

RESEARCH ARTICLE

A comparative phytochemical investigation on selected Macroalgae in Thikkodi Coast, Kerala

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ABSTRACT

Marine algae are morphologically diverse group of plants which can be regarded as primary producers. They are the sources of vitamins, mineral, proteins and antioxidants. Marine algae is an interesting group of algae which has a wide range of biological activities. They are chemically unique in nature which makes them an ideal substance for preparation of anticancer drugs. The phytochemistry of plants are gaining attention recently across the world. The Phytochemical screening tests of twelve different chemicals compounds (alkaloids, terpenoids, tannins, saponins, flavonoids, phenols, coumarins, proteins, carbohydrates, glycosides) were done in five algal species collected from Thikkodi Coast, Kerala. The results show that the flavonoids and tannins are present all the selected samples. The present research work has focussed on the comparative phytochemical profiling of the selected seaweeds in two different solvents.

Keywords: phytochemical, algae, antioxidant, drugs, solvents

1. INTRODUCTION

Recently Extensive studies on secondary metabolites have been carried out as it's a great source of medicinal agents. The Seaweeds are the major part of the marine ecosystem. They are highly nutritive in nature. They mostly grow on hard substrate areas of intertidal region, which are regularly exposed during low tides and submerged during high tides. From Ancient times the seaweeds have been used as medicine and food. The algae majorly contribute to the half of the oxygen produced in earth. Hence, it's really important to pay attention to analyse the seaweed diversity and make use of them for a sustainable environment. Ecological and biological importance of the macro algal communities of near-shore coastal ecosystems are studied worldwide [2]. Macro algae play a salient role in structuring the marine ecosystem for a variety of organisms and influences them in different stages of their lifecycle. The marine algae are also called as seaweeds. They can be divided into three, namely green algae, Red algae and Brown algae (or Chlorophyta, Rhodophyta and Phaeophyta respectively)

Phytochemistry is the study of chemicals produced by the plants. These secondary metabolites are produced as a measure of self

defence against insects, pest, pathogens. The phytochemicals from the algae are extensively used in different industries such as textile, food, confectionary pharmaceutical, diary and paper mostly as gelling, stabilizing, thickening dyeing agents. For a long time algal chemistry from terrestrial to marine or freshwater bodies has fascinated numerous investigators to develop new drugs in the nutraceutical and pharmaceutical industries [10].

Research concern has greatly enhanced the marine life and their amazing secondary metabolites started to be used for their strong therapeutic activities in the last decades. Due to the adaptive nature of the algae in different harsh type of environments, they may generate numerous secondary metabolites with complete structural cores circumscribe alkaloids, cyclic peptides, polysaccharides, sterols, glycerol, quinones. Moreover, algal organisms represent a rich source of new primary and secondary metabolites. These compounds are biologically active which can be exclusively used in pharmaceutical industry. Therefore, recently a new trend has been arisen to isolate novel bioactive compounds and constituents from edible seaweeds [7]. Phytochemical analysis of seaweeds can help the

manufactures for the identification and selection of raw materials for drug production [1]. The secondary metabolites have always attracted the interest of biochemists because of the diversity as compared with that of the higher plants. Here the present study is intended to evaluate the phytochemical screening in the five of the seaweeds collected from Thikkodi Coast, Kerala, India.

2. MATERIALS AND METHODS

2.1. Collection of Marine algae

The macro algae were collected from Thikkodi Coast of Kozhikode district, Kerala. Immediately after collection, the collected samples were washed to remove the epiphytes, other organisms or any extraneous matter. After subsequent washing the algal samples were shade dried for about a month. The shade dried seaweeds were partially powdered using the mixer and stored in air tight container for further studies.

2.2. Preparation of Extracts

The Phytochemical screening was done by using the Soxhlet apparatus. 30 g of fine powder was packed separately in No.1 Whatman filter paper and placed in Soxhlet apparatus along with solvent Chloroform and Methanol on basis of polarity. The residues were collected and dried at room temperature 30° C after which yield was weighed and then performed to activity.

2.3. Phytochemical Screening

The phytochemical screening of different algal extracts was assessed by Harborne method (1973) [5]. General reactions in these analyses revealed the presence or absence of these compounds in the algal extracts tested. Preliminary phytochemical screening of twelve different chemical compounds (alkaloids, carbohydrates, proteins, coumarins, flavonoids, steroids, glycosides, tannins, saponins, anthraquinones, glycosides, phenols) were tested in two different extracts. In order to detect the chemical composition and to establish the algal profile different qualitative chemical tests were performed.

Test for carbohydrates

2 drops of Molish reagent was added to an aqueous hydrochloric acid solution to the extract add 2ml of concentrated sulphuric acid was added by the sides of the test tube. Formation of reddish

violet ring at the junction of two liquids indicates the presence of carbohydrates.

Test for proteins

To the extract ,1 ml of 40% sodium hydroxide solution and 2 drops of 1% Copper sulphate solution were added. Appearance of violet color indicates the presence of proteins.

Test for Steroids

To the extract ,2ml of Chloroform and 1ml of concentrated Sulphuric acid was added. Formation of Red colour indicates the presence of steroids.

Test for Coumarins

To the extract 1ml of 10% NaOH was added. Formation of yellow colour indicates the presence of Coumarins

Test for alkaloids

1 ml of 1% HCl was added to the 2 ml of extract in a test tube and was treated with few drops of Mayer's reagent. The presence of alkaloids was indicated by the appearance of creamy white precipitate.

Test for saponins: Frothing test

2 ml of the extract was shaken vigorously with 5 ml of distilled water to obtain stable persistent foam. Formation of frothy solution indicates the presence of saponins

Test for glycosides

2 ml of 50% H₂SO₄ was added to the 2 ml of extract in a boiling tube. Then the mixture is heated in a boiling water bath for 5 min .10 ml of Fehling's solution was added and boiled. Formation of brick red precipitate indicates the presence of glycosides.

Test for terpenoids

To the extract ,2 ml of CHCl₃ was added in a test tube and then 3 ml of concentrated H₂SO₄ was added carefully along the wall of the test tube to form a layer. A reddish-brown colour formed on the interface confirmed the presence of terpenoids.

Test for tannins

To the extract ,1 ml of distilled water and 1-2 drops of ferric chloride solution was added. Brownish green or blue -black colouration indicates the presence of tannins.

Test for anthraquinones

2 ml of extract was mixed with benzene and 1 ml of 10% Ammonia solution was added. The presence of pink, red or violet colour indicates the presence of anthraquinones.

Test for phenolic groups

To 1 ml of extract, add 2 ml of distilled water followed by few drops of 10% Ferric chloride. The formation of blue-black colour indicates the presence of phenolic groups.

Test for flavonoids

A few drops of 1% NH₃ solution was added to 2 ml of extract in a test tube. Formation of yellow colouration indicates the presence of flavonoids.

3. RESULTS AND DISCUSSION

Seaweeds are the resource material for structurally unique natural products with pharmacological and biological activities. Marine pharmacognosy is a branch of terrestrial pharmacognosy which investigates the medically dominant plants and animal in marine ecosystem. The 79% of earth's surface is covered by water. The research into the chemistry of marine organisms is moreover unexplored. The selected solvents both chloroform and methanol have shown good results. Flavonoids and tannins are found to be present in all

the samples both in chloroform and methanol extracts. Flavonoids in human diet may reduce the risk of various cancers, as well as preventing menopausal symptoms. It's a potent water soluble antioxidants and free radical scavengers prevent oxidative cell damage and have strong anticancer activity. They show antiallergic, anti-inflammatory, antimicrobial and anti-cancer activity [3,4,6,11]. Tannins are known to possess general antimicrobial and antioxidant activities [9]. Flavonoids are hydroxylated phenolic substances known to be synthesized by plants in response to microbial infection and they have been found to be antimicrobial substances against wide array of microorganisms in vitro. Flavonoids, the major group of phenolic compounds reported for their antimicrobial and antiviral activity. Tannins have antibacterial activity, forming complex compounds with proteins through hydrogen bonds, when these are formed between tannins and proteins altering the protein structures and disrupting the bacterial metabolism. Tannins inhibit the reverse transcriptase enzyme, the DNA topoisomerase, and also cell wall polypeptides, so that the cell walls imperfections cause bacterial cell's lysis and eventually their death, due to osmotic and physical pressure [8]. Tannins are produced by algae as a form of defence against microbes. Both the solvents can dissolve the most of the organic compounds in the selected samples. The bioactive compounds found from the marine algae are shown in the tables 1 ad 2.

Table 1. Table showing the phytochemical studies in Chloroform extract

PHYTOCHEMICALS	<i>C. chemnitzia</i>	<i>C. sertularioides</i>	<i>G. corticata</i>	<i>P. tetrastromatica</i>	<i>S. polycystum</i>
Alkaloids	++	++	++	+	-
Phenols	++	+	-	+	+
Flavonoids	++	++	++	++	+
Anthraquinones	-	-	-	-	-
Tannins	+	+	+	+	++
Coumarins	-	-	+	+	-
Carbohydrates	+	-	+	+	+
Saponins	+	-	-	+	+
Steroids	-	+	+	-	-
Proteins	+	+	+	+	+
Glycosides	+	+	+	-	-
Terpenoids	-	++	++	+	+

Table 2. Table showing the phytochemical studies in Methanol extract

PHYTOCHEMICALS	<i>C. chemnitzia</i>	<i>C. sertularioides</i>	<i>G. corticata</i>	<i>P. tetrastromatica</i>	<i>S. polycystum</i>
Alkaloids	+	+	++	+	-
Phenols	++	+	-	+	-
Flavonoids	++	++	++	++	+
Anthraquinones	-	-	-	-	+
Tannins	++	+	-	++	+
Coumarins	-	-	+	+	-
Carbohydrates	+	-	++	++	+
Saponins	-	-	-	+	+
Steroids	+	+	-	+	-
Proteins	+	+	+	+	+
Glycosides	+	+	+	-	-
Terpenoids	++	++	-	++	++

-: Absent, + : Present, ++ : Intensely Present

4. CONCLUSION

The development of Science and technology has given a better understanding of the diseases, changes in disease patterns etc. The macroalgae has the potential to be a source material of the bioactive compounds. The identification of these bioactive compounds is important in drug designing. It's necessary to carry out research in this field so that we can draw out an accurate information for the development and discovery of novel drugs. Phytochemicals are solemnly embarking on research activities involving the extraction of the organic compounds. Some of these compounds have the ability to suppress the cancer cells by promoting the cell cycle inhibition and apoptosis. The demand on naturally derived compounds is increasing day by day, so as to replace the synthetic ones.

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