Growth of Seaweed *Codium sp* in Super Intensive Shrimp Pond Liquid Waste

Fauzia Nur[1], Rajuddin Syamsuddin[1], Rustam[1]

Master Program, Postgraduate School, Hasanuddin University, Makassar, Indonesia
Faculty of Marine Sciences and Fisheries, Hasanuddin University, Makassar, Indonesia

Author Email: fauzia.nur2208@gmail.com

DOI: 10.29322/IJSRP.11.05.2021.p11371
http://dx.doi.org/10.29322/IJSRP.11.05.2021.p11371

ABSTRACT

Experiments were carried out on Codium sp seaweed cultivation with different seed weights using a growing medium in the form of super intensive shrimp pond liquid waste which aims to obtain the best seed weight to produce growth with 6 weeks of growing trials. The research was carried out at the Experimental Pond Installation (ITP) Institute for Brackish Water Cultivation Research and Development (BPPBAP), Punaga Village, Mangarabombang District, Takalar Regency. The container used is a plastic box measuring 87 cm x 64 cm. The treatments in the study were seed respectively weighted at 50 g (A), 100 g (B), 150 g (C), and 200 g (D), each with 3 replications utilizing a completely randomized design. The highest growth was obtained at seed weighted at 50 g and seed weighted at 100 g.

Keyword*: Codium sp, growth, weight, waste*

FOREWORD

Seaweed (Seaweed) is a macro algae which is a source of foreign exchange and a source of income for coastal communities. This marine commodity is also very popular in world trade because of its extensive use in everyday life, both as a source of food, medicine and industrial raw materials (Indriani and Sumiarsih, 2003).

Shrimp pond waste contains a total of 1.92% C, 0.54% N total, and 1.70% PO4 (Tangguda et al., 2015). Shrimp pond waste can be reused because it contains a lot of nutrients for the growth of seaweed.

Shrimp pond waste contains nutrients needed by seaweed. This matter aims to be able to meet the growth needs of Codium sp. and at the same time improving the quality of wastewater before it is discharged into the water so as not to disturb other ecosystems.

Based on this, a study was conducted on the effect of various seed weights of Codium sp on the growth of this species in intensive shrimp pond wastewater media. The purpose of this study was to determine the weight of the seeds that could provide the highest growth. This research is expected to be useful as information on Codium sp culture that can be carried out on intensive shrimp pond waste media and additional information material for intensive shrimp pond cultivators in managing their pond waste media.

METHODS OF RESEARCH

The research was carried out in September-October 2020 with an outdoor system (outdoor) at the Experimental Pond Installation (ITP) of the Brackish Water Cultivation Research and Development Center (BPPBAP), Punaga Village,

Mangarabombang District, Takalar Regency, South Sulawesi Province as a maintenance location for Codium sp.

Figure 1. *Codium sp*

1. Seeds Preparation

The seaweed used in this research is Codium sp or so-called pencuri tiram or "oyster thief" (Figure 1) which is taken directly from seaweed collectors in Punaga Village, Mangarabombang District, Takalar Regency.

The seeds are cleaned first of the dirt and acclimatized in a basin containing filtered seawater so that the seaweed seeds do not experience stress. Then the seeds are weighed with different initial weights according to the treatment of 50 g, 100 g, 150 g and 200 g and stored in a container in the form of a plastic box.

2. The Cultivation Container

The cultivation container used was a plastic box of 87 cm x 64 cm. The water level in the container is maintained at 40 cm (Figure 2).

Figure 2. Plastic Container

The water used in this research is water taken from the Wastewater Treatment Plant (IPAL), Experimental Pond Installation (ITP), Brackish Water Cultivation Research and Development Center (BPPBAP). Water is taken from the IPAL then put into each container. Treatment of 4 (four) different seed weights, which were tried, namely:

Seed weighted 50 g (A)

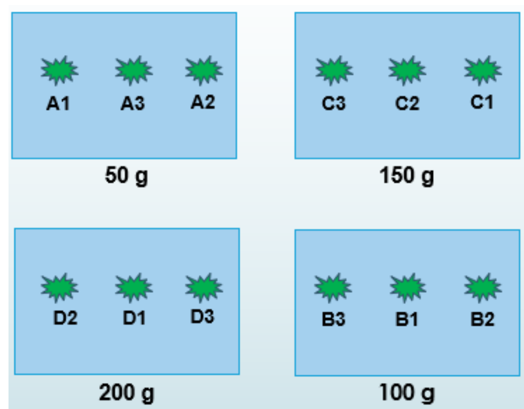
Seed weighted 100 g (B)

Seed weighted 150 g (C)

Seed weighted 200 g (D)

each with 3 (three) repetitions. The experimental design used in this study was a completely randomized design (CRD) (Figure 3).

Figure 3. Research Container Placement



3. *Daily Growth*

The daily growth of Codium sp was calculated using the Fortes formula (1981) as follows:

$$\mathbf{DGR} = \frac{\ln\left(\frac{Wt}{W0}\right)}{t} \times 100$$

Notes:

DGR =Daily Growth Rate
Wt = Weight on T day (gram)
Wo = Weight on 0 day (gram)
T = Time of planting (days)

4. Water Quality Measurement

Measurements of water quality parameters include measuring water temperature using a thermometer, measuring salinity using a Hand Refractometer, and measuring pH using a pH meter. Each measured once a week before changing the water. Meanwhile, CO2, N-Total, and P-Total were measured at the beginning and end of the study using titrimeter and spectrophotometer respectively at the Laboratory of Productivity and Water Quality, Department of Fisheries, Faculty of Marine Sciences and Fisheries, Hasanuddin University.

RESULTS

Tabel 2. *Codium sp Growth rate differences*

Seaweed Weight (*Codium sp*)	Daily Growth (%) ± Stdv
A = 50 g	5.36±0.41 [a]
B = 100 g	4.45±1.49 [a]
C = 150 g	0.36±0.05 [b]
D = 200 g	0.67±0.15 [b]

Based on the analysis of variance (ANOVA) (Appendix 4), it can be seen that the different initial weights have a significant effect (P <0.05) on the daily growth of Codium sp.

The Tukey test results (Table 2) showed that the highest daily growth of Codium sp (5.36 ± 0.41%) was obtained with an initial seed weight of 50 g and a weight of 150 g with the lowest daily growth rate (0.36 ± 0.05%). Iskandar et al., (2015) stated that initial weight is one of the technical factors that affect the growth of seaweed because of its relationship with nutrient absorption where different weights have different nutrient absorption and growth capabilities. According to Marisca (2013), the denser the maintained seaweed is, the lower its growth will be.

Soenardjo (2011) also noted that the daily growth rate of Eucheuma cottonii seaweed was high (5.74 ± 0.49%) in the 100 g seed weight treatment and low (5.39 ± 0.366%) in the 150 g seed weight treatment. Likewise Maingak et al. (2015) obtained a high daily growth rate of K. alvarezii (2.64%) at an initial seed weight of 20 g and low (0.55%) at a seed weight of 50 gr. Smaller initial seed weight (lower weight) will grow faster because there is no high competition between talus in obtaining nutrients.

Water Quality

Water quality is one of the factors that plays an important role in the success of a seaweed cultivation business. Water quality parameters (Table 3) play an important role for the growth of Codium sp because they have a direct effect on metabolic processes. The growth and quality of seaweed is influenced by environmental conditions including salinity, temperature, pH, P-Total, N-Total and CO².

Tabel 3**.** Water Quality during Maintenance

No	**Parameter**	**Range**	**Reference**	**Source**
1	Suhu (°C)	26-33⁰C	27-32 ⁰C	(Novianti *et al.*, 2015)
2	Salinitas (ppt)	33-54 ppt	25–35 ppt	(Burhanuddin, 2014)
3	pH	7,5-9,1	7,7-8,3.	(Yuliyana *et al.*, 2015)
4	N Total (ppm)	Initial 0,6 Final 0,257-0,287	0,0166-83,3333	Zatnika (2009)
5	P Total (ppm)	Initial 8,27 Final 6,01-7,19	0.1-3.5	Papalia (1997)
6	CO² (ppm)	Initial4 Final tt	10-25	Kordi (2011)

The results of temperature measurements during the study ranged from 26-330C. This range is still considered suitable to support seaweed life. According to Novianti et al. (2015) the temperature for the growth of seaweed ranges from 27-32 0C. Meanwhile, Syamsuddin (2014) states that the suitable temperature for grass cultivation ranges from 26 - 33 ° C.

The range of degree of acidity (pH) during the study ranged from 7.5-9.1. This range value is still feasible for the growth of Codium sp. This is in accordance with what Ruslaini (2016) and Anggadireja et al (2006) stated that a good pH value for seaweed growth ranges from 6–9.

The range of salinity obtained during the study was relatively high in the range of 33-54 ppt. The proper salinity range for seaweed cultivation is 28-35 ppt (Ditjenkan Budidaya, 2005). Meanwhile, Guo (2014) states that the optimal salinity range for seaweed growth is 25-33 ppt.

Carbon dioxide (CO2) at the beginning of the study had a concentration of 4 ppm. This concentration was not detected at the end of the study. This shows that carbon dioxide is absorbed by Codium sp, for its growth.

Total nitrogen which at the beginning of the study had a concentration of 0.6 ppm had a concentration ranging from 0.257 to 0.287 ppm at the end of the study. These results prove that nitrogen is absorbed by Codium sp. Phosphate (PO4) obtained in the study, namely before stocking ranged from 0.544 to 0.650 ppm and after harvest phosphorus was absorbed by Codium sp. and still in the proper range for growth of Codium sp. Papalia (1997) explained that the optimal phosphate range to support algae growth is between 0.1 - 3.5 ppm.

Ginting (2015) states that the decrease in nitrate and phosphate in cultivation locations is due to the absorption of nitrates and phosphates to support the growth of seaweed.

N and P elements are nutrients needed by algae for their growth. Elemental P is small in number and in comparison with elemental N which is a limiting factor for algae growth (Dwijdjoseputro 1994; Hutabarat, 2000).

CONCLUSIONS

Based on research on the effect of different initial weights on the growth of Codium sp seaweed in intensive shrimp pond liquid waste media, it can be concluded that the highest daily growth was obtained at initial seed weights of 50 g and 100 g.

To get optimal growth results it is recommended to use initial seed weights of 50 g and 100 g in cultivating seaweed Codium sp. And to absorb N-Total, P-Total and CO^2 *in intensive shrimp pond wastewater, Codium sp with seed weights of 150 g and 200 g can be used.*

BIBLIOGRAPHY

Anggadiredja, J. T., A. Zatnika, H. Purwoto & S. Istini. (2006). Rumput Laut. Cetakan I. Jakarta : Penerbit Swadaya.

Burhanuddin. 2014. Respon Warna Cahaya Terhadap Pertumbuhan Dan Kandungan Karatenoid Anggur Laut (*Caulerpa racemosa*) Pada Wadah Terkontrol. Jurnal Balik Diwa, *5*(1), 8-13.

Ditjenkan Budidaya. 2005. Profil Rumput Laut Indonesia. Direktorat Jederal Perikanan Budidaya. Departemen Perikanan dan Kelautan. Jakarta.

Dwidjoseputro, D. 1994. Pengantar Fisiologi Tumbuhan. PT Gramedia Pustaka Utama, Jakarta.

Fortes, T.G. 1981. Introduction to The Seaweed Their Characteristics and Economic Importance. Report in Training Course of *Glacillaria* Algae. Up-South China Sea Project. Manila Philippines.

Ginting, E.S., S. Rejeki & T. Susilowati. 2015. Pengaruh Perendaman Pupuk Organik Cair dengan Dosis yang Berbeda Terhadap Pertumbuhan Rumput Laut (*Caulerpa lentillifera*). Journal of Aquaculture Management and Technology Vol 4 (4): 82-87.

Guo, H., J. Yao, Z. Sun & D. Duan. 2014. Effect of Temperature, Irradiance on the Growth of the Green Alga *Caulerpa lentillifera* (Bryopsidophyceae, Chlorophyta). Journal of Applied Phycology Vol 27(2): 879-885.

Hutabarat, S. 2000. Produktivitas Perairan dan Plankton Telaah terhadap Ilmu Perikanan dan Kelautan. Badan Penerbit UNDIP, Semarang.

Indriani, H & E. Sumarsih. 2003. Budidaya, Pengelolaan dan Pemasaran Rumput Laut. Penebar Swadaya. Jakarta

Kordi, K. H. G. M. (2011). Ekosistem Lamun (*Seagrass*): Fungsi, Potensi, Pengolahan. Jakarta: Rineka Cipta, 191 hlm.

Maingak, T. N., R. Syamsuddin, & M. Syamsuddin. 2015. Produksi Biomassa dan Kandungan Karaginan Rumput Laut (*Kappaphycus alvarezii*) Hasil Pengembangan Spora yang Dibudidayakan dengan Bobot Awal Berbeda. Fakultas Ilmu Kelautan dan Perikanan, Universitas Hasanuddin, Makassar.

Marisca, N. 2013. Aklimatisasi Rumput Laut *Kappaphycus alvarezii* Hasil Kultur Jaringan dengan Kepadatan yang Berbeda dalam Akuarium di Rumah Kaca [skripsi]. Bogor: Fakultas Perikanan dan Ilmu Kelautan, Institut Pertanian Bogor. 73 hal.

Novianti, D., S. Rejeki, & T. Susilowati. 2015. Pengaruh Bobot Awal yang Berbeda Terhadap Pertumbuhan Rumput Laut Latoh (*Caulerpa lentillifera*) yang Dibudidaya Di Dasar Tambak, Jepara. Journal of Aquaculture Management and Technology, 4(4).

Papalia, S. (1997). Pengaruh Konsentrasi Fitohormon Auksin dan Lama Waktu Perendaman Terhadap Laju Pertumbuhan dan Mutu Rumput Laut *Euchema cottonii*. Tesis. Program Pascasarjana. Universitas Hasanuddin, Makassar.

Ruslaini. 2016. Kajian Kualitas Air Terhadap Pertumbuhan Rumput Laut (*Gracilaria verrucosa*) Di Tambak Dengan Metode Vertikultur. Octupus Jurnal Ilmu Perikanan, 5(2).

Soenardjo, N. 2011. Aplikasi Budidaya Rumput Laut (*Eucheuma cottonii*) dengan Metode Jaring Lepas Dasar

(Net Bag) Model Cidaun. Universitas Diponegoro, Semarang, 1: 36 – 44.

Syamsuddin, R. 2014. Pengelolaan Kualitas Air Teori dan Aplikasi di Sektor Perikanan. Cetakan Pertama. Pijar Press. Katalog Dalam Terbitan. 340 hal.

Tangguda, S., D. Arfiati, & A. W. Ekawati. 2015. Utiliation of Solid Waste from White Shrimp (*Litopenaeus vannamei*) Farm on The Growth and Chlorophyll Content in *Chlorella sp*. Journal of Life Sci. Biomed 5 (3), 81-85.

Yuliyana, A., S. Rejeki, & L. L. Widowati. 2015. Pengaruh Salinitas yang Berbeda Terhadap Pertumbuhan Rumput Laut Latoh (*Caulerpa lentillifera*) di Laboratorium Pengembangan Wilayah Pantai (Lpwp) Jepara. Journal of Aquaculture Management and Technology, 4(4).

Zatnika, A. (2009). Pedoman Teknis Budidaya Rumput Laut. Badan Pengkajian dan Penerapan Teknologi, Jakarta, Indonesia.