



SESUVIUM PORTULACASTRUM: PHYTOCHEMISTRY AND PHARMACOLOGICAL APPLICATIONS

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ABSTRACT *Sesuvium portulacastrum* (S. *portulacastrum*) Aizoaceae is commonly known as Sea Purslane. It is a frequent pioneer species in the backshore zone of coastal beaches, where sand movement is influenced by prevalent winds near the born crest. This article deals with the overview of *S. portulacastrum*, its phytochemical constituents pharmacological applications and its various medicinal uses. The extract of leaves and stems has different phytochemicals as polyphenols, terpenoids, flavonoids, alkaloids, tannins, steroid and volatile components. It possess a number of bioactive constituents like Phytol, Squalene, Vitamin E, Benzoic acid, Hexadecanoic acid, ethyl ester, Oleic acid, eicosyl ester. There are antibacterial, antifungal, Fatty acid Composition, antimicrobial, essential oil, antioxidant, EDTA-Enhanced Phytoremediation of Lead-Contaminated Soil activities carried out on this plant. This review could help the researchers to undertake the further investigations in these directions.

KEYWORDS : Mangroves, phytochemicals, pharmacology.

Introduction:

Mangroves occur as tall forests through shrub lands in the intertidal zone along those parts of the coast subject to low wave energy¹. Mangrove swamps form a type of coastal wetland found in the tropics and subtropics. They act as a source of energy in coastal food chain and also protects against various natural calamities such as cyclone and tsunami². Many drugs, dyes, and tannins are obtained from the mangroves. *Sesuvium portulacastrum* L. (seapurslane) belonging to family Aizoaceae is one of the fast growing, herbaceous, perennial, dichotomous plant of this genus. *Sesuvium portulacastrum* (godabari), was first published in 1953 as *Portulaca portulacastrum* by Carl Linnaeus. After six years Linnaeus displaced *Portulaca* into *Sesuvium* and it has remained same name ever since. *Sesuvium portulacastrum* also known as shoreline purslane or sea purslane is a sprawling perennial herb that can exist under stress conditions. As it is well conform to salinity and drought, *Sesuvium portulacastrum* is known to be halophytic species. It is a frequent pioneer species in the backshore zone of coastal beaches, where sand movement is influenced by prevalent winds near the born crest³. It is found in the northern, western and central parts of the world. The thick, fleshy leaves are borne on succulent, reddish green stems that branch regularly forming dense stands close to the ground. It grows in sandy clay, coastal limestone and sandstone, tidal flats and salt marshes in different parts of the world⁴. Leaves are narrow, simple, opposite resemble the shape of a spoon or paddle. They are 1/2" to 2" inches long with a fleshy texture and smooth surfaces. Leaf color is green with some occasional red and leaf bases are winged.

This review article gives an overview of the mangrove plant *Sesuvium portulacastrum*, highlighting its phytochemical constituents isolated, pharmacological studies and medicinal applications conducted on this plant.

Phytochemical constituents:

The presence of phytochemicals such as alkaloids, saponins, tannins, terpenoids and steroids were evaluated according to the methods described by Edeoga et al.⁵. Analysis of fatty acid composition of *Sesuvium portulacastrum* by gas chromatography revealed the presence of higher amount of saturated fatty acids than the unsaturated fatty acids⁶. Phytochemical screening of the stems and leaves of *S. portulacastrum* indicates the presence of terpenoids, alkaloids, and tannins. *Sesuvium* is an important source of phytoecdysteroids (insect molting hormones) 20- hydroxyecdysone (20E) which may influence many biochemical and physiological processes during the various developmental stages of insects along with the small amount of ecdysone. Moreover *S. portulacastrum* also contain fatty acids whose composition is palmitic acid (31.18%), oleic acid (21.15%), linolenic acid (14.18%) linoleic acid (10.63%), myristic acid (6.91%) and behenic acid (2.42%). The major phytoconstituents of *Sesuvium portulacastrum* are trans-4- hydroxyprolinebetaine, praline and

3,5,4_-trihydroxy-6,7- dimethoxyflavone 3-glucoside indicates its use in osmoregulation^{7,8}. Ecdysterones amino acids and mineral Constituents, flavonols and flavonol glycosides^{9,10,11,12}. The plant possess broad spectrum activity against gram positive and gram negative bacteria as well as significant antifungal and antioxidant activity. Phytochemical analysis with the use of GC- MS of the *S. portulacastrum* ethanolic extract revealed the presence of 22, 23-Dihydrostigmaterol, Benzoic acid 3, 4, 5-trihydroxy-, Epicatechin and Capsaicin¹³. Analysis of leaf essential oil yielded alpha-pinene, camphene, beta-pinene, alpha-terpinene, O-cymene, limonene, 1,8-cineole, alpha-terpinene, bornyl acetate, tridecane, trans-caryophyllene and alpha-humulene¹⁴.

Presence of tested secondary metabolites in the leaves and stems of *S. portulacastrum* will be promising for further studies on the plant as a potential study area for other researchers.

Pharmalogical uses:

The leaves and stems of *S. portulacastrum* are promising sources of natural anti-bacterial. Extract of this plant and the essential oil from the fresh leaves of *S. portulacastrum* showed antibacterial, antifungal as well as antioxidant activity. The essential oil extracted from *S. portulacastrum* exhibited antibacterial activity against *Acetobacter calcoaceticus*, *B.subtillis*, *C. porogenes*, *C. perfringens*, *E.coli*, *S. typhi*, *S.aureus* and *Yersinia enterocolitica*¹⁵. Crude aqueous extract significant enhancement on growth and metabolism in *Labeo rohita* fish¹⁶. Chandrasekaran et al., expressed the fatty acid methyl esters (FAME extract) from *S. portulacastrum* can be used in traditional medicine as a potential antimicrobial agent¹⁷. Nabikhanet al., showed the effect of extracts from tissue culture-derived callus and leaf of the saltmarsh plant, *S. portulacastrum* L. on synthesis of antimicrobial silver nanoparticles using AgNO₃ as a substrate¹⁸. *Sesuvium portulacastrum*, showed positive activity against human immunodeficiency viruses¹⁹.

Study evaluated the fatty acid methyl esters from *Sesuvium portulacastrum* leaves for fatty acid composition and antimicrobial activity against human pathogenic microorganisms. Analysis yielded the presence of palmitic acid, oleic acid, linolenic acid, linoleic acid, myristic acid and behenic acid. The FAME extract (free fatty acid methyl extract) showed the highest antibacterial and anti-candidal activities and moderate antifungal activities against tested organisms²⁰. The cholinesterase inhibitory activity of mangroves evaluated an alternative medicine for the treatment of Alzheimer's disease. The activity might be correlated to the alkaloid content²¹. The hepatoprotective and antioxidant effect of methanol extract of whole plant on CCl₄-induced hepatotoxicity in rats. *S. portulacastrum* exhibited a significant effect showing increased levels of SOD, CAT, GP, GSH, and GRD by reducing malondialdehyde (MDA) levels²².

Medicinal uses:

The plant has a long history in folk medicine and was traditionally used in given salads due to its salty taste. Moreover it is used a remedy for fever, kidney disorders and in the treatment of various infections and scurvy^{23,24}. The secondary metabolites from these plant species have been believed to have great potential substitutes for some synthetic raw materials in food, perfumery, cosmetics and pharmaceutical industries. The plant is grown as ornamental plants because of its flowers and succulent foliage of leaves. Traditional healers in Zimbabwe and South Africa use the plant to treat various infections and kidney disorders. The ethanolic extract of the medicinal plant *S. portulacastrum* showed potential against the causative agents of nosocomial infections, and important pathogens associated with various gastrointestinal disorders leading to indigestion, dysentery, and diarrhea. It has been utilized for the treatment of epilepsy, conjunctivitis, dermatitis, haematuria, leprosy and purgative, toothache and also as antimicrobial agent.

Ethanolic extract of the medicinal plant *S. portulacastrum* showed potential against the causative agents and pathogens related to various gastrointestinal disorders leading to indigestion, dysentery, and diarrhea²⁵.

Salinity is a rising problem causing tremendous yield losses. Methods for salt removal include agronomic practices or phytoremediation. Study evaluated the potential use of halophytes to remediate saline soils. *Sesuvium portulacastrum* has exhibited greater accumulation of salt in their tissues and higher reduction of salts from saline land. Study has shown *S. portulacastrum*, an obligate halophyte, decreased the soil salinity and acidity²⁶.

Conclusion:

Different parts of *Sesuvium portulacastrum*, including the leaves, roots, woods, stems, bark, latex, and seeds have been reported to have therapeutic potential in treatment of various diseases. These include antibacterial, antifungal, Fatty acid Composition, antimicrobial, essential oil, antioxidant, EDTA-Enhanced Phytoremediation of Lead-Contaminated Soil. Various classes of phytochemicals such as flavonoids, steroid, tannins, phenolic glycosides etc., have been isolated and characterized. These compounds and their derivatives might be useful in newer drug discovery process. This review highlights several pharmacological and phytochemical studies that have demonstrated the therapeutic potential and phytochemical constituents of *S. portulacastrum*.

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