

BIOCHEMICAL STUDIES IN *ULVA RETICULATA* FORSSKAL

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ABSTRACT

Major metabolites like proteins, carbohydrates and lipids in the alga *Ulva reticulata* were estimated. Carbohydrate was found to decrease after December which may perhaps be due to the spore formation and extensive growth of the thallus. Protein, also followed the same trend while lipid did not show any significant seasonal variation. C : N ratio and protein values in *U. reticulata* showed inverse relationship.

Calorific values calculated from organic carbon ranged from 2828.0 cal/g to 3725.0 cal/g and were higher than those calculated from major metabolites.

U. reticulata contributes to a major part for detritus in this bay, forming an important pathway in the biological system of the area.

Key-words : Metabolites *Ulva reticulata*, seaweeds, Goa coast.

Seaweeds are used as food and fertilizer in many parts of the world. An estimate of the biochemical composition of seaweeds, is essential to determine its nutritive value. Protein content of marine seaweeds has been estimated earlier (Chidambaram and Unny, 1953; Noda, 1971). Neela (1956) has studied the nutritive value of some Indian seaweeds. Sitakara Rao and Tipnis (1964) found high protein content in three species viz. *U. fasciata*, *U. lactuca* and *U. rigida*.

Detritus derived from the benthic macrophytes forms a major link between primary and secondary production in shallow waters (Meus, 1967; Newell, 1965). Qasim and Sankaranarayanan (1972) have shown that organic detritus plays an important role in estuarine ecosystems.

In the present investigation, biochemical analysis of proteins, carbohydrates and lipids were determined in *Ulva reticulata* Forsskal and detritus from the Chapora Bay, Goa (Fig. 1).

Samples of *U. reticulata* and detritus were analysed from July 1976 to September 1977 for biochemical components. As seaweed season is restricted to certain months of the year, the analysis was done depending upon availability of seaweeds while the detritus samples were analysed every month.

The seaweed sample was brought to the laboratory cleaned, washed with fresh water and dried at 60°C in hot air oven. Detritus was collected from the superficial sedimentary sample and coarser inorganic materials were removed by centrifuging. After drying in an oven to constant weight, the samples were powdered for analysis. Carbohydrate, nitrogen and lipids were studied following

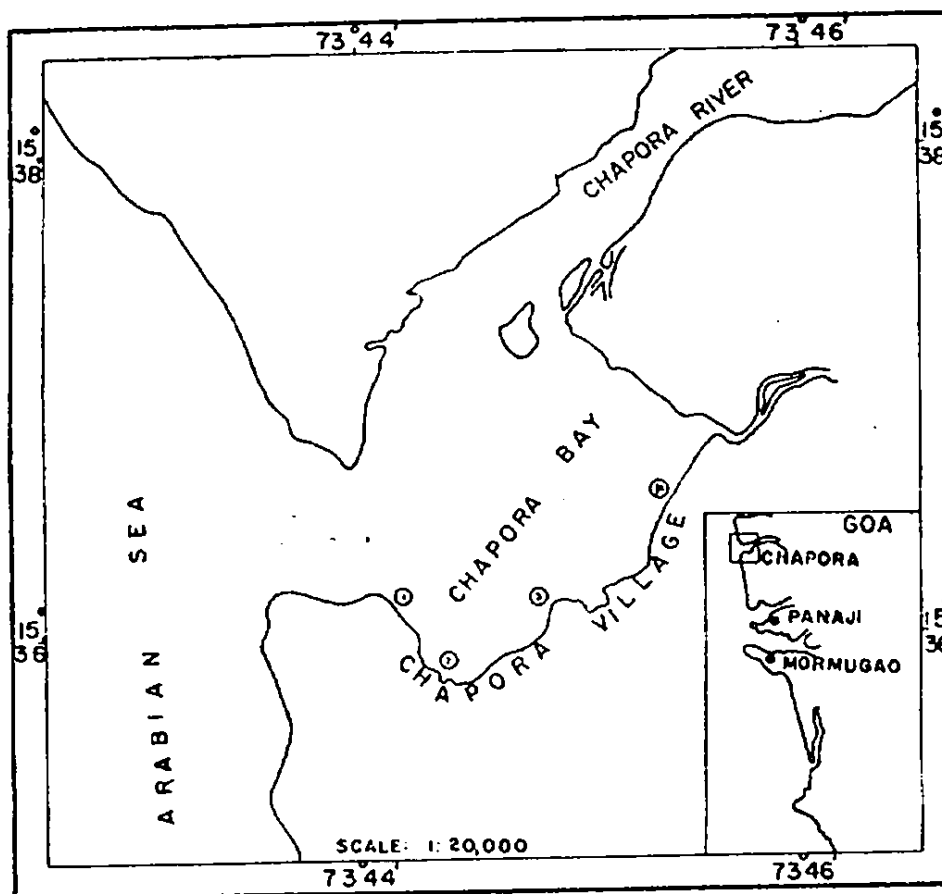


Fig. 1. Map showing the station locations.

the methodology described by Bhosle, Dhargalkar, Matondkar, and Bukhari (1976). Organic carbon was estimated following the procedure of El Wakeel and Riley (1957).

Using caloric equivalents of 5.65 for proteins (calculated as $N \times 6.25$), 4.15 for carbohydrates and 9.4 for lipids (Phillips, 1969) on dry weight basis, total energy was calculated. Energy values were also calculated from organic carbon as stated by Qasim and Sankaranarayanan (1972).

Carbohydrate in *U. reticulata* varied from 20 to 29.5% with maximum and minimum values in December and June respectively. Protein ranged from 10.9 to 19.8% and the highest value observed was 19.8%, in December. Lipids showed less variations and ranged from 2 to 4% (Fig. 2).

Seasonal changes in the biochemical composition of *U. reticulata* may be related to the chemical and morphological changes associated with the various metabolic processes of the alga. Carbohydrate values were found to decrease after December but increased in February. Patil and Joshi (1967) obtained similar results for *U. lactuca*. Protein values also showed similar trend in this

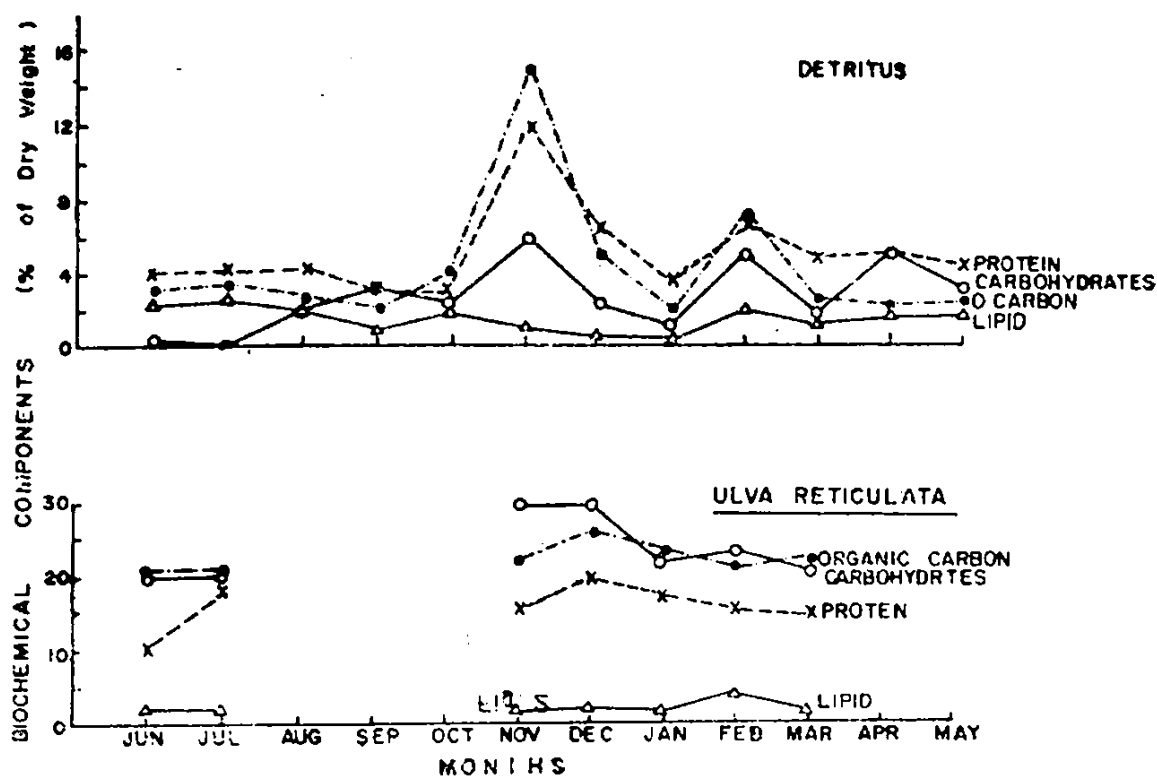


Fig. 2. Variations in biochemical components in *Ulva reticulata* and detritus.

species. Probably because carbohydrates and proteins are utilized for the growth and development of reproductive organs. Similar changes in biochemical composition during growth and development were observed in some marine algae by Baardseth (1970). Growth of alga at this bay was found maximum during December to February.

Carbohydrate content of detritus varied from 0.26 to 6% . and the maximum value was obtained in the month of November. Protein also showed similar variations from 3 to 11.8% . Lipids however showed less variation and ranged from 0.4 to 2.6% . Variations in the biochemical composition of detrital particles are related to the microbial activity. Increase in protein content of the detrital particle and low C : N ratios may be due to the growth of microbial organisms on detrital matter, absorption and adsorption of dissolved organic nutrients by the decomposing detrital matter (Fell, Cefalu, Master and Tallman 1975).

Organic carbon in this alga varied from 20.1 to 26% and higher value was observed in the month of December. In detritus, organic carbon varied from 2 to 15% . C : N ratio increased from December to March in *U. reticulata* (Fig. 3). During this period, protein decreased showing inverse relationship. While, in detritus due to the microbial activity, protein content increased resulting in the decrease in C : N ratios. Similar observations were also reported by Harrison and Mann (1975) for eelgrass.

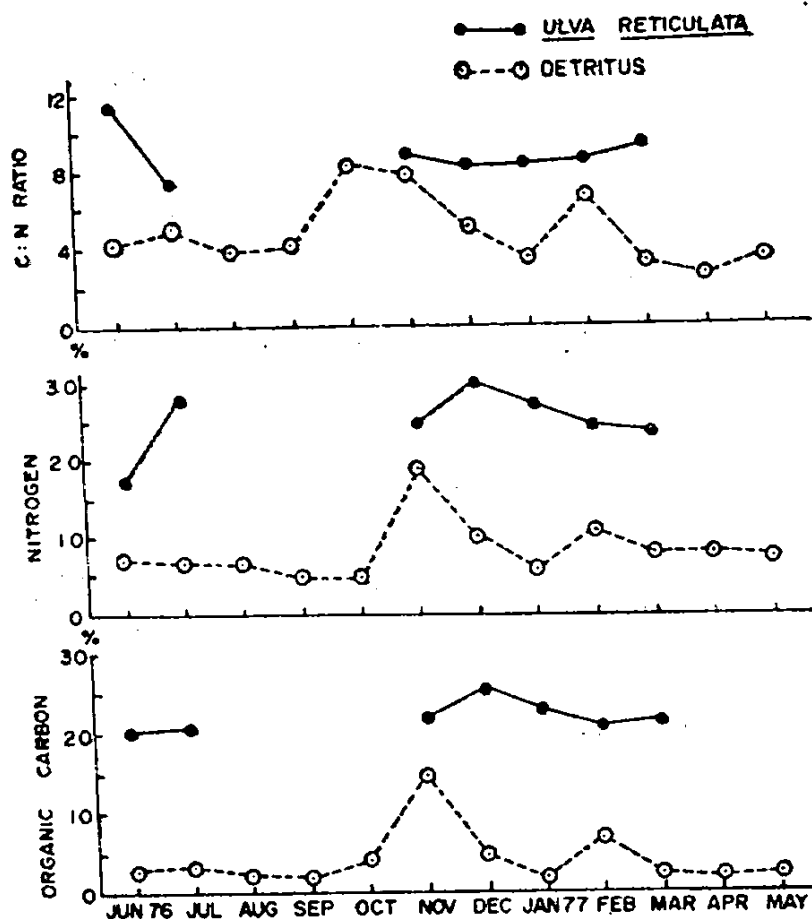


Fig. 3. Variations in organic carbon, nitrogen and C:N ratio in *Ulva reticulata* and detritus.

Concentration of organic carbon in *U. reticulata* was found to be 26% while for *U. fasciata*, it was 16.5% (Rajgopal, Vijayaraghavan and Wafar, 1975). High percentage of carbon content in the dry tissue of *U. reticulata* indicates higher caloric content as suggested by Platt and Irwin (1973).

Lipid in *U. reticulata* showed very little variations through out the algal growth. Probably, the energy for the growth of alga is being supplied by carbohydrates and proteins rather than lipid present in the tissue during the different stages of growth, as suggested by Wrot (1955).

Calorific value for *U. reticulata* in the month of March was higher than in February (Table I). Probable reason may be that plants collected for biochemical analysis may contain reproductive or fertile tissue having higher energy values as reported by Himmelman and Carefoot (1975) for *Iridaea* species.

Calorific values calculated from organic carbon for *U. reticulata* showed higher values than the values calculated from carbohydrate, proteins and lipids. This indicates that this alga contains additional carbon other than from carbohydrates, proteins and lipids. Energy values of this alga are comparatively higher than the values reported by Himmelman and Carefoot (1975) for three intertidal seaweed species. Calorific values calculated for detritus showed higher values than the values reported by Qasim and Sankaranarayanan (1972) for Cochin backwaters.

Table I. Calorific values calculated from biochemical components and from organic carbon in *Ulva reticulata* and detritus.

Months	<i>U. reticulata</i>		Detritus	
	Total Cal. Values (Cal/g)	Cal. calculated Values from organic carbon (Cal/g)	Total Cal. Values (Cal/g)	Cal. Values calculated from organic carbon (Cal/g)
Jun. 1976	1635.2	2828.2	385.8	229.0
Jul.	2057.2	2937.6	497.9	305.0
Aug.	—	—	504.4	153.0
Sep.	—	—	388.0	77.0
Oct.	—	—	452.9	381.0
Nov.	2286.0	3117.0	1013.0	2053.0
Dec.	2487.0	3725.0	498.0	533.0
Jan. 1977	2076.0	3269.0	280.2	77.0
Feb.	2198.9	2965.0	769.0	837.0
Mar.	1925.0	3120.0	493.4	153.0
April	—	—	636.4	77.0
May	—	—	521.0	153.0

Extensive growth of *U. reticulata* in Chapora Bay appears to support an extensive clam fishery throughout the year. Average annual clam landings of the bay are 6.3 m tons. *U. reticulata* after decomposition forms particulate detritus which is available as food to suspension feeders such as clams and oysters. *U. reticulata* being the dominant species, probably plays an important role in the detrital enrichment of the Chapora Bay and forms an additional pathway between primary production and animal nutrition.

ACKNOWLEDGEMENTS

I wish to thank Dr. V. V. R. Varadachari, Director, National Institute of Oceanography, for critically going through the manuscript, to Dr. T. S. S. Rao, Head, Biological Oceanography Division, for his valuable suggestions and to Dr. S. G. Torne, Head, Botany Department, S. P. C. College, Margao, Goa, for his guidance. Thanks are also due to Dr. S. Z. Qasim, former Director of NIO, Goa for critically going through the manuscript and offering valuable suggestions to improve the text.

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