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Investigation of Phytocomponents and Gc-Ms Analysis of Ethanolic Extract of Sargassum Polycystum C.Agradh

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Abstract: ***Aim: To qualitatively analyse the chemical composition in ethanolic extract from the whole part of Sargassum polycystum C.Agradh. by gas chromatography – mass spectroscopy (GC-MS). Methods: The dried entire part of Sargassum polycystum C. agardh was filtered after completion of cold maceration using a muslin cloth and Whatman filter paper, and an ethanolic extract was obtained using a cold maceration extractor. Results: The solubility level of different solvents in ethanol, chloroform, and methanol was higher in Sargassum polycystum. Then hexane, ethyl acetate, benzene and acetone were sparingly soluble in Sargassum polycystum. The physicochemical parameters of Sargassum polycystum dried were found to be total ash (6.74% w/w), water-soluble ash (1.23% w/w), acid-soluble ash (2.24% w/w), and loss on drying (5.99% w/w), which were also determined. The phytochemical screening of Sargassum polycystum C. Agardh reveals the presence of various phytochemical compounds, including alkaloids, terpenoids, flavonoids, cardiac glycosides, lipids, carbohydrates, and steroids—the absence of phytochemical compounds such as proteins, saponins, tannins, volatile oil and phenols. GC-MS analysis detected three active components in the ethanolic extract [1]. The identification of phytochemical compounds is based on retention time, molecular formula, peak area, and molecular weight, as presented.***

Keywords: Ethanolic extract, GC-MS analysis, Physicochemical Components, and Sargassum Polycystum C. Agardh.

I. INTRODUCTION

A. Marine

Over the last fifteen years, marine science has undergone a historical shift. Global initiatives, such as the History of Marine Animal Populations (HMAP), have investigated socio-ecological systems. Ecological classifications provide fundamental tools for ecosystem-based environmental and conservation management by characterising and mapping ecological heterogeneity.

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B. Marine Plants

Marine plants have been extensively studied in marine biology & it has been treated traditionally. Marine algae are among the most extensively studied organisms in the marine environment. Over 90% of marine plant species are algae. Marine plants have great potential for the discovery of new entities that can aid in the prevention and treatment of cancer.

Given the great potential of marine natural products, this research continues to attract increasing interest in rational drug discovery. Bioactive marine natural Products in computer-assisted drug design and gene therapy still face a pressing need for new drugs to counteract drug-resistant pathogens.

Marine algae are already used in a wide range of foods, supplements, pharmaceuticals, and cosmetics and are often claimed to have beneficial effects on human health.

Sargassum polycystum belongs to the genus Sargassum, as described by C. Agardh, and the family *Sargassaceae*. *Sargassum* is a type of seaweed that is widely and excessively distributed in tropical and subtropical regions, generally growing on rocky reefs. It has been reported to contain 537 species, with 358 of them accepted taxonomically. Sargassum species are utilised in various folk applications in human nutrition and are recognised as a rich source of vitamins, carotenoids, proteins, and minerals.

A variety of constituents are isolated from *Sargassum polycystum, belonging to different classes, such as glycosides, terpenoids, fucoidan, minerals, fatty acids, and amino acids*.

II. MATERIALS AND METHODS

A. Collection and Identification of Plant Materials

The seaweed of *Sargassum polycystum C.Agardh* was collected from Mandapam Camp, Ramanathapuram, Tamil Nadu, India. The seaweed specimen was identified and authenticated taxonomically by sample3: *Sargassum polycystum*. The seaweed specimen [AKCP/SCL/02/2021] (taxonomic authentication certificate has been attached) was kept as a herbarium in the research laboratory at AKCP, Krishnankoil.

The seaweed of Sargassum polycystum C. Agardh was collected in samples, which were cleaned thoroughly with seawater to remove all extraneous matter, such as epiphytes, sand particles, pebbles, and shells. The samples were then brought to the laboratory in plastic bags. The samples were then thoroughly washed with tap water followed by distilled water. For drying, washed seaweeds were blotted on blotting paper and spread

out in a room at room temperature in the shade. Shade-dried samples were ground into a fine powder using a tissue blender. The powdered samples were then stored in a refrigerator for further use.

Table-I: Seaweed Material

S. No	Seaweed Name	Part	Family	Collection Period	Place of Collection
1.	*Sargassumpolycystum C.Agardh*	Whole part	*Sargassaceae*	February-2020	Mandapam, Ramanathapuram

B. Solvent extraction of Sargassum polycystum

Solvent extraction of the dried sample, after completion of cold maceration, involves filtering the product through muslin cloth and Whatman filter paper. The solubility level of different solvents in ethanol, hexane, ethyl acetate, chloroform, benzene, acetone, and water.

C. Physicochemical Investigation of Sargassum polycystum

Physicochemical screening of *Sargassum polycystum C. Agardh revealed that it possesses good physicochemical parameters, such as total ash, water-soluble ash, acid-soluble ash,* and loss on drying.

D. Gas-Chromatography-Mass Spectrometry Analysis

GC-MS analysis of ethanolic extract of *Sargassum polycystum C.Agardh*was performed using a Perkin-Elmer GC clauses 500 system and Gas Chromatograph interfaced to a mass spectrometer (GC-MS) employed a fused silica capillary column packed with Elite-1 (100% dimethyl poly siloxane, 30 nm × 0.25 nm ID × 1µm df) For GC/MS detection, an electron ionization system with ionizing energy of 70 eV was used. Helium gas (99.999%) was used as the carrier gas at a constant flow rate of 1 ml/min, and an injection volume of 2 µl was employed (Split ratio of 10:1). The injector temperature was set at 250°C, and the ion-source temperature was set at 280°C. The oven temperature was programmed to increase from 110°C (isothermal for 2 min) at a rate of 10°C/min to 200°C, then at a rate of 5°C/min to 280°C, and finally to maintain a temperature of 280 °C for 9 min. Mass spectra were taken at 70 eV; a scan interval of 0.5 seconds and fragments from 45 to 450 Da. Total GC detection time was completed in 36 minutes. The relative percentage amount of each component was calculated by comparing its average peak area to the total area of all components. The software adopted to handle mass spectra and chromatograms was TurboMass.

III. RESULTS AND DISCUSSION

A. Different Solvent Extraction of *Sargassum Polycystum*

The dried samples (*Sargassum polycystum C. Agardh) were taken in 250g for cold maceration with ethanol (95.6%) for 28 hours. After completion of cold maceration, the product was filtered using a muslin cloth and Whatman* filter paper. The solubility level of different solvents in ethanol, chloroform, and methanol was more pronounced in Sargassum polycystum C. Agardh. Then, hexane, ethyl acetate, and acetonitrile were sparingly soluble in Sargassum polycystum C. Agardh. Water is not soluble in Sargassum polycystum C. Agardh.

Table-II: Solubility Level in Sargassum Polycystum

S.No	Different Solvent	Solubility Level
1.	Ethanol extract	More soluble
2.	Hexane extract	Sparingly soluble
3.	Ethyl acetate	Sparingly soluble
4.	Chloroform	More soluble
5.	Methanol	More soluble
6.	Benzene	Sparingly soluble
7.	Acetone	Sparingly soluble
8.	Water	Not soluble

B. Phytochemical Screening of Sargassum Polycystum

The phytochemical screening of *Sargassum polycystum C. Agardh* reveals the presence of various phytochemical compounds, including alkaloids, terpenoids, flavonoids, cardiac glycosides, lipids, carbohydrates, and steroids—the absence of phytochemical compounds such as proteins, saponins, tannins, volatile oil and phenols.

Table-III: Phytochemical Screening of Sargassum Polycystum

S. No	Phytochemical Test	Ethanolic extract
1.	Alkaloids	+
2.	Terpenoids	+
3.	Flavonoids	+
4.	Cardiac glycosides	+
5.	Lipids	+
6.	Carbohydrate	+
7.	Steroids	+
8.	Proteins	-
9.	Saponnins	-
10.	Tannins	-
11.	Volatile oil	-
12.	Phenols	-

C. Physicochemical Parameter of Sargassum Polycystum

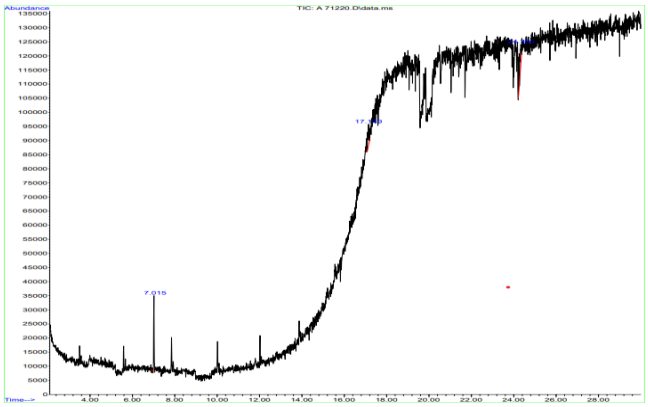
The physicochemical parameters of Sargassum polycystum C. Agardh dried were found to be total ash (6.74% w/w), water-soluble ash (1.23% w/w), acid-soluble ash (2.24% w/w), and loss on drying (5.99% w/w).

Table-IV: Physicochemical Parameter of Sargassum Polycystum

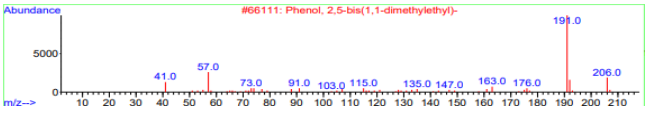
S. No	Physical constant	% (± SEM)			Average yield (%) W/W
		1(%) W/W	2(%) W/W	3(%) W/W	
1.	Total ash	6.55	6.80	6.94	6.74
2.	Water soluble ash	1,15	1.53	1.02	1.23
3.	Acid soluble ash	2.47	2.31	2.50	2.42
4.	Loss on drying	5.97	5.81	6.20	5.99

IV. GC-MS ANALYSIS

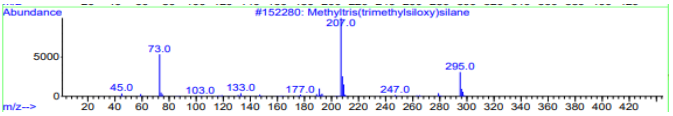
According to GC-MS analysis, three active components were identified in the ethanolic extract. The identification of phytochemical compounds was based on retention time, molecular formula, peak area, and molecular weight, as presented in Table 4.



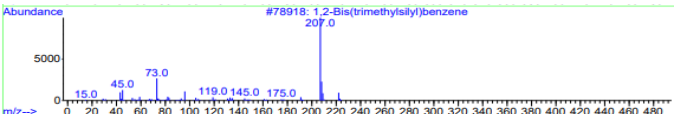
[Fig.1: GC-MS Chromatogram of Ethanolic Extract of Sargassum Polycystum]



[Fig.2: Phenol 2,5-bis (1,1-Dimethylethyl)-]

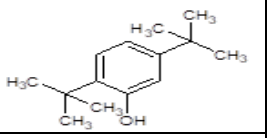
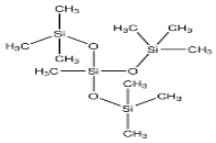
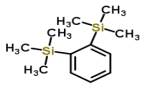


[Fig.3: Methyltris (Trimethylsiloxy) Silane]



[Fig.4: 1,2-bis (Trimethylsilyl) Benzene]

Table-V: Chemical Composition of Ethanolic Extract of Sargassum Polycystum

S. No	Retention Time (Mins)	Peak Area (%)	Name of the Compound	Molecular Formula	Molecular Weight	Chemical Structure
1.	7.013	36.46	Phenol 2,5-bis(1,1-dimethylethyl)-.	$C_{14}H_{22}O$	206.32	
2.	17.149	23.40	Methyltris (trimethylsiloxy) silane.	$C_{10}H_{30}OSi_4$	310.68	
3.	24.364	43.13	1,2-bis(trimethylsilyl) benzene.	$C_{12}H_{22}Si_2$	222.47	

Among the identified compounds, 1,2-bis(trimethylsilyl)benzene was found to be the primary compound that attained the most prominent peak (43.13%) with a retention time of 24.364 minutes. Another primary compound, Phenol 2,5-bis(1,1-dimethylethyl)- having peak area of (36.46%) with retention time (7.013) minutes.

V. CONCLUSIONS

The studies performed on these constituents are medicinally important, and many have reported biological activities. Thus, GC-MS analysis revealed the presence of various types of constituents in the ethanolic extract of Sargassum polycystum C. Agardh.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

- **Conflicts of Interest/ Competing Interests:** Based on my understanding, this article has no conflicts of interest.
- **Funding Support:** This article has not been funded by any organizations or agencies. This independence ensures that the research is conducted with objectivity and without any external influence.
- **Ethical Approval and Consent to Participate:** The content of this article does not necessitate ethical approval or consent to participate with supporting documentation.
- **Data Access Statement and Material Availability:** The adequate resources of this article are publicly accessible.
- **Author's Contributions:** The authorship of this article is contributed equally to all participating individuals.

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