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ORIGINAL ARTICLE

BIOCHEMICALS STUDIES ON GREEN, BROWN AND RED SEAWEEDS OF MANDAPAM COAST (SOUTH EAST COAST OF INDIA)

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ABSTRACT

Seaweeds are useful to man as food, biofertilizer, feed, fodder and as a source of bioactive compounds. Seaweeds and their organic extracts contain a great variety of bioactive substances. The present investigation was carried out to understand the biochemical of seaweeds from Madapam coast. In this study, four different seaweeds were analysed with the biochemical composition. The total protein was high (16.16± 0.78) in *Caulerpa taxifolia* and low (11.34 ± 0.79) in *Gracilaria biknahiae*. The maximum carbohydrate was recorded in (27.69 ± 0.70) *Caulerpa taxifolia* and maximum level lipids was observed in (0.46 ± 0.001) in *Sargassum weightii.* The present results suggest that all the seaweed species have a greater biochemical potential were proved.

Keywords: *Bombyx mori*, Seaweeds, Biochemicals, Chlorophyll 'a', Total Chlorophyll

1.INTRODUCTION

Algae are a large and diverse group of simple plant like organisms ranging from unicellular to multicellular forms. The largest and most complex marine algae are called seaweeds. Seaweeds are a group of macroscopic marine algae that form the biomass in the intertidal zone and the term seaweeds and sea vegetables are used interchangeably (Wong and Cheung, 2002). Seaweeds are multicellular and macrothallic. Seaweeds are salt water tolerant, land dependent plants growing almost exclusively at narrow interface where land and sea meet. They are photosynthetic and must be firmly attached to a stratum to stay in the photic zone where they can receive sufficient sunlight (Smith, 2004). Seaweeds are also called the benthic marine algae, which just mean attached algae that live in the sea. The seaweeds are used in the food, manure, nutraceuticals, cosmetics and pharmaceutical sectors due to its contribution of important economical and dietary resources, which lead to significant attention to the world. The phytochemicals from marine algae are extensively used in various industries such as food, confectionary, textile, pharma- ceutical, dairy and paper, mostly as gelling, stabilizing and thickening agents (Soad M. Mohy El-din and Amani M.D. El- Ahwany, 2015). In the past years, nutritional evaluation of seaweeds concentrated mainly on the red than the brown or green seaweeds (Siddique *et al.*, 2013). Hence, the present attempt has been made to study the biochemicals nature evaluated the total protein, carbohydrate, lipid and chlorophyll contents in four seaweeds from the Mandapam coast of India,

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2.MATERIALS AND METHODS

The four species of seaweeds *U lva lactuca, Caulerpa taxifolia, Sargassum weightii and Gracilaria biknahiae* collected from Mandapam (Rameswaram) coast. The sample was washed with tap water to remove dirt, sand and was shade dried until constant weight was obtained. It was powdered in an electric mixer and powder was stored in refrigerator for future use.

Extraction of seaweed

500g of the dried seaweed powder was placed in soxhlet apparatus (Perfit, India) and subjected to successive extraction using methanol and macerated to form an aqueous extract. Subsequently, extracts were filtered and the filtrate was evaporated using vacuum evaporator (Perfit, India) under reduced pressure at ≤ 50° C temperature. The crude extract obtained after evaporation was stored in desiccators. After extraction with various solvent remaining residue of leaves was discarded and extract was weighed. After the extraction, the various biochemical test were analysed.

The estimation of total proteins was done by the method of Lowry *et al*. (1951). The estimation of carbohydrates was done by the method of Dubois *et al.* (1956). The estimation of total lipids was done by the method of Sato (1988).

Estimation of Chlorophyll

500mg seaweed powder material was taken with 10 ml of 80% acetone. The samples were centrifuged at 3000 rpm for 15 minutes. The supernatant was stored. The residue was re-extracted with 5 ml of 80% acetone. The extract was utilized for chlorophyll estimation. Absorbance was read at 645 and 663 nm in the UV-spectrophotometer Arnon (1949)**.** Chlorophyll a, Chlorophyll b and total chlorophyll is expressed as mg/g.dry wt of seaweed.

3.RESULTS

The *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae* were analyzed with protein, carbohydrates, lipids, chlorophyll a, chlorophyll b, total chlorophyll. The level of protein observed in the *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae*. The total protein was high (16.16± 0.78) in *Caulerpa taxifolia* and low (11.34 ± 0.79) in *Gracilaria biknahiae*. The *Ulva lactuca* and *Sargassum weightii* were recorded with 12.80 ± 0.79 and 15.18± 1.10 respectively (Fig.1). The maximum carbohydrate was recorded in (27.69 ± 0.70) *Caulerpa taxifolia* and low in (15.75 ± 0.10) *Sargassum weightii*. The other algae of *Ulva lactuca* and *Gracilaria biknahiae* was 22.95 ± 0.80 and 22.92±0.68 respectively(Fig.2). Maximum level lipids was observed in (0.46 ± 0.001) in *Sargassum weightii* and low (0.28 ± 0.002) in *Gracilaria biknahiae*. The *Ulva lactuca* and *Caulerpa taxifolia* values were 0.31± 0.002 and 0.30± 0.003 respectively (Fig.3). The maximum total chlorophyll content was recorded (0.081± 0.0046) in *Caulerpa taxifolia* and minimum was in (0.071± 0.0016) *Sargassum weightii*. The values were 0.077± 0.0019 and 0.072± 0.0018 respectively on *Ulva lactuca* and *Gracilaria biknahiae* (Fig.4). The maximum chlorophyll 'a' content was recorded (0.050± 0.0025) in *Caulerpa taxifolia* and minimum was in (0.039± 0.0001) *Sargassum weightii*. The values were 0.046± 0.0017 and 0.041± 0.0016 respectively on *Ulva lactuca* and *Gracilaria biknahiae*(Fig.5).

The maximum chlorophyll 'b' content was recorded (0.033± 0.0008) in *Caulerpa taxifolia* and minimum was in (0.020± 0.0003) *Sargassum weightii*. The values were 0.030± 0.0007 and 0.024± 0.0006 respectively on *Ulva lactuca* and *Gracilaria biknahiae* (Fig.6).

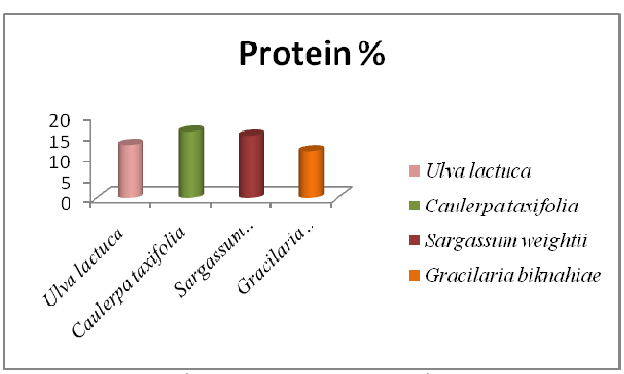

Fig. 1 Protein level of *Ulva lactuca, Caulerpa taxifoia, Sargassum weightii* and *Gracilaria biknahiae*

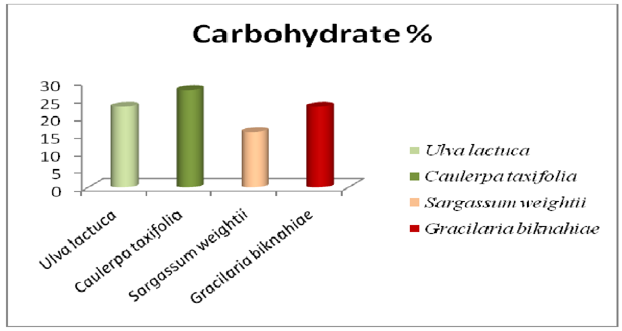

Fig. 2 Carbohydrate level of *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae*

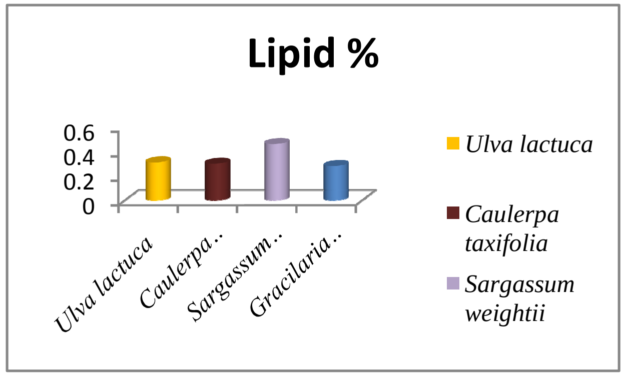

Fig. 3 Lipid level of *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae*

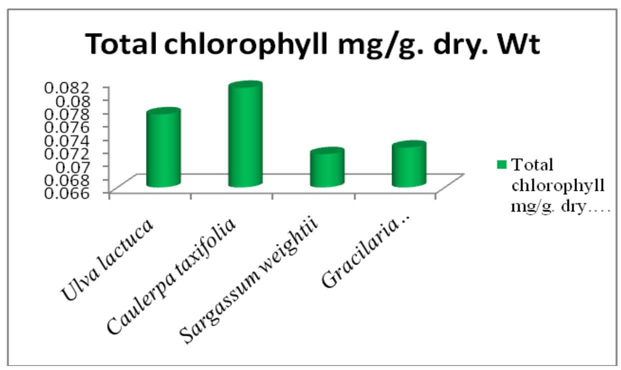

Fig. 4 Total chlorophyll level of *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae*

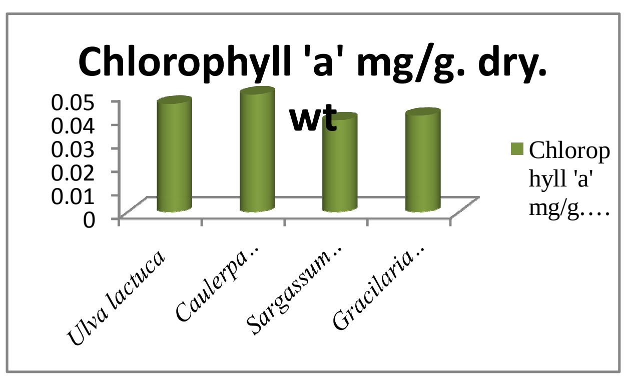

Fig. 5 chlorophyll 'a' level of *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae*

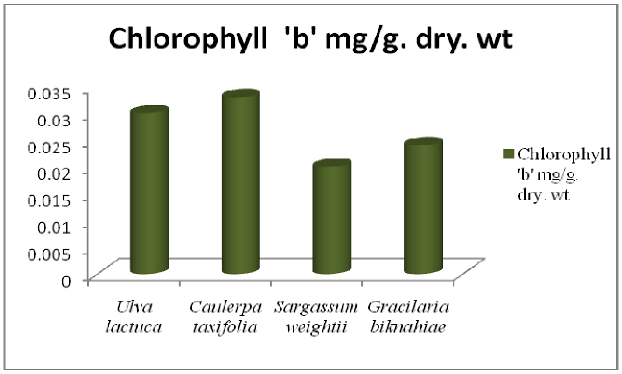

Fig. 5 chlorophyll 'a' level of *Ulva lactuca, Caulerpa taxifolia, Sargassum weightii* and *Gracilaria biknahiae*

4.DISCUSSION

Seaweeds are potential sources of bioactive compounds with immense pharmaceutical, biomedical and nutraceutical importance. They are considered as low calories foods with high content of minerals, vitamins, proteins and carbohydrates by Veena *et al*. (2006) and Subramanian *et al*. (2014)**.** Studies on the biochemical constituents in green algae have been carried out by Thinakaran *et al*., (2012) from different parts of Indian coast**.** Expect few works not much work has been done on *Halimeda tuna, Enteromorpha intestinalis* and *Caulerpa racemosa* (Subramanian *et al*., 2014). In the present study *Caulerpa taxifolia* higher value for carbohydrate whereas as lower values for lipid when compared to *Ulva lactuca*. Similarly *Caulerpa racemosa* showed higher value for carbohydrate whereas as lower values for protein and lipid when compared to *Caulerpa taxifolia* by Murugaiyan *et al*. (2012); Kokilam and Vasuki (2013) and Subramanian *et al*.(2014)**.** Similarly, *Ulva fasciata* also showed more or less similar values for protein and lipid whereas lower value for carbohydrate when compared to the species from Palk bay and Gulf of Mannar (Rameshkumar *et al*., 2012)**.** The present study the protein content varied from 11.34± 0.79 to 16.16 ± 0.78. Similarly, the protein content varied from 15.4% to 17.9% DW in *Ulva pertusa* and *Ulva intestinalis* respectively Benjama and Masniyom (2011). This result is also consistent with the earlier reports Fleurence (1999). It also described that *Ulva* sp had protein content within the range of 10-20% (DW). In the present study higher values of total chlorophyll was recorded in *Caulerpa taxifolia* and *Ulva lactuca*. The similar findings were reported in higher values for total chlorophyll and carotenoids in *Ulva fasciata* (Saranya, 2013).

5.CONCLUSION

The present study, it can be concluded that marine macro algae are a rich source of structurally novel and biologically active metabolites. Secondary or primary metabolites produced by these macro algae may be potential bioactive compounds of interest in the pharmaceutical industry and medicinal compounds. The present investigation presents adequate data on the phytochemical constituents of biochemical composition and photosynthetic pigments of the four seaweed extracts for the synthesis of novel antibiotics. The present results suggest that all the species have a greater biochemical potential, which could be considered for future applications in food production or cosmetic industry.

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