

**GC-MS ANALYSIS OF BIOACTIVE CONSTITUENTS FROM COASTAL SAND DUNE TAXON –
SESUVIUM PORTULACASTRUM (L.)**

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sheelajoshua77@gmail.com**ABSTRACT**

Sesuvium portulacastrum (L.) is a coastal plant has long been used as a remedy for fever and scurvy by rural folk. The present investigation was carried out to determine the bioactive phytoconstituents in the ethanol extracts of leaf and stem of *S. portulacastrum*. The GC/MS analysis ethanol extractive of leaf and stem was found to be value added. 9 compounds were identified in leaf extract and 8 compounds from stem. Vitamin E (44.79%), 1-Monolinoleoylglycerol trimethylsilyl ester (19.29%) are the prevailing compounds in leaf extract and Benzoic acid, 4-ethoxy-ethyl ester (23.03%), Oleic acid (15.99%) are the major phytoconstituents in stem extract of *Sesuvium portulacastrum*.

Key words: GC-MS, Phytol, Rhodopin, *Sesuvium portulacastrum*, Squalene, Vitamin E.

INTRODUCTION

Plants are man's friend in survival, giving him food and fuel and medicine from the days beyond dawn of civilization. *Sesuvium portulacastrum* (L.) 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 (Robert *et al.*, 1997). *S. portulacastrum* plant is distributed throughout the world since it is used as an ornamental plant (Rabni *et al.*, 2010). *S. portulacastrum* has a long history of use in folk medicine where, in Zimbabwe and South Africa use the plant to treat various infections and kidney problems (Lokhande, *et al.*, 2011). Kompfer *et al.*, (2011) stated a gram-staining-positive coccus belonging to genus salinicoccus, was isolated from the rhizosphere of *Sesuvium portulacastrum*. Michael L Magwa *et al.* (2011) used hydrodistillation to extract the essential oil from the fresh leaves of *S. portulacastrum* and the essential oil exhibited antibacterial, antifungal and antioxidant activity. Chandrasekaran *et al.* (2011) expressed the fatty acid methyl esters (FAME extract) from *S. portulacastrum* can be used in traditional medicine as a potential antimicrobial agent. Compared to the aqueous and dichloromethane extract, the ethanolic extract showed better antimicrobial activity against *Staphylococcus aureus* and *E.coli*, indicating its

potential application related to noscomial infections (Al-Azzawi, *et al.*, 2012).

MATERIALS AND METHODS**Collection and identification of Plant material**

Sesuvium portulacastrum was collected from Hare Island, Thoothukudi district, East Coastal Region, Tamil Nadu, India and botanical identity of the plant was authenticated by Botanical Survey of India (Southern Circle), Coimbatore. Voucher specimens were deposited in St.Mary's College Herbarium (SMCH), Thoothukudi.

Preparation of Powder and extract

Fresh leaves and stem of *Sesuvium portulacastrum* were shade dried and pulverized to powder in a mechanical grinder (Anonymous, 1998). 25 gm of powder (leaf and stem) were packed in Soxhlet apparatus and extracted with ethanol. The extracts were evaporated using a rotary evaporator. The dried extracts were stored at 20°C in vials for further studies.

GC – MS Analysis

GC-MS analysis of the extracts were carried out with GC-MS – Clarus 500 perkin Elmer system and Gas chromatograph interfaced to a mass spectrometer (GC-MS) employing following conditions: Column Elite-1 fused silica capillary column (30mm x 0.2mm ID x 1 f1mdf: composed of 100% Dimethyl poly silaxane) operating in

Table I – Bioactive Components identified and their activity in Leaf Ethanol extract of *Sesuvium portulacastrum* by GC MS study.

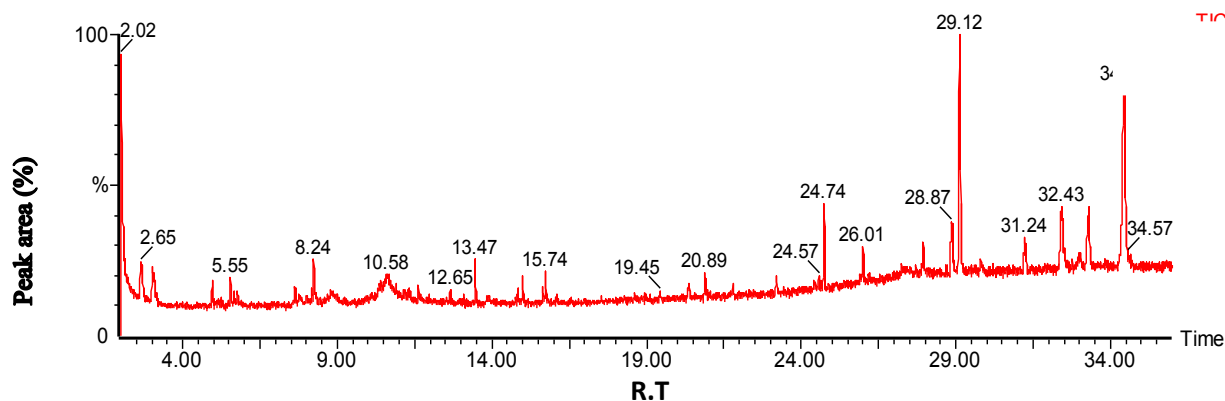
RT	Name of the compound	Molecular formula	MW	Peak Area %	Compound nature	**Activity
13.47	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	4.43	Palmitic acid ester	Antioxidant, Hypocholesterolemic Nematicide, Antiandrogenic, Flavor, Hemolytic
15.00	Phytol	C ₂₀ H ₄₀ O	296	3.55	Diterpene	Anticancer Antioxidant Antiinflammatory Diuretic
15.74	9,12,15-Octadecatrienoic acid, 2,3-dihydroxypropyl ester, (Z,Z,Z)-	C ₂₁ H ₃₆ O ₄	352	3.55	Linolenic acid ester	Antiinflammatory, Hypocholesterolemic Cancer preventive, Hepatoprotective, Nematicide, Antihistaminic Antieczemic, Antiacne, Antiarthritic, Anticoronary
20.89	Oleic acid, eicosyl ester	C ₃₈ H ₇₄ O ₂	562	4.43	Oleic acid ester	Antiinflammatory, Cancer preventive, Dermatitogenic Hypocholesterolemic, Anemiagenic Insectifuge
24.74	Squalene	C ₃₀ H ₅₀	410	11.09	Triterpene	Antibacterial, Antioxidant, Antitumor, Cancer preventive, Immunostimulant, Chemo preventive, Pesticide
29.12	Vitamin E	C ₂₉ H ₅₀ O ₂	430	44.79	Vitamin compound	Analgesic, Antidiabetic Antiinflammatory, Antioxidant, Antidermatitic, Antileukemic, Antitumor, Anticancer, Hepatoprotective, Antispasmodic
33.30	1-Monolinoleoylglycerol trimethylsilyl ether	C ₂₇ H ₅₄ O ₄ Si ₂	498	19.29	Steroid	Antimicrobial Antioxidant Antiinflammatory Antiarthritic Antiasthma, Diuretic

*** Source: Dr. Duke's phytochemical and Ethnobotanical database.

Table II – Bioactive components identified and their activity in the ethanol stem extract of *Sesuvium portulacastrum* [GC MS study].

RT	Name of the compound	Molecular formula	MW	Peak Area %	Compound nature	**Activity
8.22	Benzoic acid, 4-ethoxy-, ethyl ester	C ₁₁ H ₁₄ O ₃	194	23.03	Aromatic compound	Antimicrobial Preservative
13.46	Hexadecanoic acid, ethyl ester	C ₁₈ H ₃₆ O ₂	284	13.01		Antioxidant, Hypocholesterolemic Nematicide, Antiandrogenic, 5-Alpha reductase inhibitor
15.74	Oleic Acid	C ₁₈ H ₃₄ O ₂	282	15.99	Mono unsaturated fatty acid	Antiinflammatory, Antiandrogenic Cancer preventive, Dermatitogenic Hypocholesterolemic insectifuge
20.36	1-Docosanol	C ₂₂ H ₄₆ O	326	15.78	Alcoholic compound	Antimicrobial
20.91	Ethyl iso-allocholate	C ₂₆ H ₄₄ O ₅	436	7.46	Steroid	Antimicrobial Antioxidant Antiinflammatory Antiarthritic Antiasthma Diuretic
28.92	Rhodopin	C ₄₀ H ₅₈ O	554	10.87	Carotenoid	Antioxidant

*** Source: Dr. Duke's phytochemical and Ethnobotanical database.

**Fig 1: GC-MS Chromatogram of ethanol extract of leaves of *Sesuvium portulacastrum***

electron impact mode at 70eV, Helium (99.999%) was used as a carrier gas at constant flow of 1ml/min and an injection volume of 0.5/μl was employed (Split ratio of 10:1) injector temperature 250°C. Ion source temperature was 280°C. The oven temperature was programmed from 110°C (isothermal for 2 min) with an increase of 10°C/min to 200°C then 5°C/min isothermal at 28°C. Mass

spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 40 to 550 Da. Total GC running time was 36 min.

Characterization of Compounds

Interpretation on mass spectra of GC-MS was conducted using the database of National Institute of Standard and Technology (NIST).

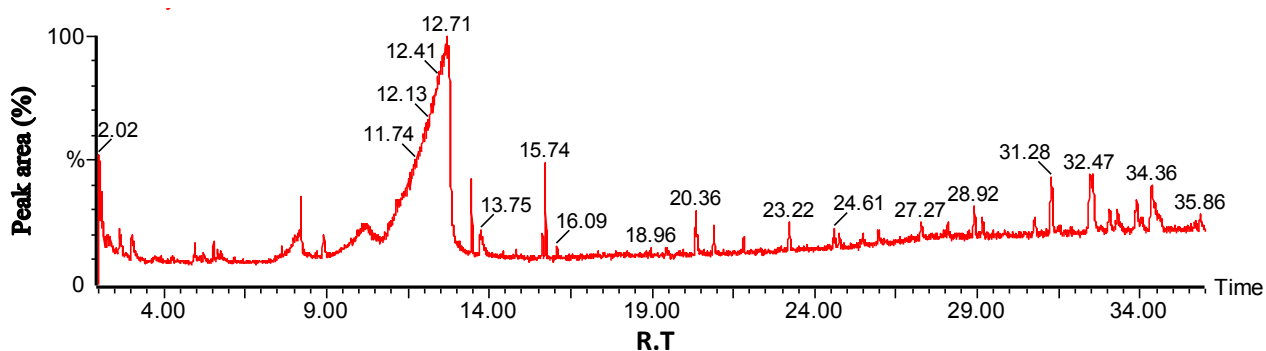


Fig 2: GC-MS Chromatogram of Ethanol extract of stem of *Sesuvium portulacastrum*

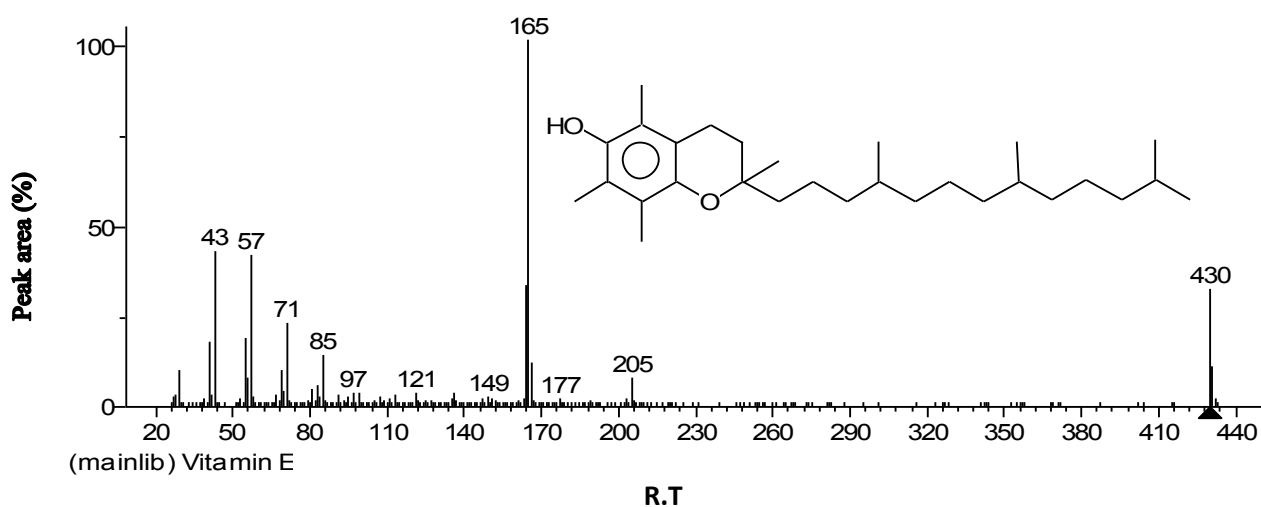


Fig 3a. Mass spectrum of Vitamin E

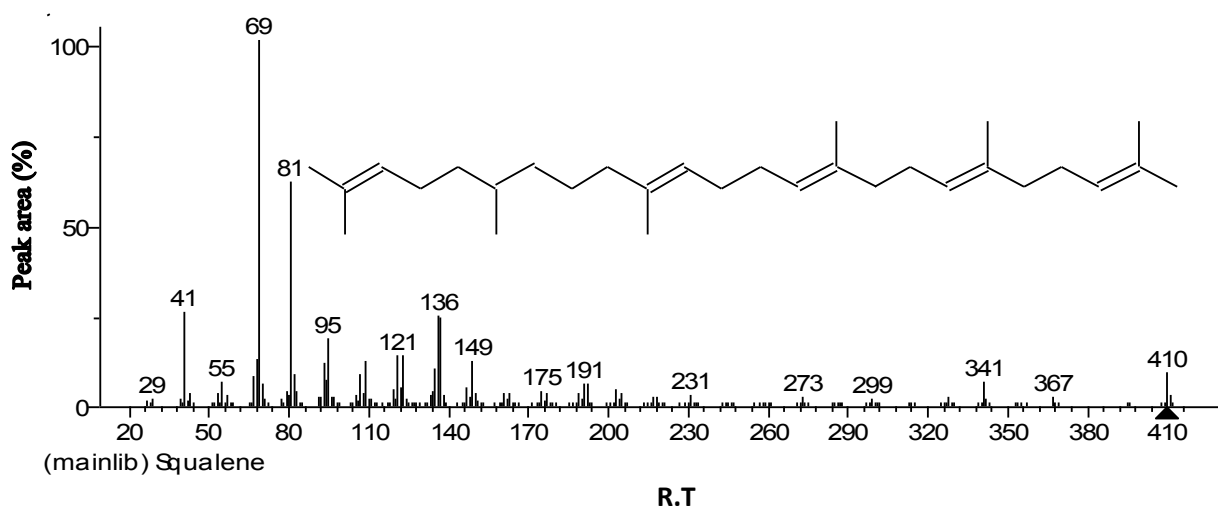


Fig 3b. Mass spectrum of Squalene

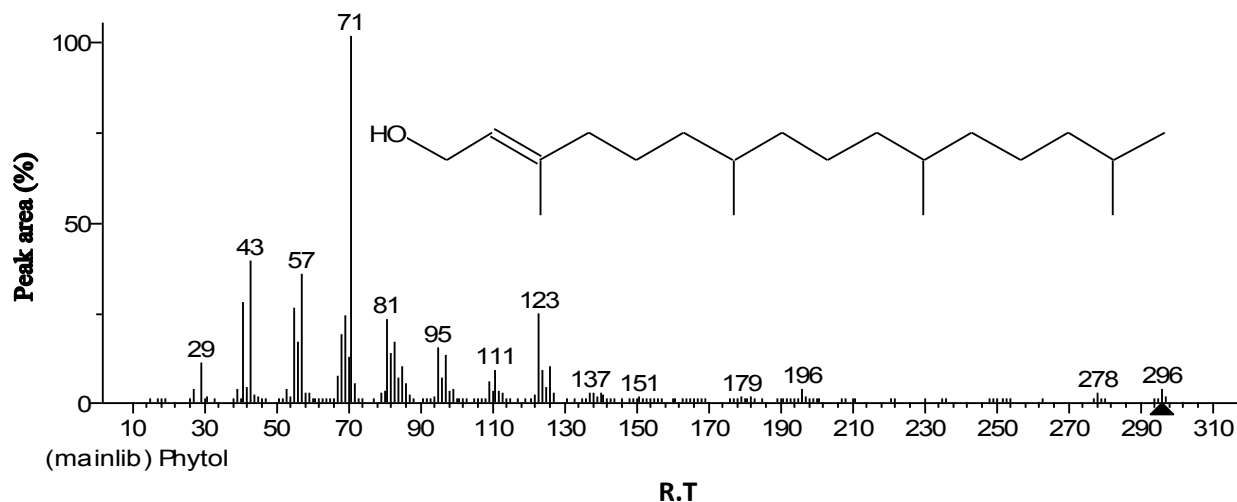


Fig 3c. Mass spectrum of Phytol

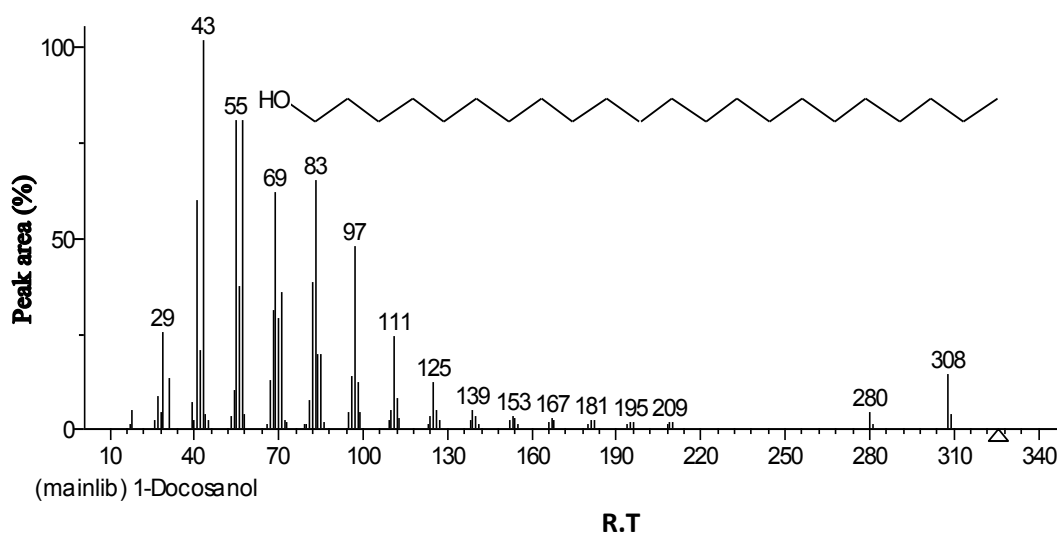


Fig 3d. Mass spectrum of 1 – Docosanol

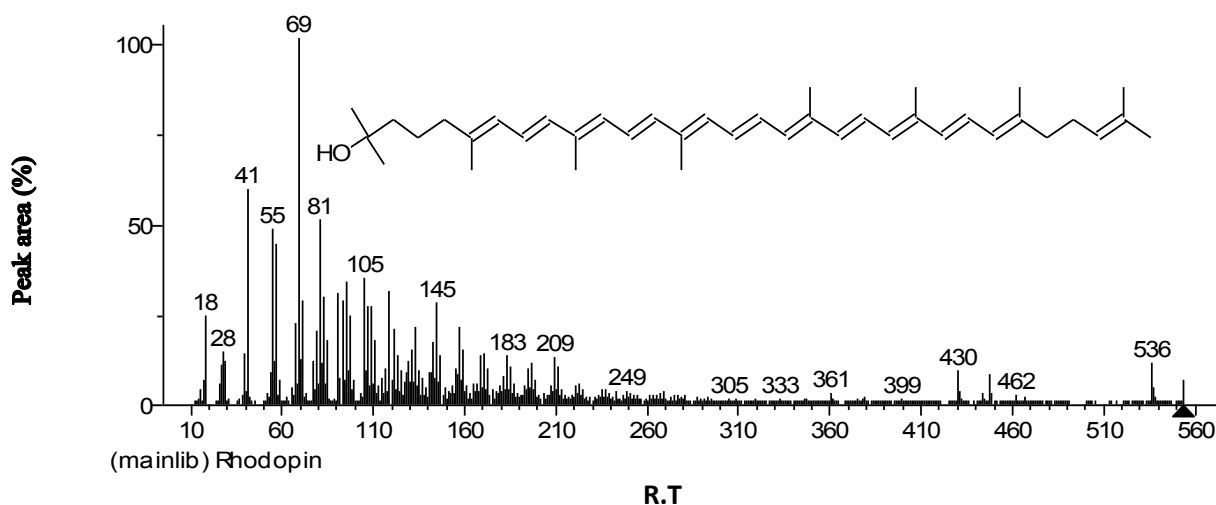


Fig 3e. Mass spectrum of Rhodopin

The mass spectra of unknown compound was compared with the known components stored NIST – Library. The name, molecular weight and structure of the compounds of the test materials were ascertained (Table 1 and 2; Fig.1 and 2).

RESULTS AND DISCUSSION

In GC-MS analysis carried out, nine compounds were identified from the leaf ethanol extract of *Sesuvium portulacastrum*. The retention time (RT) and percentage peak of the bioactive compounds were presented in Table 1. The major phytoconstituents present in the leaf extract were Vitamin E (44.99%) 1-Monolinoleoylglycerol trimethylsilyl ether (19-29%), squalene (11.09%) and phytol (3.55%). Phytol is a diterpene with antimicrobial properties, significantly against many bacterial strains (Bharathy, *et al.*, 2012).

In the GC-MS chromatogram of ethanol extractive of stem, eight compounds were identified. The compounds identified were Benzoic acid, 4-ethoxy-ethylester (23.03%), Oleic acid (15.99%), 1-Docosanol (15.78%) and Rhodopin (10.87%). These compounds were with retention life from 8.82 to 28.92. Peak area percentage was more than 10% for Squalene, Vitamin E, 1-Monolinoleoylglycerol trimethylsilyl ether, Benzoic acid, 4-ethoxy, ethyl ester, Hexadecanoic acid ethyl ester, Oleic acid, 1-Docosanol and Rhodopin (Fig.2). The details of these bioactive compounds were given in Table 2.

Kala *et al.* (2011) identified squalene have the property of antioxidant. Recently squalene possesses chemopreventive activity against colon carcinogenesis. Squalene is a hydrocarbon and a triterpene. It chemical however can being involved in the synthesis of cholesterol, steroid hormones

and vitamin D in the human body and it is also able to protect human against cancer (Musa *et al.*, 2012). The leaf extract was rich in Vitamin E. Vitamin E is the main lipid. Soluble antioxidant in the body. As antioxidant, Vitamin E acts in cell membrane where prevents the propagation of free radical reaction, although it has been also shows to have prooxidant activity (Herrera and Barbas, 2001).

Benzoic acid, 4-ethoxy, ethyl ester, 1-Docosanol and Ethyl iso-allocholate compounds with antimicrobial properties. Hexadecanoic acid, ethyl ester, phytol, Squalene, Vitamin E, 1-Monolinoleoylglycerol trimethylsilyl ether, Hexadecanoic acid, ethyl ester and Ethyl iso-allocholate compounds are with antioxidant properties (Dr. Duke's phytochemical and Ethnobotanical Databases).

Conclusion

In the present study, 9 compounds and 8 compounds were identified from ethanol extracts leaf and stem of *Sesuvium portulacastrum* respectively by Gas Chromatography – Mass Spectrometry (GC-MS) analysis. The presence of various bioactive compounds justifies the use of the whole plant for various ailments by traditional practitioners. However, subjecting it to pharmacological activity will definitely give fruitful results.

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