

Phytochemical Constituents of *Ulva lactuca* L. Collected from Mahim Beach (Dist. Palghar)

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ABSTRACT

The present investigation aims to characterize the bioactive constituents of *Ulva lactuca* L. using gas chromatography mass spectrometry (GC-MS) analysis. 10 gm sample of seaweed was successfully extracted with chloroform by continuous shaking in dark room for 36 hrs. The concentrated extracts were subjected to GC-MS analysis. The GC-MS analysis of chloroform extracts of *U. lactuca* show various types of phytochemicals screened under different R.T. These bioactive compounds are considered as biologically and pharmacologically important. The chloroform extracts of *U. lactuca* contains diverse bioactive compounds that were identified and characterized spectroscopically. Hence, identification of different biologically active compounds in the extracts of seaweeds justifies further biological and pharmacological studies.

Keywords: *U. lactuca*, GC-MS analysis, Seaweed, Phytochemicals.

INTRODUCTION

Near about 75% of the earth's surface is covered by oceans, which has a wide variety of marine organisms. These marine organisms provide a rich source of natural products. Marine environment is an excellent resource of bioactive metabolites, which exhibits structural features that have not been found in terrestrial natural products. Since ancient times, macroscopic marine algae has been

closely associated with human life and has been exhaustively used in numerous ways as a source of food, feed, fertilizer and medicine, and chiefly used for economically important phycocolloids (Chapman & Chapman, 1980). Algal-derived food products possess nutritional benefits and have been considered as a helpful approach for the management and treatment of hyperlipidemia, diabetes, and cardiovascular diseases (Murray et al., 2017).

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This is due to the occurrence of biologically active metabolites in algae which include polyunsaturated fatty acids, flavonoids, terpenoids, alkaloids, quinones, sterols, polyketides, phlorotannins, polysaccharide, glycerols, peptides and lipids (Al-Saif et al., 2014) that have antimicrobial (Zbakh et al., 2012), anti-inflammatory (Jaswir, (2011), antiviral (Bouhlal et al., 2011), antioxidant (Devi et al., 2011), anticancer (Kim et al., 2011) activities. Seaweeds or marine macro algae are renewable living resources that are also used as food, feed and fertilizer in many parts of the world. In recent years, a significant number of reviews reported numerous investigations that have been carried on crude and purified compounds obtained from marine algae to evaluate their bioactive potentials (Barbosa et al., 2014; Blunt et al., 2016).

GC-MS profiling is a simple, rapid and accurate method for analyzing plant material. GC-MS analysis has better resolution and estimation of bioactive metabolites is done with sensible accuracy in a shorter time. This method can be used for phytochemical profiling of plants and quantification of compounds present in plants, with increasing demand for herbal products as medicines and cosmetics there is an urgent need for standardization of plant products (Pawar et al., 2010). GC-MS finger print analysis has become the most effective tool for quality control of herbal medicines because of its simplicity and reliability. It can serve as a tool for identification, authentication and quality control of herbal drug (Ram et al., 2011).

Ulva lactuca L. is known as sea lettuce grows abundantly along coastal region of the Mahim beach dist Palghar, Maharashtra (Order: Ulvales, Family: Ulvaceae). It is mainly used for food, animal feed, and agriculture. The majority of seaweeds from the Mahim beach have not been examined for their bioactive metabolites. The present investigation was aimed to study the biochemical constituents present in the *U. lactuca* L using GC-MS analysis.

MATERIALS AND METHODS

Collection of seaweeds

Fresh seaweed *U. lactuca* were collected from intertidal regions of Mahim beach, dist Palghar during the month of December 2017. The collected seaweed sample was cleaned with the seawater until unwanted impurities and adhering sand particles were removed. Seaweed sample was shade dried for 7-8 days. The dried seaweed samples were powdered using mixer and it was then stored in refrigerator for further study.

Seaweed extraction

The *U. lactuca* powdered sample (10 gm) was successively extracted with HPLC grade chloroform using cold extraction method. The sample was kept in dark room for 36 hrs with continuous shaking. The extract was collected and filtered using whattman No.1. It was evaporated to dryness by a rotavap. The final residue obtained was stored at 4 °C until further use. The volatile bioactive compounds present in chloroform extracts of the seaweeds were identified by GC-MS characterization.

GC-MS analysis

GC MS analysis of chloroform extract of *U. lactuca* was carried out with Agilent 7890 system and gas chromatography interfaced to mass spectrometer (GC-MS) employing the following conditions: HP 5 column [(5%-Phenyl)-methylpolysiloxane] (30mm x0.25mmx0.25µm] thickness, Helium gas (99.999%) was used as a carrier gas at a constant flow of 1ml/min and injection volume of 1µl was employed (split ratio of 10:1) operating in electron impact mode at 70eV; injector temperature 250°C; Ion –source temperature 280°C. The oven temperature was programmed from 80°C (isothermal for 1 min), with an increase of 10°C/min, to 200°C then 5°C /min to 280°C ending with 9 min, isothermal at 280°C. Mass spectra were taken at 70eV; a scan interval of 0.5 seconds and fragments vary from 45-550 Da. Total GC running time was 35 minutes.

Identification of chemical constituents

The resulting peaks were analyzed with the database of National Institute Standard and technology (NIST) a library, which has more

than 62,000 patterns. The spectrum of the unknown component was compared with the spectrum of the known components stored in it. The Name, Molecular weight and structure of the components of the *U. lactuca* sample was determined (NIH).

RESULTS AND DISCUSSION

The volatile bioactive phytoconstituents present in chloroform extract of *U. lactuca* were identified by GC-MS analysis. The Chloroform extracts of *U. lactuca* indicated the presence of different types of phytochemicals (Table:1) screened under different retention time (R.T). The total number of the main peaks observed for *U. lactuca* collected from mahim beach dist palghar were 11 as shown in Fig. 1. Chemical constituents were identified using spectral database NIST 11 software installed in the GC-MS. The compounds prediction is based on Pub Chem (NIH). The compound name with RT, Molecular formula, Molecular weight and concentration % in the Chloroform extract of

seaweed *U. lactuca* are presented in Table. 1. The GC-MS analysis of crude extracts of *U. lactuca* revealed many components, with the main chemical constituents observed in high percentages being Pentanoic acid, 5-hydroxy-, 2,4-di-t-butylphenyl esters, Undecane, 3,8-dimethyl-, L-Norvaline, N-(2-methoxyethoxycarbonyl)-, dodecyl ester, 1,2-Benzenedicarboxylic acid, ditridecyl ester, Octadecane, 3-ethyl-5-(2-ethylbutyl)-, Heptacosane and 2-Bromotetradecane in *U. lactuca*. The phytochemicals were analyzed and compared with previously isolated compounds. Most of these compounds have been found to possess various medicinal activities such as antimicrobial, antioxidant, anti-inflammatory, antitumor and anticancer (Devi et al., 2015; Mayer et al., 2001; Usha et al., 2015).

The present study helps to predict the formula and structure of bioactive compounds in *U. lactuca*. Further work related to verifying their efficacy may lead to the improvement of drug formulation.

Table 1: Compounds identified in the Chloroform extract of *Ulva lactuca* by GC MS analysis

Extract	RT (min)	Name of compound	Molecular formula	Molecular weight (g/mol)	Peak %
<i>Ulva</i> Chloroform	9.94	Pentanoic acid, 5-hydroxy-, 2,4-di-t-butylphenyl esters	C ₁₉ H ₃₀ O ₃	306.44	13.27
	12.35	Undecane, 3,8-dimethyl-	C ₁₃ H ₂₈	184.36	8.52
	19.18	Sulfurous acid, 2-propyl tetradecyl ester	C ₁₇ H ₃₆ O ₃ S	320.53	2.17
	19.41	L-Norvaline, N-(2-methoxyethoxycarbonyl)-, dodecyl ester	C ₂₁ H ₄₁ NO ₅	387	26.39
	19.76	Dodecane, 2-methyl-	C ₁₃ H ₂₈	184.36	2.55
	19.85	Dodecane, 1-fluoro-	C ₁₂ H ₂₅ F	188.32	2.06
	19.97	1-Iodo-2-methylundecane	C ₁₂ H ₂₅ I	296.23	3.10
	24.74	1,2-Benzenedicarboxylic acid, ditridecyl ester	C ₃₄ H ₅₈ O ₄	530.82	9.53
	26.13	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	C ₂₆ H ₅₄	366.70	9.25
	28.51	Heptacosane	C ₂₇ H ₅₆	380.73	5.10
	31.85	2-Bromotetradecane	C ₁₄ H ₂₉ Br	277.29	18.01

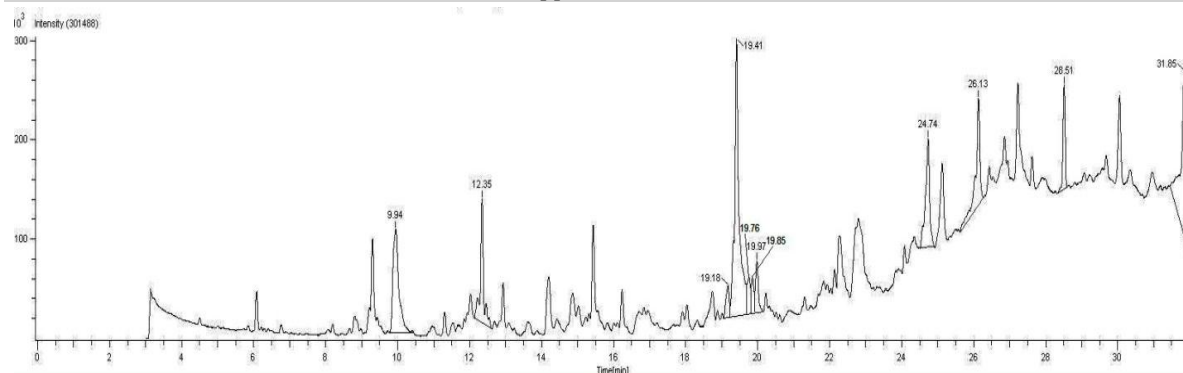


Fig. 1: GC-MS chromatogram of the crude Chloroform extract of *Ulva lactuca*.

CONCLUSION

The present research work related to GC-MS analysis of *U. lactuca* concludes that it contains various bioactive phytochemicals. The presence of various bioactive compounds identified through this study, rationalize the use of seaweeds for various ailments. However, isolation of the individual components and investigation of their pharmacological activity and industrial application are still under exploration.

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