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BIOCHEMICAL COMPOSITION OF SEAWEEDS ALONG SOUTH EAST COAST OF TAMILNADU, INDIA

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ABSTRACT

The macroalgae showed varied quantities of biochemical constituents like total carbohydrate, total protein, amino acid, and total lipid. Studies were conducted to evaluate biochemical composition of two red seaweeds, *Chondrococcus hornemanni* (Lyngbye) Schmitz, and *Spyridia fusiformis* (Boergessen) Harvey. In this study, the relationship between the nutritive components of each species was established. Both seaweeds contained high amounts of proteins and minerals. *C.hornemanni* was also rich in magnesium, iron and sodium, while *S.fusiformis* as rich in calcium, potassium, phosphorus and zinc. Comparisons to corresponding nutrient values in other seaweeds and some commonly consumed local vegetables, both seaweeds showed their potential of being health food for human diets or as source of ingredients with high nutritional values.

Keywords: Protein, Carbohydrates, Lipids, *Chondrococcus hornemanni*, *Spyridia fusiformis*

INTROUDCTION

Marine algae in human consumption have been documented since 600 BC. Seaweed is suitable for human and animal feed, as well as for fertilizer, fungicides, herbicides, and

phycocolloids (algin, carrageenan, and agar) **[1]**. In marine ecosystems, macroalgae are ecologically and biologically important which provide medicinal constituents, nutrition and an accommodating environment for other living **[2]**. Because of these properties they are the most important organisms maintaining the ecosystem's stability. In recent years a considerable work being carried out on the chemical composition of marine algae **[3]**.

Seaweeds are major coastal resources which are valuable to human consumption and environment in many countries. Seaweeds were widely consumed, especially in Asian countries as fresh, dried, or ingredients in prepared foods. Macroalgal polysaccharides are used in the food, cosmetics, paints, crop, textile, paper, rubber and building industries. In addition, they are used in medicine and in pharmacology for their antimicrobial, antiviral, antitumor and anticoagulant properties **[4]**. Amino acids and carbohydrates are considered as important groups of cell constituents in algae. Reports on certain seaweeds showed that they contain significant amounts of proteins, vitamins and minerals essential for human nutrition **[5]**. Because of their high protein content, seaweeds have become more important for the food industry, especially in developed countries **[6]**. Seaweeds are traditionally consumed in the orient as part of the daily diet. The different species consumed provides a great nutritional value as source of proteins, carbohydrates, minerals and vitamins.

Compared to land plants, the chemical composition of seaweeds has been poorly investigated and most of the available information only deals with traditional Japanese seaweeds **[7, 8]**. The nutritional properties of seaweeds are not yet noted and they are usually estimated from their chemical composition **[9, 10]**. The chemical composition of seaweeds varies with species habitats, maturity and environmental conditions **[11]**. In the present study, biochemical composition of two seaweeds viz. was recorded by analyzing organic and inorganic content in them.

MATERIALS AND METHODS

Collection of Seaweeds

In the present study the red algae *C. hornemanni* and *S.fusiformis* was collected from Kanyakumarai, South East Coast of Tamilnadu, India. Collected seaweed was washed thoroughly with seawater to remove all the unwanted impurities, adhering sand particles and epiphytes. Then the sample was washed thoroughly using tap water to remove all the salt on the surface. The water was drained off and the seaweed was spread on blotting paper to remove excess water.

Preparation of Seaweed Powder

The seaweed was shade dried and then kept in an oven 60°C for 4 hrs dried seaweeds was ground to make powder approximately 100 g of seaweed powder was obtain from 1 kg of raw seaweed.

Total carbohydrate content was estimated following anthrone method **[12]**. Total soluble proteins were estimated from the fresh thalli of seaweeds according to the method **[13]**. From air dried algal sample total lipid content was determined **[14]**. The mineral content were subjected to acid digestion and analyzed through atomic absorption spectrophotometry following the procedures described by AOAC **[15]**.

RESULTS AND DISCUSSION

Carbohydrates, proteins and lipids, are the most important biochemical components in algal biomass. Carbohydrate is one of the important components for metabolism and it supplies the energy needed for respiration and other most important processes **[16]**. The values of carbohydrate, protein, lipid and minerals of the red algae are presented and the significant individual differences in the metabolite content of the algae are shown in the **Tables 1** and **2**. The concentration of carbohydrate was higher in *S. fusiformis* than that of *C. hornemanni*. The decrease in carbohydrates may be observed due to extensive growth of thallus of algae **[17]**.

Proteins have crucial functions in all the biological processes. Their activities can be described by enzymatic catalysis, transport and storage, mechanical sustentation, growth and cellular differentiation control **[18]**. In the present study, protein content showed remarkable variation in *S.fusiformis* than that of *C.hornemanni*. Burtin **[19]** investigated the higher protein content in green and red seaweeds. Manivannan *et al.* **[20]** described that the higher protein was found in *G. acerosa* (31.07 ± 0.33%) followed by *H. macroloba* (28.94 ± 0.68%), *H. tuna* (23.12 ± 0.86) and *C. glomerata* (20.38 ± 0.73%). However, it should be noted that the protein content of seaweeds varied not only between species but also between seasons **[21]**.

Lipids are rich in -C = O- bonds, providing much more energy in oxidation processes than other biological compounds. They constitute a convenient storage material for living organisms. In general, seaweeds exhibit low lipid contents **[22, 23]**. In macroalgae, the lipids are widely distributed, especially in several resistance stages **[24]**. The total lipid contents in both algae (*C.hornemanni* and *S. fusiformis*) were found relatively low. Of the marine algae studied, S. *fusiformis* contained

the highest amounts of lipids while *C.hornemanni* had the lowest lipid content.

The mineral contents of both seaweeds were shown in table.2. *S. fusiformis* was also rich in magnesium, iron, sodium and potassium while *S. fusiformis* was rich in, calcium, phosphorus and zinc. Mineral content also depends on the type of seaweed processing **[25, 26]**, and the mineralization methods used **[27]**. Based on the result, these seaweeds may serve as food supplements help to meet the recommended daily adult intakes of some minerals. From these results, it is concluded that the experimental algae contains high macro mineral (i.e., Na, K, Ca and Mg) contents, but low trace-mineral (i.e., Zn and Fe) contents. Since people consume food not in a single form but in mixed forms, our study of the interaction between food components and minerals as enhancers or inhibitors is ongoing. The present study indicates the possibility of both seaweed species being used as food supplements to improve the nutritive value for the human diet and animal feed.

Table 1: Organic Constituents in Seaweeds

S. No.	Minerals	*C. hornemanni* (Mean ± S.D)	*S. fusiformis* (Mean ± S.D)
1	Total carbohydrates	3.96 ± 0.021^{a}	4.10 ± 0.021^{b}
2	Total proteins	12.55 ± 0.050^{a}	14.84 ± 0.020^{c}
3	Total lipids	0.08 ± 0.002^{a}	0.91 ± 0.001^{a}
4	Total minerals	254.56 ± 57.78^{b}	191.17 ± 0.020^{d}
5	P- Value	0.000	0.000
6	F- Value	55.823	0.0000008313

Table 2: Inorganic Constituents in Seaweeds

S. No	Minerals	*C.hornemanni* (Mean ± S.D)	*S. fusiformis* (Mean ± S.D)
1	Calcium	19.800 ± 0.1000^{e}	11.970 ± 0.0100^{e}
2	Magnesium	5.680 ± 0.0100^{c}	6.077 ± 0.0153^{c}
3	Iron	0.883 ± 0.0208^{b}	0.984 ± 0.0025^{b}
4	Sodium	124.46 ± 0.1528^{g}	145.633 ± 0.1528^{g}
5	Potassium	24.400 ± 0.1000^{f}	112.533 ± 0.1528^{f}
6	Phosphorus	15.600 ± 0.1000^{d}	6.763 ± 0.0153^{d}
7	Zinc	0.223 ± 0.01^{a}	0.113 ± 0.0015^{a}
8	P- Value	0.000	0.000
9	F- Value	0.00007467	0.000001672

NOTE: All values in mg/100 g Dry Wt.

CONCLUSION

The results of the study suggest that the algae which are abundantly available in this ecosystem also have considerable potential of carbohydrates, proteins and lipids for their use as food and pharmaceutical industry as a source in preparation of nutrient supplements, medicine and fine chemical synthesis. The

protein content was higher; however, lipid values were lower. It was found that the two seaweeds studied appeared to be interesting potential sources of plant food proteins owing to their high protein level. In addition, they also showed the potential of being good sources of mineral supplements. The present study concluded that these seaweeds can provide dietary alternatives due to their nutritional values.

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