

Unveiling Versatility: Potential Implications of a Halosucculent Plant- Sea Purslane (*Sesuvium portulacastrum*)

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Introduction

Sea purslane, or *Sesuvium portulacastrum*, is one of the most durable and adaptable plants in the world of coastal habitats. Because of its numerous functions and uses, as well as its capacity to adapt to different environmental circumstances, it is an important part of the coastal biodiversity. This article explores the many facets of *Sesuvium portulacastrum*, including its various ecotypes, functions within ecosystems, and several applications in various fields.

Morphology, Ecotypes and Distribution:

S. portulacastrum (Fig. 1) is a herbaceous, perennial, psammophytic, dicotyledonous, and facultative halophyte that belongs to the Aizoaceae family (Lokhande et al. 2009). Although plants have tap roots, their creeping habit causes them to develop accidental roots from the nodal area. *S. portulacastrum* plants are upright, sub-teretglabrous herbs that are succulent, trailing, and greenish pink or red in color. They have numerous branches that are organized in an opposing orientation, and the simple, succulent leaves have paracytic stomata. The plant blooms all year long, usually producing pink to purple flowers that are sporadically white. It yields circumscissile fruits (capsules). *Sesuvium portulacastrum* exhibits remarkable ecological plasticity, thriving in a spectrum of coastal habitats worldwide. Across a variety of ecological niches, this succulent plant makes its presence known, from sandy beaches to salt marshes and mangrove fringes. It is found throughout tropical and subtropical climates, including the coasts of continents including Australia, Asia, Africa, and the Americas. *Sesuvium portulacastrum* appears in various areas in a variety of ecotypes, morphologically and physiologically adjusting to the unique requirements of its environment. The plant's adaptive responses to many factors like as salinity, substrate composition and tidal fluctuations are reflected in terms of variations in leaf size, shape, and succulence.

Functions within Coastal Ecosystems:

Sesuvium portulacastrum, a fundamental species in coastal ecosystems, performs a variety of

functions that support the resilience and smooth operation of the ecosystem. Its vast root system helps to reduce erosion, stabilize sandy surfaces, and encourage soil accretion. *Sesuvium portulacastrum* also improves soil fertility in coastal settings by facilitating nitrogen cycling and capturing sediments and organic materials. For a wide range of invertebrates, shorebirds, and small mammals, this species provides essential habitat and food in intertidal zones, which supports complex trophic interactions within coastal food webs. Furthermore, it is a pioneer species in salt marsh colonization due to its resistance to high salinity levels, which helps varied plant groups to establish themselves in these dynamic conditions.



Fig. 1 Morphology of *Sesuvium portulacastrum*

Table 1 Botanical classification of *Sesuvium portulacastrum*

Kingdom:	Plantae
Clade:	Tracheophytes
Clade:	Angiosperms
Clade:	Eudicots
Order:	Caryophyllales
Family:	Aizoaceae
Genus:	<i>Sesuvium</i>
Species:	<i>S. portulacastrum</i>

S. portulacastrum and abiotic stress tolerance:

This plant can adapt to and live under a variety of abiotic stress situations due to its unique molecular and physiological flexibility (Lokhande et al. 2011). Significant advancements in research during the last 20 years have demonstrated its significance and potential applications in desalination, phytoremediation, and environmental preservation. They are extremely resilient to the strains of flooding and salt because they can live and grow in soil even in the face of flooding or sea water spraying. Plants are resistant to nutrient shortages and drought stress, and they can thrive on dry, sandy soils with low mineral nutrient concentrations. *S. portulacastrum* can withstand both flooding and drought. Rewatering stressed plants restored the plants' growth, indicating that *S. portulacastrum* retains its potential for growth and nutrient absorption during drought stress, allowing it to quickly resume growth activity once water becomes available. Drought stress has been shown to reduce the growth of *S. portulacastrum* by decreasing the leaf relative water content and increasing the proline, K, and Na contents (Slama et al., 2006). Meetam et al.'s 2020 study revealed that *S. portulacastrum* was able to permit more than 80% of stomatal opening following five days of drought stress.

As of now, not much is known about how sea purslane reacts to floods or the reasons it can thrive in water or after flooding. While there are no reports on *S. portulacastrum*'s ability to withstand both drought and flooding, this species may really provide a perfect model plant for researching the mechanisms behind co-tolerance. Toxic metals are also tolerated by sea purslane plants. Depending on the kind of metal, different tolerance mechanisms apply (Alsherif et al., 2023). Research projects carried out by various groups of scientists have shown that *S. portulacastrum* is more resistant to lead (Pb), cadmium (Cd), and nickel (Ni).

Uses and Economic Importance:

Sesuvium portulacastrum has a number of uses that have an impact on the economy in addition to its ecological value. This plant's preparations have been used in traditional medicine for their supposed antibacterial, anti-inflammatory, and wound-healing qualities. Furthermore, its succulent leaves are prized in dry coastal areas for providing cattle with wholesome forage that is tough enough to last during

dry spells. *Sesuvium portulacastrum*'s ability to flourish in saline soils and withstand heavy metal contamination further makes it a promising candidate for phytoremediation and soil remediation programs. Its ornamental value and erosion control qualities are used in coastal landscaping and restoration projects to improve the ecological functionality and aesthetic appeal of coastal habitats.

Conclusion

Sesuvium portulacastrum is a prime example of nature's inventive adaptability; it represents toughness, adaptability, and ecological importance in coastal environments. Its significance as a keystone species in the conservation of coastal biodiversity and sustainable development initiatives is highlighted by its capacity to flourish in a variety of environments, carry out a range of biological activities, and provide several applications. Through deciphering the complex ecological dynamics and socio-economic contributions of *Sesuvium portulacastrum*, we are able to comprehend the rich network of life that exists along the world's coastlines and the priceless services provided by nature's hardy stewards.

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