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PHYTOCHEMICAL ANALYSIS OF MARINE BROWN ALGAE (SARGASSUM *WIGHTII)* FROM GULF OF MANNAR, MANDABAM, INDIA

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ABSTRACT

Seaweeds are one of the most important marine resources of the world and being used as human food, animal feed and raw material for many industries. Brown algae are large group of marine multicellular algae commonly found in Mandapam coast, Gulf of Mannar. In the present study , the methanolic extract of marine *Sargassum wightii* showed significant phytochemical components such as carbohydrates, proteins, phenol, saponins, glycosides, steroids, terpenoids and alkaloids.. These findings suggested that bioactive potential metabolites present in *Sargassum wightii* showed the potential biomedical importance and could be used as potential drugs to cure emerging diseases..

Key words: *Sargassum wightii,* macroalgae, phytoconstituents.

INTRODUCTION

In recent years, with an increase in awareness of functional ingredients from foods much attention has been focused on polysaccharides isolated from natural sources. During the last decade, numerous bioactive polysaccharides with interesting functional properties have been discovered from seaweeds, and its the most important living resource of the ocean.

The east cost of India is a unique marine habitat with diverse seaweeds and are distributed in Gulf of Kutch, Gangeya, South West Coast of India; Mandapam, Kanyakumari; Muttam and Arokiapuram Karnataka, Kerala, Lakshaweep, Tamil

Nadu, Andhra Pradesh, Gopalpur coast and brackish water lake Chilika of Orissa, West Bengal and Andaman and Nicobar Islands. India presently harvests only about 20,000 tonnes of macroalgae annually. The cell wall of seaweeds contain polysaccharide, which give flexibility to the algae and helps to adapt to a variety of water currents in which they grow (Rinaudo, 2007). The total polysaccharide concentration in seaweed species ranges from approximately 4-76 % dry weight (Kraan, 2012).

Brown algae are rich sources of bioactive compounds such as polysaccharides, peptides, omega-3 fatty acids, carotenoids, phenolics, vitamins, and minerals. Laminarin is low- molecular-weight polysaccharide present in brown algae. The reported content of laminarin from brown algae is up to levels of 35% on dry basis, which varies depending on species, harvesting season, habitat and method of extraction. Laminarin has many biofunctional activities including antitumor, anti-apoptotic, anti-inflammatory, anticoagulant and antioxidant activity. (Shekhar *et al*, 2014).

Bioactive compounds extracted from seaweeds can be classified into three types. The major fucan yielding brown seaweeds genera are *Fucus, sargassum*, *Laminaria, Undaria, Lessonia, Dictyota, Dictyopteris, Ascophyllum, Eclonia, Canistrocarpus, Lobophota, Turbinaria, pandina, Adenocystis, Sphacelaria*, *Cystoseria*, etc. Fucan represents a family of water soluble. Species rich in sulfated L-fucose, extracted from extracellular matrix of these weeds (Costa *et al*., 2011). Fucoidan, the sulfated alpha - L- Fucan (term often interchangeably used with fucans) has demonstrated a wide range of pharmcological activities.

The main bioactive compounds synthesized by brown algae like sulfated polysaccharides, phlorotannins, terpenes that present in the aqueous extracts are responsible in part for the anti- proliferative activity (Lamia *et al*., 2014).Among them, the seaweeds, that produce a wide range of secondary metabolites with broad spectrum bioactivity, have immense biomedical potential (Smit,2004 and EI- Gamal, 2010) and has been used in folk medicine for a variety of remedial purposes such as in eczema, gallstone, gout, scrofula, cooling agent for fever, menstrual trouble, renal problem, and scabies (Hoppe, 1979).

Seaweeds have recently received much attention for the potential secondary metabolites. Most of the metabolites isolated

from seaweeds have bioactive effects (Somepalli, 2007). They have a lot of Phyto constituents with functional properties including anticancer, hypocholesterolemic, antihelminthic substances and antimicrobial activities of seaweeds. (Thirumaran,2006).Seaweeds are considered to produce a great variety of secondary metabolites characterized by a broad spectrum of biological activities. Compounds with cytostatic, antiviral, antihelminthic and antifungal activities, have been detected in green, brown and red algae. (Lindequist and Newman.2003). Hence the present study was carried out to analyse the phytochemical constituents from brown algae, *Sargassum wightii.*

MATERIALS AND METHOD

COLLECTION OF SAMPLE

Sargassum wightii (Plate 1) species was collected from Gulf of Mannar. The collected seaweed samples were rinsed with marine water to remove debris and epiphytes. In the laboratory, the seaweeds were once again washed in freshwater and stored in refrigerator for further analysis (John Peter Paul, and Shri Devi SDK, 2014).

Plate. 1. Brown seaweed from Gulf of Mannar.

Plate .2. Extraction of Brown algae.

Extraction of Brown algae: plate 2

The dried sea weeds were grounded to fine powder using a blender. About 3 g of powdered samples was packed in soxhlet apparatus and extracted with methanol for 8 hr separately. The excess amount of methanol was evaporated and fine methanol crude powder was prepared and stored in the refrigerator for experimental analysis. (John peter paul., 2013).

QUALITATIVE PHYTOCHEMICAL ANALYSIS

The extract was tested for the presence of bioactive compounds by using following standard methods as described by Savithramma *et.al*., 2011).

TEST FOR PROTEINS

Crude extract was boiled with 2ml of 0.2% solution of Ninhydrin, appearance of violet colour suggesting the presence of amino acids and proteins.

TEST FOR CARBOHYDRATES

Crude extract was mixed with 2ml of iodine solution. A dark blue or purple coloration indicated the presence of the carbohydrate.

TEST FOR PHENOLS AND TANNINS

Crude extract was mixed with 2ml of 2% solution of $FeCl_3$. A blue-green or black coloration indicated the presence of phenols and tannins.

TEST FOR FLAVONOIDS

Crude extract was mixed with few fragments of magnesium ribbon and concentrated HCl was added drop wise. Pink scarlet colour appeared after few minutes which indicated the presence of flavonoids.

TEST FOR SAPONINS

Crude extract was mixed with 5ml of distilled water in a test tube and it was shaken vigorously. The formation of stable foam was taken as an indication for the presence of saponins.

TEST FOR GLYCOSIDES

Crude extract was mixed with 2ml of chloroform. Then 2ml of concentrated H_2SO_4 was added carefully and shaken gently. A reddish brown colour indicated the presence of steroidal ring, i.e., glycone portion of the glycoside.

TEST FOR STEROID

Crude extract was mixed with 2ml of chloroform and concentrated H_2SO_4 was added sidewise. A red colour produced in the lower chloroform layer indicated the presence of steroids. Another test was performed by mixing crude extract with 2ml of chloroform. Then 2ml of each of concentrated H_2SO_4 and acetic acid were poured into the mixture. The development of a greenish coloration indicated the presence of steroids.

TEST FOR TERPENOIDS

Crude extract was dissolved in 2ml of chloroform and evaporated to dryness. To

this, 2ml of concentrated H_2SO_4 was added and heated for about 2 minutes. A grayish colour indicated the presence of terpenoids.

TEST FOR ALKALOIDS

Crude extract was mixed with 2ml of 1% HCl and heated gently. Mayer's and Wagner's reagents were then added to the mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.

TEST FOR QUINONES

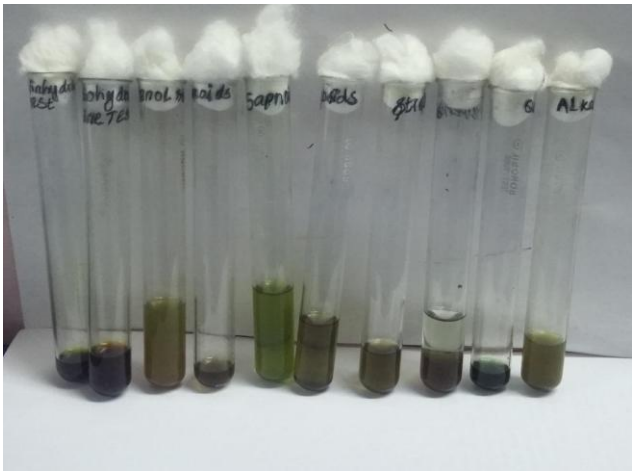
Crude extract was mixed with 2ml of concentrated HCl and heated gently. A yellow coloration indicated the presence of the quinones.

RESULT

PHYTOCHEMICAL ANALYSIS OF BROWN ALGAE

The extract of brown seaweed revealed the presence of carbohydrates, Proteins, phenol, Saponins, glycosides, steroids, terpenoids and alkaloids.(Table 1)

Phytochemical analysis of brown seaweed extracts: plate 3



PHYTOCHEMICAL ANALYSIS OF MARINE BROWN ALGAE (*Sargassum wightii)*

Table 1.

S.NO.	Test	Result
1	Proteins (Ninhydrin test)	Positive
2	Carbohydrates (Iodine test)	Positive
3	Phenols and tannins	Positive
4	Flavonoids (shinoda test)	Negative
5	Saponins	Positive
6	Glycosides (salkowski's test)	Positive
7	Steroids	Positive
8	Terpenoids	Positive
9	Alkaloids	Positive
10	Quinone	Negative

DISCUSSION

Seaweeds are macrophytic marine algae available largely in shallow coastal water. They offer a wide range of therapeutic properties both internally and externally. Seaweeds can be classified into three broad groups based on pigmentation such as brown, red and green algae. Seaweed contains virtually all the minerals, vitamins and it is useful in preventing free radical formation.(Dhargalkar and Neelam, 2005).

Brown algae are rich sources of bioactive compounds such as polysaccharides, peptides, omega-3-fatty acids, carotenoids, phenolics, vitamins, minerals and consist of mainly 90% water (Shekhar *et al*, 2014). In the present study the results of the qualitative analysis of phytochemical screening in methanolic extract of *Sargassum wightii* revealed the presence of carbohydrates, proteins, phenols and tannins, saponins, glycosides, steroids, terpenoids and alkaloids. These results suggest that the presence of bioactive metabolites and these Phytochemical constituents have substantial medicinal merit.

In conclusion, the present study revealed that the methanolic extracts of marine *Sargassum wightii* has potential biomedical components . It has to reinforce the claims of health care industry and indigenous medicine that these brown seaweeds can be used as remedies of biomedical importance. Further research studies are being carried out on the other species of seaweed from same habitat in order to provide the complete data on the nutritive and antimicrobial properties of these plants.

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