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CULTIVATION OF *CAULERPA LENTILLIFERA* USING TRAY AND SOWING METHODS IN BRACKISHWATER POND

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ABSTRACT

Commercial cultivation of *Caulerpa lentillifera* is now gaining recognition because of the increasing demand in the domestic and international market. Studies on the different culture methods for large scale production of the species in the country are scarce. The present study evaluated the effects of two cultivation methods namely sowing and tray on the growth and biomass production of *C. lentillifera* cultured in brackishwater pond. For the tray method, propagules were clipped in two 0.75 m x 0.75 m tray and were hung in bamboo frame whereas for the sowing method, propagules were planted directly in the pond substrate with an interval of one meter. The weight gain using the sowing method was significantly higher and could be translated to an average of 1 kg every month of new or harvestable biomass. Specific growth rate of *C. lentillifera* grown in the substrate was at 3.85% day^{-1} during the first month and at 2.92% day^{-1} during the second month and was significantly higher compared to that of stocks grown in trays. High organic load of the soil (substrate) could have improved growth and biomass productivity. The results show that cultivation of *C. lentillifera* using the sowing method is more effective. This system has significantly contributed to increase in biomass yield. Moreover, this method of farming entails lesser capital outlay without any other material requirements such as bamboos and trays.

INTRODUCTION

Green seaweeds from the genus *Caulerpa* particularly *Caulerpa lentillifera* and *Caulerpa racemosa* are consumed all throughout the Philippines. Both species are called sea grapes because of the grape-like tiny spherical beads tightly packed together on the stems. *C. lentillifera* or locally known as "*lato*" is more preferred because of its light, refreshing taste, soft and succulent texture (FAO, 1999). It is a popular seafood delicacy eaten as raw dip only in vinegar or used in fresh salads with other seafood and vegetables. It has gained recognition in the international seafood industry because of its high nutritional value. According to Saito et al. (2010), it has relatively high polyunsaturated fatty acids including omega 3 fatty acids. It has also high mineral content such as zinc and iron and trace elements including cobalt, selenium and valium that meet daily body requirements (Peña-Rodriguez et al., 2011).

This seaweed is adaptable to a variety of environments making it suitable for cultivation in ponds. It naturally inhabits a wide range of substrate consisting of rubbles to over 50 meters deep, sand on reef flats and shallow, muddy lagoons and forms beds and meadows in excellent condition habitats. However, it is sensitive to changes in salinity being stenohaline; salinities lower than 30 ppt result to poor growth and lower than 25 ppt salinity cause mortality.

Trono (1988) accounted the cultivation of *C. lentillifera* in the country and studied the culture method. It started in early 1950s when it was accidentally introduced in fishponds with some other seaweeds as feed in the province of Cebu. The culture technology of this species is relatively simple. Existing milkfish ponds can be used for cultivation. Cuttings are used as planting material and are planted one meter apart in the pond bottom. After the cuttings have rooted and started to grow, regular water exchange is needed to maintain a fresh supply of nutrients and maintain good water quality. Fertilization is done during the later stage when the seaweed is almost harvestable and the natural nutrients may no longer available to support the biomass. Fertilizer is applied using the "teabag" method wherein sacks of fertilizers are suspended in the ponds. Paul & de Nys, 2011 evaluated the use a culture vessel or tray in the cultivation of *C. lentillifera*. The vessels are square peforated plastic trays with an area of almost 1 m^2. Culture trays were rotated every 4 days, moving randomly positions with the system. They found out that this method is highly feasible.

The increasing demand for domestic consumption and international trade has led to the commercial cultivation of the species. Among the other varieties of *Caulerpa*, commercial aquaculture production only exists for *C. lentillifera* (Paul & de Nys, 2008). Nonetheless, different culture methods for large scale production of the species in the country are rarely evaluated. The development of a practical commercial production system will significantly contribute to increase in biomass yield and control of production cycles.

OBJECTIVE

The main objective of the study was to determine the effects of different cultivation methods (sowing and tray) on the growth and biomass production of *C. lentillifera* cultured in brackishwater pond. The results of the study could serve as basis in the development of effective culture system of *C. lentillifera* in brackishwater pond.

MATERIALS AND METHODS

Experimental Design

The experiment utilized a complete randomized design with two treatments corresponding to the cultivation methods: tray and sowing. Growing of *C. lentillifera* lasted for 60 days. The experiment was conducted in a private brackishwater fishpond owned by Mr. Buenaventura M. Cabangbang located at Bentig, Calape, Bohol.

Pond and Set Up Preparation

Two ponds with an area of 37.5 m^2 each were used in the experiment; each pond was assigned respectively to the two culture methods tested. Standard methods of pond preparation were observed. The ponds were dried and weeds were removed. Weeding is very important to get rid of other algae that might compete with *C. lentillifera*. Tea seed was added at 100 ppm to eradicate naturally occurring predators in the mud and lime at 100 ppm was applied subsequently. Ponds were fertilized with urea and cow manure at a rate of 100 ppm and 1500 ppm respectively. The incoming water was screened to prevent the entry of other organisms. The depth of the water was maintained at 1.2 – 1.5 m depth all throughout the experiment.

Stocking and Water Quality Monitoring

C. lentillifera shoots or fronds were collected from a private *Caulerpa* farm. The propagules were weighed and stocked according to the method of cultivation used. For the tray method, 2,500 grams of propagules was used for each tray. The propagules were clipped in two 0.75 m x 0.75 m tray; a total of 18 trays were utilized. For the sowing method, 250 grams of propagules was planted directly in the pond substrate with an interval of one meter; a total of 18 points were sowed. Water quality parameters such as salinity, temperature and pH were monitored daily. Water exchange (25% of pond water) was done daily to maintain necessary level of nutrients required for growth.

Biomass Production Monitoring

Growth and biomass were monitored monthly by sampling three trays and sowed points randomly. Total production yields were evaluated after 60 days. Pond water was drained prior to final harvesting. Biomass was determined by weighing the total harvested *C. lentillifera* for each treatment. Frond density was calculated by counting the number of fronds protruding above the tray and number of fronds that grow in the sowed propagules. Frond length was determined by measuring the length of newly grown fronds using a caliper. To estimate the specific growth rate (SGR), the following formula was used: SGR = [(ln final weight − ln initial weight)/days] x 100. Where: ln = natural logarithm of final and initial weight.

Statistical Analysis

All data were subjected to T-test. Differences were considered significant at the $p < 0.05$ level.

RESULTS AND DISCUSSION

Water Quality

Important water quality parameters such as pH, salinity and temperature were monitored twice a day, early in the morning and late in the afternoon to check fluctuations that could affect the results of the study. Within the duration of the experiment, the water quality parameters recorded were within the favorable range for seaweed culture as manifested from their morphological features and relatively high growth rates; the pH was at 7.9-8.4, salinity was at 29-37 ppt and temperature at 28-31^{o}C.

Growth

Total biomass productivities for *C. lentillifera* of the two methods are presented in Figure 1. After 30 days of culture, *C. lentillifera* in the tray method gained 800 g which is equivalent to 32% based on the initial weight while in the sowing method 1,190 g was added to total biomass which is equivalent to 476% increase based on the initial weight. After 60 days, *C. lentillifera* in the tray method gained another 649 g and accrued a total of 58% weight increment while in the sowing method swelled to almost double gaining another 1030 g and accumulated a total of 888% weight increment based on the initial weight. The weight gain using the sowing method was significantly higher and could be translated to an average of 1 kg every month of new or harvestable biomass. High organic load of the soil (substrate) could have improved biomass productivity. The weight gain obtained in the present study however is relatively lower compared to the report of Paul et al. (2009). They found out that total biomass productivity of *C. lentillifera* monoculture in plastic trays was at 1.5 kg week^{-1}. The culture system used a tip bucket to generate sporadic and turbulent water renewals and this was a key feature to sustaining biomass productivity with high biomass densities.

Average monthly growth rate is presented in Figure 4. Generally, there was a decline in the growth rate after 30 days of culture. Specific growth rate of *C. lentillifera* grown in the substrate was at 3.85% day^{-1} during the first month and at 2.92% day^{-1} during the second month and was significantly higher compared to that grown in trays. The results were comparable to specific growth rate of *Kapphycus alvarezii* cultured using bottom line and raft monocline methods (Samonte et al., 1993). The growth rates recorded in the experiment were lower compared to the average monthly growth rate of *Kapphycus alvarezii* grown on bamboo raft inside a floating net cage (Hurtado-Ponce, 1992).

Biomass Properties

C. lentillifera is characterized by thallus consisting of long horizontal stolons with few rhizoidal branches below and many erect, grapelike branches above. The erect branches are populated with many small capitates ramuli crowdedly attached to the main axis. There is no significant different in terms of thallus and branch length of *C. lentillifera* grown using the two methods.

CONCLUSION

C. lentillifera grown using the sowing method had significantly higher growth rate and biomass production. The results show that cultivation of *C. lentillifera* using the sowing method is more effective. This method of *C. lentillifera* farming entails lesser capital outlay without any other material requirements such as bamboos and trays.

REFERENCES

1. Avelin, M., Vitalina, M., Araceli, L., Matias, J. Rediscovery of naturally occurring seagrape *Caulerpa lentillifera* from the Gulf of Mannar and its mariculture. Current Science, 2009; 97(10): 1418-1420.

2. Hurtado-Ponce, A.Q. Cage culture of *Kapphycus alvarezii* var tambalang (Cigartinales, Rhodophyceae). Journal of Applied Phycology, 1992; 4: 311-313.
3. Paul, N.A., de Nys, R. Invention title: "Cultivating Seaweed" Specification for a patent in the name of James Cook University A01G 33/00 (2006.01). OPI date, 07-04-2011.
4. Paul, N.A., Symon, A.D., de Nys R. Green caviar and sea grapes: targeted cultivation of high value seaweeds from the genus Caulerpa. School of Marine and Tropical Biology, James Cook University, Townsville, 2009; 4811.
5. Peña-Rodríguez, A., Mawhinney T.P., Denis Ricque-Marie D., Cruz-Suárez L.E. Chemical composition of cultivated seaweed *Ulva clathrata* (Roth) C. Agardh. Food Chemistry, 2011; 129: 491–498.
6. Saito H., Xue, C.H., Yamashiro, R., Moromizato, S., Itabashi, Y. High polyunsaturated fatty acid levels in two subtropical macroalgae, Cladosiphon okamuranus and *Caulerpa lentillifera*. Journal of Phycology, 2010; 46: 665–673.
7. Samonte, G.P.B., Hurtado-Ponce, A.Q., Caturao, R.D. Economic analysis of bottom line and raft monocline culture of *Kapphycus alvarezii* var tambalang in Western Visayas, Philippines. Aquacuture, 1993; 110: 1-11.
8. Trono, G.C. Manual on Seaweed Culture: Pond Culture of *Caulerpa* and Pond Culture of *Gracilaria*. Marine Science Institute, College of Sciences, University of the Philippines Diliman. Quezon City, 1988.