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Biochemical composition of some selected seaweeds from Tuticorin coast

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ABSTRACT

Seaweeds have been used as an important source of food because of their biochemical composition. In the present study, biochemical composition of edible seaweeds was investigated. Totally six seaweed samples (Enteromorpha compressa, E. intestinalis, Dictyota dichotoma, Turbinaria ornata, Gracilaria corticata and Hypnea musciformis) were analyzed. Quantitative analysis of protein content ranged from 9.47% and 14.68%. High protein content was found in the brown seaweed T. ornata and low protein content in the red seaweed G. verrucosa. Carbohydrate content of seaweeds ranged from 10.63% and 28.58%. The maximum carbohydrate content was recorded in the green seaweed Enteromorpha intestinalis and the brown seaweed Dictyota dichotoma recorded the minimum value. The Lipid content of seaweeds varied from 3.15% to 5.30%. The maximum lipid content was recorded in green seaweed E. intestinalis and the red seaweed G. verrucosa recorded the minimum content.

Keywords: *Enteromorpha compressa, Enteromorpha intestinalis, Dictyota dichotoma, Turbinaria ornate, Gracilaria corticata, Hypnea musciformis*

INTRODUCTION

From the time immemorial the seaweeds have been closely associated with human life and are being exhaustively used in numerous ways as a source of food, feed, fertilizer, medicine and chiefly for economically important phycocolloids (Levering *et al*., 1969; Chapman, 1970). In India, seaweeds are mainly used for the commercial production of phytochemicals namely agar, agarose, carrageenan and seaweed liquid fertilizer (Ramalingam *et al*., 2000).

Knowledge of the chemical composition of marine macroalgae is both important for the assessment of nutritional value to marine invertebrate or vertebrate herbivores (Hawkins and Hartnoll, 1983), for the evaluation of potential sources of protein, carbohydrate and lipid for commercial use or for possible human consumption (Chapman and Chapman, 1980).

Seaweeds are use as food and fertilizer in many part of the world. Therefore, studies on the proximate composition of seaweeds are important to determine their nutritive value (Dawes, 1981). Dhargalkar *et al*., (1980) have estimated the protein, carbohydrate and organic carbon content in 43 marine algal species collected from different marine stations along the Maharashtra coast and observes more protein and carbohydrate content in Chlorophycean and Rhodophycean then Phaeophycean algae. Lipid content of some seaweed of Saurashtra coast (Parekh *et al*., 1983) and Goa coast (Sumitra Vijayaragavan, 1980) has been also reported. Reeta Jeyasankar *et al.,* **(**1990) have also estimated protein, lipid and carbohydrate contents of 23 species of green algae collected from the Mandapam area of the Tami Nadu coast.

Seasonal variation in biochemical constitutions of *Sargassum wightii* with special reference to yield in alginic acid content from Pudumadam has been reported (Reeta Jeyasankar, 1990). Selvaraj and Sivakumar (1998) studied biochemical composition of three species of *Sargassum* from Pamban coast. Seasonal variation in growth and biochemical constitutions such as protein, carbohydrate and lipid in *Hypnea valentiae, Acanthophora spicifera,*

Laurencia papillosa, Enteromorpha compressa, Ulva lactuca and *Caulerpa racemosa* were observed for one year from Mandapam coast (Kaliaperumal *et al* ., 2002).

Hannah Vasanthi and Rajamanikam (2003) studied variations in the chemical constituents of the marine red alga *Hypnea valentiae* from Tuticorin and Mandapam coast. Marine algae are the excellent source of bioactive compounds such as carotenoids, dietary fibre, protein, essential fatty acids, vitamins and minerals (Viron *et al*., 2000, Sanchez-Machado *et al*., 2002, Fayaz *et al*., 2005). Fayaz *et al*., (2005) suggested the utility of *Kappaphycus alvarezzi* for various nutritional products including antioxidant for use as health food or nutraceutical supplement.

MATERIALS AND METHODS

2.1. Collection of Sample

Two green seaweeds (*Enteromorpha compressa* and *E. intestinalis)*, two brown seaweeds *(Dictyota dichotoma and Turbinaria ornata)* and two red seaweeds *(Gracilaria corticata* and *Hypnea musciformis)* were collected from the Tuticorin coast. Exactly 1 kg (wet weight) of each species were taken and the sample was thoroughly washed with seawater to remove epiphytes and dirt particles, followed by shade-drying at 70°C to obtain a constant weight and pulverized in the grinder (size 2mm). The ground samples were sieved to get uniform particle size, then kept in air tight container and stored in a freezer until further analysis.

2.2. Biochemical Analysis

2.2.1. Estimation of Carbohydrate

The carbohydrate content was estimated by Dubois method (Dubois, 1956). 20 mg of dried seaweeds powder was taken and to this 1 ml of 4% phenol solution and 5 ml of concentrated sulphuric acid were added. After that, they kept in a dark room for 30 minutes. The colour intensity developed was read in a spectrophotometer at 490 nm. Sugar content was calculated by referring to a standard D- Glucose and the results have been expressed as mg/g sugar.

2.2.2. Estimation of Protein

The protein content was estimated by Biurette method (Raymont *et. al* ., 1964). To 5 mg of dried powdered sample, 1ml of distilled water followed by 4ml of biurette reagent were added and incubated for 30 min in room temperature. Then the mixture was centrifuged for 10 min at 4000 rpm. The supernatant was collected and the optical density was measured in a Spectrophotometer at 540 nm. The protein content was calculated using BSA as standard and expressed as mg/g protein.

2.2.3. Estimation of Lipid

The lipid content was estimated using chloroform-methanol mixture as described by Folch et al. (1957). To 400 mg of sample, 5 ml of Chloroform-methanol (2:1) mixture was added. The mixture was incubated at room temperature for 24 h. After incubation, mixture was filtered using a filter paper. The filtrate was collected in a 10 ml pre-weighed beaker. The Chloroform-methanol mixture was evaporated on a hot plate leaving a residue at the bottom of the beaker. The beaker with the residue and the weight of the empty beaker was calculated to know the weight of the lipid present in the sample.

RESULTS AND DISCUSSION

3.1. Protein

Quantitative analysis of protein content ranged from 9.47% and 14.68%. Higher protein content was found in the brown seaweed *T. ornata* and lower in the red seaweed *G. verrucosa* (**Fig.:** 1). Similarly Dinesh *et al*., (2007) recorded highest protein content in brown alga *Tubinaria ornata* from Gulf of Mannar region. Selvi *et al*., (1999) reported more protein content in red alga *Hypnea valentiae*. Mairh *et al*., (1991) reported 22.22% of crude protein in *Ulva fasciata*. Protein content varied among different genera and also in different species of the same genus (Dhargalkar *et al*., 1980). This change may be of spatial or temporal in nature. However, it is largely attributed to the surrounding water quality as reported by Dave and Parekh (1975).

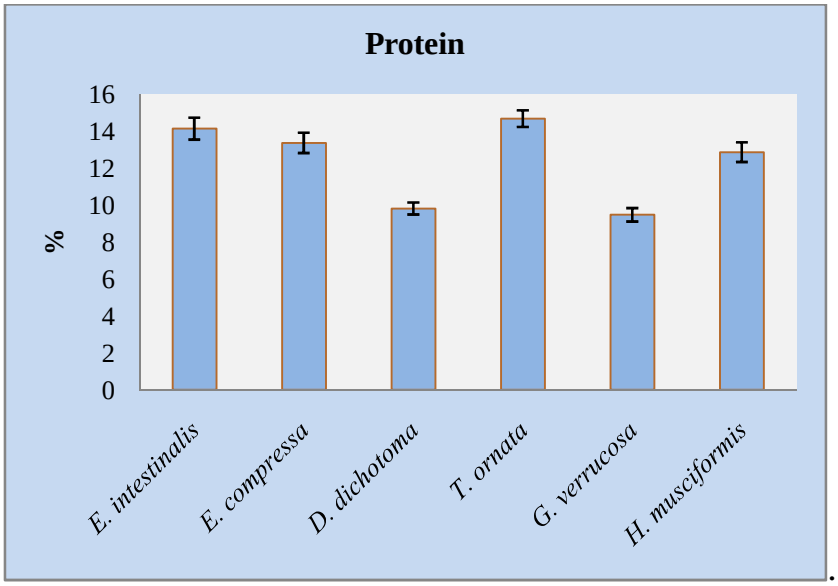

Fig. 1: Protein content of seaweeds from Tuticorin coast

3.2. Carbohydrate

Carbohydrate content of seaweeds ranged from 10.63% and 28.58%. The maximum carbohydrate content was recorded in the green seaweed *Enteromorpha intestinalis* and the brown seaweed *Dictyota dichotoma* recorded the minimum value (**Fig.**: 2). Similarly Chakraborthy and Santra (2008) recorded higher carbohydrate in the green seaweeds *Ulva lactuca* (35.27%) and *E. intestinalis* (30.58%). Kaliaperumal *et al*. (1987) also reported similar kind of results that the green seaweed have high carbohydrate than the red and brown. Dhargalkar *et al*. (1980) from the Maharashtra coast and Shoba *et al*., (2001) Kovalam coast noted maximum value of carbohydrate content in Rhodophycean members than in Phaeophycean and Chlorophycean members. In the present study, the contrastingly Chlorophycean members showed high carbohydrate content than Rhodophycean and Phaeophycean members. The high content of carbohydrate in red algae might be due to higher phycocolloid content in their cellwalls (Dhargalkar *et al.*, 1980).

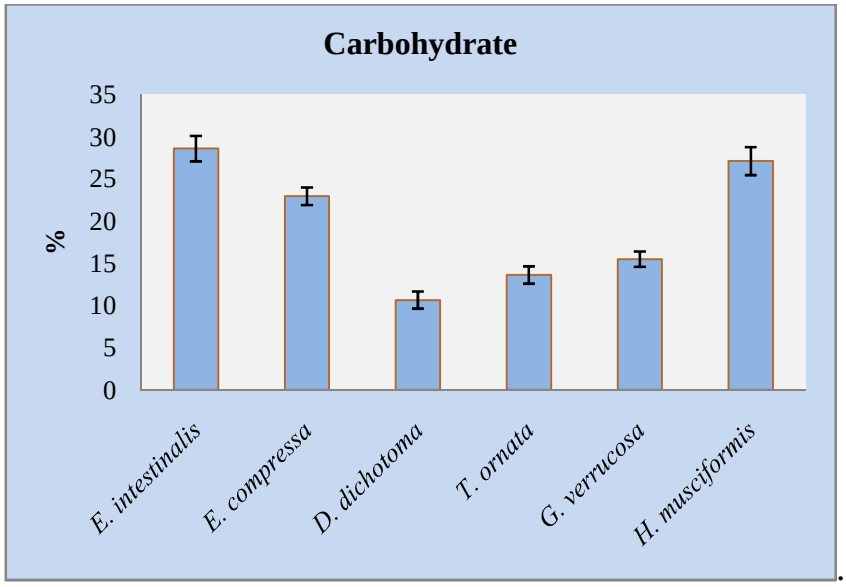

Fig. 2: Carbohydrate content of seaweeds from Tuticorin coast

3.3. Lipid

The Lipid content of seaweeds varied from 3.15% to 5.30%. The maximum lipid content was recorded in green seaweed *E. intestinalis* and the red seaweed *G. verrucosa* recorded the minimum content (**Fig.**: 3). Similarly Chakraborthy and Santra (2008) have recorded higher lipid content in the same green seaweeds *E. intestinalis* (7.13%). Muthuraman and Ranganathan (2004) have also recorded highest lipid content in green alga *Ulva fasciata*.

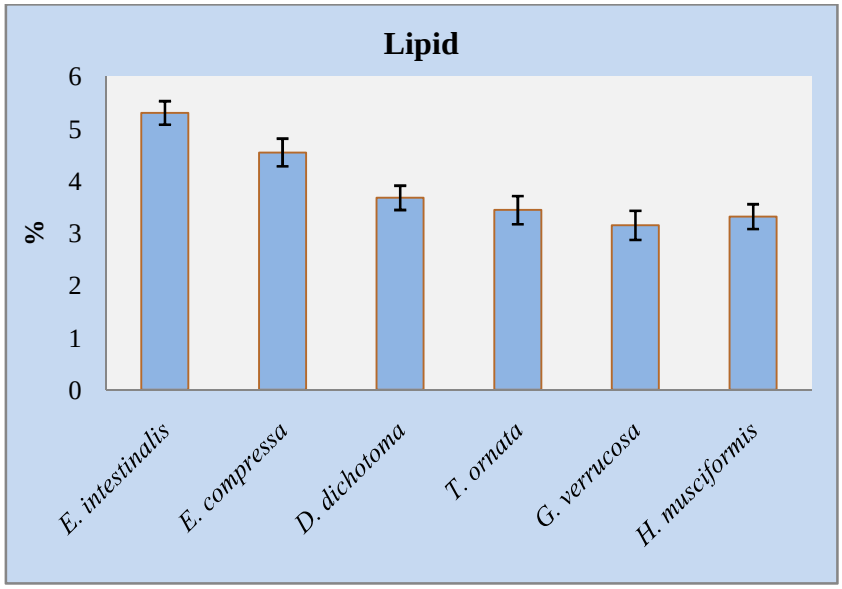

Fig. 3: Lipid content of seaweeds from Tuticorin coast

CONCLUSION

Thus results of the present study conclude that seaweeds are a potential health food in human diets and may be of use to the food industry as a source of ingredients with high nutritional value. Seaweeds can provide a dietary alternative due to its nutritional value and its commercial value can be enhanced by improving the quality and expanding the range of seaweed-based products. More research is needed to evaluate the nutritional value of marine algae, seaweeds can be regarded as an under-exploited source of health benefit molecules for food processing and neutraceutic industry.

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