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Paper-58

BIOCHEMICAL COMPOSITION OF SOME MARINE ALGAE FROM MANDAPAM COAST, TAMIL NADU

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ABSTRACT

The present paper deals with some important biochemical components such as proteins, carbohydrates and lipids of 33 marine algae, growing abundantly on the coast of Ramanathapuram District.

The results indicated that the green algae (Chlorophyceae) has the maximum of protein content ranging from 6.9 to 25.8%, next in order comes the brown algae (Phaeophyceae) with 1.3 to 16.6% followed by red algae (Rhodophyceae) with 1.5 to 8.8%. The range of carbohydrate content was from 0.3 to 11.6% in green algae, 3.3 to 24.9% in brown algae and 1.8 to 67.0% in red algae. The lipid content ranged from 0.5 to 8.6% in green algae, 0.5 to 3.7% in brown algae and 0.4 to 6.1% in red algae.

The results of the study give an insight into the biochemical content of the algal species studied could be used to decide their suitability for the formulation of feed to fishes in aquaculture and to other animals.

INTRODUCTION

The importance of marine algae as a source of phytochemicals such as agar-agar, algin and carrageenan and their use as food, fertilizer, manure and pharmaceutical compounds has brought a new awareness in many countries. In recent years, studies were carried out on their chemical composition and also on the properties of their important biochemical products. As a result, some of algal species have been reported to be good alternative sources of aminoacids, proteins, carbohydrates, vitamins and minerals (Hoppe, 1979 and Pillai, 1956). The occurrence of aminoacids like methionine and triptophane not available in other vegetables was also reported (Lewis, 1967).

The marine algal resources of India can be termed as moderately rich (Michanek, 1975) and at present *Gelidiella acerosa and species of Gracilaria, Sargassum* and *Turbinaria* are being harvested for the

commercial production of agar-agar and sodium alginate. Surveys conducted in recent years along the coast of Gujarat (Chauhan and Krishnamurthy, 1968; Bhanderi and Trivedi, 1975; Sreenivasa Rao *et al.*, 1964 and Chauhan and Mairh, 1978), Tamil Nadu (Anon, 1978), Goa (Untawale and Dhargalkar, 1975) Maharashtra (Untawale *et al.*, 1979), Lakshadweep (Anon, 1979) and Kerala (Chennubhotla *et al.*, 1987) indicated that there is a very good resource of marine algae at several places along the Indian coast. As per the reports available a total of 680 marine algae occur in Indian waters (Anon, 1987). The Tamil Nadu coast especially the one from Rameswaram to Colachel has luxuriant growth of marine algae where 22,044 tonnes of algae (fresh weight) is expected to be present over an area of 17,120 ha (Subbaramaiah *et al.*, 1979).

Considering the availability of algae and the contribution of marine algae as food, an attempt has been made to study their important biochemical composition in order to decide their suitability for the formulation of feed for fishes in aquaculture and to other animals.

MATERIALS AND METHODS

Seaweeds comprising 16 green algae (Chlorophyceae), 7 brown algae (Phaeophyceae) and 10 red algae (Rhodophyceae) were collected from the intertidal area of Rameswaram, Pamban, Pudumadam and Kilakarai located on the coast of Ramanathapuram District along the Gulf of Mannar.

The fresh weeds were washed thoroughly with distilled water, moisture removed by using blotting paper and dried up in an oven at 70°C to constant weight. The loss in weight was taken into account for the determination of water content.

The dried plants were powdered using mortar and pestle. The total carbohydrate content was estimated by the method of Dubois *et al.* (1956). The protein was determtned by the method of Lowry *et al.* (1951). The crude liquid was extracted in soxhlet apparatus by using the mixture of chloroform and methanol (2:10/v) and estimated gravimetrically as described by Krishnamoorthy *et al.* (1980)

RESULTS

Proteins: As shown in Table 1, the data indicate that the green algae had high amount of protein compared to other algal groups. It fluctuated between 6.9 and 25.8% among the green algae. The protein content in brown algae varied between 13.0% and 16.6%. Among the red algae the protein content ranged from 1.5 to 8.8%.

Carbohydrate: Among the three algal groups analysed, brown and red algae had higher carbohydrate content and green algae had lesser content. The carbohydrate content in the brown algae ranged from 3.3 to 24.9%. Among the red algae while *Gelidiella acerosa* (57.0%) had maximum quantity of carbohydrate the minimum content was found in *Jania rubens* (1.8%) and *Centroceras clavulatum* (4.8%).

Lipid: In green algae, the lipid content ranged from 0.5 to 8.6%. in brown algae from 0.5 to 3.7% and in red algae from 0.4to 6.1%.

DISCUSSION

Biochemical studies on algal protein, Peptides and free aminoacids were made extensively by Lewis (1962 and 1963). While reviwing his studies he pointed out that the Indian marine algae have all the essential aminoacids needed in human diet.

In India much attention has been paid on commercially important carbohydrate such as agar and sodium alginate and very few studies made on other biochemical products such algal proteins and vitamins. Parekh and Visweswara Rao (1964) recommended a method to extract protein in bulk quantity from the green alga, *Ulva rigida* and Subbaramaiah (1976) studied on vitamins present in algae. Dave *et al.* (1977) assessed the possibility of

Table 1. *Biochemical composition of seaweeds (Dry weight basis)*

Name of alga	Water content %	Protein %	Carbohydrate %	Lipid %
CHLOROPHYCEAE				
1. *Enteromorpha compressa*	91.4	23.8	6.2	6.1
2. *Ulva lactuca*	87.3	25.8	8.7	5.2
3. *U. reticulate*	79.4	24.4	11.6	5.3
4. *Chaetomorpha antennina*	89.1	19.7	6.4	8.6
5. C. *linum*	90.2	16.7	7.6	8.1
6. *Cladophora* sp.	79.1	9.2	6.6	6.5
7. *Caulerpa peltata*	89.4	24.4	1.3	1.6
8. *C. racemosa* var. *macrophysa*	96.4	24.8	8.7	0.8
9. *C .scalpelliformis*	88.9	25.2	10.7	7.6
10. *C. taxifolia*	89.2	23.6	9.7	4,1
11. *C. sertularioides*	81.6	22.7	9.9	4.6
12. *Valoniopsis pachynema*	84.3	18.8	2.5	0.7
13. *Bryopsis plumosa*	72.8	19.2	10.1	2.0
14. *Halimeda gracilis*	44.8	least	least	least
15. *Cladophoropsis zollingeri*	51.9	10.3	0.3	0.5
16. *Codium decorticatum*	89.6	6.9	10.0	4.2
PHAEOPHYCEAE				
17. *Sargassum wightii*	80.4	16.3	24.9	1.2
18. *S. myriocystum*	64.4	15·6	23.8	0.5
19. *S. ilicifolium*	70.6	15.1	24.0	1.1
20. *Stoechospermum marginatum*	79.6	14.9	15.4	3.7
21. *Hormophysa triquetra*	61.0	16.6	3.3	0.6
22. *Padina gymnospora*	71.3	13.0	13.2	1.3
23. *Turbinaria conoides*	72.4	15.2	14.0	3.6
RHODOPHYCEAE				
24. *Jania rubens*	39.4	1.5	1.8	0.4
25. *Centroceras clavulatum*	66.9	3.8	4.8	3.4
26. *Hypnea valentiae*	87.5	6.1	37.8	6.1
27. *Gracilaria edulis*	85.5	3.9	45.8	2.4
28. *G. corticata*	79.3	6.1	45.5	6.0
29. *G. crassa*	88.4	4.3	30.4	0.9
30. *Grateloupia lithophila*	72.0	5.8	36.9	0.7
31. *Gelidiella acerosa*	86.8	8.8	57.0	3.6
32. *Acanthophora spicifera*	86.1	4.8	29.7	0.5
33. *Laurencia papillosa*	87.9	4.3	11.6	0.6

seaweeds to be used as a supplementary animal feed. The seaweed meal prepared from *Sargassum* and the results of its feeding trials on chicks, sheep and cattle are given by Dave *et al.* (1979). The study was mainly to find out the effect of algal-feed on the body weight of the animals. Seaweeds are also widely used for human consumption and they are eaten as salad, curry, soup or vegetables in many countries (Chapman and Chapman, 1980). Some of the edible seaweeds occurring in India are *Ulva, Enteromorpha, Chaetomorpha, Caulerpa, Gracilaria* etc. (Umamaheswara Rao, 1973).

On viewing the ever growing demand for proteinaceous food for human consumption and for other purposes, it is necessary to properly utilize this non-conventional resources. The present study revealed that seaweeds like *Ulva lactuca, U. reticulata,* species of *Caulerpa, Hypnea valentiae* and species of *Sargassum* which are available abundantly along our coastline could be used as additional sources of protein and carbohydrate.

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