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A Tank Culture Trial of the Seaweed, *Gracilaria* sp.

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Abstract

A red algae, *Gracilaria* sp., was cultured in two 100 litre transparent plastic tanks with a conical shaped bottom and provided with a continuous supply of seawater and aeration. In one tank, Tank A, a culture was started with sea weed 200 g in wet weight, and in the other, Tank B, with 50 g in wet weight. After the seaweed had grown to about 450 g in wet weight, it started to grow faster with a constant daily growth rate of 114 g in Tank A and 93 g in Tank B. The growth then slowed down after it reached around 4,500 g and started to decrease after about 5,800 g. The stronger aeration in Tank A seems to be responsible for the larger daily growth rate than in Tank B.

Introduction

The red algae of genus *Gracilaria* is important as food for the green snail in its seed production and brood stock culture (Kikutani, 1994). The Ministry of Fisheries of Tonga presently maintains 73 green snails in a 4.5 m^3 concrete raceway tank with *Gracilaria* sp. as the main food. However, the collection of an adequate amount of the seaweed is time consuming work, particularly when the seaweed becomes scarce in the coastal waters in some seasons. In order to solve this problem, this study examined the possibility of culturing the sea weed, *Gracilaria* sp., in the plastic tank to ensure a constant supply.

Materials and Method

Gracilaria sp. used in the examination was collected on November 5, 1994 in the shallow sea along the coast of Nukuleka on Tongatapu Island (Fig. 1). The collection location was close to a mangrove area, 80 cm deep at high tide and with the bottom deposits being a mixture of sand and mud. Two 100 litre transparent polycarbonate tanks were used for the sea weed culture. The tank (Earth Co. Ltd., Tokyo, Japan) was originally designed for the purpose of brine shrimp egg incubation and has a conical shaped bottom. Untreated seawater of 600 litres per hour and gentle aeration were supplied to each tank from the bottom (Fig. 2). The tanks were placed on an open concrete floor with a roof of translucent corrugated plastic panels. In one tank (Tank A) the seaweed of 200 g in wet weight (WW) was stocked on November 11, 1994. In another tank (Tank B) the seaweed of 50 g WW was stocked on November 23, 1994.

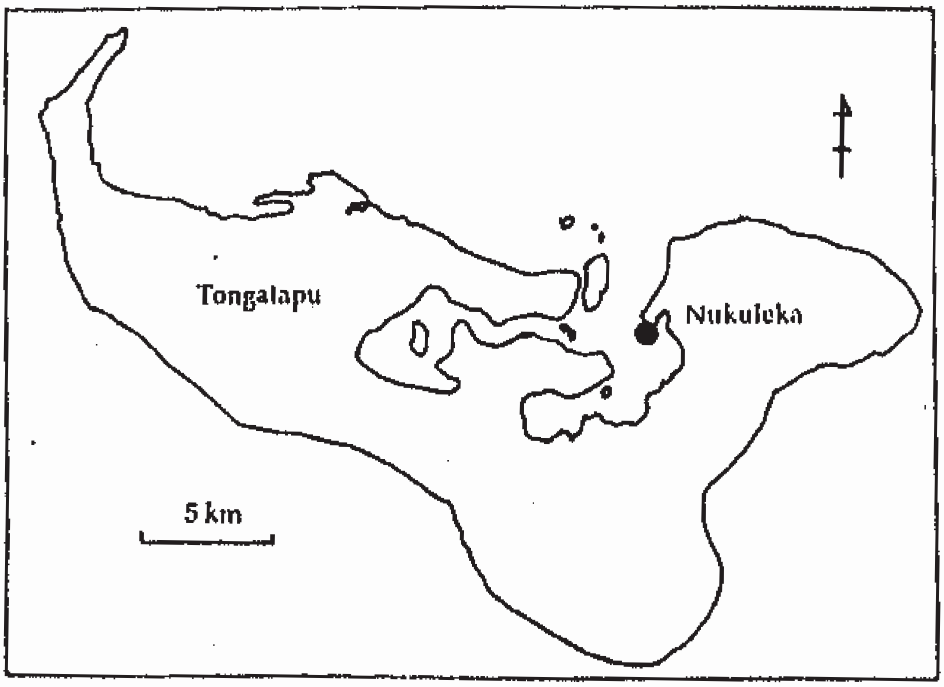

Fig. 1. Location of *Gracilaria* sp. collection.

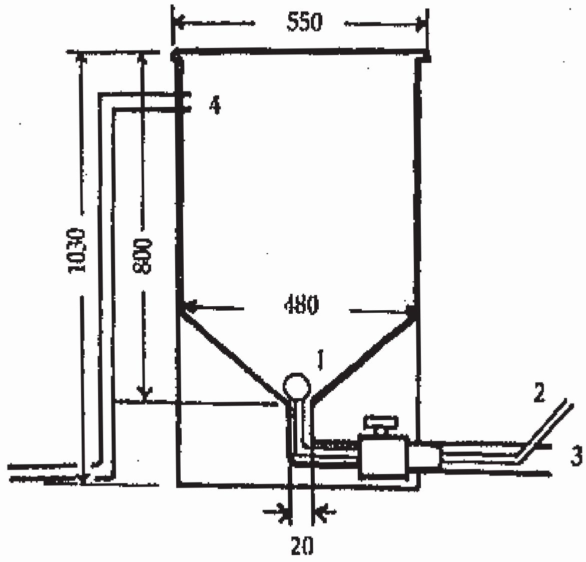

Fig. 2. Plastic tank used in the culture trial (dimensions in mm).
1: air-stone, 2: air supply pipe,
3: seawater supply pipe, 4: draining pipe.

Before the seaweed was weighed, as much water as possible was drained by putting the whole seaweed from each tank in a mesh bag and strongly swinging it around by hand.

Results

Fig. 3 shows the growth of the seaweed for both tanks. In Tank A, the seaweed grew from 200 g WW to 464.7 g WW in 6 days. Then the seaweed started to grow faster and constantly until 4,545 g WW on the 41st day. The linear regression line

$$y = 114.13\,x - 272.38 \qquad (R^2 = 0.995)$$

represents well the growth during this period. This indicates that the seaweed grew 114 g WW daily. After reaching 4,545 g WW, the seaweed continued to grow at a slower speed until the maximum of 5,789 g WW was reached on the 59th day. On the 62nd day, the wet weight of the seaweed dropped to 5,329 g and some parts of the seaweed were observed to be dead.

In Tank B the growth of the seaweed was slow until 492 g WW on the 14th day. Then the growth was faster and reached 3,864 g WW on the 50th day. The growth during the fast growing period is also described well by the linear regression line of

$$y = 92.64 x - 738.54 \qquad (R^2 = 0.995),$$

which indicates that the seaweed grew 93 g WW everyday during the period.

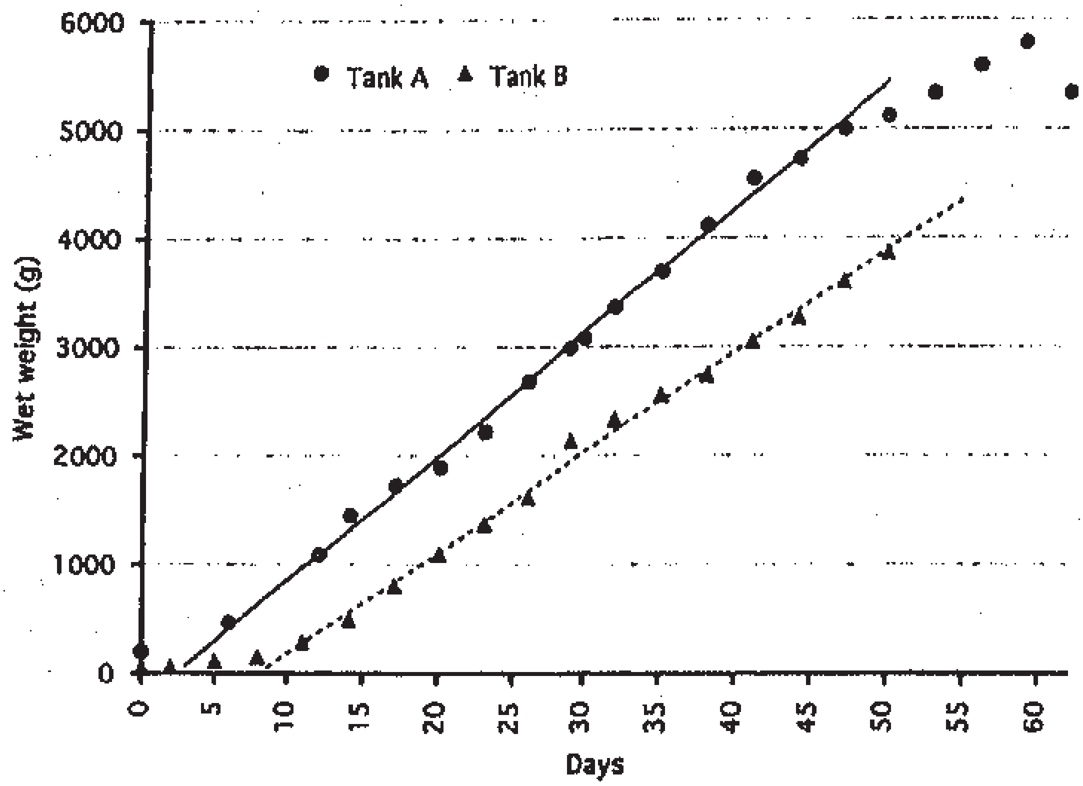

Fig. 3. Growth of *Gracilaria* sp. in the tanks.

The slopes of the regression lines are different at the 5% significance level between Tank A and Tank B. This indicates that the daily growth rate was significantly higher for Tank A than Tank B.

Discussion

The daily increase in weight of the seaweed was constant, namely 114 g WW for Tank A and 93 g WW for Tank B, after the total weight of the seaweed exceeded 460-490 g WW. Those daily increases are the daily sustainable crops from the tanks. At present, the brood stock of green snails consume seaweed at about 60 g per day, per one kg of total body weight. Therefore, the daily crops from Tank A and Tank B can maintain green snails of about 2 kg and 1.5 kg in total weight, respectively, or 26 and 20 individuals in number at the present body size, respectively.

Many factors affect the growth of the seaweed, namely, the seasons of the year, capacity of the tank, rate of water flow, intensity of aeration, intensity of illumination, growth of contaminating diatoms, concentrations of nutrient salts in the seawater etc. Among these factors, the intensity of aeration was stronger for Tank A than Tank B, while other factors were more or less the same. Therefore the difference in the daily growth between the two tanks can be explained by the difference in the aeration intensities. Further study should be conducted to clarify the relationship between the speed of growth and the intensity of aeration before the optimum intensity is determined.

References

Kikutani, K. 1994. Seed production of the green snail. Part I.

Yoshoku, 31 (11): 106-108. (in Japanese)
Kikutani, K. 1994. Seed production of the green snail. Part II. Yoshoku, 31 (12): 104-106. (in Japanese)