Assessment Of Phytochemical Profiles In *Ulva lactuca, Sargassum wightii,* And *Gracillaria edulis*: Exploring Their Bioactive Potential

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Abstract
Qualitative phytochemical screening is a crucial method for elucidating the chemical composition and potential medicinal properties of natural substances. This study conducted screenings on extracts from *Ulva lactuca, Sargassum wightii,* and *Gracillaria edulis* to discern their phytochemical profiles. Results revealed unique chemical compositions for each species, with *Ulva lactuca* exhibiting the presence of Tannins, Steroids, and Glycosides, and *Sargassum wightii* containing Flavonoids, Tannins, and Steroids. Notably, *Gracillaria edulis* extract displayed a rich diversity of phytoconstituents including alkaloids, flavonoids, phenols, tannins, and saponins. Tannins emerged as a prominent compound across all extracts, suggesting their potential as bioactive compounds warranting further investigation. This study sheds light on the chemical diversity present in algae extracts and underscores their significance in pharmaceutical and nutraceutical research.

Keywords: *Sargassum wightii, Ulva lactuca,* Phytochemical screening, Comparative.

Introduction

Seaweeds, also known as marine macroalgae, are a diverse group of multicellular, photosynthetic organisms that primarily inhabit marine environments. They are found in coastal areas around the world, from Polar Regions to the tropics, and play crucial ecological roles in marine ecosystems. Seaweeds are not true plants but rather belong to various groups within the Kingdom Protista (such as green algae), Kingdom Chromista (such as brown algae), and Kingdom Rhodophyta (red algae) (Miranda *et al*., 2016).

These organisms come in a variety of shapes, sizes, and colors, ranging from small filamentous forms to large, complex structures. They can be classified into three main groups based on their pigmentation: green, brown, and red seaweeds. Seaweeds have been reported to be an important source of Bio active compounds (Lopez-santamarina et *al*., 2020).

Sargassum wightii is a genus of brown seaweeds belonging to the class Phaeophyceae is a diverse and widespread group of marine macroalgae found in tropical and temperate oceans worldwide, particularly in shallow coastal waters and coral reef ecosystems (Kaliperfumal *et* al., 1998). These species are known for their distinctive appearance, with complex branching structures and characteristic air bladders known as nematocysts. They are valued for their rich phytochemical composition. *Sargassum wightii* is one of the important species with wide range of bioactive properties has been reported from this species (Antonisami *et al*., 2012).

Ulva lactuca, a green seaweed commonly known as sea lettuce, belonging to the genus *Ulva* within the phylum Chlorophyta. It is widely distributed in coastal waters around the world, thriving in intertidal and shallow subtidal habitats. It is characterized by its bright green, sheet-like thalli that resemble lettuce leaves, hence its common name. In addition to its ecological importance as a primary producer and habitat provider in marine ecosystems (Mohan *et al*., 2023).

Gracilaria edulis is a genus of red seaweeds belonging to the phylum Rhodophyta, commonly known as "red algae." These marine macroalgae are found in various coastal regions worldwide, thriving in both tropical and temperate waters. They are characterized by their slender, branching thalli with a distinct red to purple coloration (Pradhan *et al*., 2022).

Phytochemicals are bioactive compounds naturally produced by plants and algae, which often exhibit various health-promoting properties. Natural products are important in the treatment of life- threatening conditions which usually has biological or pharmacological activity that can be used in drug recovery and drug design (Nostro *et al*., 2000). The evaluation of all the drugs is based on phytochemical and pharmacological approaches which leads to the drug discovery referred as natural product screening (Foye *et al*., 2008).

Materials and Methods:

The samples were collected from Rajakkkamangalam thurai costal range, Kanniyakumari. The collected samples were washed and shed dry for 7 days. The dried samples were extracted in autoclaved distilled water (Aqueous) using soxhlet

extraction method. About 50 grams of dried powder of *Sargassum wightii* , *Ulva lactuca* and *Gracillaria edulis* with 500 mL of distilled water and were subjected to soxhlet extraction. The yield was stored at 4°C for further analysis.

Preliminary Phytochemical Screening

Test for Carbohydrates

To 0.5 mL of test solution, about 0.5 mL of Benedict's reagent is added. The mixture is heated on a boiling water bath for 2 minutes. A characteristic coloured precipitate indicates the presence of sugar (Brain & Turner, 1975).

Test for protein

With 3ml of test solution , few drops of 4% NaOH and 1% CuSO4 solution were added. The tubes were observed for violet or pink colour formation (Ansari, 2006).

Test for Alkaloids

The extract was evaporated in a test tube. To the residue dilute HCl was added, shaken well and filtered .To the 2-3 mL of filtrate Mayer's reagent was added. Formation of yellow precipitate showed the presence of alkaloids (Ansari, 2006).

Test for Flavonoids

To the extract, 5 mL of 95% ethanol and few drops of concentrated hydrochloric acid were added. To this solution about 0.5 gm of magnesium turnings were added. Pink colouration indicated the presence of flavonoids (Kokate, 1994).

Test for Phenol

The extract was diluted to 5 mL with distilled water. To that, few drops of neutral 5% ferric chloride solution was added. A dark green color indicates the presence of phenolic compounds (Mukherjee, 2002).

Test for Glycosides

To 2 mL of the extract, glacial acetic acid, one drop 5% $FeCl_3$ and conc. H_2SO_4 were added. Reddish brown colour appeared at junction of two liquid layers and upper layer turned bluish green indicating the presence of glycosides (Ansari, 2006).

Test for Steroids

To 2 mL of extract, 2 mL of chloroform and 2 mL of conc. H_2SO_4 were added. The solution was shaken well. As a result, chloroform layer turned red and acid layer showed greenish yellow fluorescence (IP, 1996).

Test for Tannins:

On addition of lead acetate solution to the extract white precipitate appeared (Mukherjee, 2002).

Test for Sapanins

Drug extract was shaken vigorously with water. No persistent foam was formed (Ansari, 2006).

Test for Triterpenoids

To the test solution, 2mL chloroform was added with few drops of conc. sulphuric acid (3mL) at the sides of the test tube. An interface with a reddish brown coloration is formed if terpenoids constituent is present (Horbone, 1984).

Results and Discussions:

Qualitative phytochemical screening of *Ulva lactuca* revealed the presence of Tannins, Steroids, and Glycosides, whereas Carbohydrates, Proteins, Alkaloids, Flavonoids, Phenols, Saponins, and Triterpenoids were conspicuously absent. Similarly, in *Sargassum wightii*, Flavonoids, Tannins, and Steroids were detected, while Carbohydrates, Proteins, Alkaloids, Phenols, Saponins, Glycosides, and Triterpenoids were entirely absent. Notably, *Gracillaria edulis* extract exhibited the highest diversity of phytoconstituents, including alkaloids, flavonoids, phenols, tannins, and saponins, with Carbohydrates, Proteins, Glycosides, and Triterpenoids absent. Remarkably, Tannins were the sole compound detected in all three extracts. *Gracillaria edulis* extract displayed the maximum number of compounds (5), followed by *Sargassum wightii* and *Ulva lactuca* extracts.

Qualitative phytochemical screening serves as a vital tool in understanding the chemical composition and potential medicinal properties of various natural substances. In the case of *Ulva lactuca*, the absence of several phytochemicals highlights its unique chemical profile, while the presence of Tannins, Steroids, and Glycosides hints at its potential pharmacological significance. Conversely, *Sargassum wightii* demonstrates a different phytochemical composition, further emphasizing the diverse array of compounds found in different algae species. The absence of certain phytochemical classes across all three extracts underscores the specificity of their chemical makeup and potential biological activities. Additionally, the prominence of Tannins across all extracts suggests their potential role as bioactive compounds worthy of further investigation.

Table: 1 Qualitative Screening of phytoconstituents of *Ulva lactuca* (Green Algae*) Sargassum wightii* (Brown Algae) and Gracillaria *edulis* (Red Algae)

S. No	Phytochemical Tests	*Ulva Sps*	*Sargassum sps*	*Gracilaria sps.*
1.	Carbohydrate	Negative	Negative	Negative
0.	Protein	Negative	Negative	Negative
0.	Alkaloids	Negative	Negative	Positive
0.	Flavonoids	Negative	Positive	Positive

0.	Phenols	Negative	Negative	Positive
0.	Tannins	Positive	Positive	Positive
0.	Saponins	Negative	Negative	Positive
0.	Steroids	Positive	Positive	Negative
0.	Glycosides	Positive	Positive	Negative
0.	Triterpenoids	Negative	Positive	Negative

Figure: 1- Qualitative Screening of Phytoconstituents of *Sargassum wightii, Ulva lactuca, Gracillaria edulis* through different solvent extracts.

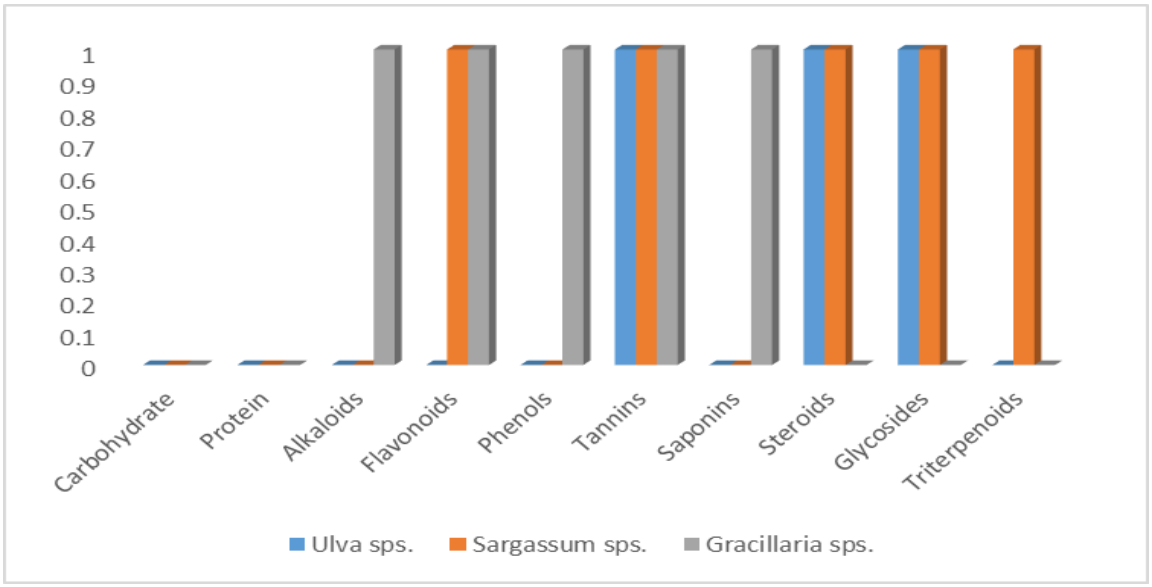

Figure: 2- Qualitative Screening of Phytoconstituents of *Sargassum wightii, Ulva lactuca, Gracillaria edulis* through different solvent extracts.

Many researchers have worked on the phytochemical constituents and found the compounds such as phenols, alkaloids, flavonoids, steroid, glycosides, tannins etc. (Patel *et a*l., 2011). Anand & Gokulakrishnan (2012) states that the extract of this plant contains alkaloids and flavonoids, which are having biological activities Generally, secondary metabolites and nutrients confirmed the pharmacological and ethno medicinal values of the plants. Flavonoids are present in the form of polyphenolic compounds that have potent antimicrobial, anti-inflammatory (Okwu, 2001) activity.Terpenoids are the myriad compounds used by humans in the food and pharmaceuticals (Tholl, 2015). Phenols are largest group of plant metabolites, which have many biological properties such as antiapoptosis, antiageing, anticarcinogen, anti- inflammation and cell proliferating activities (Han *et al*., 2007). Tannins have astringent properties, which accelerate the healing of wounds and inflamed mucous membrane due to their physiological activities (Killedar & More, 2010). The glycosides are useful in lowering blood pressure (Nyarko & Addy, 1990). They are used in the treatment of congestive heart failure and cardiac arrhythmia (Jyothiprabha & Venkatachalam, 2016). Raju *et al.*, 2015 reported that the isolated alkaloids and their synthetic derivatives are used as basic medicinal agent.

SUMMARY AND CONCLUSION:

The study underscores the importance of qualitative phytochemical screening in understanding the chemical composition and potential medicinal properties of algae species. The absence of certain phytochemical classes across all extracts highlights the uniqueness of their chemical makeup. Tannins emerged as significant compounds present in all three extracts, indicating their potential as bioactive compounds. *Gracillaria edulis* extract showcased the utmost diversity of

phytoconstituents, signifying its potential pharmacological significance, thereby compelling additional exploration into the bioactivity and therapeutic potential of these compounds for pharmaceutical and medical applications.

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