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# Phytochemical analysis on some south Indian seaweeds

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**ABSTRACT**

*To study the phytoconstituents present in some selected seaweeds collected from the Rasthakaud coastal waters, southeast coast of Kanyakumari district, Tamilnadu, India. Phytochemical screening of the seaweed extracts were carried out using standard methods. The present study screened the phytochemical properties of eleven seaweeds with fourty four extracts and showed varied degree of phyto-constituents present. The presence or absence of phytoconstituents depends upon the solvent medium used for extraction and the physiological property of the seaweeds. From the results of the present study, it can be concluded that the seaweeds may be used as broad-spectrum antimicrobial and bioactive agent after extensive investigation.*

**Keywords:** Seaweeds, Secondary metabolites, Phytoconstituents

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## INTRODUCTION

Seaweeds constitute a vital part of marine ecosystems. It was estimated that about 90% of the species of marine plant are algae and about 50% of the global photosynthesis is contributed from algae [1]. Over the past several decades seaweeds have been used by humans as medicine and food and their extracts have generated an enormous amount of interest in the pharmaceutical industry as a fresh source of bioactive compounds with immense medicinal potential. Seaweeds are reservoirs of carotenoids, pigments, polyphenols, enzymes, diverse functional polysaccharides. Seaweeds are excellent source of vitamin A, $B_1$, $B_{12}$, C, D and E [2].

The Southern Coast of India bears luxuriant growth of seaweeds. [3]. These vast varieties of seaweeds were potential reservoirs of biochemical compounds, which might be a potential source of drug discovery in the future [4]. More than 2400 marine natural products have been isolated from seaweeds [5-6]. These natural products, are known as secondary metabolites which posses a broad range of biological activity [7]. From the findings it is well known that seaweeds contained antibacterial [8-9], antiviral [10-11], antifungal [12-13], cytotoxic [14] and larvicidal potentials [15]. The secondary metabolites synthesized by seaweeds demonstrate a broad spectrum of bioactivity [16]. With this background, the present study was aimed to explore the bioactive potential of eleven major seaweeds collected from the south east coast of India as a potential source of marine bioprospecting.

## EXPERIMENTAL SECTION

### Collection of samples

The samples of *Acanthophora nayadiformis* (Delile) Papenfuss, *Ceramium virgatum* Roth,

*Chaetomorpha antennina* (Bory de Saint-Vincent) Kützing, *Chondracanthus teedei* (Mertens ex Roth) Kützing, *Gracilaria debilis* (Forsskål) Børgesen, *Gracilaria idinthakaraiensis* Umamaheswara Rao, *Padina pavonica* (Linnaeus) Thivy, *Padina tetrastomatica* Hauck, *Sargassum linearifolium* (Turner) C.Agardh, *Spiridia hypnoides* (Bory) Papenfuss, and *Ulva lactuca* Linnaeus were collected from Rasthacaud coastal waters by handpicking (Gulf of Mannar Coast, Lat N 08008'308'' E77032'80"). The collected samples were cleaned well with seawater to remove all the extraneous impurities such as epiphytes, sand particles, pebbles and shells and brought to the

laboratory in plastic bags. The samples were then thoroughly washed with tap water followed by distilled water. Washed seaweeds were blottedon the blotting paper, shade dried and the samples were grounded into fine powderusing tissue blender. The powdered samples were then stored in refrigerator for further use.

**Extract preparation**

The powdered samples (2 g) and packed in Soxhlet apparatus and extracted with solvents like aqueous, chloroform, ethanol and petroleum ether for 8 h. The crude extracts were weighed and deep frozen until tested. The preliminary phytochemical screening was performed using standard methods [17].

**Table 1. Preliminary phytochemical studies on selected seaweeds**

| Name of the seaweed | Solvents | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Acanthophora nayadiformis* (Delile) Papenfuss | Aqueous | - | ++ | - | ++ | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | ++ | - | ++ | - | - | - | + | - | - | - | - |
| | Ethanol | - | - | - | + | - | - | + | - | - | - | - | - |
| | Petroleum ether | - | + | - | ++ | + | - | + | - | - | - | - | - |
| *Ceramium virgatum* Roth | Aqueous | - | ++ | - | - | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | - | - | ++ | - | - | - | - | - | - | - | - |
| | Ethanol | - | - | - | ++ | - | - | - | - | - | - | - | - |
| | Petroleum ether | - | - | - | ++ | + | - | - | - | - | - | - | - |
| *Chaetomorpha antennina* (Bory de Saint-Vincent) Kützing | Aqueous | - | ++ | - | - | - | - | - | - | - | - | - | - |
| | Chloroform | - | +++ | - | + | - | - | - | ++ | - | - | - | ++ |
| | Ethanol | - | +++ | - | + | - | - | - | ++ | - | - | - | + |
| | Petroleum ether | - | ++ | - | - | - | - | - | + | - | - | - | + |
| *Chondracanthus teedei* (Mertens ex Roth) Kützing | Aqueous | - | +++ | - | +++ | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | + | - | ++ | - | - | - | - | | - | - | - |
| | Ethanol | - | - | - | + | - | - | - | - | - | - | - | - |
| | Petroleum ether | - | - | - | ++ | - | - | - | - | - | - | - | - |
| *Gracilaria debilis* (Forsskål) Børgesen | Aqueous | - | +++ | - | - | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | +++ | - | ++ | - | - | - | - | - | - | - | - |
| | Ethanol | - | ++ | - | - | - | - | - | ++ | - | - | - | - |
| | Petroleum ether | - | ++ | - | ++ | - | - | - | ++ | - | - | - | - |
| *Gracilaria idinthakaraiensis* Umamaheswara Rao | Aqueous | - | ++ | - | ++ | - | - | ++ | - | - | - | - | - |
| | Chloroform | - | + | - | + | - | - | ++ | ++ | - | - | - | +++ |
| | Ethanol | - | ++ | - | + | - | - | +++ | ++ | - | - | - | ++ |
| | Petroleum ether | - | ++ | - | ++ | - | - | ++ | + | - | - | - | ++ |
| *Padina pavonica* (Linnaeus) Thivy | Aqueous | - | - | - | ++ | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | - | - | ++ | - | - | - | - | - | - | - | +++ |
| | Ethanol | - | ++ | - | - | - | - | - | + | - | - | - | - |
| | Petroleum ether | - | ++ | - | ++ | - | - | - | - | - | - | - | - |
| *Padina tetrastomatica* Hauck | Aqueous | - | +++ | + | - | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | + | ++ | +++ | - | - | +++ | - | - | - | + | +++ |
| | Ethanol | - | +++ | + | - | - | - | - | + | - | - | - | + |
| | Petroleum ether | - | + | - | +++ | - | - | - | + | - | - | - | - |
| *Sargassum linearifolium* (Turner) C.Agardh | Aqueous | - | ++ | - | - | - | - | - | ++ | - | - | - | - |
| | Chloroform | - | +++ | - | +++ | - | - | - | - | - | - | - | +++ |
| | Ethanol | - | ++ | - | - | - | - | - | ++ | - | - | - | - |
| | Petroleum ether | - | - | - | ++ | - | - | - | - | - | - | - | - |
| *Spiridia hypnoides* (Bory) Papenfuss | Aqueous | - | - | - | - | - | - | - | +++ | - | - | - | - |
| | Chloroform | - | - | - | +++ | - | - | - | ++ | - | - | - | + |
| | Ethanol | - | - | - | - | +++ | - | - | +++ | - | - | - | +++ |
| | Petroleum ether | - | - | - | ++ | ++ | - | - | ++ | - | - | - | ++ |
| *Ulva lactuca* Linnaeus | Aqueous | - | ++ | ++ | ++ | - | - | - | + | - | - | + | - |
| | Chloroform | - | + | + | +++ | - | - | - | + | - | - | +++ | +++ |
| | Ethanol | - | + | - | - | - | - | + | + | - | - | - | - |
| | Petroleum ether | - | + | +++ | - | - | - | - | +++ | - | - | + | - |

*1-Alkaloid, 2-Phenolics, 3-Flavonoid, 4-Saponin, 5-Protein, 6-Quinones, 7-Steroids, 8-Tannins, 9-Xanthoproteins, 10-Carboxylic acid, 11-Coumarins, 12-Carbohydrates*

## RESULTS

In the present study the phytochemical screening was performed with aqueous, chloroform, ethanol and petroleum ether extracts of eleven different marine algae. The results were depicted in table -1. Out of the fourty four tested extracts, thirty one extracts showed the presence of phenolics. Next to that, thirty extracts illustrated the presence of saponins. Twenty eight extracts showed the presence of tannin. Carbohydrates showed its presence only in fourteen extracts, followed by steroid in eight extracts and flavonoids in six extracts. Both protein and coumarins showed their presence in four extracts each. Alkaloid, quinones, xanthoprotein and carboxylic acids were completely absent in all the tested extracts.

## DISCUSSION

The present study screened the phytochemical properties of eleven marine algae (*Acanthophora nayadiformis* (Delile) Papenfuss, *Ceramium virgatum* Roth, *Chaetomorpha antennina* (Bory de Saint-Vincent) Kützing, *Chondracanthus teedei* (Mertens ex Roth) Kützing, *Gracilaria debilis* (Forsskål) Børgesen, *Gracilaria idinthakaraiensis* Umamaheswara Rao, *Padina pavonica* (Linnaeus) Thivy, *Padina tetrastomatica* Hauck, *Sargassum linearifolium* (Turner) C. Agardh, *Spiridia hypnoides* (Bory) Papenfuss, and *Ulva lactuca* Linnaeus) with fourty four extracts and showed varied degree of phytoconstituents present. The presence or absence of the phyto-constituents depends upon the solvent medium used for extraction and the physiological aspect of the sea weeds selected.

In the present study phenolic compounds were noticed in thirty one extracts. In general, phenolic compounds possess specific physical, chemical and biological activities that make them useful as drugs. Phenolics were also responsible for the antimicrobial, anti-inflammatory, anti-feedant, anti-viral, anticancer and vasodilatory actions [18].

Saponins are considered as a key ingredient in traditional chinese medicine and are responsible for most of the observed biological effects. Saponins are known to produce effect on inflammation and it is commercially exported as dietary supplements [19-20]. In the present study saponins were noticed in thirty extracts and tannins in twenty eight extracts. Tannins were used therapeutically as antiviral, antibacterial, antiulcer and antioxidant agents. Many tannin containing drugs are used in the treatment of piles, inflammation, burns and as astringent [21]. Steroids of plant origin are known to be important for insecticidal, antimicrobial, antiparasitic and cardiotonic properties. Steroids also play an important role in nutrition, herbal medicine and cosmetics [22]. Proteins and coumarins were noticed in only four seaweed extracts. Coumarins has been used as anti-coagulant to treat lymphedema [23]. The various phytochemicals detected from the seaweeds are known to have beneficial importance in industrial and medicinal sciences [24-30]. Seaweeds with antimicrobial compounds have enormous therapeutical potential and from these results it can be concluded that the selected eleven seaweed extracts may be used as broad-spectrum antimicrobial, bioactive agent after extensive investigation. Further work will emphasize the isolation and characterization of active principles responsible for bio-efficacy and bioactivity.

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