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Analysis of Nitrogen and Phosphorus Content of Seaweed *Codium* sp. in Super Intensive Shrimp Pond Liquid Waste

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Abstract**—** *Codium sp. seaweed cultivation trials. Which is different seed weights on the growth media in the form of super intensive shrimp pond liquid waste. The research aims to analyze the ability of Codium sp. absorbing nitrogen and phosphorus from shrimp culture media. The study was conducted for 45 days at the Experimental Pond Installation (ITP) Research and Development Center for Brackish Water Aquaculture (BPPBAP), Punaga Village, Mangarabombang District, Takalar Regency. A plastic box is used by container in this reseach measuring 87 cm x 64 cm with a water level of 40. The study consisted of 4 weight treatments of Codium sp. namely A (50 g), B (100 g), C (50 g) and D (200 g) and each treatment was repeated three times. Data of reseach is analyzed by ANOVA with 95% confidence level and further W-Tuckey test using SPSS version 23 software. The results showed that there was an effect of absorption by seaweed Codium sp. with a seed weight of 200 g resulted in the highest N-total absorption rate of 0.1133±0.01155%, while the highest P-Total absorption rate was at a weight of 100 g with a value of 0.00500±0.002646%.*

Keywords**— *Nitrogen and Phosphorus Content, Liquid Waste, BPPBAP***

I. INTRODUCTION

Pollutant compounds have the ability to lead to a greater decrease in water quality, and waste is one of the hazards to contaminating the aquatic environment. Contaminants in the water will have an impact on the biota there as well as the quantity and quality of fisheries products (Syamsuddin, 2014). One of the major issues with the development of super-intensive technology in Indonesia is the environmental contamination caused by organic waste from super-intensive shrimp ponds that contains nitrogen (N) and phosphate (P) from the usage of a lot of feed (Paena *et al.*, 2020).

The most frequent issue with shrimp farming is the impact of shrimp pond waste on the environment (Buir *et al.*, 2012). The high quantity of organic waste and nutrients from pond water discharge is one of the factors contributing to the reduction in the environmental quality of pond waters. Remaining feed and excrement dissolve in pond water and are then released into the waters beyond the cultivation area, where they contribute to the high organic and nutrient waste output.

According to Stowell (2000), aquatic plants generally have the ability to neutralize specific elements in waterways, which is particularly helpful for treating wastewater. This demonstrates that aquatic plants' capacity to filter substances dissolved in liquid waste may have application in the liquid waste treatment industry.

Due to its ability to extract macronutrients and metal pollutants from the environment, seaweed is an aquatic plant or fishery product that is increasingly exploited in the bioremediation of polluted waters (Neori *et al.*, 2004). In terms of N uptake, seaweed has been found to outperform bacterial filters. Using seaweed as a filter will reduce the amount of ammonium in the water, whereas using a bacterial filter and recirculating the water will cause nitrate levels to gradually rise (Cahill *et al*., 2010)

Research is needed to find a way to use Codium sp. seaweed as a medium for absorbing N-Total and P-

Total in waters, which would minimize pollution of super-intensive vannamei shrimp pond waste.

II. Research Methodology

Location of The Study

The Experimental Pond Installation (ITP) of the Research and Development Center for Brackish Water Cultivation (BPPBAP), Punaga Village, Mangarabombang District, Takalar Regency, South Sulawesi Province, was the site of this study for 6 (six) weeks.

Preparation of seeds

This study used the seaweed Codium sp., sometimes known as oyster thieves (Figure 1). To prevent stress on the seaweed seeds, the seeds are first cleared of any clinging dirt before being acclimated in a basin of filtered seawater. Following that, the seedlings were placed in plastic boxes and preserved after being weighed at various beginning weights (50 g, 100 g, 150 g, and 200 g).

Fig.1. Codium sp. used in research

Preservation of Seaweed

Codium sp. is chosen for seed planting and weighed with an electric balance. The seeds were attached with ropes to coral fragments that were 5 cm and 4 cm thick and that served as the growing medium for super-intensive shrimp waste water. A particularly designed off-bottom approach is used to plant seedlings in culture containers in the shape of plastic boxes (Figure 2).

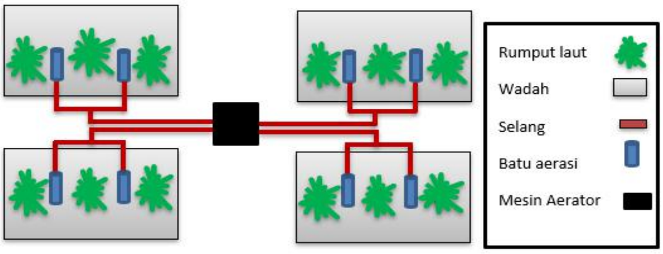

Fig.2. Seaweed cultivation construction

Once a week, media water changes are performed by first sucking out 80% of the water in the container using a hose. Every week, the codium that has been placed in the container is checked to see how it is developing.

Research and treatment planning

Completely randomized design (CRD) was employed in this study, and the following treatments were evaluated:

Treatment A: 50g of *Codium* sp

Treatment B: 100g of *Codium* sp

Treatment C: 150g of *Codium* sp

Treatment D: 200g of *Codium* sp

Parameters

Absorption of Nitrogen and Phosphorus

According to Kitadai et al. (2007), the equation that is used to compute the absorption rate of N and P in seaweed is as follows:

$$\boldsymbol{Pob = (Ct - Co) \times \alpha / t}$$

Where:

Pob = is the rate of N and P uptake of seaweed per square meter of culture (mg/m2/day).

Co =is the initial maintenance N and P concentration of seaweed (mg DW/g).

Ct = is the seaweed's N and P content at the conclusion of maintenance (mg DW/g).

A = Dry biomass of seaweed per square meter of cultivation

t = Duration of upkeep (days)

Data Analysis

Using SPSS version 23 software, an ANOVA and W-Tuckey follow-up test were conducted to ascertain the influence of treatment on the observed variables, namely the absorption of Total N and Total P in *Codium* sp.

III. RESULT AND DISCUSSION

The analysis of variance (ANOVA) findings revealed that *Codium* sp's weight treatment had an impact ($P < 0.05$) on the rate of N-total absorption from super-intensive shrimp pond effluent. According to Tukey's test, treatment D with an initial seed weight of 200 g had the maximum absorption rate of N-total *Codium* sp., which was not statistically different from treatment B. (100 g weight). There was no discernible difference between treatment A (50 g weight) and treatments B and C. Treatment A had the lowest rate of total N absorption (0.0433 0.005%). The following table displays the overall N absorption rate.

Table 1. Absorption rate of N-Total Codium sp

Treatment (g)	Absorption rate N-Total (%) ± Stdv
A = 50	0.0433± 0.00577 [a]
B = 100	0.1000±0.03464 [ab]
C = 150	0.0533±0.02517 [a]
D = 200	0.1133±0.01155 [b]

Note: Divergent letters within a single column signify statistically significant variations between treatments at the 5% level ($p < 0.05$).

Treatment D produced the highest N-total Codium sp. absorption rate. The table above demonstrates a decrease in N-Total content in the water as a result of the seaweed *Codium* sp. absorption, including nitrification, nitrogen assimilation, denitrification, and ammonification, can fix nitrogen for use by organisms. However, because the majority of the nitrogen in the water is present as nitrate and nitrite ions, bacteria with the capacity to convert nitrite to nitrate can aid (Patadjai, 2007).

According to Budiyani *et al.* (2012), a decline in nitrate content denotes a reasonably good uptake of nutrients for growth. According to Kushartono *et al.* (2009), nitrate is a component of nitrogen that is crucial for stimulating a plant's growth so that it can expand quickly. Conversely, if there is a deficiency of nitrogen, it will hinder growth since photosynthesis would be interrupted.

While, Budiyani *et al.* (2012) said that the higher the nitrogen concentration, the less fresh the seaweed is and the easier it is to break the thallus, which stunts the growth of the seaweed.

The Tukey test was omitted since the analysis of variance (ANOVA) results indicated that the seedling initial weight treatment had no impact ($P>0.05$) on the rate of absorption of P-total *Codium* sp. (Table 2).

Table 2. Absorption Rate of P-Total Codium sp.

Treatments (g)	Absorption Rate P-Total (%) ± Stdv
A = 50	0.00233± 0.000577[a]
B = 100	0.00500±0.002646 [a]
C = 150	0.00333±0.002517 [a]
D = 200	0.00392±0.003606 [a]
D = 200	0.00392±0.003606 [a]

Note: Divergent letters within a single column signify statistically significant variations between treatments at the 5% level ($p< 0.05$).

The highest P-total Codium sp. absorption rate was found in treatment B, where it was 0.00500 ±0.002646%, followed by treatments D (0.00392 ±0.003606%), C (0.00333± 0.002517%), and A (0.00233± 0.000577%).

According to Yuniarsih *et al.* (2014), seaweed may take up N and P from the water. According to theory, seaweed used phosphate, an important nutrient involved in photosynthesis, to lower the amount of phosphate in the water. This is in line with Dwijdjoseputro's (1994) assertion that phosphate is an essential nutrient for all kinds of plants since it is a macroelement that is crucial for photosynthesis and other metabolic activities including the production of adenosine triphosphate (ATP). Additionally, phosphate can be swiftly absorbed by aquatic plants, lowering the phosphate level in the water.

The nitrogen percentage in offshore cultivation ranges from 0.44 to 4.73%, and the phosphorus value is between 0.06 and 1.07%. It is consistent with the belief that seaweed typically has a network content of macronutrients N and P that is typically produced at levels between 3.5 and 5% N. (Marinho, 2015; Handa, 2013). Additionally, the results of phosphorus values in Bruhn's research (2016) ranged from 0.3-0.9%.

IV. CONCLUSION

According to the study's findings, media D experienced the greatest decrease in N-Total, or 0.1133%, whereas media B experienced the greatest decrease in P-Total, or 0.00500%.

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