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GC-MS Analysis of Acetone Extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse collected from Kanyakumari in the South East Coast of Tamil Nadu, India

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ABSTRACT

The present study was carried out to analyse the acetone extract of marine green macro alga *Caulerpa racemosa* (Forssk.) Web. V. Bosse using Gas Chromatography-Mass Spectrometry (GC-MS) to reveal the presence of various secondary metabolites and bioactive compounds. The analysis revealed eleven bioactive compounds such as trans-Z-.alpha-bisabolene epoxide (2.041%), hexadecanoic acid, ethyl ester (10.528%), n-hexadecanoic acid (4.562%), octadecanoic acid (16.371%) pentadecane (44.589%), didodecyl phthalate (2.323%), palmitaldehyde (5.316%), α-D-ribofuranoside phenyl-2,3-O-isopropylidene-1-thio- (2.247%), tetracosanal (2.589%), vitamin-E (3.976%) and 1,3-dioxolane, 4-ethyl-5-octyl-2, 2-bis (trifluoromethyl)- (5.458%). The bioactive compounds from acetone extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse may have the potential effect against bacteria, fungi, free radical scavenging, etc and can used in the drug discovery and development sector.

Keywords: *Caulerpa racemosa*, Seaweed, Bioactive, GC-MS, Secondary metabolites.

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INTRODUCTION

Naturally occurring substances are derived only from plants, animals and mineral origin. These organic substances could be obtained in both primary and secondary metabolic process; they also provide a source of medicine since the earliest time. The plant kingdom has proven to be the most useful in the treatment of various diseases and they provide an important source of all the world's pharmaceuticals. The most important of these bioactive constituents of plants are steroids, terpenoids, carotenoids, flavanoids, alkaloids, tannins and glycosides. Plants in all facet of life have served a valuable starting material for drug development[1]. The bioactivce substances such as saponins, glycosides, flavonoids, alkaloids, etc are found to be distributed in plants, yet these compounds were not well established due to the lack of knowledge and techniques[2]. The phytoconstituents have been reported to exhibit hemolytic and foaming activity[3], antifungal[4], anti-inflammatory[5], fungistatic[6] and molluscidal[7].

Seaweeds or marine macro algae are potential renewable plant resources in the marine environment. Over the past several decades, seaweeds have generated an enormous amount of interest in the pharmaceutical industry as a fresh source of bioactive compounds with immense medicinal potential. Nowadays, the use of antibiotics has increased significantly due to heavy infections and the pathogenic bacteria becoming resistant to drugs due to indiscriminate use of antibiotics. The first investigation on antibiotic activity of algae was carried out by Pratt *et al*[8]. Since algae have been used in traditional medicine for a long time and also some algae have bactericidal, antifungal, antiviral and antitumor activity, they have been extensively studied by several researchers[9]. Seaweeds are exploited mainly for the industrial production of phycocolloids such as agar agar, alginate and carrageen, not for health aspects. Biostimulant properties of seaweeds are explored for use in agriculture and the antimicrobial activities for the development of novel antibiotics. Seaweeds have some of the valuable medicinal components such as antibiotics, laxatives, anticoagulants, antiulcer products, neurotoxins and suspending agents in radiological preparations. With this background the present study was explored the screen the phytochemicals present in the acetone extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse using GC-MS.

MATERIALS AND METHODS

Collection of Plant Sample

Caulerpa racemosa (Forssk.) Web. V. Bosse, one of the important green seaweeds shows much attention in the present study as it has potential to supplement native vegetation. *Caulerpa racemosa* (Forssk.) Web. V. Bosse was collected from Kanyakumari in the south east coast of Tamil Nadu, India. Samples were rinsed with marine water to remove debris and epiphytes. The entire epiphytes were removed using soft brush. In the laboratory, the collected plants were again washed in freshwater and stored in refrigerator for further analysis[10].

Preparation of extracts

For the preparation of acetone extract, the plant specimens were washed thoroughly and placed on blotting paper and spread out at room temperature in the shade condition for drying. The shade dried samples were grounded to fine powder using a tissue blender. The powdered samples were then stored in the refrigerator for further use. 30g powdered samples were packed in Soxhlet apparatus and extracted with acetone for 8h separately[11].

Gas Chromatography-Mass spectrometry (GC-MS)

The GC-MS analysis was carried out using GC model Clarus 680, Mass Spectrometer Clarus 600 (EI) Perkin Elmer, Gas Chromatography was equipped and coupled to a mass detector TurboMass 5.4.2 spectrometer with an Elite-5MS, (100% Dimethyl ply siloxane), 30.0m × 250µm df capillary column. The instrument was set to an initial temperature of 60°C and maintained at this temperature for 2min. At the end of this period, the oven temperature was raised upto 300°C, at the rate of an increase of 10°C/min and maintained for 6min. Injection port temperature was ensured as 250°C and Helium flow rate as 1ml/min. The ionization voltage was 70eV. The samples were injected in split mode as 10:1. Mass Spectral condition solvent delay 2min, transfer temperature 240°C, source temperature 240°C and scanning range was set at 50-600Da. The chemical constituents were identified by GC-MS[12].

Interpretation of mass spectrum of GC-MS was conducted using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST library. The retention time, compound name, molecular formula and molecular weight and area percentage of the test materials were ascertained.

RESULT AND DISCUSSION

GC-MS spectrum of acetone extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse indicated 11 major peaks which showed the presence of 11 compounds. The expecting compounds in acetone extract were trans-Z-.alpha-bisabolene epoxide (2.041%), hexadecanoic acid, ethyl ester (10.528%), n-hexadecanoic acid (4.562%), octadecanoic acid (16.371%) pentadecane (44.589%), didodecyl phthalate (2.323%), palmitaldehyde (5.316%), α-D-ribofuranoside phenyl-2,3-O-isopropylidene-1-thio- (2.247%), tetracosanal (2.589%), vitamin-E (3.976%) and 1,3-dioxolane, 4-ethyl-5-octyl-2, 2-bis (trifluoromethyl)- (5.458%). The spectrum profile of GC-MS confirmed the presence of eleven components with retention time 16.36min, 17.82min, 19.04min, 19.13min, 19.47min, 21.23min, 22.60min, 23.73min, 25.13min, 26.46min and 28.57min respectively (Figure-1 and Table-1).

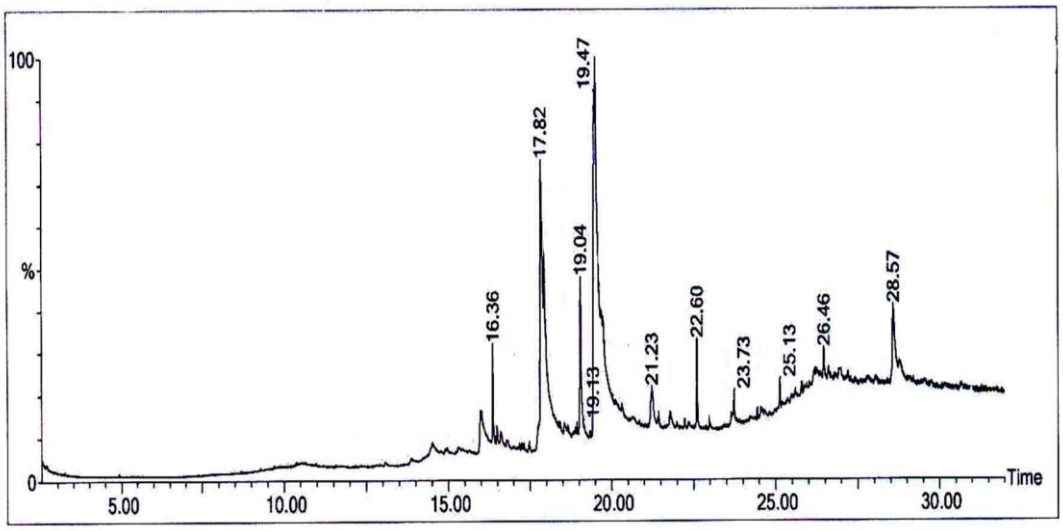

Figure-1: GC-MS profile of acetone extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse

Table-1: GC-MS profile of acetone extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse

SN	RT	Name of compound	MF	MW	PA
1.	16.36	trans-Z-.alpha.-Bisabolene epoxide	$C_{15}H_{24}O$	220.35	2.041
2.	17.82	Hexadecanoic acid, ethyl ester	$C_{16}H_{32}O_2$	256.42	10.528
3.	19.04	N-Hexadecanoic acid	$C_{16}H_{32}O_2$	256	4.562
4.	19.13	Octadecanoic acid	$C_{18}H_{36}O_2$	284	16.371
5.	19.47	Pentadecane	$C_{15}H_{32}$	212	44.589
6.	21.23	Didodecyl phthalate	$C_{32}H_{54}O_4$	502	2.323
7.	22.60	Palmitaldehyde	$C_{16}H_{32}O$	240	5.316
8.	23.73	α-D-Ribofuranoside phenyl-2,3-O-isopropylidene-1-thio-	$C_{14}H_{18}O_4S$	282	2.247
9.	25.13	Tetracosanal	$C_{24}H_{48}O$	352	2.589
10.	26.46	Vitamin E	$C_{29}H_{50}O_2$	430	3.976
11.	28.57	1,3-Dioxolane, 4- Ethyl-5-Octyl-2,2-Bis (Trifluoromethyl)-	$C_{15}H_{24}O_2F_6$	350	5.458

SN: Serial Number; RT: Retention Time; MF: Molecular Formula; MW: Molecular Weight; PA: Peak Area.

CONCLUSION

GC-MS analysis of the acetone extract of *Caulerpa racemosa* (Forssk.) Web. V. Bosse showed the presence of bioactive components. Retention time, molecular formula, molecular weight and peak area were used for the confirmation of phytochemical compounds. Totally there were 11 bioactive principles were reported in the present study. Among them, the major constituents were trans-Z-.alpha-bisabolene epoxide, hexadecanoic acid, ethyl ester, n-hexadecanoic acid, octadecanoic acid pentadecane, didodecyl phthalate, palmitaldehyde, α-D-ribofuranoside phenyl-2,3-O-isopropylidene-1-thio-, tetracosanal, vitamin-E and 1,3-dioxolane, 4-ethyl-5-octyl-2, 2-bis (trifluoromethyl)-. The research work is in progress to ascertain the medicinal quality of the green seaweed and brighten the phytochemical profile of it in the field of medicinal value.

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CONFLICT OF INTEREST

The author declares that she has no conflict of interest.

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