IJBPAS, December, Special Issue, 2021, 10(12): 446-453
ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)
'A Bridge Between Laboratory and Reader'

www.ijbpas.com

PHYTOCHEMICAL INVESTIGATION OF BROWN ALGAE *DICTYOTA DICHOTOMA* COLLECTED FROM RAMANATHAPURAM DISTRICT, TAMILNADU

SALUNKE MOHINI ANANDRAO [1*], WAKURE BALAJI SOPANRAO[2] AND WAKTE PRAVIN SHRIDHAR [1]

1: University Department of Chemical Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad- 431004, Maharashtra, India

2: Vilasrao Deshmukh Foundation, Group of Institutions, VDF School of Pharmacy, Latur-413531, Maharashtra, India

***Corresponding Author: Mohini A. Salunke; E Mail: mohinisalunke82@gmail.com**

Received 9th May 2021; Revised 10th July 2021; Accepted 29th Aug. 2021; Available online 15th Dec. 2021

https://doi.org/10.31032/IJBPAS/2021/10.12.1039

ABSTRACT

Objective: In the present study, the phytochemical investigation of *Dictyota dichotoma* were done to find out the presence of phytochemical constituents.Algae were obtained from Rameshwaram, Ramanathapuram district, Tamilnadu, India, for this study.

Methods: A standard approach is used to conduct a preliminary phytochemical investigation of *Dictyota dichotoma*. Spectroscopic UV-Visible and Fourier transform infrared (FTIR) analysis were used to demonstrate the presence of functional group in the ethanolic extracts of *Dictyota dichotoma*.

Results: Alkaloids, Glycosides, Terpenoids, Phenol, Tannins, Saponin, Anthocyanin and Flavonoids were revealed in the preliminary phytochemical investigation of *Dictyota dichotoma*. The UV-Visible spectra of *Dictyota dichotoma* revealed the existence of biologically active compounds in the absorbance range of 200 - 800 nm.The presence of functional groups such as Alcohols, Alkanes Aliphatic Compounds, Aldehydes, Ketone, Carboxylic Acids, Alkenes, Aromatics, Alkene Methylene Group, Phenols, Aliphatic Amines and Alkanes was confirmed by FTIR analysis of the ethanolic extract of *Dictyota dichotoma*.

Conclusions: According to the findings of this study *Dictyota dichotoma* could be a source of natural bioactive chemicals, and further isolation could lead to the discovery of a novel biopotential substance with a wide range of biological activities. As a result, the current research could serve as a foundation for the effective biomedical application of the algae *Dictyota dichotoma*.

Keywords: Phytochemical, Brown Algae, *Dictyota Dichotoma*, Ramanathapuram District, Tamilnadu

INTRODUCTION

The marine environment is a great place to find biologically active natural substances that have structural characteristics that aren't seen in terrestrial natural products.Secondary metabolites found in marine species are extremely bioactive and could be useful in the development of new therapeutic agents.Many bioactive compounds have been isolated from various marine plants, animals, and microorganisms in recent years.A total of 2500 novel metabolites have been identified in various marine species.Algae are a type of marine plant that adheres themselves to the seafloor in relatively shallow coastal waters.They lack roots, flowers, seeds, and actual leaves, making them less complex than blooming plants. Within these structural constraints Algae, however, demonstrate a wide range of shapes, sizes, colours, and structural complexity.More than 1,50,000 algae species have been discovered in the world's oceans, but just a few have been recognised and utilised for human purposes **[1]**.

Algae are divided into three groups based on their nutritional and chemical composition: Rhodophyta (red algae), Phaeophyta (brown algae), and Chlorophyta (green algae). They are an important aspect of marine ecosystems. Algae are thought to make up around 90% of marine plant species, and algae are responsible for around 50% of world photosynthesis.In past few decades, algae have been utilised by humans as medicine and food, and their extracts have piqued the pharmaceutical industry's interest as a new source of bioactive chemicals with vast medical potential.Algae are rich in carotenoids, pigments, polyphenols, enzymes, and a variety of functional polysaccharides, as well as vitamins A, B1, B12, C, D, and E **[2]**.

Algae are a rich source of bioactive secondary metabolites with a wide range of biological activity, including antioxidant, anticoagulant, antiviral, antibacterial, antifungal, antimutagenic, and anticancer properties.Algae develop potent secondary metabolites as a defence system when they are exposed to extremely hazardous situations. Algae also contains a wide range of bioactive phytochemicals, including vitamins,

riboflavin, minerals, polyunsaturated fatty acids, sterols, proteins, polysaccharides, tocopherols, and pigments.Previous research has shown that algae contain high amount of natural phytochemicals such as phenolics, tannins, glycosides, flavonoids, and alkaloids, which have been attributed to the treatment of a variety of chronic diseases **[3]**.

*Dictyota dichotoma*is a marine brown alga member of Kingdom: Chromista, Subkingdom: Harosa, Infrakingdom: Heterokonta, Phylum: Ochrophyta, Subphylum: Phaeista, Infraphylum: Limnista, Superclass: Fucistia, Class: Phaeophyceae, Order: Dictyotales, Family: Dictyotaceae. *Dictyotales* (brown algae) species produce a diverse range of bioactive secondary metabolites with extensive anti-herbivore properties in the marine environment. A single genus, Dictyota, is responsible for over a third of the reported brown algal chemistry **[4]**.

The Gulf of Mannar, which runs along India's south-east coast, is rich in algal resources. However, they are mostly used in the manufacturing of agar and algin.In India, they have yet to find a place in people's diets. Algae, on the other hand, are the greatest low-cost supplementary food for individuals due to their high nutritional value and health advantages. As a result of the foregoing facts, the current research intends to investigate *Dictyota dichotoma*.

MATERIALS AND METHODS:

Collection of Algae

Dictyota dichotoma, a brown alga, was collected recently in the Kilakarai region, which is located between 9.23135° N and 78.7844° E in Ramanathapuram District, Tamil Nadu, India. It was quickly rinsed with marine water to remove epiphytes, and the necrotic areas were discarded. The samples were cleaned and rinsed twice with distilled water before being transported to the lab.At room temperature, the samples were shadow dried for two months. The collected materials were crushed to a fine powder after drying and used for further examination **[5]**.

Figure 1: ***Dictyota dichotoma***

Extraction of *Dictyota dichotoma*

Dried and coarsely powdered algal material were macerated with 70% ethanol for 3 weeks at room temperature.The extraction procedure was repeated three times, and the extract was filtered using Whatmann No. 1 filter paper. The filtrate was concentrated to dryness under reduced pressure using a

rotary evaporator, producing a dark greenish-brown crude residue. The ethanolic extracts were kept in an airtight container at 4 °C **[6]**.

Preliminary Phytochemical Investigation

The ethanolic extracts of *Dictyota dichotoma* were investigated for the presence of Alkaloids, Glycosides, Diterpenes, Terpenoids, Phenol, Tannins, Steroids, Saponin, Anthocyanin and Flavonoids. Phytochemical investigation of the ethanolic extract was carried out according to the standard procedure **[7]**.

UV – Visible Spectral analysis

For UV-VIS Spectrophotometric evaluation, the ethanolic extract of *Dictyota dichotoma* was scanned with a (Shimadzu UV1800) UV-Visible double beam Spectrophotometer at wavelengths ranging from 200 to 800 nm, and the distinct peaks and their absorption values were recorded **[8]**.

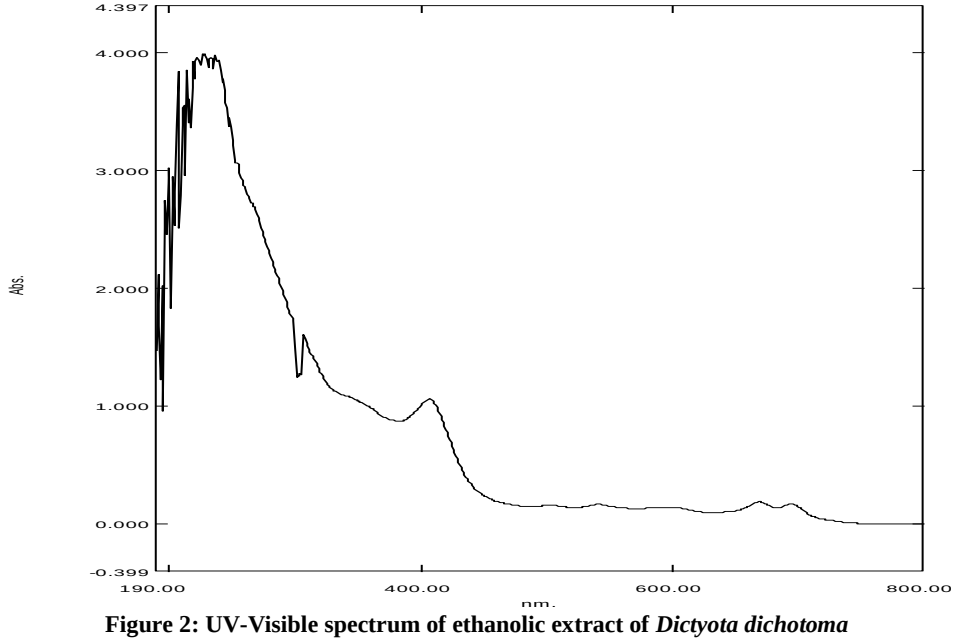

Figure 2: UV-Visible spectrum of ethanolic extract of *Dictyota dichotoma*

FT-IR Analysis

The ethanolic extract of *Dictyota dichotoma* was focused in the transmittance range of 400-4000 cm-1 for FTIR analysis on a Perkin Elmer Spectrophotometer system, and the characteristic peak values and functional groups were identified.

A small amount of *Dictyota dichotoma* extract was placed directly on the sample container of an infrared spectrometer with constant pressure, and data of infrared absorbance ranging from 4000 cm–1 to 400 cm–1 was obtained. The peak values of the FT-IR have been recorded. To ensure that the spectrum was correct, each analysis was double-checked **[9, 10]**.

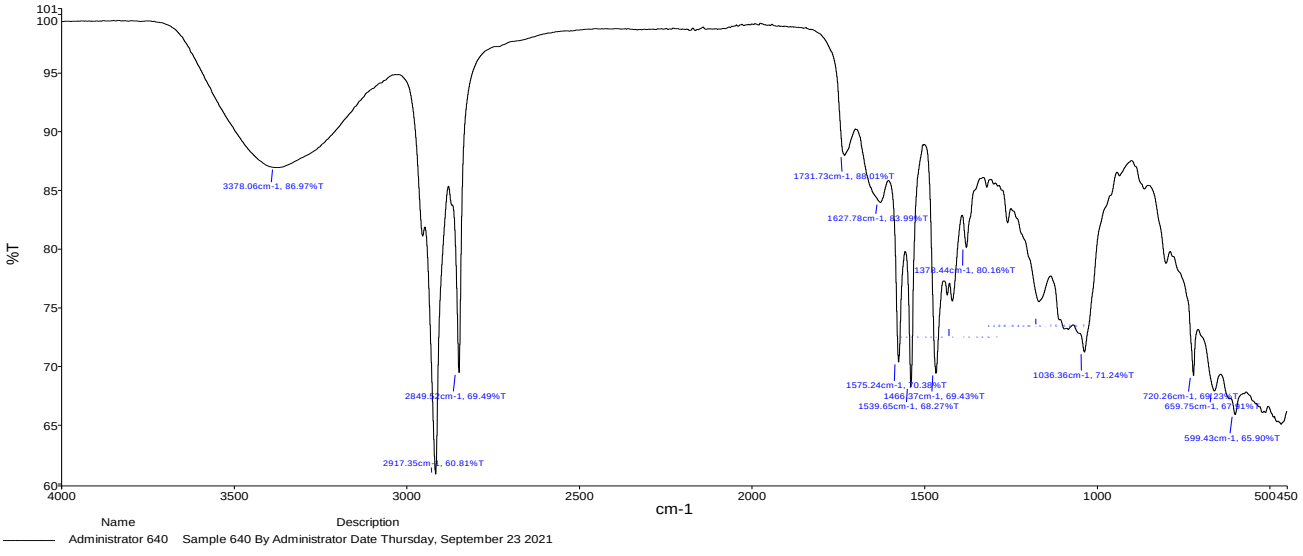

Figure 3: FTIR spectrum of ethanolic extract of *Dictyota dichotoma*

RESULTS AND DISCUSSION

Preliminary Phytochemical Investigation

Preliminary phytochemical investigation of ethanolic extracts of *Dictyota dichotoma* reveals the presence several secondary metabolites. **Table 1** shows the secondary metabolites reported, which include alkaloids, glycosides, terpenoids, phenol, tannins, saponin, anthocyanin and flavonoids.

UV – Visible Spectral analysis

The UV-Visible fingerprint profile of the ethanolic extract of *Dictyota dichotoma* was chosen at 200nm to 800nm due to the sharpness of the peaks and proper baseline. The compounds were found to be separated at wavelengths of 232, 399, and 663nm, with absorbances of 3.997, 0.872, and 0.192, respectively. UV-VIS spectroscopy investigation reveals the presence of phenols and flavonoids **(Figure 2 & Table 2)**.

FT-IR Analysis

Fourier Transmission Infrared Spectroscopy is used to detect the functional group of bioactive components based on the peak value in the region of infrared light. The *Dictyota dichotoma* extract powder was put through the FT-IR and the main functional group of the components was determined based on the peak ratio. The FTIR spectrum peak values containing functional groups of bioactive components were marked in **(Figure 3 and Table 3)**. FT-IR spectra of *Dictyota dichotoma* revealed a peak at 3378.06, 2917.35, 2849.52, 1731.73, 1627.78, 1575.24, 1539.65, 1466.37, 1419.39, 1378.44, 1168.04, 1036.36, 720.26cm^{-1} this confirms the presence of Alcohols**,** Alkanes Aliphatic Compounds, Aldehydes, Ketone, Carboxylic Acids, Alkenes, Aromatics, Alkene Methylene Group, Phenols, Aliphatic Amines and Alkanes.

Table 1: Preliminary phytochemical Investigationof ethanolic extracts of*Dictyota dichotoma*

Bioactive compounds	Test	Present/absent
Alkaloids	Mayer's test	+
Glycosides	Keller-kiliani test	+
Diterpenes	copper acetate	-
Terpenoids	Salkowski's test	+
Phenol and tannins	Ferric chloride test	+
Steroids	Salkowski's test	-
Saponin	Foam test	+
Anthocyanin	Hydrochloride test	+
Flavonoids	Alkaline reagent test	+

+ Present –Absent

Table 2: UV-Visible spectrum of ethanol extract of *Dictyota dichotoma*

Nanometers	Absorption values	Compounds
232	3.997	Phenol and Flavonoid [10]
399	0.872	
663	0.192	

Table 3: FTIR spectrum *peak value* of ethanolic extract of *Dictyota dichotoma*

Peak Value	Spectroscopic Assignments	Functional Group
3378.06	O-H stretch, H–bonded	Alcohols, Phenols
2917.35	-CH stretch	Alkanes Aliphatic compounds
2849.52	-CHstretch	Alkanes Aliphatic compounds
1731.73	C=O stretch	Aldehydes, Ketone, Carboxylic acids
1627.78	C=C-C symmetric stretch	Alkenes
1575.24	C=C	Aromatics
1539.65	C=C	Aromatics
1466.37	C–H bending	Alkene methylene group
1419.39	=CH-H	Alkanes
1378.44	O–H bending	Phenol
1168.04	C-O	Carboxylic acid carbohydrates and polysaccharides
1036.36	C-N stretch	Aliphatic amines
720.26	C-H Stretch	Alkanes

CONCLUSION

Brown algae, as opposed to green or red algae, are known to have more bioactive components. Because of their numerous health benefits, the relevance of marine algae as a source of functional components has long been recognised. The current investigation found that the ethanolic extracts of *Dictyota dichotoma* contained the most of the bioactive chemicals. These algae's secondary metabolites may be of interest to the pharmaceutical industry.It is intended that this work will serve as a source of inspiration and guidance for researchers interested in doing additional research that will lead to the development of new phytochemicals produced from the brown algae *Dictyota dichotoma.*

CONFLICTS OF INTEREST:

The author(s) declare that there is no conflict of interest. The authors alone are responsible for the content and writing of this article.

ACKNOWLEDGEMENT:

The authors are thankful to Vilasrao Deshmukh Foundation, Group of Institutions, VDF School of Pharmacy, Latur, Maharashtra, India and University Department of Chemical Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra, India for technical support.

REFERENCES:

[1] Deepak P, Josebin MPD, Kasthuridevi R, Sowmiya R, Balasubramani G, Aiswarya D, *et al*. GC-MS Metabolite Profiling, Antibacterial, Antidiabetic and Antioxidant Activities of Brown Seaweeds, Sargassum wightii Greville Ex J. Agardh, 1848 and Stoechospermum marginatum (C. Agardh) Kützing 1843. Pharmacology, Toxicology and Biomedical Reports 2017;3:27–34. https://doi.org/10.5530/PTB.2017.3.5.

[2] Leandro A, Pacheco D, Cotas J, Marques JC, Pereira L, Gonçalves AMM. Seaweed's Bioactive Candidate Compounds to Food Industry and Global Food Security. Life 2020; 10:140. https://doi.org/10.3390/life10080140.

[3] Elkhateeb MI, El-Bitar AMH, Saleh SR, Abdelreheem AMA. Evaluation of bioactive phytochemical character-rization, antioxidant, anti-microbial, and antihemolytic properties of some seaweeds collected from Red Sea coast, Egypt. Egyptian Journal of Aquatic Biology & Fisheries 2021; 25:417–36.

[4] Deyab M, Ward F, Deyab M, Elkatony T, Student PD. Qualitative and Quantitative Analysis of Phytochemical Studies on Brown Seaweed, *Dictyota dichotoma*. International Journal of Engineering Development and Research 2016; 4:674–8.

[5] Pande J, Dhanki A, Padalia H, Chanda S. Pharmacognostic characterization, phytochemical and physicochemical evaluation of *Sargassum wightii* and *Padina gymnospora*, two brown seaweeds from Gujarat coast. The Pharma Innovation Journal 2018; 7:78–86.

[6] Noorjahan A, Aiyamperumal B, Anantharaman P. Characterization and Biochemical Properties of Brown Seaweed *Sargassum Tenerrimum* (J. agardh). International Journal of Pharmacy and Biological Sciences-IJPBS TM 2019; 9:252-8. https://doi.org/10.21276/ijpbs.2019.9.2.34.

[7] John Peter PJ. Preliminary phytochemical profile of Dictyota dichotoma (Huds.) Lamouroux collected from Koothankuzhi Coast, Tirunelveli district, Tamil Nadu, India. Journal of Drug Delivery and Therapeutics 2018; 8:53–6. https://doi.org/10.22270/jddt.v8i6-s.2079.

[8] Girija K HASCPC and PA. Extraction and isolation of phlorotannins from brown seaweed *Turbinaria ornata* (TURNER) J. Agardh And Its Antioxidant Activity. International Journal of Bioassays 2013; 2:1185–9.

[9] Isaac Dhinakaran D, Rajalakshmi R, Sivakumar T, Jeeva S. Antimicrobial Activities and Bioactive Metabolites from Marine Algae *Valoniopsis pachynema* and *Sargassum swartzii*. Research and Reviews: Journal of Pharmacognosy and Phytochemistry 2016; 4:19–26.

[10] Sahu N, Saxena J. Phytochemical Analysis of *Bougainvillea Glabra Choisy* by FTIR and UV-VIS Spectroscopic Analysis. International Journal of Pharmaceutical Sciences Review and Research 2013; 21:196–8.