

The Effect of Coconut Water on Increasing Biomass Production of Marine Algae (*Kappaphycus alvarezii*)

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ABSTRACT

A shortage of seeds and low-quality production of the marine algae *Kappaphycus alvarezii* are classic problems that farmers encounter. Therefore, growth hormones, a natural ingredient in young coconut water, must be used. This research aimed to analyze the growth rate of the marine algae *K.alvarezii* using coconut water immersion treatment at different times (0 minutes, 30 minutes, 40 minutes, and 50 minutes) with an initial weight of 50 g. This research was conducted in South Sulawesi, Wakatobi Regency, Wangi-Wangi Selatan District, Liya One Melangka Village from June to October 2023. This research used the RAL method to measure the weight of the marine algae *Kappaphycus alvarezii* every 10 days and measure water quality for 40 days. The results of the ANOVA analysis in the soaking treatment of *K.alvarezii* sea algae seeds showed significant effects.

Keywords: *Kappaphycus alvarezii*, Specific Growth Rate, Water Quality.

1. INTRODUCTION

Wakatobi Regency is located in Southeast Sulawesi, which is an island regency which has a land area of ± 823 km² or only around 4.5% of the entire district area, where the sea area is more expansive than land, $\pm 18,377$ km². The water area has the potential for developing various aquaculture activities, such as marine algae cultivation and marine tourism, which have developed so far.

Marine algae has advantages compared to other aquaculture commodities in that it has simple cultivation technology, high export markets, relatively small capital, diverse processed products and several other functions. These advantages provide positive indications for marine algae cultivation (Parenrengi et al., 2008).

The type of marine algae that is often cultivated is *Kappaphycus alvarezii*. This type of algae has smooth and cylindrical thallus has red, grey, yellow and green colors (Wiratmaja et al., 2011). The type of algae *K.alvarezii* has a yeast content consisting of lambda, kappa and iota. Cultivating marine algae also has obstacles to its growth. In this case, the growth of marine algae *K.alvarezii* can be increased by using nutrients and growth hormones or growth regulators (Sugara, 2011).

The ingredient that contains growth

regulators is coconut water. The coconut water used is young coconut with a maximum age of 6-8 months (Bhagya et al., 2012). Furthermore, Aisa et al. (2020) stated that coconut water is one of the sources of natural growth hormones, where coconut water contains minerals, cytokinin hormones and auxin, and a small amount of gibberellin. The cytokinin content accelerates the speed of cell division, and the auxin content increases cell enlargement. The cytokinin and auxin content in coconut water is vital in the growth of the marine algae *K.alvarezii*. Based on the above background, research was conducted titled "the effect of coconut water on increasing marine algae biomass production (*K.alvarezii*).

2. RESEARCH METHOD

Time and Place

This research was conducted for 40 days in June – August 2023 in Liya One Melangka Village, Wangi-Wangi District, Wakatobi Regency, Southeast Sulawesi.

Method

The method used in this research used the RAL method with 4 treatments and 3 repetitions.

Procedures

In this case, several things need to be

prepared for preparing a place for raising marine algae, such as nylon ropes, buoys, boat anchors, polyethylene ropes, and sea algae seeds. The marine algae cultivation process is carried out based on the Indonesian National Standard (SNI: 7579.2.2010); at this stage, seawater (5 L) and young coconut water (25 mL) will be mixed in each soaking container for different durations of time. Required consists of 0 minutes as control, 30 minutes, 40 minutes, and 50 minutes. After that, the soaked sea algae will be tied to a rise rope, which will be stretched by tying it to the end of a rock rope or anchor according to the long line method (Tamala et al., 2022).

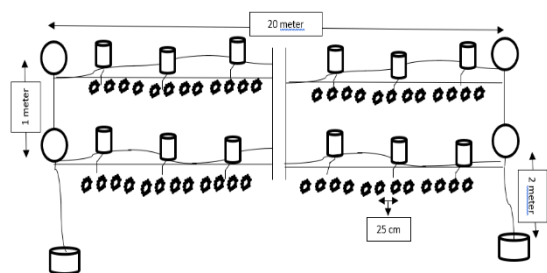


Figure 1. Long line method

Specific Growth Rate (SGR)

According to Sangkia (2017), the calculation of a specific growth rate using the following formula

$$SGR = \frac{\ln W_t - \ln W_o}{t} \times 100\%$$

Information:

SGR : Specific growth rate (% days)

Wt : Weight at the end of the study (g)

Wo : Weight at the start of the study (g)

T : Duration of research (days)

Water Quality Parameters

Water quality measurements consisting of temperature, pH, salinity, phosphate and nitrate are the parameters observed as supporting factors in maintaining marine algae. This measurement was carried out 4 times during observations of marine algae growth, which was carried out for 40 days (Yusran et al., 2021):

$$\text{Total oil content (ppm)} = \frac{(A-B)g \times 75ml}{(C \text{ ml} \times 1000)}$$

Description:

A : Weight of flask after evaporation (g)

B : Weight of empty flask (g)

C : Volume of CHCl_3 after extracting (mL)

Data Analysis

To find out the results of the effect of giving coconut water to marine algae with long soaking, the data obtained includes the results of calculating the specific growth rate of the marine algae *K.alvarezii*, which was calculated using one-way analysis of variance (ANOVA) by carrying out an F test from the completely randomized design method.

3. RESULT AND DISCUSSION

Specific Growth Rate

The following data shows the growth in specific weight during 40 days of observation. For observation results, see Figure 2.

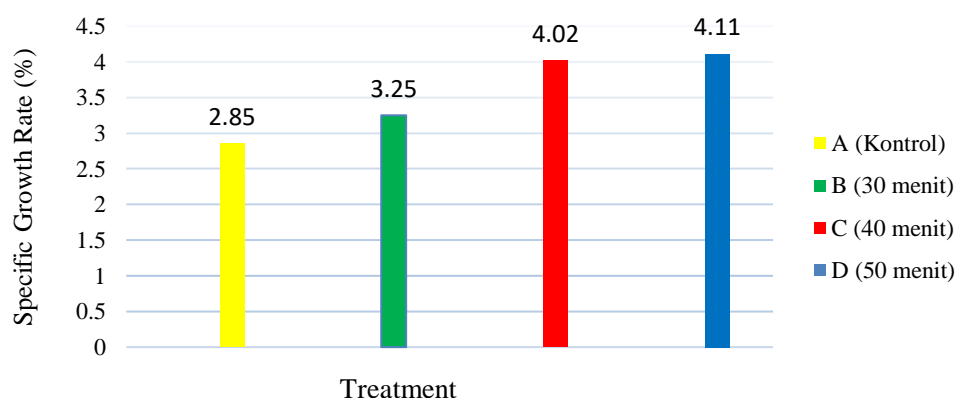


Figure 2. Specific average growth of *K.alvarezii* during 40-day maintenance

Duncan's test showed that giving young coconut water showed that treatments A and B were significantly different, while treatments C and D were not significantly different. This proves that the longer soaking using young coconut water will affect the absorption of nutrients for the growth of the marine algae

K.alvarezii. Meanwhile, treatment B had less time than treatments C and D to absorb the nutrients in coconut water during soaking; as a control, treatment A did not use coconut water as a treatment mediation, so the growth process was slower. According to Aisa et al. (2020), soaking marine algae for different lengths of

time can affect growth using coconut water.

growth of marine algae. The measured parameters are temperature, pH, salinity, nitrate, and phosphate.

Water Quality

Water quality has a vital role in the

Table 3. Water quality parameters

Parameter	Day 10		Day 20		Day 30		Day 40	
	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
Temperature (°C)	26, 8	27, 5	26, 7	27, 1	26, 2	27, 0	27, 7	27, 4
pH	7, 0	6, 51	6, 51	6, 95	6, 71	6, 61	7, 36	7, 33
Salinity (ppt)	28	29	29	30	28	30	29	30

Table 4. Nitrate and phosphate

No	Parameter	Beginning	End	Analysis method
1.	Nitrate (mg/L)	0,126	0,114	Brucin's method
2.	Phosphate (mg/L)	0,038	0,048	Spectrophotometer Method

Temperature measurements during the research ranged from 26.2-27.7°C. Water temperature is related to photosynthesis. This follows the statement of Anggadireja et al. (2006) that the optimal temperature for the marine algae *K. alvarezii* is 26-30 °C. The results of salinity measurements during the research ranged from 28-30 ppt. In this case, Anggadiredja et al. (2006) showed that the salinity range for the growth of marine algae *K.alvarezii* is around 25-31ppt, which is still tolerated by marine algae for its growth and development needs.

The pH range during the study was 6.51 - 7.36. This follows Zatinika (2009), where almost all marine algae have a pH adjustment range of 6 to 9. The phosphate concentration in the study

ranged between 0.038 - 0.48 mg/L. This data shows that phosphate in the waters is sufficient for the growth of marine algae. Nitrate is also an essential component for the growth of the thallus of the marine algae *K.alvarezii*. Research shows that nitrate concentrations range from 0.126 - 0.114 mg /L.

4. CONCLUSION

The young coconut water used in this research process significantly impacts Followed by treatment C (4.02%) and treatment B (3.25%). Meanwhile, for treatment A (2.85%), this treatment was only a control, so it experienced slow growth.

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