ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2022; 8(10): 197-200
www.allresearchjournal.com
Received: 16-08-2022
Accepted: 20-09-2022

Dr. Anupama Rai
PGT (Chemistry), Directorate of Education, Andaman and Nicobar Administration, Port Blair, Andaman and Nicobar, India

Corresponding Author:
Dr. Anupama Rai
PGT (Chemistry), Directorate of Education, Andaman and Nicobar Administration, Port Blair, Andaman and Nicobar, India

Biochemical composition of seaweeds in little Andaman of Andaman and Nicobar islands

Dr. Anupama Rai

Abstract
Seaweeds are the macrophyte marine algae; a primitive variety of plants absent of true roots, steam and leaves. The term seaweed gives the erroneous impression that it is a useless plant but seaweeds are miracle plants of the sea and extremely useful plants. Seaweeds were mainly utilized for food, medicine, fertilizers etc. In this study, four seaweed species were identified *viz*., red seaweed species *Gracilaria corticata* and *Hypnea musciformis*, Green seaweed species *Ulva reticulata* and Brown seaweed species *Sargassum cinctum*. The biochemical composition of those species studied for Crude Protein, Fat, Carbohydrate, Moisture and Ash content. The values of biochemical composition were varies from; crude protein: 12.23±0.06-16.61±0.04%, lipid content: 0.22±0.05-3.12±0.01%, carbohydrate content: 46.76±0.02-58.18±0.06%, moisture content: 2.78±0.03-7.92±0.06 and ash content: 21.88±0.0432.13±0.05%, which represents these available seaweed resources in future could become one of the supreme important resource and so in future this scenario ultimately causes the utilization and demand of seaweed was goes on increasing, not only along the India, but also from all over the world.

Keywords: Seaweed, biochemical composition, protein, lipid

Introduction
Seaweeds have been used since ancient times as food, fodder, fertilizer and as source of medicine today seaweeds are the raw material for many industrial productions like agar, algin and carrageenan but they consumed as food in Asian countries (Mishra *et al.* 1993) [1]. They are nutritionally valuable as fresh or dried vegetables, or as ingredients in a wide variety of prepared foods (Robledo and Pelegrin, 1997) [2]. In particular, certain edible seaweeds contain significant quantities of protein, lipids, minerals and vitamins (Wong, *et al.* 2000; Norziah and Ching, 2002 and Sanchez-Machado, *et al.* 2002) [3-5].

Seaweeds are the macrophyte marine algae; a primitive variety of plants absent of true roots, steam and leaves. The term seaweed gives the erroneous impression that it is a useless plant but seaweeds are miracle plants of the sea and extremely useful plants. Majority of seaweed species are growing in the shallow water. Major seaweeds belongs to three division green algae (Chlorophyta), brown algae (Phaeophyta) and red algae (Rhodophyta). Over all 900 species of green seaweed species, 4,000 species of red seaweed and 1500 species of brown seaweed found in nature.

Seaweeds are rich source of proteins, carbohydrates, fiber, lipids, vitamins and minerals also entitled as a medicinal food of the 21st century. Seaweed genus *Gracilaria corticata* and *Hypnea musciformis* are almost extensively huge available during all months of seaweed growing season at Andman and Nicobar. The genus Gracilaria and Hypnea (Rhodophyta) befalls naturally in tropical and subtropical coastal areas of the world and it has been regularly considered as one of the best auspicious candidates as an alternative source of nutrients for aqua feeds, mostly herbivorous gastropods (Capinpin and Corre, 1996; Reyes and Fermin, 2003; Vieira *et al*., 2005) [6, 7, 8] but also sea urchin (Shpigel *et al*., 2005) [9], fish (Neori *et al*., 2000; Valente *et al*., 2006) [10, 11], shrimp (Di Silva and Barbosa, 2009)[12] and Patel *et al.* (2020) [24].

Most studies on nutritional evaluation were carried out from all parts of the world. Hence, the present study is concentrated on different groups of seaweeds and its proximate composition of Andman and Nicobar region.

Study site

The islands extend from 6° to 14° North latitudes and from 92° to 94° East longitudes. The Andamans are separated from the Nicobar group by a channel (the Ten Degree Channel) some 150 km (93 mi) wide. The highest point is located in North Andaman Island (Saddle Peak at 732 m (2,402 ft)). The Andaman group has 325 islands which cover an area of 6,170 km^2 (2,382 sq mi) while the Nicobar group has only 247 islands with an area of 1,765 km^2 (681 sq mi).

Materials and Methods

Fresh marine red seaweed species *Gracilaria corticata* and *Hypnea musciformis*, Green seaweed species *Ulva reticulata* and Brown seaweed species *Sargassum cinctum* were collected from Andman and Nicobar region. The collected seaweeds were washed systematically with freshwater in order to eradicate other marine micro and macro organisms, epiphytes after removing fixed on herbarium sheet for preparation of identification of specimen and using the standard literature for identification. The seaweeds species was then dried under at room temperature and dried seaweeds samples were ground well by using mixer grinder and sieved using a nylon sieve in order to remove seaweed fiber and prepared fine powder.

Proximate composition analysis

Proximate composition of collected seaweed samples were analyzed by using of AOAC standard methods (Anon., 2000) [13]. The micro-kjeldahl digestion and distillation method was use for the crude protein estimation. The Soxhlet apparatus was use for the crude lipid estimation. Ash and Moisture content were determined using the incubator and muffle furnace.

Crude protein (CP)

The protein concentration of the samples was assessed as nitrogen content by micro kjeldahl method after acid digestion. The nitrogen content of the sample was estimated constitutively by the semi-automatic micro-kjeldahl digestion and distillation apparatus (Gerhardt, Germany) than titration. The crude protein was estimated by multiplying nitrogen percentage by a constant factor of 6.25. Crude protein (%) = N2 (%) X 6.25.

Crude lipid

Crude lipid was investigated through the ether extraction by Soxhlet apparatus with petroleum ether (Boiling point 40-60°C) as the solvent. The crude lipid concentration were resolute gravimetrically following overnight drying of extracts by using of oven (80 °C).

$$\text{Crude lipid/Fat (\%)} = \frac{\text{Weight of the ether extract}}{\text{Weight of the sample}} \times 100$$

Moisture

The moisture content of the feed ingredients, diet and animal were determined by takings known weight of the sample in the petri dish and drying it in a hot air oven at 100-105 °C till a constant weight was achieved. The difference in weight of the sample gave the moisture content, which was calculated by using the following formula.

$$\text{Moisture (\%)} = \frac{\text{Net weight of sample} - \text{Dried weight of sample}}{\text{Net Weight of sample}} \times 100$$

Ash

Ash content was estimated by taking the known weight of the sample in the silica crucible and placing it in a muffle furnace at 600°C for 6 hours. The calculation was done as follows:

$$\text{Ash (\%)} = \frac{\text{Weight of Ash}}{\text{Weight of sample}} \times 100$$

Carbohydrate Estimation

The total carbohydrate was estimated by following the Phenol-sulphuric acid method of Dubois *et al.* (1956) [14].

Result and Discussions

The proximate composition of Red seaweeds species *Gracilaria corticata*, *Hypnea musciformis***,** Green seaweed species *Ulva reticulata* and Brown seaweed species *Sargassum cinctum* is shown in the Table 1. Results of the analysis revealed the major components of seaweeds *Gracilaria corticata*, *Hypnea musciformis*, *Ulva reticulate* and *Sargassum cinctum* with Moisture level of seaweeds was 2.78±0.03% (*G. corticata*), 7.92±0.06% (*H. musciformis*), 6.63±0.05% (*U. reticulata*) and 6.61±0.04% (*S. cinctum*). Crude protein component of seaweeds was obtained in amount with 12.64±0.05% (*G. corticata*), 16.61±0.04% (*H. musciformis*), 12.23±0.06% (*U. reticulata*) and 10.31±0.03% (*S. cinctum*). Crude lipid component of seaweeds was obtained in little amount with 0.46±0.03% (*G. corticata*), 0.22±0.05% (*H. musciformis*), 2.86±0.02% (*U. reticulata*) and 3.12±0.01% (*S. cinctum*). Carbohydrate 52.18±0.04%, 46.76±0.02%, 51.79±0.03% and 58.18±0.06%, followed by ash content of 32.13±0.05%, 28.59±0.03%, 26.66±0.06% and 21.88±0.04% respectively.

Table 1: Biochemical composition of seaweeds

Ingredients (%)	Moisture	Crude Protein	Crude Lipid	Ash	Carbohydrate
Gracilaria corticata	2.78±0.03	12.64±0.05	0.46±0.03	32.13±0.05	52.18±0.04
Hypnea musciformis	7.92±0.06	16.61±0.04	0.22±0.05	28.59±0.03	46.76±0.02
Ulva reticulata	6.63±0.05	12.23±0.06	2.86±0.02	26.66±0.06	51.79±0.03
Sargassum cinctum	6.61±0.04	10.31±0.03	3.12±0.01	21.88±0.04	58.18±0.06

The moisture content (2.78±0.03) and *H. musciformis* ash content (28.59±0.03) and moisture content (7.92±0.06) comparatively similar and higher to those obtained in same species by Rohani-Ghadikolaei *et al.* (2012) [17]. In *U. reticulata* the ash content (26.66±0.06%) and moisture content (6.63±0.05) are comparatively higher and similar to those obtained in *Ulva spp.* by Rohani-Ghadikolaei *et al.* (2012) [17], whereas in *Sargassum cinctum* ash (21.88±0.04%) and moisture (6.61±0.04%) contents are comparatively lower than *Sargassum spp.* those obtained by Rohani-Ghadikolaei *et al.* (2012) [17]. The protein content of 12.64±0.05% (*G. corticata*), is similar to those obtain by Chithra and Chandra (2013)[20] whereas 16.61±0.04% (*H. musciformis*) also similar to those obtain by Patel *et al.*

(2020) [24], *U. reticulata* (12.23±0.06%) is similar to those obtained in *Ulva spp.* by Manivannan *et al.* (2009) [15] but higher than those obtained by Manivannan *et al.* (2008) [16] whereas in *S. cinctum* (10.31±0.03%) is similar to those obtained in *Sargassum spp.* by Rohani-Ghadikolaei *et al.* (2012) [17] and Manivannan *et al.* (2008) [16]. Seaweeds are relatively low I n lipid (1–5% of dry weight) (Burtin, 2003; Polat and Ozogul, 2008) [18-19]. In the present study crude lipid content of 0.46±0.03% (*G. corticata*), 0.22±0.05% (*H. musciformis*), *U. reticulata* (2.86±0.02%) and *S. cinctum* (3.12±0.01%) is similar to those reported by Rohani Ghadikolaei *et al.* (2012) [17] but higher than those estimated by Manivannan *et al.* (2008) [16] and Chithra and Chandra (2013) [20] for same genus of both seaweeds. In *G. corticata* ash content (32.13±0.05). Carbohydrates was the major component in the proximate composition of *G. corticata* (52.18±0.04), *H. musciformis* (46.76±0.02) and *U. reticulata* (51.79±0.03%) comparatively lower to those obtained by Ortiz *et al.* (2006) 21] and Rohani-Ghadikolaei *et al.* (2012) [17] for *Ulva spp.*, whereas in *S. cinctum* (58.18±0.06%) it is similar to *Sargassum* spp. obtained by Kumar *et al.* (2017) [22]. These results are comparatively higher than those reported for same genus by Chakraborty and Santra (2008) [23], Manivannan *et al.* (2008) [16] and Patel *et al.* (2020) [24].

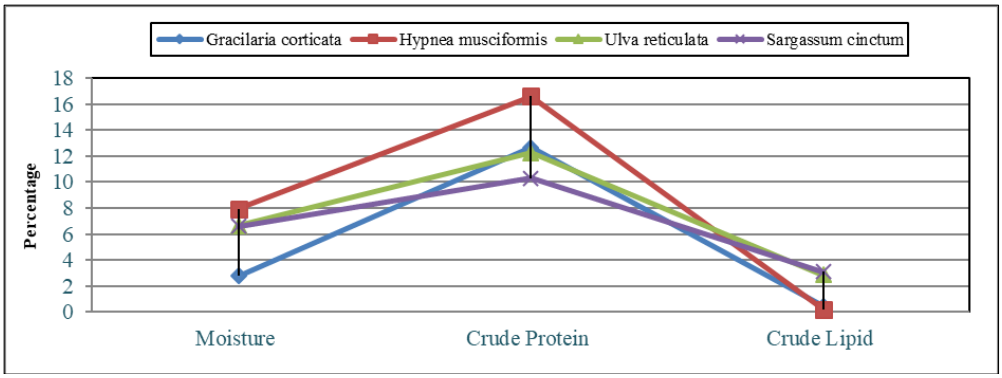

Fig 1: Graph analysis of biochemical composition of (Moisture, protein and Lipid) seaweeds

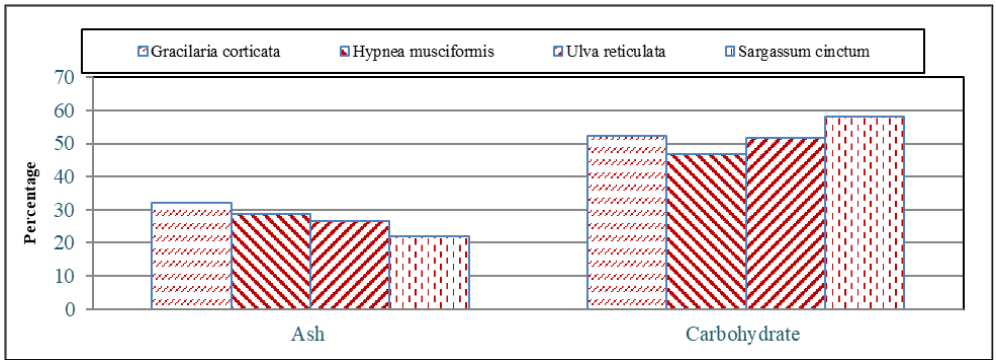

Fig 2: Graph analysis of biochemical composition of (Ash & Carbohydrate) seaweeds

Conclusion

Studies on the chemical composition of seaweeds have shown that these are good sources of minerals, trace elements, proteins, lipids and carbohydrates. In this study, four seaweed species were identified viz., red seaweed species *Gracilaria corticata* and *Hypnea musciformis*, Green seaweed species Ulva reticulata and Brown seaweed species *Sargassum cinctum*. The biochemical composition of those species studied for Crude Protein, Fat, Carbohydrate, Moisture and Ash content.

References

1. Mishra VK, Temelli F, Ooraikul Shacklock PF, Craigie JS. Lipids of the red alga Palmaria palmata. Botanica Marina. 1993;36(2):169-174.
2. Robledo D, Pelegrin YF. Chemical and mineral composition of edible seaweed species of Yucatan. Botanica Marina. 1997;45:58-65.
3. Wong KH, Cheung PCK. Nutritional evaluation of some subtropical red and green seaweeds. Part I-proximate composition, amino acid profiles and some physico-chemical properties. Food Chemistry. 2000;71:475-482.
4. Norziah MH, Ching Ch Y. Nutritional composition of edible seaweeds Gracilaria changgi. Food Chemistry. 2002;68:69-76.
5. Sanchez-Machado DI, Lopez-Hernandez J, Paseiro-Losada, P. High-performance liquid chromatographic determination of tocopherol in macroalgae. J. Chromatography. 2002;976:277-284.
6. Capinpin EC, Corre KG. Growth rate of the Philippine abalone Haliotis asinina fed an artificial diet and macroalgae. Aquaculture. 1996;144:81-89.
7. Reyes OS, Fermin AC. Terrestrial leaf meals or freshwater aquatic fern as potential feed ingredients for farmed abalone Haliotis asinina (Linnaeus1758). Aquaculture Research. 2003;34:593-599.
8. Vieira MP, Gomez-Pinchetti JL, Courtois deViscose G, Bilbao A, SuaŁ rez RJ, Haroun RJ, et al. Suitability of three red macroalgae as feed for the abalone Haliotis tuberculata coccinea Reeve. Aquaculture. 2005;248:7582.

9. Shpigel M, McBride SC, Marciano S, Ron S, Ben-Amotz A. Improving gonad colour and somatic index in the European sea urchin Paracentrotus lividus. Aquaculture. 2005;245:101-109.
10. Neori A, Shpigel M, Ben-Ezra D. A sustainable integrated system for culture of fish, seaweed and abalone. Aquaculture. 2000;186:279-291.
11. Valente LMP, Gouveia A, Rema P, Matos J, Gomes EF, Pinto IS. Evaluation of three seaweeds Gracilaria bursapastoris, Ulva rigida and Gracilaria cornea as dietary ingredients in European sea bass (Dicentrarchus labrax) juveniles. Aquaculture. 2006;252:85-91.
12. Di Silva RL da, Barbosa JM. Seaweed meal as a protein source for the white shrimp Litopenaeus vannamei. J Appl. Phycol. 2009;21:193-197.
13. Anonymous. Official Methods of Analysis of Association of Analytical Chemist (AOAC), Horwitz, W., Gaithersburg, Maryland, USA; 2000.
14. Dubois M, Giles KA, Hamilton JK, Rebors PA, Smith F. Calorimetric method for determination of sugars and related substances. Analytical Chemistry. 1956;28:350356.
15. Manivannan K, Thirumaran G, Karthikai Devi G, Anantharaman P, Balasubramanian P. Proximate Composition of Different Group of Seaweeds from Vedalai Coastal Waters (Gulf of Mannar): Southeast Coast of India. Middle-East Journal of Scientific Research. 2009;4(2):72-77.
16. Manivannan K, Thirumaran G, Devi GK, Hemalatha A, Anantharaman P. Biochemical Composition of Seaweeds from Mandapam Coastal Regions along Southeast Coast of India. American-Eurasian Journal of Botany. 2008;1(2):32-37.
17. Rohani-Ghadikolaei K, Abdulalian E, Ng WK. Evaluation of the proximate, fatty acid and mineral composition of representative green, brown and red seaweeds from the Persian Gulf of Iran as potential food and feed resources. J Food Sci. Technol. 2012;49(6):774-780.
18. Burtin P. Nutritional value of seaweeds. Electron. J Environ. Agric. Food Chem. 2003;2:498-503.
19. Polat S, Ozogul Y. Biochemical composition of some red and brown macro-algae from the Northeastern Mediterranean Sea. Int. J Food Sci. Nutr. 2008;59:566572.
20. Chithra R, Chandra S. Qualitative and quantitative analysis of phytochemical variation in G. corticata and K. alvarezii. International Journal for Scientific Research & Development. 2013;1(10):2174-2176.
21. Ortiz J, Romero N, Robert P, Araya J, Lopez-Hernandez J, Bozzo C, et al. Dietary fiber, amino acid, fatty acid and tocopherol contents of the edible seaweeds Ulva lactuca and Durvillaea Antarctica. Food Chemistry. 2006;99:98104.
22. Kumar NJI, Barot M, Kumar RN. Distribution and biochemical constituents of different seaweeds collected from Okha coast, Gujarat, India. Indian Journal of Geo Marine Science. 2017;46(2):349-357.
23. Chakraborty S, Santra SC. Biochemical composition of eight benthic algae collected from Sunderban. Indian J Mar. Sci. 2008;37:329-332.
24. Patel MR, Ojha ML, Vadher KH, Saini VP, Sharma BK, Sharma SK, *et al*. Biochemical composition of seaweeds from Veraval coastal regions along Saurashtra coast of Gujarat, India, International Journal of Chemical Studies. 2020;8(1):1508-1511.