STUDIES ON PHYCOCOLLOID CONTENTS FROM SEAWEEDS OF SOUTH TAMIL NADU COAST

N. Kaliaperumal, S. Kalimuthu and J.R. Ramalingam

Regional Centre of Central Marine Fisheries Research Institute,
Marine Fisheres-623 520, Tamilnadu, India

Abstract

Studies were made on agar from 8 red algae and algin from 10 brown algae collected from Tuticorin, Manapad, Tiruchendur, Idinthakarai and Kovalam along south Tamil Nadu Coast. The yield of agar varied from 18.0 to 48.3% and gel strength from 9 to 119 gm/sq. cm. The algin content ranged from 8.7 to 34.0%. These agar and algin yielding seaweeds can be exploited from the above places and used as additional source of raw material for the production of agar and sodium alginate.

Introduction

At present in India the red algae Gelidiella acerosa, Gracilaria edulis and G. crassa are used as raw material for the manufacture of agar and species of Sargassum and Turbinaria for sodium alginate. All the seaweed based industries are depending for their raw material mainly on the natural vegetation occurring only in certain localities along the Tamil Nadu Coast, mostly from Mandapam area. The available resource of the above mentioned agarophytes is inadequate to meet the requirement of the agar industries. Studies made on the seaweed resources of Tamil Nadu coast (Umamaheswara Rao, 1969 a and 1972; Anon, 1978 and Kaliaperumal and Pandian, 1984) indicate that many red and brown algae occur from Mandapam to Muttam which could form an additional source of raw material to the seaweed based industries. Information is available on the phycocolloid contents of various seaweeds growing around Mandapam (Anon, 1987). Although some information is available on the agar content of a few red algae growing at Tiruchendur (Subba Rao et al., 1977), no studies were made on the agar and algin contents of seaweeds from other localities of south Tamil Nadu coast. Hence the agar and algin yielding seaweeds growing between Tuticorin and Kovalam were collected and their phycocolloid contents were analysed. The results obtained on these aspects are presented in this paper.

Material and Methods

Eight species of red algae (Table 1) and ten species of brown algae (Table 2) were collected from five localities namely Tuticorin (Hare Island, Kasuwar Island and Karaichalli Island), Manapad, Tiruchendur, Idinthakarai and Kovalam in the first fortnight

TABLE 1. Yield and physical properties of agar from red algae of South Tamil Nadu Coast.

Sl. No.	Species	Place of collection	Yield (%)	Gel strength (gm/cm^2) 1.5% conc.	Gelling temperature (°C) 1.5% conc.	Melting temperature (°C) 1.5% conc.
1.	Gelidiella acerosa	Manapad	36.3	119	50	98
2.	G. indica	Manapad	28.5	23	48	92
	- do -	Tiruchendur	28.1	13	47	97
	- do -	Kovalam	48.3	46	42	98
3.	Gracilaria corticata var. corticata	Tiruchendur	27.2	9	33	70
	- do -	Manapad	21.5	9	36	72
4.	G. corticata var. cylindrica	Idinthakarai	37.9	15	45	74
5.	G. crassa	Tuticorin (Karaichalli Island)	18.0	11	13	86
6.	G. edulis	Tuticorin (Hare Island)	43.8	9	39	65
7.	G. foliifera	Idinthakarai	27.5	15	37	84
	- do -	Kovalam	26.8	11	36	78
8.	G. obtusa	Idinthakarai	43.7	11	42	63

of January 1985 during spring tide periods from the intetidal and subtidal region (upto 0.5 m depth). The yield of agar from the red algae was determined following the method of Kaliaperumal and Umamaheswara Rao (1981). The gel strength of agar was determined using a gelometer described by Funaki and Kojima (1951). The gelling and melting temperature of agar were found with a thermometer following the movement of glass beads in the setting and melting gels. Extraction of algin was made by the method outlined by Suzuki (1955). Three replicates were used to estimate the agar, algin and also the physical properties of agar.

Results

Data obtained on the yield and physical properties of agar from the red algae are given in Table 1. The yield of agar ranged from 18.0 to 48.3% with minimum yield in Gracilaria crassa and maximum yield in Gelidiella indica growing at Kovalam. The gel strength of 1.5% agar solution varied from 9 to 119 gm/sq. cm with highest value in Gelidiellaacerosa. The gelling and melting temperature of 1.5% agar solution ranged from 33 to 50°C and 63 to 98°C respectively among the eight red algae.

TABLE 2. Yield of algin from brown algae of South Tamil Nadu Coast.

Species	Place of collection	Yield (%)
1. Padina gymnospora	Tuticorin (Kasuwar Island)	9.7
- do -	Manapad	12.1
2. P. pavonica	Idinthakarai	8.7
3. P. tetrastromatica	Tiruchendur	10.0
4. Stoechospermum marginatum	Tuticorin (Hare Island)	15.9
- do -	Manapad	21.0
- do -	Tiruchendur	23.8
- do -	Idinthakarai	25.7
5. Rosenvingea intricata	Tuticorin (Kasuwar Island)	19.8
6. Chnoospora implexa	Kovalam	34.0
7. Sargassum ilicifolium	Tuticorin (Hare Island)	26.5
8. S. myriocystum	Manapad	22.8
- do -	Idinthakarai	19.4
- do -	Kovalam	16.9
9. S. Wightii	Manapad	21.3
- do -	Tiruchendur	17.7
- do -	Kovalam	16.7
10. Turbinaria conoides	Tuticorin (Hare Island)	27.3

Data collected on algin content from the ten brown algae are presented in Table 2. The yield of algin varied from 8.7 to 34.0%. The minimum value was obtained in Padina pavonica and maximum value in Chnoospora implexa. The yield of algin was more than 15% in all plants except Padina spp.

Discussion

The phycocolloid obtained from Gelidiella acerosa, Gracilaria edulis, Padina gymnospora, Stoechospermum marginatum, Sargassum ilicifolium, S. myriocystum, S. wightii and Turbinaria conoides during the present investigations can be compared with the phycocolloid content of these species growing at Mandapam coast (Umamheswara Rao, 1969 b; Chennubhotla et al., 1977, 1982 and 1986; Kalimuthu, 1980 and Kalimuthu et al., 1980). Species of Gelidiella, Gracilaria, Sargassum and Turbinaria growing at different localities along the southern coast of Tamil Nadu could be exploited and used as additional source of raw mateial for the production of agar and sodium alginate in India. Studies on the seasonal variation in the growth, fruiting and phycocolloid contents of these seaweeds occurring in various places along southern Tamil Nadu coast are necessary to know the suitable period for harvesting each plant in order to get maximum yield of agar and sodium alginate.

Acknowledgements

Our thanks are due to Dr. P.S.B.R. James, Director, Central Marine Fisheries Research Institute, Cochin-31 for his encouragement in carrying out this investigation and to Dr. K. Radhakrishna, Asst. Director General (Fisheries), Indian Council of Agricultural Research, New Delhi for going through the manuscript.

Literature cited

Anon 1978 A report on survey of marine algal resources of Tamilnadu 1971-1976. CSMCRI, Bhavnagar. pp. 1-137

Anon 1987 Seaweed research and utilization in India CMFRI Bulletin, 41: 1-116

Chennubhotla, V.S.K., S. Kalimuthu, N. Kaliaperumal and J.R. Ramalingam, 1977 Studies on the growth variation, alginic acid and mannitol contents in Padina gymnospora (Kuetzing) Vickers. Seaweed Res. Utiln 2 (2) : 91-94.

Chennubhotla, V.S.K., N. Kaliaperumal, S. Kalimuthu, M. Selvaraj, J.R. Ramalingam and M. Najmuddin 1982 Seasonal changes in growth and alginic acid and mannitol contents in Sargassum ilicifolium (Turner) J. Agardh and S. myriocystum J. Agardh Indian J. mar. Sci., 11 (2) : 195-196

Chennubhotla, V.S.K., S. Kalimuthu, M. Najmuddin, R. Panigrahy and M. Selvaraj 1986 Changes in growth and phycocolloid content of Gelidiella acerosa and Gracilaria edulis Seaweed Res. Utiln 9 (1 & 2) : 45-48

Funaki, K. and Y. Kojima 1951 Studies on the properties of agar-agar from Gracilaria confervoides Part-3. Bull. Jap. Soc. Sci. Fish., 16 : 401-404

Kaliaperumal, N and M. Umamaheswara Rao 1981 Studies on the standing crop and phycocolloid of Gelidium pusillum and Pterocladia heteroplatos Indian J. Bot. 4 (2) : 91-95

Kaliaperumal, N. and G. Pandian 1984 Marine algal flora from some localities of south Tamilnadu Coast J. mar. Biol. Assn. India, 26 (1 & 2) : 159-164

Kalimuthu, S. 1980 Variation in growth and mannitol and alginic acid content of Sargassum myriocystum J. Agardh Indian J. Fish. 27 (1 & 2) : 265-266

Kalimuthu, S., V.S.K. Chennubhotla, M. Selvaraj, M. Najmuddin and R. Panigrahy 1980 Alginic acid and mannitol contents in relation to growth in Stoechospermum marginatum (C. Agardh) Kuetzing Indian J. Fish., 27 (1 & 2) : 267-269

Subba Rao, P.V., K. Rama Rao and K. Subbaramaiah 1977 Screening of certain red seaweeds for phycocolloids Seaweed Res. Utiln 2 (2) : 82-86

Suzuki, N. 1955 Studies on the manufacature of algin from brown algae Mem. Fac. Fish., 3 : 93-158

Umamaheswara Rao, M. 1969 a Agar and algin yielding seaweeds of India Proc. 6th Int. Seaweed Symp., pp. 715-721

Umamaheswara Rao, M. 1969 b Seasonal variation in growth, alginic acid and mannitol content of Sargassum wightii and Turbinaria conoides from the Gulf of Mannar, India Proc. 6th Int. Seaweed Symp., pp. 579-584

Umamaheswara Rao, M. 1972 Gracilariaceae of the seas around India J. mar. biol. Assn. India, 14 (2) : 671-696