The AJAS THE ASIAN JOURNAL OF ANIMAL SCIENCE
Volume **12** | Issue 2 | December, 2017 | 107-110
◆ e ISSN–0976–8963
DOI : 10.15740/HAS/TAJAS/12.2/107-110
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RESEARCH ARTICLE.....

Seasonal fluctuation in biochemial constituents of seaweeds of Chilika Lake

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ABSTRACT..... The present study deals with monthly as well as seasonal variation in the major biological composition of different seaweeds namely *Enteromorpha intestinalis* and *Chaetomorpha media* of chlorophyceae. *Rosenvingea intricate* of phaeophyceae and *Gracillaria verrucosa*, *Gracillaria lichenoids* and *Ceramium elegans* of rhodophyceae were available during March 2014 to February 2015 in Chilika Lake of Odisha. Among the three major groups of seaweeds, red algae (rhodophyceae) are rich in carbohydrate content and green algae (chlorophyceae) are rich in protein and lipid contents as compared to other algae. Most of the algal species showed maximum values of major biochemical constituents during post-monsoon period. However, proteins, carbohydrates and lipids play an important role in influencing the calorific value of brown, red and green algae, respectively. The red algae showed highest calorific value (184.32 KCal/g) among the other two algae.

KEY WORDS..... Seaweeds, Biochemical constituents, Chilika lake, Calorific value

HOW TO CITE THIS ARTICLE - Jema, Suryakanti, Mishra, R. and Jena, M. (2017). Seasonal fluctuation in biochemial constituents of seaweeds of Chilika Lake. *Asian J. Animal Sci.,* **12**(2): 107-110. **DOI : 10.15740/HAS/TAJAS/12.2/107-110.**

ARTICLE CHRONICLE - Received **:** *29.04.2017;* Revised **:** *03.11.2017;* Accepted **:** *17.11.2017*

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INTRODUCTION.....

Chilika lake of Odisha, the largest brackish water lake is rich in some edible varieties of seaweeds primarily belonging to one of the three divisions, namely the Chlorophyta (greenalgae), Phaeophyta (brown algae) and Rhodophyta (red algae). In India there are about 220 genera and 740 species of seaweeds, of which 60 are commercially important (Kathiresan, 1990) and fairly rich seaweed beds are reported in coastal lakes like Chilika and Pulicat (Kalimuthu *et al.*, 1992). Seaweeds are widely used by man as food, medicine, fodder and fertiliser. They are rich in carbohydrate, protein and lipid. Although several studies on biochemical composition of some seaweeds of Indian coast have been made by several workers (Sobha *et al.*, 1988; Mishra *et al.*, 1993; Vagas *et al.*, 1988 and Mishra and Sahu, 2001) reports that from Chilika lake specially with reference to seasons is scanty. Therefore, the present study was made to determine the seasonal fluctuation in proximate composition and calorific value of some commercially important seaweeds of Chilika Lake.

RESEARCH METHODS.....

The commercially important seaweeds of Chilika Lake namely *Enteromorpha intestinalis* and *Chaetomorpha media* of green algae, *Rosenvingea*

Table 1: Biochemical constituents of some seaweeds from Chilika lake

	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
E. intestinalis **(Chlorophyceae)**	Pre-monsoon					Monsoon				Post-monsoon		
Protein %	18.6	17.5	21.3	18.8	16.5	18.5	19.3	21.6	15.7	17.8	16.5	17.3
Carbohydrate %	20.3	18.6	19.5	17.6	16.3	18.3	21.4	23.8	21.6	20.7	21.4	19.6
Lipid %	12.7	13.3	13.8	12.7	11.4	13.3	13.5	13.8	13.1	14.2	15.6	13.4
Energy (Kcal/g)	173.765	166.157	183.324	164.884	148.556	170.438	182.547	199.478	170.241	177.497	180.335	169.365
C. media **(Chlorophyceae)**												
Protein %	21.2	23.1	19.8	20.7	18.7	19.1	24.2	22.5	23.1	23.7	21.6	20.8
Carbohydrate %	20.1	19.2	18.1	16.7	14.6	14	16.8	20.2	19	18.6	18.5	18.3
Lipid %	8.4	10.1	9.3	8.1	6.8	7.1	8.5	8.7	9.6	9.5	9.1	9.2
Energy (Kcal/g)	167.405	175.979	158.747	152.794	134.617	134.783	165.834	172.967	173.633	173.843	165.353	162.375
G. verrucosa **(Rhodophyceae)**												
Protein %	13.1	13	12.3	11.7	13.6	10.7	11.8	12.5	12.6	14.1	12.6	11.7
Carbohydrate %	33.8	35.2	38.1	30.7	26.8	33.5	39	40.1	40.3	35.7	33	36.4
Lipid %	3.9	3.8	4	4.1	3.8	3.6	4.2	4.1	4.3	4.3	4.1	4
Energy (Kcal/g)	174.681	178.97	187.588	159.844	151.268	164.838	189.796	195.626	197.313	185.95	170.888	179.637
G. lichenoids **(Rhodophyceae)**												
Protein %	9.9	9.7	9.8	10.3	11.2	9	9.3	10.2	10.4	10.6	11	10.8
Carbohydrate %	34.7	33.1	36.7	38.9	32	35.8	37.6	40.2	37.3	36.8	33.8	35.1
Lipid %	6.8	6.7	7.2	7.4	7.7	6.6	6.9	7.2	7.5	8	7.9	7
Energy (Kcal/g)	176.97	170.344	185.017	195.064	174.616	177.272	185.585	198.672	190.069	190.594	180.976	181.963
C. elegans **(Rhodophyceae)**												
Protein %	9.2	10	10.1	8.8	7.7	8	8.6	10.1	9.1	9.3	10.3	8.8
Carbohydrate %	38.2	41.6	40.5	39.5	36.6	38.2	41.6	46.7	42.4	40.8	36.3	37.1
Lipid %	3.8	4.5	4.4	4.1	3.8	4.2	4.6	4.5	4.5	4.4	4	3.9
Energy (Kcal/g)	177.21	194.108	190.222	181.483	166.687	174.622	189.386	212.436	194.007	188.681	174.734	172.355
R.intricate ***(Phaeophyceae)***												
Protein %	17.5	19.3	18.8	16.2	14.6	17.1	21.3	18.7	20.8	19.7	18.5	17.6
Carbohydrate %	21.8	22	19.6	18.3	18.2	21	23.3	24	23.2	22.7	21.6	20.9
Lipid %	3.8	3.9	3.7	3.8	3.8	3.9	4	4.1	4	3.9	4	3.8
Energy (Kcal/g)	146.293	153.177	142.424	129.713	124.16	142.497	164.594	158.943	162.616	156.948	149.493	143.441

intricate of brown algae, *Gracillaria verucosa, Gracillaria lichenoids* and *Ceramium elegans* of red algae were collected from the rocky areas of Chilika Lake in three different seasons such as Pre-monsoon (March 2014 to June 2014), Monsoon (July 2014- to October 2014 and Post –monsoon (November 2014 to February 2015) from selected sites namely Rambha Light house, Palur Canal, Samala Island and Nalaban Island in each month and were brought to the laboratory. They were washed with tap water and cleaned thrice and dried overnight in an hot air oven at 60°C. After drying a known weight of sample was powdered and used for their biochemical analysis. Protein and carbohydrate were estimated following the methods of Herbert *et al.* (1971) and Dubois *et al.* (1956) modified by Hitchcock (1977), respectively. Further lipid was estimated following the method described in Parsons *et al.* (1984). The calorific value of seaweeds was computed as described by Elliot and Davisson (1975). A simple statistical analysis of correlation was carried out to identify and understands the major biochemical constituents that influence the calorific value.

RESEARCH FINDINGS AND ANALYSIS.....

Seaweeds have been gaining importance due to their nutritive and industrial applications. They are rich in major biochemical constituents like protein, carbohydrate, lipids and some of the elements (Jagtop and Untawale, 1984 and Norziah and Ching, 2002). Nutrient content of seaweeds vary with species, geographical location, season, humidity and temperature (Dawes *et al.*, 1993; Kaehler and Kennish, 1996 and Cohen *et al.*, 1988). Monthly variation in major biochemical composition and the calorific value of the species of green algae namely *Enteromorpha intestinalis, Chaetomorpha media*, one species of brown algae *Rosenvingea intricate* and three species of red algae namely *Gracillaria verucosa*, *Gracillaria lichenoids* and *Ceramium elegans* are given in Table 1. It has been observed that there is no significant difference among the protein and carbohydrate contents of green and brown algae ($p > 0.05$). But the carbohydrate content of red algae was at a higher level (35.22% to 39.96%) than the protein content (9.17% to 12.48%). This is in agreement with the results of Kumar (1993) as Qari and Qasim (1993). The lipid content of green algae was observed more than that of brown and red algae. The calorific values of brown algae was observed to be low as compared to red and green algae which might be due to low carbohydrate and lipid content which corroborates the findings of Dhangalkar (1986). Further from the present study it was found that there is no significant difference in protein, carbohydrate and lipid contents of green, brown and red algae due to seasonal fluctuation. But the biochemical constituents showed a peak value in October which suggests that most of the carbohydrates and proteins get accumulated for its utilisation in grown and reproductive organs (Kumar, 1993). A high value of carbohydrate in the month of September to November in the present study could be due to factors like high nutrient content, low temperature and salinity prevalent in that season (Sobha *et al.*, 1988). A higher lipid content in green algae and lower levels in brown and red algae ($p<0.05$) in the present study might be due to the variation from species to species and also their age, growth and reproducing stages (Dhargalkar, 1986). The calorific content showed peak values in October (Monsoon season) coinciding with higher values of carbohydrate, Protein and lipid. Similar report was made by Vijayaraghawan *et al.* (1980). They also attributed clear and consistent seasonal variation in energy content of the seaweeds to their reproductive cycle.

Further, a simple statistical analysis of correlation indicates that the energy values in red algae are largely influenced by carbohydrate content ($r = 0.9694$) whereas in brown algae, proteins play a decisive role in influencing energy value as compared to carbohydrate ($r = 0.9365$). Dhargalkar (1986) also suggests that the carbohydrate plays a major role in influencing the calorific content of seaweeds. However, the lipid content played a major role in energy values in brown algae ($r = 0.9813$).

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LITERATURE CITED.....

Cohen, Z., Vorshak, A. and Richmond, A. (1988). Effects of environmental conditions of fatty acid composition of red alga Porphyridium cruentum, correlation to growth rate, *J. Phycol.*, **24**: 328-332.

Dawes, C. J., Kovach, C. and Friedlander, M. (1993). Expose of Gracilaria to various environmental conditions II. The effect of Fatty acid composition. *Botanica Marina*, **36**: 289-296.

Dhargalkar,V.K. (1986). Biochemical studies in *Ulva reticulata*. Forsskal. Mahasagar *Bull. Nat..Inst. Oceanography*, **19** : 45-51.

Dubois, M., Gilles, K.A., Hamilton, J.K., Robbes, P.A. and Smith, F. (1956). Calorimetric method for determination of sugar and related substances. *Anal. Chem.*, **28** : 350-356.

Elliot, J. M. and Davisson, W. (1975). Energy equivalent of oxygen consumption in animal energetic, *Oecology* (Berlin), **19** : 195-201.

Herbert, D., Phipps,P.J. and Strange, R.C. (1971). *Chemical analysis of microbiological cell*. J.K. Nortis and D.W. Ribbons (Ed). Methods in microbiology. Academy press, London, U.K. pp.244-252.

Hitchcock, G.L. (1977). The concentration of particulate in region of West Africa upwelling zone during March 1994. *Deep. Sea. Res*., **24** :83-93.

Jagtop, T.G. and Untawale, A.G. (1984). Chemical composition of marine macrophyte and their surrounding water and sediments from Minicoy, Lakshadweep. *Indian J. Mar. Sci*., **13** : 123-125.

Kaehler, S. and Kennish, R. (1996). Summer and winter comparisons in the nutritional value of marine macroalgae from Hong Kong. *Botanica Marina*, **39**: 11-17.

Kalimuthu, S., Kaliaperumal, N. and Ramalingam, J.R.(1992). Present status of seaweed exploitation and seaweed industry in India. *Bull. Mar. Fish. Serv*., July-Sep. pp. 7-8.

Kathiresan, K. (1990). Seaweeds- A promising food for future. *Seafood Expert J.* ,11-12pp.

Kumar, V. (1993). Biochemical constituents of marine algae from Tuticorin Coast. *Indian J. Mar. Sci*., **22** : 138-140.

Mishra, R. and Sahu, S. (2001). Proximate composition and calorific value of seaweeds of Chilika lake, *Env. & Eco.,* **19** (3) : 658-661.

Mishra, V.K., Temelli,F., Ooraiknl, B., Sockloc. P.K. and Craigie, S. (1993). Lipids as the red algae, *Palmaria parata*, *Bot. Mar*., **36** : 169-174.

Norziah, M.H. and Ching, Y. (2002). Nutritional composition of edible seaweeds *Gracilaria changgi*. *Food Chem.*, **68**: 69-76.

Parsons, J.R., Maita,V. and Lalhi, C.M. (1984). *Manual of Chemical and biological methods for seawater analysis*. Pergamon Press, NEW YORK.USA.

Qari, R. and Qasim, R. (1993). Biochemical constituents of seaweeds from Karachi Coast. *Indian J. Mar. Sci.,* **22** : 229-231.

Sobha, V., Maya, K.S.D and Nair, T.V. (1988). Proximate composition of certain algae at Kovalam (south west coast of India). *Seaweed Resource Utilisat*., **11**: 31-38.

Vagas, M.A., Rodriguez, H., Moreno, J., Olivares, H., Campo, A., Rivas, J. and Guerrero, M.G. (1988). Biochemical composition of fatty acid content of filamentous N2 fixing cyanobacteria. *J. Phycol.*, **34** : 812-817.

Vijayaraghawan, S., Rajagopal, M.D. and Wafar, M.V.M. (1980). Seasonal variation in biochemical composition of some seaweeds from Goa Coast. *Indian J. Mar. Sci.*, **9**:61-63.