STUDIES ON INTERCROPPING OF *PORPHYRA HAITANENSIS* T. J. CHANG ET B. F. ZHENG WITH BAY SCALLOP *ARGOPECTEN IRRADIANS* LAMARCK*

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Abstract

Results of the experiment of northward transplantation of *Porphyra haitanensis* showed that intercrop of *P. haitanensis* with Bay Scallop is feasible because the growth duration of both of them is about the same in August-December.

Full use of cultivating area, lowering its cost and increasing its product per unit area as well as improving the ecological environment are realized during intercrop.

Key words: intercrop, *P. haitanensis*, Bay Scallop, conchoecelis, sporeling

INTRODUCTION

*P. haitanensis* is of subtropic species with properties of fast growing and generally acceptable as cultivated alga by local inhabitants of Fujian and Zhejiang provinces. The cultivated area can reach thousands of Mu.

Bay Scallop, *Argopecten irradians* is a good cultivable species. It has the characteristics of fast growth rate, a wide range of adaptable temperature and simple cultivation. The mariculture of Bay Scallop begins in the coastal waters of the Yellow Sea.

In consideration of developing *Porphyra* cultivation in Northern China, we had successfully undertaken the experiments of northward transplantation of *P. haitanensis* in 1985-1988. As the optimum temperature for *P. haitanensis* sporeling is about 25-26 °C, corresponding to Shandong seawater temperature in August, we are able to promote *Porphyra* cultivation two months ahead, i.e. from October to August. This promotion not only makes the rotation cultivation of *P. haitanensis* and *P. yezoensis* Ueda possible and consequently resulted in higher yield, but also makes intercropping of *P. haitanensis* with Bay Scallop realizable due to coincidence in their growth duration.

CULTIVATION OF *P. HAITANENSIS*

Experimental intercropping of *P. haitanensis* and Bay Scallop conducted in

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1) 1 Mu = 180 m²
Jiaonan in 1990 is described as follows:

1. **Cultivation of conchocelis of *P. haitanensis***

*P. haitanensis* is a subtropical species, and its conchocelis needs higher temperature for growth and development. The carpospores are made to settle on the shell of *Meretrix* sp. The shells are placed on the bottom of shallow tanks one by one. Carpospores are usually collected at the end of March. The density is about 300 spores/cm² and the light intensity is controlled from 120 to 140μE/(m²·s) in the early phase. As the seawater temperature cannot be artificially controlled, it is subject to fluctuation with air temperature. In order to raise temperature and to accelerate the growth and development of conchocelis, the light area for culture room is increased and the tanks are covered by polyethylene membranes. This can meet the needs for conchocelis growth at 25–28°C. According to the different phases of growth and development of conchocelis in Northern China approximately from late June, weaker light intensity and shorter light hours were provided. The conchospores were generated at the beginning of August (Li Shiyi et al., 1992). The changes of air and seawater temperature in the culture room are given in Table 1.

**Table 1** The temperature changes of air and water in culture room

<table>
<thead>
<tr>
<th>Month</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature°C</td>
<td>Air (H/L)</td>
<td>Water</td>
<td>Air (H/L)</td>
<td>Water</td>
<td>Air (H/L)</td>
<td>Water</td>
</tr>
<tr>
<td>The first ten days</td>
<td>15.4</td>
<td>16.5</td>
<td>19.5</td>
<td>24.5</td>
<td>27.7</td>
<td>30.1</td>
</tr>
<tr>
<td>The second ten days</td>
<td>21.7</td>
<td>26.8</td>
<td>30.7</td>
<td>35.2</td>
<td>36.8</td>
<td>27.7</td>
</tr>
<tr>
<td>The third ten days</td>
<td>15.4</td>
<td>18.3</td>
<td>23.0</td>
<td>27.7</td>
<td>29.1</td>
<td>28.8</td>
</tr>
</tbody>
</table>

2. **Collection of conchospores of *P. haitanensis***

The collection of conchospores was performed from August to the middle of September. At the beginning, the conchocelis needed to be put into the sea stimulated with current overnight (at least 12–14 hours) to discharge the conchospores. On the following day, the stimulated conchocelis discharged a lot of conchospores in the tank before noon. For all-artificial spore collection, a layer of closely set and constricted *Porphyra* nettings was placed directly on the shells overgrown with the conchocelis, special attention being paid to let the nettings not too thickly set and the light intensity on the surface of the tanks regulated to 60μE/(m²·s) or more so as to improve the lighting conditions of the netting in the tank and to facilitate even distribution of the conchospores and their germination. In shallow tanks with 10–15 cm deep water, pump or other simple implements were used to circulate water and to systematically agitate all part of the nettings. Shallow water layer was helpful in affecting greater agitation with comparatively less power and increasing the density of the spores in the water mass. In the course of the spore collecting, it was necessary to examine the spore adherence condition periodically. No. 20 bolting silk was used as the substrate for the examination. The nettings might be taken out of the tank when the adhering density reaches 15–20 spores/mm². The above method of directly employing the conchocelis culture tanks for all-artificial spore-collection by means of water jet