RESEARCH PAPER | Botany | Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

Phytochemical Estimation of Selected Brown Seaweeds from Mulloor Coast, Kerala

KEYWORDS

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ABSTRACT *Seaweeds are the marine macro algae which play an important role in the marine ecosystem, functions as primary producers and provide food, and shelter to various aquatic organisms. From time immemorial marine algae have been considered as a food of delicacy and used as a part of diet.The use of marine algae as food for human, animals and aquaculture purposes is based on their high nutritive value arising from the richness of biochemical constituents such as proteins, carbohydrates, lipids, vitamins and trace elements. Phytochemical estimation provides a good information about the dietary values of seaweeds based on their abundance. In the present study, three brown seaweeds, such as Sargassum wightii, Sargassum cristaefolium and Padina tetrastromatica were selected from Mulloor coastal region of Thiruvananthapuram, Kerala to study the biochemical composition. The quantification of the metabolites like Carbohydrates, Proteins and Lipids were done using standard methods that revealed a high Carbohydrate content compared to protein and lipids. Among the three taxa studied high carbohydrate content was recorded in Sargassum wightii.*

Introduction

Marine macro algae, the most accessible marine resources of coastal zone,occupy a potentially important place as a source of biomedical compounds.The importance of marine algae as food is well known in many countries of Indo-Pacific region. About 2400 natural products have been isolated from macro algae belonging to the class Chlorophyceae, Phaeophyceae and Rhodophyceae (Faulkner, 2001).Like other plants,seaweeds contain various organic and inorganicsubstances which can benefit human health (Kuda *et al.,* 2002). The marine algae contain Minerals, Trace elements, Proteins, Carbohydrates, Lipids, etc. They constitutes an important sources of natural resources for fertilizers and play an important role in agriculture and horticulture (Fan *et al.,* 2011, Bierman and Rosen, 2013; Cordell and White, 2013; FAO, 2013). Seaweeds are of nutritional interest as they contain low calorie food, but rich in vitamins, minerals and dietary fibres (Ito K. *et al*., 1989).

Marine algae have been consumed in Asia since ancient times,but to a much lesser extent in the rest of the world. Many seaweed species are used in the industry, principally for the extraction of phycocolloids (Jiminez- Escrig and Sancez – Muniz, 2000).

Fresh and dry seaweeds are extensively consumed by people especially living in the coastal areas. Compared to land plants, the chemical composition of seaweeds has been poorly investigated and most of the available information deals only with traditionally Japanese seaweeds. Consumption of seaweeds can increase the intake of dietary fibre and decrease the occurrence of chronic diseases (Cancer, diabetes, cardiac disease etc.) which are associated with lower dietary fibre intake especially in western countries (Southgate D. A.T., 1990). In addition to vitamins and minerals seaweeds are also potentially good sources of proteins, polysaccharides and fibres.The nutritional properties of seaweeds are not yet noted and they are usually estimated from their chemical composition alone (Darcy-Vrillion *et al.,* 1993.).

Marine algae exhibit variations in their biochemical composition, so biochemical investigation is essential for the proper utilization of marine algal resources and for the cultivation of economically and nutritionally important marine algae.The main objective of the present study was the estimation of primary metabolites (Carbohydrate Protein, and Lipids) and analysis of minerals in selected macro algae of Phaeophyceae from Mulloor coastal regionfrom Thiruvananthapuram, Kerala.

MATERIALS AND METHODS

STUDY AREA

Kerala is situated on the South West coast of India between the Lat 8^0 20′ to 12^0 51′N and Long. 74^0 53′ E to 77^0 30′ E.The location chosen for collection from Kerala coast wasMulloor in Thiruvananthapuram district ($8^0$31′43″ N Lat. & $76^0$55′21″E Long.).

The coastline of Kerala is dissected with sandy stretches and natural rocks and also artificial granite sea walls which protrude in to the sea. The natural rocks are of laterite, granite or calcareous origin of different kinds. Climatic conditions along the Kerala coast were characterised by pre-monsoon, monsoon, and post monsoon season from December to April /May June to September & October to November respectively. The selected site in the present study was Mulloor, the southernmost part of Kerala coast, from Thiruvananthapuram district.The nature of the coast was mostly sandy, however in this area rocks of different kinds were found in patches in the sub tidal and intertidal regions. The total area covered for collection were about 1-2 km. Samples were available in a depth ofabout 1.2m. These were collectedat a distance of 5-6 m from the shore during low tides.

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SAMPLE PREPARATION

Fresh algal samples were handpicked and thoroughly washed first with seawater to remove all the impurities, sand particles and epiphytes. Then they were brought to the laboratory and washed with freshwater to remove salt from the surface of the samples and finally with distilled water. After draining off water using blotting paper excess water was removed from the algal materials. They were then shade dried for 7-10 days, powdered and stored in polythene containers for further analysis.

ESTIMATION OF PRIMARY METABOLITES

The phytochemical estimation of primary metabolites such as carbohydrates, proteins and lipids were done by following methods. The estimation of carbohydrate were done by Dubois *et al.*, 1956. Quantification of proteins were analysed by Lowry *et al.*, 1951. Lipids were estimated by Blackstock *et al.*, 1973. All the analysis were done in the powdered samples in triplicate on dry matter basis and the results were expressed in mg/g.

RESULTS AND DISCUSSION

PHYTOCHEMICAL ANALYSIS

Phytochemical estimation of Carbohydrates, Proteins and Lipids were done in *Sargassum wightii*, *Sargassum cristaefolium* and *Padina tetrastromatica*collected from Mulloor coastal region from Thiruvananthapuram district in Kerala during the month of November 2014. In the present study it was found that Carbohydrate content was maximum in all the three algal members compared to Proteins and Lipids. Among the members selected Carbohydrate content of *Padina tetrastromatica* was found to be more (78.16±0.8) compared to *Sargassum cristaefolium* (43.73±.08) and *Sargassum wightii* (30.23±0.2). This reduction in carbohydrate content may be due to the variation in the ecological conditions. All these samples were collected after the monsoon season. The vegetative growth of the thallus of these members were high during this period, which might have increased the carbohydrate content in them (Sarojini and Subbarangaiah, 1999). Almost 60%of the dry weight of seaweeds comprises of Carbohydrate.

Seaweeds were found to be a rich source of dietary fibre and protein compared to fruits and vegetables. The protein content also showed a similar pattern compared to the previous studies done by Kaliaperumal *et al.*, 1994. The protein content of seaweeds differs according to the species. *Sargassum wightii*recorded a high protein content (25.31±0.4) compared to *Sargassum cristae folium* (19.32±0.6) and *Padina tetrastromatica*(4.76±0.13). Generally, the protein fraction of brown seaweed are low (3-15 %) compared with that of green or red seaweeds (10 – 47%) of dry weight. The protein content of seaweeds also depends on seasonal period. Higher protein levels were observed during the end of the winter period and spring and lower amounts were recorded during summer months.

Generally lipids were found to be low in seaweeds. Lipids serves as a store of energy and provides much more energy through oxidation processes. Here it was found the pattern of lipid composition as *Sargassum cristae folium* (24.75±0.12) >*Sargassum wightii* (20.11±0.02) > *Padina tetrastromatica* (12.58±0.06). Fatty acids are important for human and animal health because they are precursors in the biosynthesis of eicosanoids, which are important bioregulators in many cellular processes. The fatty acids of seaweeds generally have linear chains containing an even number of carbon atoms with one or more double bonds (Shameel, 1990). Polyunsaturated fatty acids content are high as those of terrestrial vegetables. Lipids comprise 2-3 per cent of dry weight of *Porphyra* (Noda 1993).**(Fig: 1 &Table 1)**

CONCLUSION

Algae contain 80–90 per cent water and on a dry weight basis approximately 50 per cent are carbohydrates, 1–3 per cent are lipids and 7–38 per cent minerals. Protein content is highly variable (10–47 per cent) with a high proportion of essential amino acids. In the present study it was found among the three selected brown seaweeds, more than 75% carbohydrate content was recorded in *Padina tetrastromatica* and appreciable quantities were present in *Sargassum cristae folium* and *Sargassum wightii*. When coming to Protein and lipids, also showed their presence in an appreciable manner. The quantitative differences in the biochemical composition and minerals may be due to environmental factors, location, collection time, analytical methods used etc.

From the study it is clear that all these three members possess high energy and nutritive values and can be used as a part of the diet as a substitute to vegetables that contains these three metabolites for human consumption. Further research work have to be made to confirm and deeply understand about the active ingredients present in these group of algae and their role in industry and medicine.

ACKNOWLEDGEMENT

The authors are thankful to the authorities of CMFRI Library, Cochin for providing permission for reference work related to the topic and also thankful to Dr. Gopakumar and staff of CMFRI, Mandapam for extending help during the collection and identification. We would also wish to thank the principal and authorities of Department of Botany, St.Teresa's College, Ernakulum, Kerala.

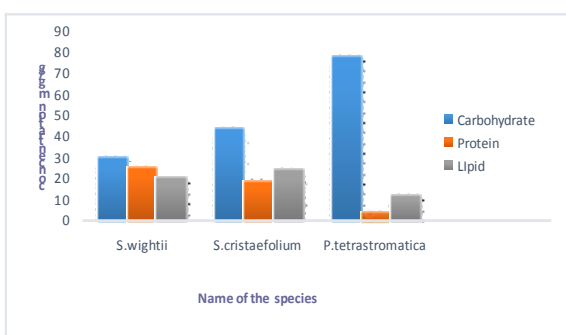

FIG:1 Nutritive composition of seaweeds

TABLE: 1 Carbohydrate,Protein and lipid content of seaweeds (as Mean±S.D in mg/g

S.NO	Nutritional Compositin	*Sargassum wightii*	*Sargassum cristaefolium*	*Padina tetrastromatica*
1	Carbohydrate	30.23±0.2	43.73±.08	78.16±0.8
2	Protein	25.31±0.4	19.32±0.6	4.76±0.13
3	Lipid	20.11±0.02	24.75±0.12	12.58±0.06

Volume : 5 | Issue : 9 | September 2015 | ISSN - 2249-555X

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