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STANDING CROP, ALGIN AND MANNITOL OF SOME ALGINOPHYTES OF MANDAPAM COAST*

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ABSTRACT

Studies were made from September 1985 to August 1986 on the standing crop, algin and mannitol contents of three brown algae *Colpomenia sinuosa, Hydroclathrus clathratus* and *Rosenvingea intricata* growing at Shingle Island and Kilakkarai near Mandapam. The vegetation of these species occurred between September and March with maximum biomass of plants from December to February. The standing crop varied from 0.814 to 4.250 kg wet/m² for *C. sinuosa*, 1.823 to 4.971 kg wet/m² for *H. clathratus* and 3.309 to 12.024 kg wet/m² for *R. intricata* and the algin content ranged from 4.7 to 14.1%, 7.5 to 14.7% and 10.4 to 20.5% respectively with maximum values during December-February. The mannitol content varied from 0.5 to 2.2% in these seaweeds. There was no marked seasonal variation in the yield of algin and mannitol in these algae. The period from December to February is suitable for the harvest of these alginophytes for the production of sodium alginate.

INTRODUCTION

ALGIN, a polysaccharide is the cell wall content of many marine brown algae and it is widely used in several industries mostly as thickening and stabilizing agent. The algin and mannitol contents of many Indian brown algae have been studied by several workers (Valson, 1955 ; Kappanna *et al.*, 1962 ; Shah and Rao, 1969 ; Umamaheswara Rao, 1969, 1978 ; Chauhan 1970 ; Umamaheswara Rao and Kalimuthu, 1972 ; Solimabi and Naqvi, 1975 ; Kaliaperumal and Kalimuthu, 1976 ; Chennubhotla *et al.*, 1977, 1982 ; Durairaj *et al.*, 1978 ; Mehta and Parekh, 1978 ; Kalimuthu, 1980 ; Kalimuthu *et al.*, 1980; Mairh, 1982). Only few studies provide information on the seasonal growth of the algae and changes in the algin and mannitol contents during their growth period. Observations made from September, 1985 to August, 1986 on the standing crop, algin and mannitol contents of three brown algae *Colpomenia sinuosa* (Roth) Derbes and Solier, *Hydroclathrus clathratus* (Bory) Howe and *Rosenvingea intricata* (J. Agardh) Boergesen growing at Shingle Island and Kilakkarai near Mandapam are presented in this paper.

MATERIAL AND METHODS

Plants of *C. sinuosa* and *H. clathratus* grow on the subtidal reefs occurring at Shingle Island and Kilakkarai and *R. intricata* only at Shingle Island near Mandapam (78°08′ E, 09°17′ N). A metal quadrat of 1 m² size was used for collection of these seaweeds. Ten to twenty quadrat samples were collected twice in a month from September 1985 to March 1986 and wet weights were noted after cleaning and

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washing the samples in the laboratory. The samples were then dried in the sun and later in an oven at 60°C to a constant weight. From the total number of quadrat samples collected every month, monthly fresh and dry weights of the standing crop per metre square area were calculated. The oven dried plants were powdered and used for analysing algin and mannitol contents. The method suggested by Suzuki (1955) was followed for extraction of algin. The estimation of mannitol was done by the per-iodic acid method of Cameron *et al.* (1948). The analysis was repeated four times and the mean values are given on dry weight basis.

Results

Population of *C. sinuosa* occurred at Shingle Island for 7 months in a year from September to March and at Kilakkarai for 5 months from November to March. Plants of *H. clathratus* occurred for 4 months from December to March in Shingle Island and for 5 months from November to March in Kilakkarai. The vegetation of *R. intricata* occurred for 5 months between November and March at Shingle Island. Results obtained on the fresh and dry weights per metre square and percentage of water content in *C. sinuosa*, *H. clathratus* and *R. intricata* are given in Table 1. The mean density of the crop was comparatively higher in *R. intricata* than in *C. sinuosa* and *H. clathratus* with almost similar values. The water content (82-88%) did not vary markedly in these brown algae growing along Mandapam Coast.

Data obtained on the biomass (wet and dry weight in 1 m^2) for *C. sinuosa*, *H. clathratus* and *R. intricata* are plotted in Fig. 1. In *C. sinuosa* growing at Shingle Island, the wet and dry weights ranged from 1.24 to 4.25 kg/m^2 and 0.15 to 0.74 kg/m^2 respectively. In *C. sinuosa* occurring at Kilakkarai, the wet weight varied from 0.81 to 2.29 kg/m^2 and dry weight from 0.15 to 0.38 kg/m^2. In *H. clathratus* growing at Shingle Island the wet and dry weights varied from 1.82 to 3.06 kg/m^2 and from 0.26 to 0.57 kg/m^2 respectively. In *H. clathratus* occurring at Kilakkarai the wet weight ranged from 1.84 to 4.97 kg/m^2 and dry weight from 0.21 to 0.52 kg/m^2. In *R. intricata* growing at Shingle Island, the wet weight varied between 3.31 to 12.02 kg/m^2 and dry weight from 0.51 to 1.68 kg/m^2.

Monthly variations observed in the yield of algin from *C. sinuosa*, *H. clathratus* and *R. intricata* are plotted in Fig. 2. The yield of algin varied from 4.7 to 7.1% and from 9.8 to 14.1% in *C. sinuosa* growing at Shingle Island and Kilakkarai respectively. The algin content in *H. clathratus* ranged from 7.5 to 10.6% at Shingle Island and from 9.7 to 14.7% at Kilakkarai. In *R. intricata* growing at Shingle Island, the algin content varied from 10.4 to 20.5%.

Table 1. *Biomass and water content in* C. sinuosa, H. clathratus *and* R. intricata

Species	Wet weight (kg/m^2)			Dry weight (kg/m^2)			% water content
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	
Colpomenia sinuosa ..	0.814	4.250	2.218	0.146	0.740	0.361	82
Hydroclathrus clathratus ..	1.823	4.971	2.788	0.209	0.568	0.371	88
Rosenvingea intricata ..	3.309	12.024	5.606	0.510	1.676	0.865	86

In general the mannitol content was very low and it varied from 0.6 to 1.9% in *C. sinuosa*, 0.5 to 2.2% in *H. clathratus* and 1.0 to 1.5% in *R. intricata*. (Table 2).

Discussion

The results obtained in the present study indicate that *C. sinuosa*, *H. clathratus* and *R. intricata* are seasonal plants and they occur during a part of the year between September and March in Mandapam area without regular monthly changes in the standing crop. But in

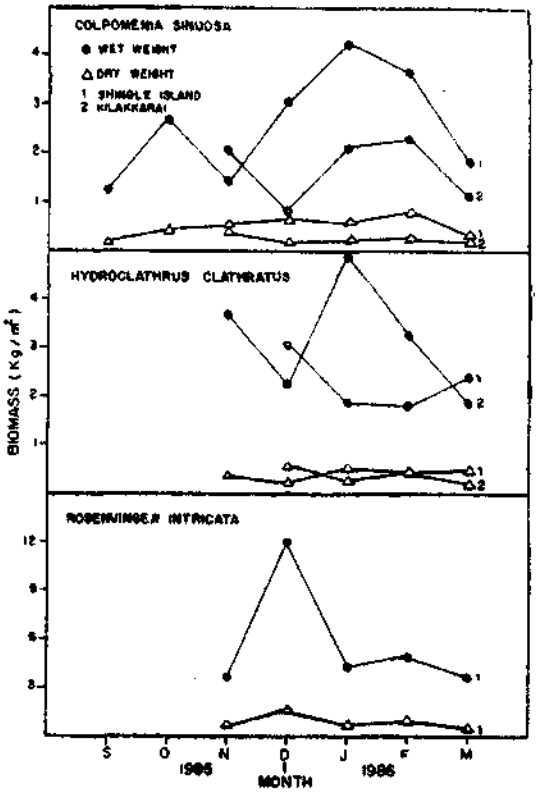

Fig. 1. Monthly variations in wet and dry weights of *C. sinuosa*, *H. clathratus* and *R. intricata*.

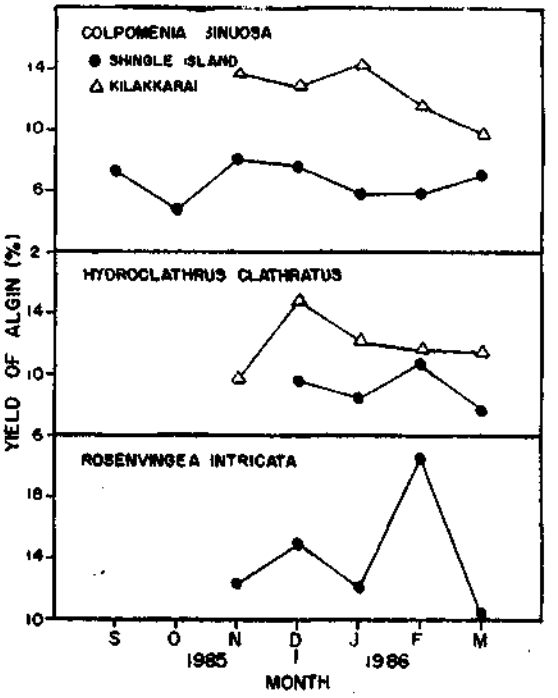

Fig. 2. Monthly variations in the yield of algin in *C. sinuosa*, *H. clathratus* and *R. intricata*.

TABLE 2. *Seasonal changes in the mannitol* content *of* C. sinuosa, H. clathratus *and* R. intricata

Species	Place of collection	Period of collection and yield of mannitol (%)						
		Sept. '85	Oct.	Nov.	Dec.	Jan. '86	Feb.	Mar.
Colpomenia sinuosa	Shingle Island	0.7	0.7	0.6	0.9	1.0	0.9	0.9
-Do-	Kilakkarai	—	—	1.3	0.9	1.8	1.9	1.7
Hydroclathrus clathratus	Shingle Island	—	—	—	1.3	1.0	0.5	1.1
-Do-	Kilakkarai	—	—	1.4	0.9	1.7	1.1	2.2
Rosenvingea intricata	Shingle Island	—	—	1.0	1.3	1.5	1.1	1.3

general the maximum biomass of plants was observed from December to February.

The maximum yield of algin was found to be higher in *R. intricata* than in *C. sinuosa* and *H. clathratus* with almost same values. The maximum yield of algin was obtained from these 3 species during December-February. The maximum algin yield obtained in *C. sinuosa* during the present investigation almost agrees with the value obtained for this species occurring at Goa (Solimabi and Naqvi, 1975). The algin content of *C. sinuosa, H. clathratus* and *R. intricata* can be compared with the species of *Dictyota* (Kappanna *et al.*, 1962 ; Solimabi and Naqvi, 1975 ; Umamaheswara Rao, 1978), *Padina* (Valson, 1955 ; Solimabi and Naqvi, 1975 ; Chennubhotla *et al.*, 1977; Umamaheswara Rao, 1978) ; *Cystoseira* (Valson, 1955 ; Kappanna *et al.*, 1962 and Mairh, 1982) ; *Hormophysa* (Valson, 1955), *Spatoglossum* (Solimabi and Naqvi, 1975) and *Stoechospermum* (Kalimuthu *et al.*, 1980) and it was lesser than the species of *Sargassum* (Kappanna *et al.*, 1962 ; Umamaheswara Rao, 1969, 1978 ; Kalimuthu, 1980; Chennubhotla *et al.*, 1978) and *Turbinaria* (Umamaheswara Rao, 1969 ; Umamaheswara Rao and Kalimuthu, 1972; Kaliaperumal and Kalimuthu, 1976) which are used at present for commercial algin production in India. The mannitol content in *C. sinuosa, H. clathratus* and *R. intricata* is very low when compared with the mannitol content of several other brown algae studied earlier.

Marked seasonal variation in the yield of algin and mannitol was not found in these three species and in this respect it is in conformity with the results obtained for *Turbinaria ornata* (Umamaheswara Rao and Kalimuthu, 1972), *T. decurrens* (Kaliaperumal and Kalimuthu, 1976), *Padina gymnospora* (Chennubhotla *et al.*, 1977), *Stoechospermum marginatum* (Kalimuthu *et al.*, 1980), *Sargassum myriocystum* and *S. ilicifolium* (Kalimuthu, 1980 and Chennubhotla *et al.*, 1982). The algin yield was high during the period of maximum biomass (December-February) in *C. sinuosa, H. clathratus* and *R. intricata*. There is no correlation between the seasonal changes of the mannitol content and growth behaviour of these algae. The maximum growth period December-February is suitable for the harvest of these seaweeds from Mandapam Coast for the production of algin.

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