

## SEASONAL VARIATIONS IN PRODUCTION OF CULTURED SEAWEED *GRACILARIA EDULIS* (GMELIN) SILVA IN MINICOY LAGOON (LAKSHADWEEP)

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### ABSTRACT

With a view to finding out the feasibility of Lakshadweep lagoons for cultivation of *Gracilaria edulis* in Minicoy experimental culture has been undertaken at four sites. Very encouraging results indicating high potential of about 8.1 fold increase for this species in the lagoon environments of Minicoy was obtained. Seasonal variations in the growth of the culture seaweed is high-lighted in this account indicating favourable seasons and potential sites.

### INTRODUCTION

#### Seaweed Culture Technology

At present it is estimated that about 40,000 tonnes (fresh wt) of seaweeds are annually harvested for extraction of phycocolloids agar-agar and algin. However it has exceeded the renewable capacity especially along Tamil Nadu coast and hence the need to cultivate the same has arisen. (Anon, 1987).

Since 1972, the Central Marine Fisheries Research Institute (Chennubhotla et.al.1977 & 78) and Central Salt and Marine Chemicals Research Institute (Raju & Thomas, 1971, Krishnamurthy et.al. 1975) have been involved in the experimental field cultivation of agar-yielding *G. acerosa* and *G. edulis* and agaroid yielding *Hypnea valentiae* and *Acanthophora spicifera*, algin yielding species such as *Sargassum* and *Turbinaria* in near shore areas of Gulf of Mannar and Palk Bay through vegetative propagation methods by inserting the fragments of the mother material into the twists of coir rope nets. Out of these, encouraging results were obtained with *G. edulis*, *G. acerosa* and *A. spicifera*.

The culture technology involved tying of coir or HDP rope net seeded with seaweed, to fixed poles in the inshore waters or ponds. The plants reach harvestable size after 60 days .

*G. edulis* cultured in the near shore areas of Gulf of Mannar and Palk Bay using coir ropes and HDP rope nets yielded an average of 3 fold increase after 60 days (Chennubhotla et al 1978) *G.acerosa* fastened to coral stones with the help of iron nails reached harvestable size after five months recording 3 fold increase and sometimes manifold (Chennubhotla et al 1977; Subharamaih et al 1975). *A. spicifera* cultured in ponds over coir rope and HDP rope nets yielded a 3.6 and 2.3 fold increase after 45 days and 70 days respectively (Anon 1977).

With a view to finding out the feasibility of Lakshadweep lagoons for *G. edulis* culture, for the first time, the experimental culture has been undertaken since 1990 in Minicoy (Lat 8° 17'N and Long 73° 04') at four sites, viz, Near Helipad, Light House, Fisheries Jetty and Navodaya school.

HARVEST PARTICULARS OF GRACILARIA EDULIS AT MINICOY

| Species cultivated                 | Place of cultivation | Date of introduction | Seed material introduced (kg) | Date of harvest & no.of days | Crop harvested (Wet wt. in kg) | Increase in yield | Percentage growth of seaweed/day |
|------------------------------------|----------------------|----------------------|-------------------------------|------------------------------|--------------------------------|-------------------|----------------------------------|
| (1)                                | (2)                  | (3)                  | (4)                           | (5)                          | (6)                            | (7)               | (8)                              |
| (1) G. edulis (Kavaratti material) | Fisheries Jetty      | 12-3-90              | 0.250 (one long line)         | 13-4-90 (30 days)            | 0.800                          | 3.2 fold          | 3.953                            |
| (2) -do-                           | -do-                 | 13-4-90              | 0.250 (remnets on long line)  | 28-5-90 (45 days)            | 1.475                          | 5.9 fold          | 4.023                            |
| (3) -do-                           | -do-                 | 13-4-90              | 0.800                         | 11-6-90                      | 6.450                          | 8.1 fold          | 3.540                            |
| (4) -do-                           | -do-                 | 12-3-90              | 3.750 (one net)               | 9-5-90 (60 days)             | 11.850                         | 3.2 fold          | 1.936                            |
| (5) G. edulis (Mandapam material)  | -do-                 | 27-3-90              | 2.000 (one net)               | 9-5-90 (45 days)             | 3.150                          | 1.6 fold          | 1.015                            |
| (6) G. edulis (Kavaratti material) | Light House          | 16-3-90              | 1.600 (one net)               | 10-5-90 (60 days)            | 5.980                          | 3.7 fold          | 2.222                            |
| (7) G. edulis (Mandapam material)  | -do-                 | 29-3-90              | 2.000 (one net)               | 10-5-90 (45 days)            | 3,470                          | 1.7 fold          | 1.232                            |

|      |                                   |                    |          |                                         |                       |                             |           |       |
|------|-----------------------------------|--------------------|----------|-----------------------------------------|-----------------------|-----------------------------|-----------|-------|
| (8)  | G. edulis<br>(Mandapam material)  | Fisheries<br>Jetty | 27-3-90  | 1.800<br>(one net)                      | 26-7-90<br>(122 days) | 6.600                       | 3.7 fold  | 1.071 |
| (9)  | -do-                              | -do-               | 9-5-90   | 2.000                                   | 26-7-90<br>(79 days)  | 12.200<br>Second<br>harvest | 6.1 fold  | 2.315 |
| (10) | -do-                              | -do-               | 13-6-90  | 0.700<br>(one long line<br>14m. length) | 7-9-90<br>(87 days)   | 4.000                       | 5.7 fold  | 2.024 |
| (11) | G. edulis<br>(Kavaratti material) | -do-               | 9-5-90   | 3.000                                   | 10-7-90<br>(63 days)  | 6.600<br>Second<br>harvest  | 2.20 fold | 1.259 |
| (12) | -do-                              | -do-               | 9-5-90   | 2.900<br>(one net)                      | 7-9-90<br>(122 days)  | 6.250                       | 2.2 fold  | 0.631 |
| (13) | -do-                              | Navodaya           | 26-10-90 | 0.600<br>(net)                          | 31.12.90<br>(66 days) | 4.300                       | 7.1 fold  | 3.029 |
| (14) | -do-                              | -do-               | 26-10-90 | 0.600<br>(net)                          | 31.12.90<br>(66 days) | 1.480                       | 2.4 fold  | 1.377 |
| (15) | -do-                              | Fisheries          | 25-10-90 | 1.000                                   | 31.12.90<br>(67 days) | 2.300                       | 2.3 fold  | 1.251 |
| (16) | -do-                              | -do-               | 25-10-90 | 1.000                                   | 31.12.90<br>(67 days) | 4.050                       | 4.05 fold | 2.110 |

Initially the seaweed *G. edulis* was not available in the wild in Minicoy Lagoon. Hence the same was transported from Mandapam (east coast) and Kavaratti, the Capital of Lakshadweep group of Islands.

The seed material was introduced in the long line ropes, coir nets and nylon nets (HDP rope nets) in all the 4 culture sites. The growth of *G. edulis* at fisheries jetty and near Light House was found to be encouraging and the plants reached harvestable size after 45 days and 60 days growth. The remnants of the plants left on the nets and long line rope after first harvest were allowed to grow and a second harvest also was made after another 60 days. A maximum yield of 8.1 fold increase over the seed material was obtained after 60 days on a long line rope near fisheries jetty (Table I)

As rough conditions prevailed during monsoon season, the culture operations were discontinued at all the places except near Fisheries Jetty.

The nets introduced at Fisheries Jetty were harvested in July and September '90 after the plants had attained the harvestable size and the yield was found to be 6.1 and 5.7 fold. In the other nets the growth was not encouraging. The yield of the crop in the nets would have been more than that was observed, but for the heavy grazing by the fishes of the genus *Siganus* from June to September. The grazing of *G. edulis* by the species of *Siganus* is not an uncommon feature, as it was already reported by James *et.al* 1980 on the east coast.

During October culture operations were started at all four culture sites. The growth of *G. edulis* near the sites at Navodaya School and Fisheries Jetty was good. The harvest was taken after 66 days at both places, with 7.1 fold increase in one net and 2.4 fold increase in another at the former place while the yield was 2.3 and 4.5 fold in the two nets at the latter site (Table. I). At the other two sites, the growth was not encouraging due to heavy sedimentation and epiphytic growth of *Acanthophora spicifera*. At Navodaya School site also, the epiphytic growth of the blue green *Lyngbya* was observed, but it did not hamper the growth of *G. edulis* in the nets. Another important feature is that the grazing hitherto observed at fisheries jetty was minimized during December 1990, thus allowing the seaweed crop to thrive well on the nets.

During January and February '91 also the grazing was not much at Fisheries jetty and as a result the seaweed growth was found to be good.

The percentage growth rate of seaweed per day was calculated using the formula given below and the results are presented in Table I:  $d^{-1} = (W_2/W_1) 1/t - 1 \times 100$ .

A notable observation is the settlement and colonization of *G. edulis* on the seagrass beds in the vicinity of Fisheries Jetty and Navodaya School sites in the lagoon. The same grew to harvestable size and got established in the lagoon thus bringing the Minicoy on the map of the *Gracilaria* growing areas. The grazing observed on the crop in the nets was simultaneously noted on the natural crop also. In conclusion, it can be said that the present studies have revealed a great potential for the growth and culture of *G. edulis* in Minicoy lagoon.

It has also indicated that out of the four culture sites tried, two viz Fisheries jetty and Navodaya school are very productive with regard to *G. edulis* culture.

From the foregoing account, it can be said that seasonwise, best results can be obtained during pre and post monsoon seasons and during the monsoon season turbulence causes heavy sedimentation

on the growth of seaweed and makes the infrastructure used (i.e culture nets etc) for cultivation, very unstable.

Hydrological conditions of the areas of study were monitored throughout and the correlation of the same with seaweed growth will be discussed separately.

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### References

- Anon 1987 Seaweed Research & utilization in India CMFRI Bulletin 41 pp.
- Chennubhotla, V.S.K., S. Kalimuthu, M. Najamuddin & M. Selvaraj 1977 Field culture of *Gelidiella acerosa* in the inshore waters of Gulf of Mannar. Supplement to J. Phycol. vol.13, Abstract No.454.
- Chennubhotla, V.S.K., N. Kaliaperumal & S. Kalimuthu 1978 Culture of *Gracilaria edulis* in the inshore waters of Gulf of Mannar (Mandapam) India. J. Fish. 25 (1 & 2) 228-229
- Cheuh, C.T. & C.C. Chen 1982 Seaweed economics in Taiwan In R.T. Tsuda & Y.M. Chiang (Eds.) Proc. Coop. Sci. Sem. Cultivation and utilization of economic algae, June 1978
- James, PSBR., VSK. Chennubhotla & J.X.Rodrigo 1980 Studies on the fauna associated with the culture of seaweed *Gracilaria edulis* Proc. Symp. coastal Aquaculture-MBAI, Cochin
- Krishnamurthy, V., P.V. Raju & P.C. Thomas 1975 On augmenting seaweed resources of India J. mar biol.Ass. India, 17(2):181-185
- Pizarro, A & N.Barrales 1986 Field assessment of two methods of planting of the agar containing seaweed, *Gracilaria*, in northern Chile Aqua culture 59:31-44
- Raju.P.V. & P.C. Thomas 1971 Experimental field cultivation of *Gracilaria edulis* (Gmel.) Silva Bot. mar. 14(2) : 71-75
- Ren G.Z., J.C. Wang & M.O.Chen 1984 Cultivation of *Gracilaria* by means of low rafts *Hydrobiologia* 116/117:72-76
- Ren. G.Z. & M.S. Chen 1986 The effect of temperature on the growth and development of *Gracilaria asiatica*, *Oceano Limnol.Sin* 17:292-300
- Santelices. S & N. Vgarte Production of Chile *Gracilaria* : Problems and perspectives in Proc.12 Int. Seaweed Symp. Sao Paulo, Brazil, August, 1986
- Tseng, C.K. 1989 Material on extended seaweed component to be incorporated in "seafar ning" prepared for NCM/TPR-Aug.
- Yang S.S. 1982 Seasonal variation of the quality of agar-agar produced in Taiwan. In R.T. Tsuda & Y.M. Chiang (Eds.) Proc. Coop. Scisem. Cultivation ..... algae, June 1978, pp. 65-80
- Subharamaiah, K., K. Rama Rao, P.C. Thomas, MRP Nair, B.V. Gopal & V.R. Nagulan 1975 Cultivation of *Gelidiella acerosa* Salt Res. Ind. II (1): 33-36