

## Biochemical Studies and Extraction of Agar from *Gracilaria edulis* Mallipattinan Coastal Villages, South East Coast of India

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South East Coast of India especially Mallipattinam is rich in seaweed vegetation. Our information is incomplete regarding their biochemical composition especially chlorophyll content and thus their economic importance. *Gracilaria edulis* were collected from four stations for the study area. Physico-chemical parameters such as atmospheric and surface water temperature, salinity, dissolved oxygen and nutrients like phosphate, nitrate, nitrite and silicate were studied. The variation in chemical constituents such as chlorophyll, carotenoids, starch, glucose and protein of algae were discussed in relation to physicochemical factors. It is concluded that maximum amount of agar concentration observed from our study areas. So, this *Gracilaria* species also can be used as a source of food grade agar and also used in pharmaceutical industrial product.

**Key words:** *Gracilaria edulis*, Mallipattinam coastal area, Agar.

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In India bacteriological grade agar and food grade agar are manufactured from *Gracilaria edulis*. There are about 25 agar 4 industries situated in the maritime states of Tamil Nadu, Karnataka and Kerala. Among these industries more than 20 industries are producing food grade agar utilizing *G. edulis* as raw material. During the year 1978 to 2003, 108 to 974 tons of *G. edulis* raw materials exploited per year from wild were Indian coastal area is rich in algal diversity. Our coastal area

covers about 7000 km and harbors about 844 marine algal species belonging to different families and genera. The potential areas in India for luxuriant growth of species of red, brown and green algae are the South East Coast and covering 21 islands (Sylvia *et al.*, 2005). The present study is a preliminary study on the biochemical composition of *G. edulis* with special emphasis to chlorophyll content in them.

### MATERIAL AND METHODS

Biochemical constituents of *Gracilaria edulis* were studied at four station viz., Adaikadevan, Sethubavachatram, Manora and Mallipattinam along South East Coast of India,

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December 2006 to May 2007. Meteorological data such as monthly rainfall and humidity were obtained from the meteorological department. Physical parameters such as atmospheric temperature, surface water temperature and pH were determined in the field itself. Chemical parameters such as salinity dissolved oxygen and nutrients were studied using standard methods (Gresshoff *et al.*, 1983). The collected algal samples were washed thoroughly in filtered seawater and freshwater to remove calcareous as well as sand particles and associated fauna. After cleaning, the separated algae were dried in shade at room temperature for five days and then oven dried at 60°C for 48 hrs. The dried algal samples were powdered and used for various biochemical studies. Estimation of protein, starch, glucose, chlorophyll, and carotenoid were done by standard procedures (Lowry *et al.*, 1951; Dubois *et al.*, 1956; Mahadevan and Sridhar, 1982).

The extraction of agar-agar in the case of species of *Gracilaria edulis* was done by soaking the dried seaweeds, grinding into pulp 20gm of

powered sample was soaked in the 100ml distilled water at overnight. Later the samples were cooked and digested for 2-3 hrs by passing steam at 50 lbs pressure. The supernatant clear sol was removed after it gels. Drying of the gel was done on plastic netting. The agar gel was cooled at room temperature for 1-2 hours and it was shredded with gel chopper. Then the agar gel was kept in the freezer for 24 hours (temp. comes down to 20°) and after 24 hrs, the agar gels were removed from the freezer and allowed to thaw. The agar gel was dried in sun light on velon screen frames and it was bleached in 10% chlorine water for 5-10 minutes. The agar was washed with fresh water for 2-3 times then they were dried in sunlight on velon screen frames. Finally, the dried materials were packed in polythene bags.

## RESULTS AND DISCUSSION

Physicochemical factors such as atmospheric and surface water temperature, dissolved oxygen, pH and salinity are presented in

**Table 1.** Physico-chemical parameters variation in different stations of Mallipattinam coastal villages

S. No.	Parameters	Stations			
		Adaikadevan	Sethbavachatram	Manora	Mallipattinam
1.	Atmospheric temperature (°C)	30.00	33.00	29.00	28.00
2.	Water temperature (°C)	28.00	31.00	2.00	26.00
3.	pH	8.00	8.20	7.85	8.00
4.	Salinity (ppt)	27	28	29	27
5.	Dissolved oxygen (ml/l)	5.55	5.46	5.75	5.76
6.	Silicate (Mmol/l)	0.95	0.96	0.94	0.95
7.	Phosphate (Mmol/l)	1.24	1.30	2.68	2.65
8.	Phosphate (Mmol/l)	1.04	1.94	1.94	1.60
9.	Nitrite (Mmol/l)	0.29	0.13	0.25	0.12

**Table 2.** Estimation of total chlorophyll, total carotenoid and biochemical's in *G. edulis* for different stations of South East Coast of Tamil Nadu

S. No.	Study area	Starch	Protein (mg/gm. fr.wt)	Glucose	Total Chlorophyll (µg/gm. fr.wt)	Total carotenoid
1.	Adaikadevan	21.66±2.89	13.16±1.04	10.66±1.25	0.14±0.03	1.40±0.3
2.	Sethbavachatram	18.33±2.89	16.33±1.15	181.66±2.51	0.12±0.03	1.26±0.34
3.	Manora	21.16±1.50	14.67±0.5	9.00±0.02	0.08±0.02	0.75±0.16
4.	Mallipattinam	23.33±2.89	13.16±0.29	9.05±0.29	0.31±0.09	2.08±0.68

Table 1. Estimation of biochemical constituents such as starch, protein, glucose, total chlorophyll and total carotenoids are presented in table 2.

Air and surface water temperature was recorded in the study periods. These finding correlates with that of Sarala Devi *et al.*, (1979) and Bandala *et al.*, (1998). The decrease of the water temperature increase the capacity of oxygen to dissolve in water was observed by Hutchinson (1975), Wong (1979) and Nedumaran *et al.*, (2001).

The high pH recorded in station II could be due to the increased temperature coupled with high salinity. These findings were correlates with that of Tiwari (1990). Salinity is an important ecological factor, which influences distribution of phytoplankton and zooplankton. The salinity was recorded 27 ppt at station I, 28 ppt at station II, 29 ppt at station III and 27 ppt at station IV. Salinity was showed direct relationship with pH such relationship has also been recorded by Bhavé and Borse (2001).

During the study period, the highest total chlorophyll content was recorded in (0.31 µg/mg fr. wt) and the carotenoid content was maximum of 2.08 µg of *G. edulis*. Similarly observation in *Vigna* sp by Nedunchezian and Kulandaivelu (1991) and in Cyanobacteria by Quesada *et al.*, (1995) were recorded.

*G. edulis* can synthesis some metabolic products such as starch, glucose and protein during the metabolic process. These products used for various purpose. The total starch, glucose and protein were estimated from the isolated of different stations. Among the isolates showed the maximum amount of starch, total chlorophyll and total carotenoids present in station IV.

In the present study, agar content were identified from he isolates are maximum total amount of agar concentration (30%) observed from station II and station IV. The agar fields of seaweeds constitute one of the commercially important marine living renewable resources. They are the only source for the production of phytochemical such as agar. Agarose carrageen and algin air widely used in various industries as gelling, Stabilizing and thickening agents and used as good source of food and medicine (Christian *et al.*, 1987).

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