Studies on Phytochemical Analysis and Antimicrobial Activity of *Sargassum Wightii*

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Abstract

Introduction: Seaweeds are natural sources rich in active compounds used extensively by cultivating the weeds to cure various ailments. *Sargassum wightii* is distributed in coastal areas, especially in tropical regions.

Materials and Method: Seaweeds are collected from coastal area of Tamil Nadu and screened for phytochemical analysis by Evans method, total phenol content by Folin-Ciocalteau colorimetric method and antibacterial activity were performed by the well diffusion method.

Results: *S.wightii* was extracted in the ratio of 1:10 and phytochemical analysis of ethyl acetate extract showed the presence of various secondary metabolites. The *S.wightii* crude extract was screened for antimicrobial activity and showed good zone of inhibition against human pathogens.

Conclusion: *S.wightii* is a potent antimicrobial drug as it shows a good zone of inhibition against the harmful pathogens and the secondary compound screening proves the activity. So the *S.wightii* can be cultivated more and can be used for clinical purpose without any side effects.

Keywords: *S.wightii, secondary metabolites, phytochemical analysis, Antimicrobial.*

Introduction

The emergence of science in pharmaceutical industry explores the active ingredients from natural resources is the current era of development. In this scenario, seaweed gained the importance, especially against human pathogens and the cultivation has been started by the local people and supply of raw material is about 15 Million MT in one year as per the guidelines of[22]. *Sargassum* species distributed widely in external conditions where the temperature is humid and semihumid across the world and the characteristic feature of the plant is dark-brown, with approximately 30cm in height. *S.wightii* has branched leaves, stem like parts and root like holdfasts. This seaweed not only helps the pharmaceutical industry, but also act as supplementary food, fertilizer for plant enrichment and conversion of renewable sources.

Secondary metabolites derived from the innate source are not responsible for growth or reproduction [5] but minor quantities of these materials are very much helpful in producing new drugs in pharma industry, defense mechanism against harmful pathogens [8], hormones, enzymes[14] symbiotic activity[7], in agriculture and interacts with other species.

The bioactive compounds obtained from the seaweeds helps pharma industry as polysaccharide production[4], against bacterial, fungal pathogens[6,10], as a remedy for cancer[12,25] and against viral

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strains[3,11,23,24]. The secondary metabolites consist of chemical structures which possess high therapeutic activities. The study from earlier researchers focused on phytochemical analysis, Nutraceuticals and medicinal value from marine macroalgae as food and in the field of research it is widely used in characterizing the medicinal properties[19].

The current study focused on analyzing the crude extract of *S.wightii* for phytochemical analysis and Antimicrobial activity against the harmful pathogens. The outcome and aim of the research is to attain the knowledge of *S.wightii* and explore to the scientific world. Thus products from the natural sources are always advisable as a means of safer method without any side effect.

Materials and Method

Sample location and extraction: The sample was collected from the southern region of Tamil Nadu, i.e. Mandapam coastal area and was identified as *Sargassum wightii*. The sample was initially collected with forceps and a sterilized plastic bag and immediately after reaching laboratory sample has to be washed in running water followed by double distilled water and the entire process was left for a few days in shade condition and dried at appropriate temperature inside the room.

The dried sample was powdered and soaked in mid polar solvent ethyl acetate for a period of 3 days. The compounds will be eluted from the sample are mixed with solvent by frequent shaking or kept in shaker at 37°C for a fixed time period. The collected sample was pooled by filtration method and condensed using a rotary evaporator.

Phytochemical analysis: Screening of secondary metabolites from the sample *S.wightii* are alkaloids by Mayers reagent method[20], Tannins, by Ferric chloride method and Flavonoids, by alkaline reagent and shinoda's magnesium ribbon test[9], Saponins and Terpenoids[18] and cardiac glycosides by Keller-Killani method.

Quantitative analysis of Total Phenol content: The crude extract of *S.wightii* determines the total phenolics present in the sample by UV spectrophotometer and followed Folin-Ciocalteau calorimetric method[17]. The obtained total phenolic content was measured at 726nm and expressed by GAE in mg/g of dry sample.

Antimicrobial activity of *S.wightii:* The most common technique to perform Antimicrobial activity is by the well diffusion method of Peela *et al*., (2005) [16] using the MHA medium. The test was performed against four bacterial strains and one fungal strain and the test results were observed for inhibition zone.

Results and Discussion

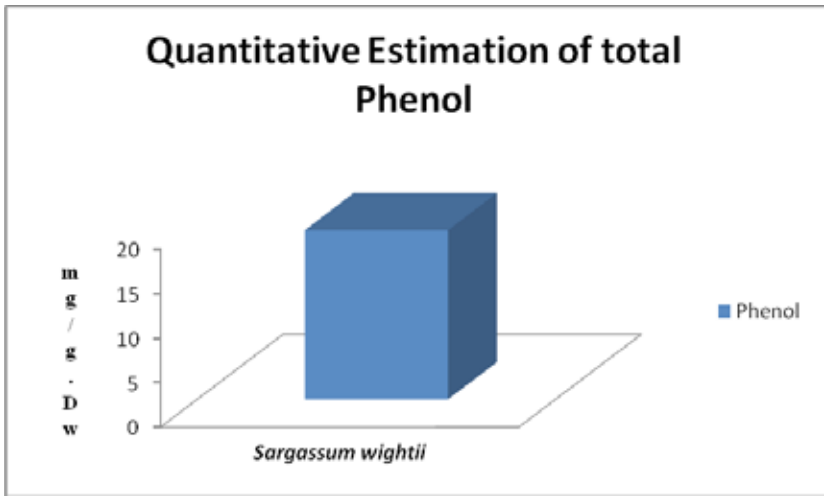
Sample Extraction: The sample was powdered and extracted with the solvent ethyl acetate in the ratio of 1:10 and sample was condensed using a rotary evaporator. The percentage of the crude extract yield was 5.2%. The solvent ethyl acetate was preferred because it elutes both polar and non polar compounds and the toxicity of the cell is very much low compared to other solvents.

Crude Extract of *S. wightii* screened for Phytochemical analysis: The secondary metabolites present in the ethylacetate extract of *S.wightii* is Flavonoids, Terpenoids and Cardiac glycosides and alkaloids, Tannins and saponins are absent in this extract. Flavonoids belong to phenolic group and rich in antioxidant activities [2] and it helps in healthy circulation by strengthening the capillary wall [15]. Terpenoids are widely useful against various pharmacological activities by inhibiting the synthesis of cholesterol, antimicrobial and also acts as an anticancer agent [13]. Glycosides consists of sugar molecule adhered with non carbohydrate moiety and has sedative property and diuretic[21].

Table 1: Phytochemical analysis of crude extracts *S. wightii*

Phytochemical Constituents	Ethyl Acetate
Mayer's Method for Alkaloids	–
$FeCl_3$method for Tannins	–
Shaking method of Saponin	–
Alkali and Shinoda's method for Flavanoids	+
	+
Sofowara method for Terpenoids	+
Keller Killani method for Cardiac glycosides	+

Determination of total phenol content: Phenols are a diversified group of natural element obtained from innate sources and distributed widely. The ethyl acetate extract of *S. wightii* were analyzed and showed 18.98 mg of GAE/g dry weight of phenols are present (Graph 1). The phenolic estimation is performed because the macroalgae *S.wightii* has redox property and has a high amount of antioxidants.



Graph 1: Total Phenolic content

Well diffusion method against harmful pathogens: *Sargassum wightii* crude extract obtained from ethyl acetate were tested against four human bacterial pathogens viz., *Staphylococcus aureus*, *Klebsiella pneumoniae, Pseudomonas aeruginosa* and *Escherichia coli* and one fungal pathogens *Candida albicans*. Antimicrobial activity of crude extract from *S.wightii* showed good inhibition to all the tested human pathogens (**Figure 1)**. The antimicrobial activity was concentration dependant, when increasing concentration showed increased zone of inhibition. Among the solvents, the ethyl acetate crude extract showed more activity than the methanol extract (**Table 2**).

The antimicrobial activity was concentration dependant, where increasing the concentration showed increased zone of inhibition. The red and green seaweeds *Gracillaria edulis* and *Enteromorpha flexousa* at 60µg/ disc, concentration showed effective antibacterial activity against *Klebsiella aerogenes*. The methanol extract showed highest activity compared with other solvents[1]. In challenge, our results showed maximum zone of inhibition from ethyl acetate extract.

Table 2: *S.wightii* against harmful human pathogens

Human pathogens	Antimicrobial activity in Zone of Inhibition (mm)			
	Ethyl acetate extract (µg/mL)			
	50	**100**	**150**	**200**
Staphylococcus aureus	0	7	9	12
Klebsiella pneumonia	7	8	9	10
Pseudomonas aeruginosa	0	0	7	9
Escherichia coli	0	6	8	11
Candida albicans	7	8	8	9

Ethical Clearance: Nil

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Conflict of Interest: Nil

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