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Research Article

Bioactive potential analysis of brown seaweed *Sargassum wightii* using UV-VIS and FT-IR

R. Rajeswari*¹ and Dr. K. Jeyaprakash²¹ Associate Professor, Department of Biotechnology, P.S.R. Engineering College, Sivakasi, Sevalpatti, Tamil Nadu- 626140² PG & Research Department of Biochemistry, Rajah Serfoji Government College (Autonomous), Thanjavur, Tamil Nadu-613005

ABSTRACT

The current study was investigated to explore the biogenic molecules of *Sargassum wightii* collected from the south east of Tamil Nadu, India. The biogenic molecules extracted from *Sargassum wightii* by using methanol as a solvent and the analysis was carried out by using UV-Visible spectroscopy and FT-IR. The UV-Visible spectrum of the methanolic extract of *Sargassum wightii* exposed the existence of the biogenic molecules separated from 200 - 1100 nm among the absorption. The incidence of peaks from 234-676 nm discovered the presence of flavonoids and its derivatives. The unprocessed methanolic extract of *Sargassum wightii* was travelled in to FT-IR and it indicated the being of phenols and flavonoids their functional groups such as alcohol, alkane, carboxylic acids, esters, ethers, alkynes and aromatics. From the results, the future aim of this study is necessary to develop the target site to treat dreadful diseases.

Keywords: *Sargassum wightii*, FT-IR, UV-Visible Spectroscopy, Phytochemical analysis.

Article Info: Received 23 Nov 2018; Review Completed 02 Jan 2019; Accepted 04 Jan 2019; Available online 15 Jan 2019



Cite this article as:

Rajeswari R, Jeyaprakash K, Bioactive potential analysis of brown seaweed *Sargassum wightii* using UV-VIS and FT-IR, Journal of Drug Delivery and Therapeutics. 2019; 9(1):150-153 DOI: <http://dx.doi.org/10.22270/jddt.v9i1.2199>

*Address for Correspondence:

R. Rajeswari, Associate Professor, Department of Biotechnology, P.S.R. Engineering College, Sivakasi, Sevalpatti, Tamil Nadu- 626140

INTRODUCTION

Seaweeds or macroalgae fit in to the lower plants that they do not possess roots, stems and leaves, as a substitute they are collected of a thallus. Gas-filled structures to supply buoyancy in many numbers of species. Seaweeds belongs to three groups namely the red (rhodophyceae), green (Chlorophyceae) and brown (Phaeophyceae) algae ¹. Macroalgae are nutritionally expensive as green or dried vegetables, or as components in an extensive range food. In 2014, the total worldwide seaweed manufacture was more than 15 million metric tons ² of which nearly 15%-20% 100 000 metric tons is contributed by Indian ocean ³. The nautical world provides a tremendously wealthy resource for significant compounds of structurally new and biologically energetic metabolites. It also represents enormous challenges that require inputs from a diversity of technical areas to fetch the aquatic chemical diversity up to its healing potential. Seaweeds are well-thought-out to exist a wealthy resource of antioxidants ⁴. Recently the latent antioxidant compounds were recognized as some pigments (fucoxanthin, astaxanthin, carotenoid) and polyphenols (phenolic acid, flavonoids, tannins). These composites are extensively dispersed in plants and seaweeds and are identified to reveal elevated antioxidant behavior.

Seaweeds are prominent to enclose not merely labile antioxidants (ascorbate, glutathione) when fresh ⁵, but in addition, more stable compounds such as carotenoids ⁶. Seaweeds are quite uncomplicated green plants with monocellular propagative structures; they array from single cell organisms to non-vascular filamentous or thyloid plants ⁷. Seaweeds offer for an tremendous information source of bioactive compounds such as carotenoids, dietary fibre, protein, essential fatty acids, vitamins and minerals ⁸⁻¹¹. Japanese are the major users of seaweed with an approximate of 1.6 kg (dry weight) per year per capita in the Asian countries ¹². Phytochemicals are biogenic substances of obtained from plant origin. They are called as secondary metabolites, since the plants that manufacture themselves might have tiny need for the resistance mechanism ¹³. Chemically and taxonomically, the secondary metabolites are various compounds with ambiguous function. They are extensively employed in the human therapy, veterinary, agriculture, technical research and innumerable other areas ¹⁴. Adequate familiarity of the element constituents of plants is advantageous because such knowledge will be value in favor of production of complex chemical substances ¹⁵. Recent search for the photochemical that might be an advantage to the pharmaceutical along with medicinal industry ¹⁶. At present globally, there is an amplified interest

in plant drugs, and this is because of numerous reasons particularly, artificial medicine can be inefficient, offensive or faulty use of these medicines results in harmful side effects, whereas drugs obtained from natural plant origin are non-narcotic, having refusal or less side effects and are cost effective^{17,18}. Hence the proposed work was intended to consider the molecular composition and absorption of the unknown compounds in *Sargassum wightii* by using UV-Visible and FT-IR analysis.

METHODS

Sample collection

The plant samples of *S. wightii* were gathered by hand plucking from sea zone of Mandapam, Tamilnadu, India. The gathered samples were wiped well by means of seawater to eliminate every one of the inessential matter such as epiphytes, sand particles, pebbles and shells and transported to the laboratory in airtight bags. The samples were then systematically washed thoroughly with running tap water followed by deionized water. For drying, cleaned seaweeds were blotted on the blotting paper and spread out in shade at room temperature. In the dehydrated samples were crushed in to tiny powder using tissue blender. The pulverized samples were subsequently deposited in refrigerator for future use.

Preparation of Extracts

25 gm of the *Sargassum wightii* powder was poured into 250 ml Erlenmeyer flask. The conical flask comprising 100 ml of methanol as a solvent and the extract. The contents were shake well for 48 hrs by free hand. After 2 days, the crude extract was filtered by means of Whatmann filter paper No.1 and poured into china dish. The supernatant was entirely removed by keeping the china dish over a boiling water bath at 45 °C. The obtained extracts were kept at 4 °C in air tight container until further use.

UV - Visible Spectral analysis

The crude extract of methanol of *Sargassum wightii* comprising the bioactive compound was investigated spectroscopically for further validation. To detect the UV - Vis range of the purified sample of *S. wightii*, the extracts were scanned in the wavelength ranging from 200 - 1100 nm by using Shimadzu Spectrophotometer and distinctive peaks were recorded¹⁹.

FT-IR Analysis

Spectra were obtained through the provision of an OMNI-sampler attenuated total reflectance (ATR) accessory on a FT-IR spectrophotometer (Perkin Elmer Spectrophotometer system, USA) followed by earlier methods with little modification. A tiny amount of liquid of *Sargassum wightii* was correspondingly positioned directly on sample container of the infrared spectrometer by constant pressure applied and data of infrared absorbance, gathered over the wave number ranged from 4000 cm⁻¹ to 400 cm⁻¹ and computerized for evaluates by using the 21 CFR part 11 software. The reference spectra were attained from the cleaned blank crystal prior to the performance of each sample replicate. The peak values of FT-IR were documented. Each and every analysis was repeated twice and confirmed the spectrum.

RESULT AND DISCUSSION

UV - Visible Spectral analysis

UV - Visible Spectral analysis UV-VIS spectrum profile of methanolic extract of *Sargassum wightii* was selected from 200 - 1100 nm due to the sharpness of the peaks. The profile showed the compounds separated at the nm of 242,356, 607 and 664. These absorption spectra are distinctive for flavonoids and its derivatives. The flavonoids spectral bands characteristically comprise of two absorption spectra maximum in the ranges 230-290 nm and 300-360 nm. (Fig.1 & Table.1). The exact position and virtual intensities of these maxima give enormous valuable information on the nature of the flavonoids²⁰. Then peak occurrence of at 234-676 nm exposes the presence of phenolic and alkaloids compounds in the *Sargassum wightii*. On comparison of the spectra of seeds and flowers, shows that the extract has some similar alkaloid, flavonoids and glycoside compounds reported^{21,22}.

Table 1: UV-Visible Spectrum of methanolic extract of *Sargassum wightii*

Peak No.	Wavelength (nm)	Optical density (O.D)
1.	242.8	4.0
2.	356.7	2.4
3.	607.5	0.23
4.	664.5	0.37

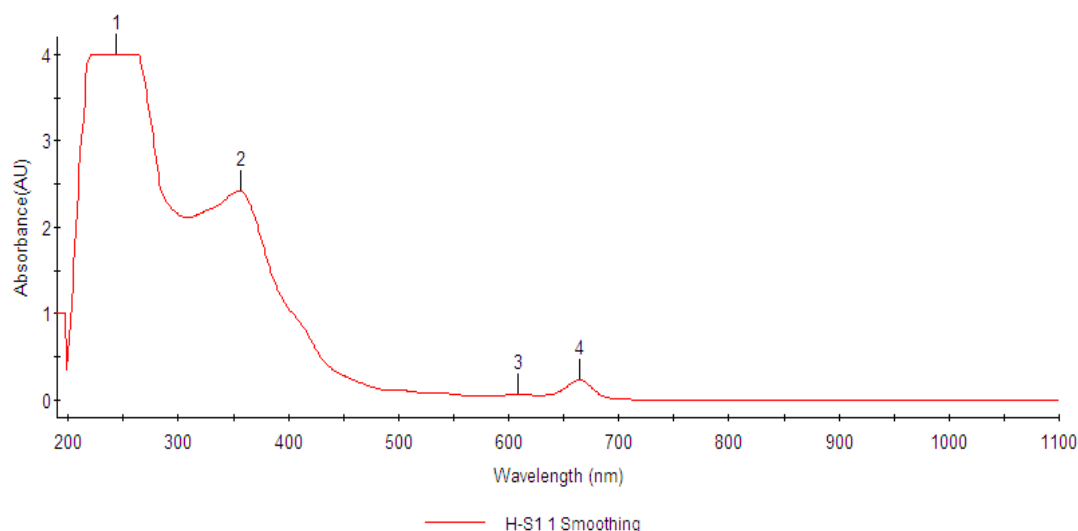


Figure 1: UV-Visible spectrum of methanolic extract of *Sargassum wightii*

FT-IR Analysis

The Fourier Transmission Infrared Spectroscopy is employed to detect the functional group of the bioactive components based on peak value in the area of infrared radiation. The crude powder of the *Sargassum wightii* was transferred into the FT-IR and the main functional group of the components was detached based on the peak ratio. The outcomes of FTIR spectrum and its peak values with functional groups of the bioactive components were denoted in (Fig.2 and Table.2). FT-IR spectrum of *Sargassum wightii* showed a peak at 3405.13, 2977.54, 2541.21, 2133.94, 1649.13, 1450.46, 1412.60, 1335.22, 1274.18, 1085.32 and 650.48 cm⁻¹ respectively. The characteristic peak at 3405.13 cm⁻¹ equivalent to hydroxyl (OH) groups are 1085.32 – 3405.13 were produced by the extending vibration of OH of strong stretch in axial position, the stretching vibration of C-H, C-C, C-O of strong band and C-O stretch mode respectively in signals at 3405.13 – 650.48 resembled to stretching vibration of OH.

FTIR is an important instrument for measuring the chemical ingredients in plants and seaweeds exhibit the organic compounds. Some indicator bands that are related to functional groups depict chemical components or metabolic products²³. In studies reported that the absorption bands at 1100 – 1000 cm⁻¹ in the area point out numerous modes such as C-H deformation or C-O or C-C stretching, concern to carbohydrates and polysaccharides^{24,25}. The FT-IR spectra of seaweed extracts explore the surfaces of algae had the toxic interaction sites of carboxyl, amino acid and hydroxyl groups of algae^{26,27}. Recent report, the bands were reported in diverse materials at to some extent different frequencies at peaks 1147, 1086 and 1025 cm⁻¹. In that studies observed that the strongest absorbers between 1200 and 1000 cm⁻¹ were carbohydrates²⁸. Nucleic acids like a number of classes of other compounds, also showed similar absorption bands with similar functional groups in the similar spectral region²⁹.

Table 2: FTIR peak value of methanolic extract of *Sargassum wightii*

S.No.	Peak Value	Spectroscopic Assignments	Functional Groups
1.	3405.13	O-H stretch, H-bonded	Alcohols, Phenols
2.	2977.54	C-H stretch	Alkanes
3.	2541.21	O-H stretch	Carboxylic acids
4.	2133.94	-C≡C- stretch	Alkynes
5.	1649.13	C-C stretch (in-ring)	Aromatics
6.	1450.46,	C-H bend	Alkanes
7.	1412.60	C-C stretch (in-ring)	Aromatics
8.	1335.22	C-N stretch	Aromatic amines
9.	1274.18, 1085.32	C-O stretch	Alcohols, Carboxylic acids, Esters, Ethers
10.	650.48	-C≡C-H: C-H bend	Alkynes

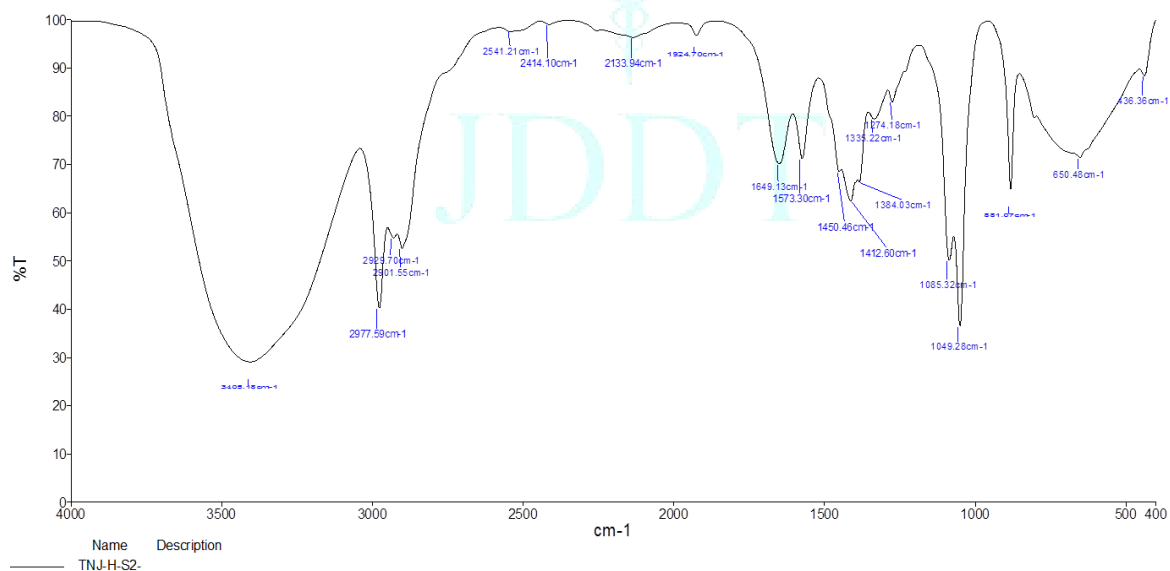


Figure 2: FTIR spectrum of methanolic extract of *Sargassum wightii*

CONCLUSION

The present-day study revealed that the brown seaweed *Sargassum wightii* crude extract containing many bioactive molecules. These bioactive molecules are characterized by UV – Visible spectrum and FT-IR studies and exhibit the

numerous chemical constituents. The UV –Visible spectrum of seaweed confirmed that the absorption bands for flavonoids and its derivatives. FT-IR spectra showed that many functional groups were in the crude extract. The Further study necessary to exploit the target site for novel drugs.

REFERENCES

1. Manilal A, et al, Antimicrobial potential and seasonality of red algae collected from the southwest coast of India tested against shrimp, human and phytopathogens. *Ann. Microbiol.* 1998; 2:207-219.
2. Food and Agricultural Organization of the United Nations. Year book of fishery statistics, vol. 98/1 & 2. Rome: FAO; 2006, p. 134.
3. Dhargalkar VK and Pereira N. Seaweed: promising plant of the millennium. *Sci Cult* 2005; 71:60-66.
4. Cahyana AH, et al, Pyropheophytin as an antioxidative substance from the marine algae, Arame (*Eicenia bicyclis*), *Biosci Biotechnol Agrochem*, 1992. 56:1533-1535
5. Kakinuma M, et al, Distribution of free L-Cystenine and glutathione in seaweeds, *Fish Sci.*, 2001, 67:194-196
6. Yan XJ, et al, Fucoxanthin as the major source of antioxidant in *Hijikia Fusiformis*, A common edible seaweed, *Biosci Biotechnol Biochem.* 1999. 63:605-607
7. Druehl L.D, Pacific Seaweeds, A Guide to Common Seaweeds of the West Coast, Harbour Publishing, BC Canada, 2000, 190
8. Bhaskar N and Miyashita K. Lipid composition of Padina tetratomica (Dictyotales, Phaeophyta), brown seaweed of the west coast of India. *Ind J of Fish*, 2005; 52:263-268.
9. Fleurence J. Seaweed proteins: Biochemical, nutritional aspects and potential uses. *Trends in Food Sci & Technology*, 1999; 10:25-28.
10. Mabeau S and Fleurence J. Seaweed in food products: Biochemical and nutritional aspects. *Trends in Food Sci and Technology*, 1993; 4:103-107.
11. Nisizawa K and DJ Mchaugh (eds.) Production and utilization of products from commercial seaweeds. Rome: FAO; 1988, p. 147.
12. Fujiwara-Arasaki T, et al, The protein value in human nutrition of edible marine algae in Japan. *Hydrobiology*, 1984. 116:513-516.
13. Tiwari P, et al, Phytochemical screening and extraction: a review. *Internationale Pharmaceutica Scientia.* 2011. 1:106.
14. Vasu, K, et al, Biomolecular and phytochemical analyses of three aquatic angiosperms. *Afr. J. Microbiol. Res.* 2009. 3(8):418-421.
15. Mojab F, et al, Phytochemicals screening of some species of Iranian plants. *Iran. J. Pharm. Res.* 2003. 3:77-82.
16. Das K, et al, Techniques for evaluation of medicinal plant products as antimicrobial agent: Current methods and future trends. *Journal of Medicinal Plants Research.* 2010. 4:104-111.
17. Nagashayan N, et al, Association of L-Dopa with recovery following ayurveda medication in Parkinson's disease. *Journal of Neurological Science.* 2000. 176:124-127.
18. Srikanth K, et al, Pharmacognostic and phytochemical investigations in Strychnous potatorum Linn. F. *Journal of Pharmacognosy and Phytochemistry.* 2013; 246-51.
19. John Peter Paul J and Shri Devi SDK. Phytochemical Screening of Padina Tetrastromatica Hauck, *American Journal of Pharm Tech Research.* 2013. 3(5):214-222.
20. Neha Sahu and Jyoti Saxena. Phytochemical Analysis of *Bougainvillea Glabra Choisy* by FTIR and UV-VIS Spectroscopic Analysis. *Int. J. Pharm. Sci. Rev. Res.*, 2013; 21(1):196-198.
21. Jasper C, et al, The antimicrobial activity of perfume oils. *J Am Pharm Asso* 1958. 47, p. 471-476.
22. Sofowora A. Medicinal Plants and Traditional Medicine in Africa. John Wiley and son Ltd 1993, 150-153.
23. Kristin Lammer et al, FT-IR study of the changes in carbohydrate chemistry of three New Jersey pine barrens leaf litters during simulated control burning. *Soil Biology & Biochemistry*, 2009. 41:340-347.
24. Li YM, et al, Identification of American ginseng from different regions using FT-IR and two-dimensional correlation IR spectroscopy. *Vibrational spectroscopy.* 2004. 36:227-232.
25. Nakamoto, K, 1986. Infrared and Raman Spectra of inorganic and coordination compounds, John Wiley and Sons: New York.
26. Mishra A and Jha B. Isolation and characterization of extracellular polymeric substances from micro-algae *Dunaliella salina* under salt stress. *Bioresource Technology*, 2009; 100:113.
27. Marimuthu J, et al, Phytochemical characterization of brown seaweed *Sargassum wightii*. *Asia Pacific J of Trop disease*, 2012. p. 109-113.
28. Diem M, et al, Infrared spectroscopy of human cells and tissue. VIII. Strategies for analysis of infrared tissue mapping data and applications to liver tissue. *Biopolymers*, 2000. 57(5):282-290.
29. Nithyadevi R and Sivakumar. Phytochemical Screening and GC-MS, FT-IR Analysis of Methanolic Extract Leaves of *Solanum torvum* Sw. *J International Journal of research studies in Biosciences*, 2015. 3(9):61-66

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