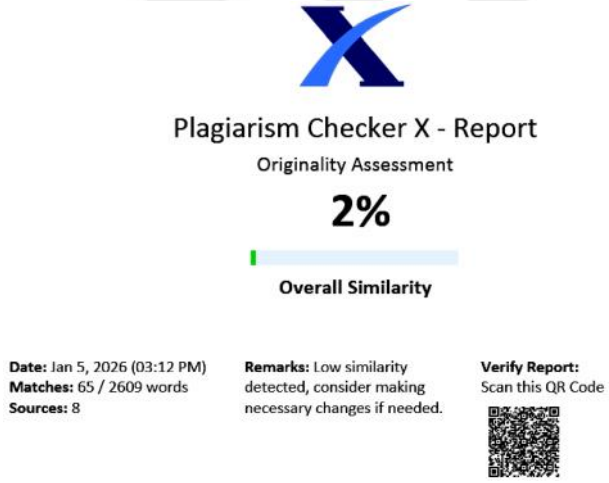


ABSTRACT

Portulaca quadrifida, scientifically known as Portulaca quadrifida, is a leafy green vegetable widely used across rural and tribal India for its dual role in traditional medicine and culinary practices. The plant contains a rich profile of bioactive compounds such as flavonoids, alkaloids, vitamins, and essential minerals. These compounds contribute to its anti-inflammatory, antioxidant, and digestive-enhancing effects. Traditionally, it has been used for treating ulcers, indigestion, inflammation, and skin ailments. Alongside its therapeutic properties, Portulaca quadrifida is also a popular kitchen ingredient, offering high fiber and taste when cooked as curry or stir-fry. This paper aims to study the chemical composition of Portulaca quadrifida and document its relevance in the medical and domestic sectors, especially focusing on its value in traditional healing and daily meals.

KEY WORDS

Portulaca Quadrifida, Traditional Medicine, Wild Vegetables, Phytochemicals, Rural Diet, Medicinal Plants.

INTRODUCTION

In India's indigenous and rural settings, wild leafy vegetables serve as a bridge between nutrition and health. One such valuable plant is Portulaca quadrifida, regionally known but scientifically classified under the genus Portulaca. It grows widely in tropical and subtropical areas, requiring minimal care and flourishing during monsoon. Often considered a weed, it is actually a reservoir of medicinal and nutritional benefits. Traditional healers and tribal communities rely

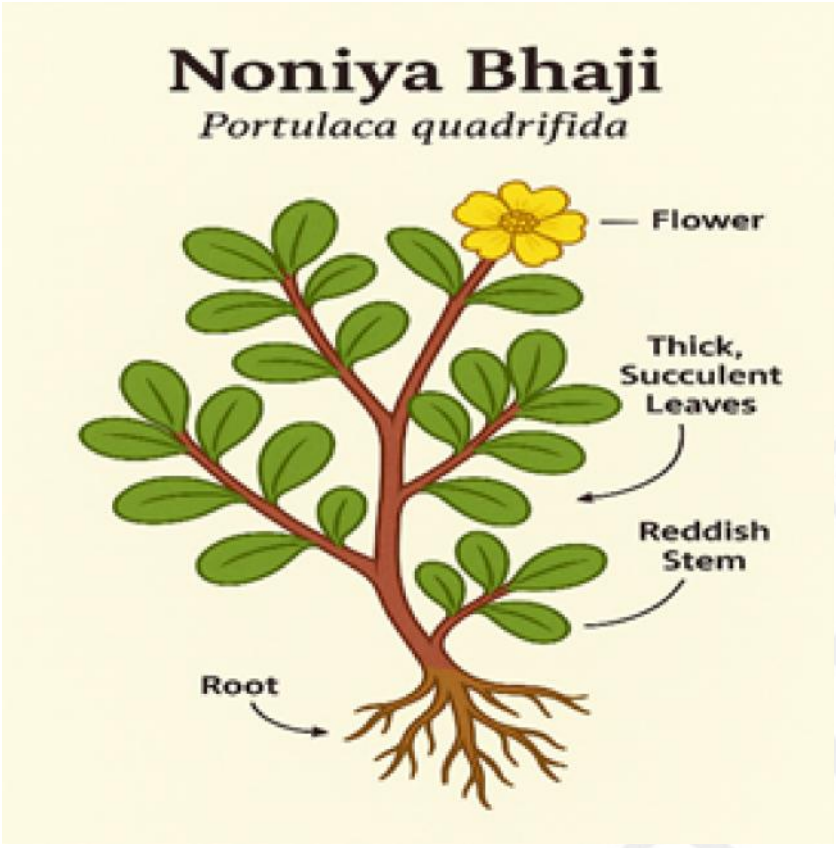
on this plant for treating ailments such as dysentery, ulcers, and chronic inflammations. At the same time, its culinary use prepared with mustard, garlic, and basic spices makes it a seasonal delicacy in village kitchens. This paper explores both chemical and practical aspects of this underutilize green resource.

Botanical Description

Portulaca quadrifida, is a herbaceous, spreading plant known for its edible and medicinal properties, predominantly found in tropical and subtropical regions of India, especially in the rural belts of Chhattisgarh, Jharkhand, Madhya Pradesh, and Odisha. The plant is commonly referred to as a "wild green," often growing unnoticed in fields, pathways, gardens, and among other crops as a spontaneous ground cover. Despite its weedy appearance, it plays a vital role in the local diet and ethnomedicine of tribal and rural communities.

Morphologically, *Portulaca quadrifida* is a low-growing, mat-forming, prostrate herb. Its growth pattern is characterized by a radial spreading of stems from the center, creating a ground-hugging, cushion-like structure that helps prevent soil erosion and maintain ground moisture. The stems are fleshy, soft, and usually exhibit a reddish to purplish tint due to the presence of anthocyanin pigments. These pigments not only add to the aesthetic value but also contribute to the plant's antioxidant properties.

The leaves are small, thick, and fleshy (succulent), which indicates the plant's adaptation to withstand drought conditions and retain water during dry seasons. Typically, the leaves are ovate to oblong in shape with a smooth surface and are arranged oppositely along the stems. In some cases, leaf whorls may appear at the nodes, especially in nutrient-rich soils. The succulent nature of the leaves makes them soft in texture when cooked and contributes to the soothing and mucilaginous effect on the digestive tract. Flowering occurs primarily during the monsoon and early post-monsoon period, although some regions may see extended blooming depending on humidity. The flowers are small, bright yellow in color, and typically open for a short duration in daylight hours, often closing by noon. The flowers are solitary or occur in small clusters, and each flower has five petals with a central reproductive structure comprising multiple stamens and a pistil. The fruit of the plant is a small capsule containing numerous minute seeds. These seeds are dark, smooth, and glossy, and are dispersed naturally through wind or rain splash. Germination is quick, especially after the onset of rains, making the plant one of the first green herbs to appear in cultivated or disturbed soils. The plant's entire life cycle is short, generally completing within one season, but due to its prolific seeding and easy propagation, it grows back each year, making it a dependable seasonal food source. Harvesting is done manually by collecting the entire shoot system with tender leaves, which are then cleaned and cooked fresh. In some cases, the leaves are shade-dried and stored for use during dry months when green vegetables are scarce.



From a taxonomical standpoint, *Portulaca quadrifida* belongs to the following classification:

- **Kingdom:** Plantae – representing all multicellular plants.
- **Phylum:** Angiosperms – flowering plants with seeds enclosed in fruit.
- **Class:** Eudicots – plants with two seed leaves and net-like veins.
- **Order**: Caryophyllales – a group known for species with betalain pigments.
- **Family:** Portulacaceae – the purslane family, rich in succulent plants.
- **Genus:** *Portulaca* – known for edible, low-growing, succulent herbs.
- **Species:** *quadrifida* – specifically referring to its four-fold leaf arrangement or branching pattern.

In ecological terms, the plant is highly resilient, tolerant to drought, and requires minimal care. Its growth in neglected or fallow lands makes it a vital component of food security in rain-fed areas. The minimal input requirement and wide availability make Portulaca quadrifida not just a botanical curiosity, but a valuable natural resource for sustainable nutrition and health.

Chemical Composition of Portulaca Quadrifida

Scientific studies and ethnobotanical surveys have revealed that Portulaca quadrifida is rich in various bioactive and nutritive compounds:

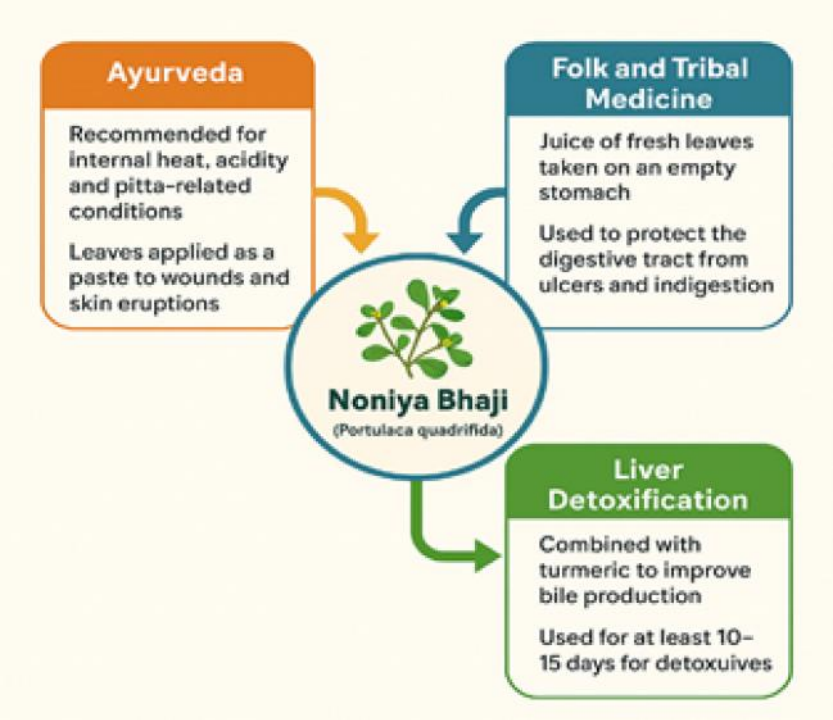
Constituent	Function / Benefit
Flavonoids (Quercetin)	Antioxidant, anti-inflammatory
Alkaloids	Antimicrobial, digestive aid
Iron, Calcium, Potassium	Blood formation, bone health, heart regulation
Vitamin C	Immunity boost, skin health
Mucilage & Fiber	Digestive health, stool regulation

These compounds contribute to treating gastritis, acidity, mouth ulcers, and general weakness. Their concentrations may vary slightly depending on the soil and environment in which the plant is grown.

Applications in Traditional Medical Systems

Portulaca quadrifida (Portulaca quadrifida) holds a prominent place in traditional healing systems like Ayurveda, Siddha, and local tribal medicine, owing to its gentle yet effective healing properties. Classified as a cooling herb with pitta-pacifying effects, it is known for its soothing influence on inflammation, skin disorders, and digestive imbalances.

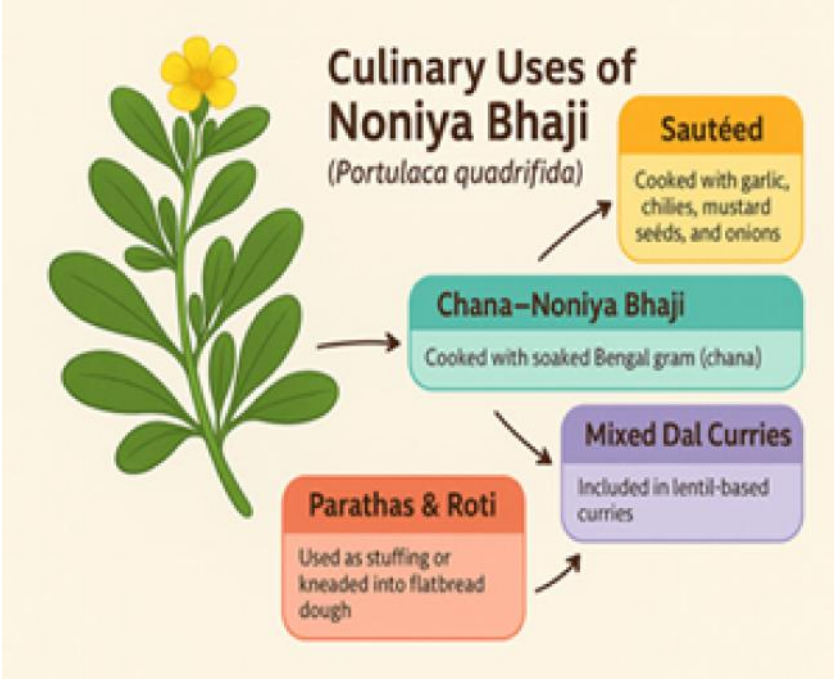
In Ayurveda, Portulaca quadrifida is often recommended for individuals suffering from internal heat, acidity, and toxins in the bloodstream. Its bitter astringent taste (tikta–kashaya rasa) and cooling potency (sheeta virya) make it ideal for reducing pitta-related conditions such as ulcers, gastritis, and skin eruptions. The leaves are often crushed into a paste and applied to minor wounds, cuts, or insect bites to promote healing and reduce irritation. The mucilaginous sap acts as a natural barrier, maintaining moisture and speeding up epithelial repair. In folk and tribal medicine, especially in regions like Chhattisgarh, Odisha, and Jharkhand, the juice extracted from fresh leaves is taken early in the morning on an empty stomach. This traditional method is believed to cleanse the digestive system, regulate bile flow, and relieve constipation. In many households, especially during the summer months, a mild cooked preparation of Portulaca quadrifida is used to protect the gastrointestinal tract from ulcers, acidity, and chronic indigestion. For **liver detoxification**, Portulaca quadrifida is often paired with turmeric and taken either raw or lightly steamed. This combination is thought to support liver enzymes and improve bile production, aiding in natural detoxification pathways. People experiencing liver heat, sluggish digestion, or skin dullness due to toxin accumulation are advised this combination for at least 10–15 days. Moreover, seasonal detox routines in rural homes include this herb as a staple. Its consumption during spring and summer is particularly encouraged to counteract body heat, improve fluid balance, and prevent heat-induced skin disorders such as prickly heat, rashes, or boils.



Culinary Uses in the Kitchen

Apart from its medicinal value, Portulaca quadrifida is a popular culinary green in several Indian states due to its mild flavor, smooth texture, and nutritional benefits. Known for its slightly tangy and earthy taste, it is frequently prepared as part of traditional meals in rural as well as urban households. The leaves and tender stems are typically washed thoroughly and sautéed with ingredients like garlic, green chilies, mustard seeds,

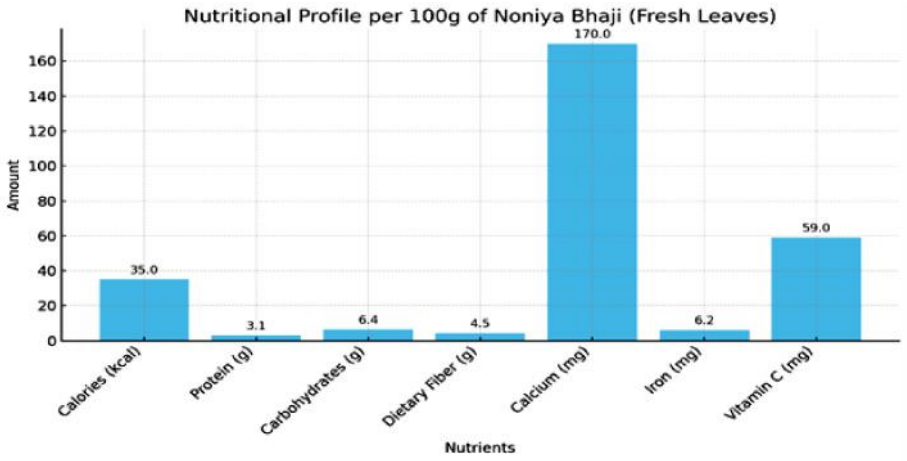
and onions, enhancing both taste and digestibility. This preparation style is prevalent in the tribal belts of Chhattisgarh, Jharkhand, Bihar, and Odisha, where it is consumed with rice, millets, or roti. In Jharkhand, a famous dish called "Chana–Portulaca quadrifida" involves cooking it with soaked Bengal gram for added protein. It is also used as a stuffing in parathas or kneaded directly into dough for making traditional "bhaji roti" a nutritious flatbread especially served to children and elderly individuals for its soft texture and digestibility. Additionally, it is included in mixed dal curries, where its mucilaginous texture thickens the broth naturally, making it more soothing and richer.



Nutritional Profile per 100g (Fresh Leaves)

Nutrient	Amount
Calories	35 kcal
Protein	3.1 g
Carbohydrates	6.4 g
Dietary Fiber	4.5 g
Calcium	170 mg
Iron	6.2 mg
Vitamin C	59 mg
Water Content	85–90%

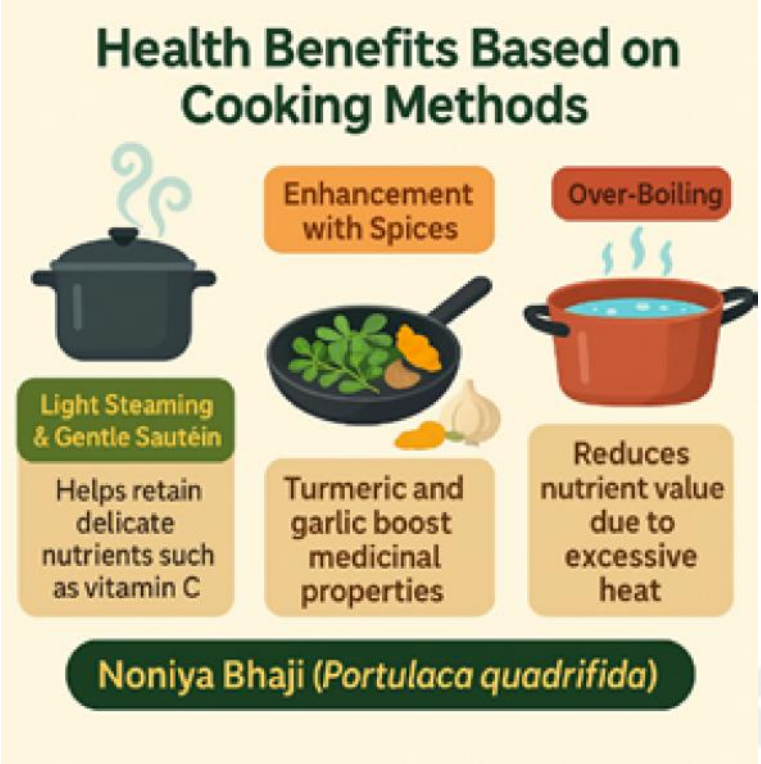
This profile indicates that Portulaca quadrifida is a low-calorie, nutrient-dense food, rich in essential micronutrients required for healthy blood, bones, and immune function. Its high calcium and iron content makes it particularly beneficial for women, adolescents, and the elderly who may be prone to deficiencies. The mucilaginous quality of the leaves not only helps in digestive lubrication but also provides a natural soothing effect to the stomach and intestines, making it ideal for people with gastric sensitivity.



In essence, Portulaca quadrifida merges health and taste, offering a sustainable, indigenous alternative to expensive superfoods. Its wide use in kitchens underscores its relevance as a functional food that goes beyond basic nutrition.

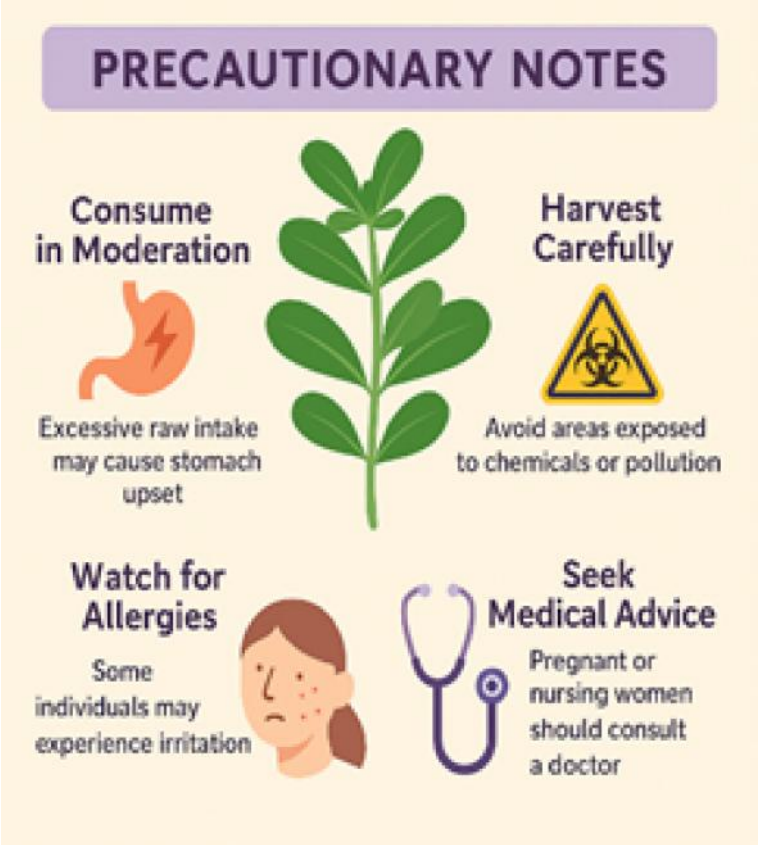
Health Benefits Based on Cooking Methods

Portulaca quadrifida (Portulaca quadrifida) is not only nutritionally rich but also versatile in the way it is cooked and consumed. Interestingly, the method of preparation has a direct influence on the bioavailability and preservation of its nutrients and medicinal compounds. Various traditional cooking techniques have been developed over generations to enhance its health-promoting properties while maintaining its taste and digestibility. Among the most preferred cooking methods, light steaming and gentle sautéing are considered ideal for retaining its delicate nutrients. For instance, Vitamin C—a vital antioxidant presents in abundance in fresh Portulaca quadrifida—tends to degrade at high temperatures. Therefore, short cooking durations with minimal heat exposure help in conserving this water-soluble vitamin. When lightly sautéed with minimal oil, the plant not only retains its vitamin C but also activates certain fat-soluble compounds, making them more bioavailable for the body. Moreover, pairing Portulaca quadrifida with traditional spices such as turmeric and garlic enhances its medicinal potency. Turmeric, rich in curcumin, offers anti-inflammatory and liver-protective effects, and when cooked with Portulaca quadrifida, it boosts overall detoxification pathways. Garlic, known for its sulfur-containing compounds, enhances digestion and immunity. These combinations are often employed in rural and tribal kitchens not only for taste but also for their synergistic healing benefits. In regions like Chhattisgarh and Jharkhand, mustard oil is often used to cook Portulaca quadrifida. This not only improves its flavor but also aids in digestion and acts as a carrier for the absorption of fat-soluble phytonutrients such as flavonoids and polyphenols. The pungency of mustard oil balances the mucilaginous nature of the bhaji, reducing any feeling of heaviness after consumption and supporting better metabolism. On the other hand, over-boiling or excessive frying, although practiced occasionally, is discouraged from a nutritional standpoint. Prolonged cooking leads to the breakdown of important enzymes and antioxidants, diminishing the plant's therapeutic value. Excess water used during boiling may also leach out minerals such as iron, calcium, and potassium, which are naturally present in Portulaca quadrifida in significant amounts.



Precautionary Notes

Although Portulaca quadrifida (*Portulaca quadrifida*) is widely celebrated for its nutritional richness and healing potential, it is essential to acknowledge certain precautionary aspects related to its consumption and harvesting. Like many wild or semi-domesticated leafy greens, the plant must be consumed mindfully to avoid potential health concerns, especially among individuals with sensitive digestive systems or underlying health conditions. In most traditional practices, Portulaca quadrifida is consumed either lightly cooked or steamed, which significantly reduces any risk of digestive irritation. However, overconsumption in its raw form—such as juicing large quantities of the fresh leaves or eating uncooked shoots may lead to temporary stomach discomfort. This is primarily due to its mucilaginous nature and the presence of certain bioactive alkaloids, which can act as mild laxatives. Individuals with weak digestion or a history of gastrointestinal sensitivity are advised to start with small portions and always consume the plant after proper washing and minimal cooking. Another important consideration is the source of cultivation or collection. Since Portulaca quadrifida is commonly found in wild, open areas, including roadsides, uncultivated fields, or near sewage runoffs, it has a natural tendency to absorb heavy metals and harmful residues from contaminated soil. These pollutants such as lead, arsenic, or pesticide residues can accumulate in the plant tissues and pose serious long-term health risks if consumed regularly. Therefore, it is strongly recommended to harvest Portulaca quadrifida only from chemical-free, organically maintained lands or personal kitchen gardens where the use of synthetic fertilizers and insecticides is strictly avoided. Additionally, while the plant is not classified as toxic, some individuals may be allergic to it or experience rare skin irritation when handling the fresh leaves or stems. Hence, it is best to wear gloves during collection if skin sensitivity is known. Pregnant or lactating women should also consult with a physician or an Ayurvedic expert before adding Portulaca quadrifida to their regular diet, especially in therapeutic doses, to avoid any unintended effects. In summary, when used with proper care such as ensuring clean sourcing, moderate consumption, and mindful preparation Portulaca quadrifida is a safe, nourishing, and beneficial herb. Traditional cooking methods and age-old knowledge offer the best guidance for its safe use, reinforcing the importance of respecting the plant's natural characteristics while enjoying its many advantages.



CONCLUSION

Portulaca quadrifida is a perfect example of how traditional knowledge and scientific validation can merge. It offers medicinal value and culinary pleasure in equal measure. With its high micronutrient density and phytochemical richness, it can be promoted both as a functional food and a traditional herbal remedy. There is potential for commercial processing and packaging in dehydrated or preserved forms, ensuring year-round availability.

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