The Effect of Seaweed (Eucheuma cattonii) Growth Using Fluid Fertilizer with Different Concentration in Coastal Area of Batuboy Village Namlea District

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Abstract—The purpose of this research was to analyze how far the growth of seaweed using fluid fertilizer with different concentration towards the growth rate of Seaweed (Eucheuma cattonii). This research has been held on July to August 2019, that located on coastal area of Batuboy Village Namlea District Buru Regency. From the analysis result of growth rate of seaweed either from the weekly growth rate, specific growth rate or the absolute growth rate shows a great significant influence where the best treatment was on treatment B (dosage 300 cc) with the soaking time around 6 hours with growth value at the end of the research as shown as weekly growth was 576,222 gram, absolute growth around 546,222 gram and specific growth around 7,767 %.

Index Terms—Growth, Fluid Fertilizer, Seaweed (Eucheuma cattonii), Coastal Area of Batuboy village

1 INTRODUCTION
Seaweed is one of marine biology resource that has a high economic value that could potentially developed as cultivation business. The reason why seaweed has a high economic value is because value the high in hydrocolloid content of the seaweed (karagenan, agar and alginat) that really needed by lots of industries. The seaweed could be utilize and processed to be 500 kind of commercial product. Started with gelatin of seaweed, wool, food, medicine, cosmetics, tooth paste, shampoo, paper, textile, and even lubricating oil on Petro-gas industries. The seaweed has been utilized in Indonesia around the 20th century, but the use of seaweed was quite limited on medicine and food by the traditional utilization way. One of benefit of the seaweed are anti-tumor, lowering blood pressure, and overcome some glandular disease (Zatnika, 2009). While the kind of seaweed including Eucheuma sp, Gelidium, Gelidiopsis, and Gracilaria. By those 4 groups of species, Eucheuma sp. Is the most available in coastal area, and even by Doty (1973) in Soegiarto et al., (1978) the world need of Eucheuma sp. Seaweed was 10 times of it’s availability in it’s natural habitat. This demand showing that Indonesian seaweed is favorable and could compete with other seaweed from other country. The high in demand of seaweed as one of export commodity so therefore we need an effort to increase the cultivation of seaweed, especially in Buru regency.

Buru regency has the coastal area around ±1,972.5 km² with coastline area around ± 232,2 km and the the land area around ±7,549.98 km². with that kind of coastal condition, therefore the Buru regency has a potential in marine and coastal resources that quite high that supported by it’s ecosystem. (Anonymous, 2011).

Saliong village is on of village located on namlea district with. it’s area of Batuboy. Saliong village has the kind of fishery potential that quite high either the direct fishery or cultivation fishery. The direct fishery shown by the existence of bagang or fish dome, comb and cultivation fishery shown by the ex istence of seaweed cultivation. Seaweed cultivation in Saliong village has been held since 2007, but year by year the seaweed production of Saliong village was not quite maximum.

2. METHOD
2.1 The location of observation station
The observation location was on the seaweed cultivation center that has been held there by the local society. While the stated location was chosen on the area in which a coastal area with a great potential for cultivation.

2.2 Method to Obtain Data
Method to obtain data was by doing observation directly, the approach of the method are:
Primary Data : data that obtained from direct observation, directly saw the cultivation technique and doing some interview towards respondent that basically knew the tested object. Secondary Data : data that obtained from books, thesis and internet that would support the research result. Wither by noted all information obtained directly in the research station that related to the object observed

2.3. Cultivation Method
The cultivation method that has been used in this research was long line method. Long line method basically the same as the raft method, but not using bamboo as the raft. And using a plastic rope or a bottle of Aqua as floating kit. This method widely known by the society because it was more affordable and economic and could be applied in a quite deep coast. According to Wisnu (2006), the beneficial by using this kind of method are:

a. The plant get the optimum light
b. The plant resist to the changes of water quality
c. Free of pest that basically infect on the base of the coast
d. Faster in growth
e. The installation is quite easy and affordable or economic
2.4. Research Procedure
Well the research procedure shown on figure 1 below

![Research Procedure Diagram]

**Preparation Stage:**
1. Quality measurement
   - Kit for the water
2. a unit of long line (rope) with diameter 8 mm, 4 mm, 1 mm, flouter, and anchor
3. other toolkit: bucket, knife, and tray

**Seed Selection:**
1. Brighter in color
2. Fresh and lateral
3. soaks the tested seed in a solution that contain fertilizer

**Research Treatment:**
1. the tested-seed soaked with concentration
   - 250 cc/L, 300 cc/L, and 350 cc/L
   - (symbol = A, B, C)
2. the soaking time about 6 hours with each treatment repeated for 3 times

2.5. Observed Variable

**Absolute Weight of Growth**

To know the absolute growth rate there must be a measurement of weight of the seaweed at the initial and at the end of the research. Then the weight of seaweed obtained would be analyzed using a formula by Jana, et al., (2009) as follows:

\[
G = W_t - W_0
\]

Where:
- \(G\) = Absolute Growth Rate
- \(W_t\) = Average weight of seaweed at the end of the research
- \(W_0\) = Average weight of seaweed in the initial treatment

**Specific Growth Rate**

Specific growth rate measure every single interval of time for about 7 times a day, for almost 35 days, there were 5 times sampling until the end of the research. To measure the SGR using formula with N equation. Zonneveld et al. (1991) in Patadjai (2007)

\[
SGR = (\frac{W_t}{W_0})^{\frac{1}{t}} - 1 \times 100\%
\]

Where:
- \(SGR\): Specific Growth Rate (%)
- \(W_t\): weight on \(t\) time (g)
- \(W_0\): initial weight (g)
- \(t\): numbers of observation day (days)

2.6. Data Analysis

According to Jalil Silea.L.M and Lita Masitha (2004), seaweed grew well on bionic solution on concentration 150 cc with soaking period around 6 hours. While by Yanto.A.A (2008) revealed that on his previous research been using treatment with concentration 100 cc, 150 cc and 200 cc stated that the wel-grown was on solution with concentration 200 cc. Therefore researcher has done the research that has been using 3 kind of different concentration treatment, they were the treatment A (dosage 250 cc), Treatment B (dosage 300 cc) and Treatment C (dosage 350 cc). The research has done 3 repetition for each treatment (\(i = 1,2,3\)) based on figure 3, so the design that has been used was the Complete Random Design (CRD). According to Gasperz (1994) as follows:

\[
Y_{ti} = \mu + ti + Eij
\]

Keterangan:
- \(\mu\): Mean of population;
- \(ti\): additive influence of treatment- \(i\);
- \(Eij\): research typograph on treatment - \(i\) on observation - \(j\);
- \(I\): number of treatment (\(i = 1,2,3,\ldots,n\));
- \(J\): number of repetition per treatment (\(j = 1,2,3,\ldots,n\))

3. RESULT AND DISCUSSION

3.1. Average Growth of Seaweed (E.cattonii) per Week (Gram)

The average growth result of seaweed *Eucheuma cattonii* each week based on the influence of fluid fertilizer shown on Table 1 and Figure 2.

Table 1: Average Growth Weight of Seaweed (E.cattonii) Per Week (Gram)

<table>
<thead>
<tr>
<th>No</th>
<th>Treatment</th>
<th>Observation time (Week)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M I</td>
<td>M II</td>
</tr>
<tr>
<td>1</td>
<td>CV</td>
<td>38.66</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>42.66</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>45.11</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>43.55</td>
</tr>
</tbody>
</table>

Information:
- CV: Control Variable
- A: dosage 250 cc
- B: dosage 300 cc
- C: dosage 350 cc

![Graph of average weight of Seaweed E.cattonii per week along the research](image)

3.2. Absolute Growth Rate

Absolute Growth Rate Data of Seaweed (E.cattonii) along the research Growth of Seaweed (E.cattonii) Per Week (Gram) shown on Table 3 and Figure 2 below:

Table 2: Absolute Growth Rate Data of Seaweed (E.cattonii) per Week (Gram)

<table>
<thead>
<tr>
<th>No</th>
<th>Treatment</th>
<th>Average Absolute Growth Rate Per week (Gram)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M I</td>
<td>M II</td>
</tr>
<tr>
<td>1</td>
<td>CV</td>
<td>8.667</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>12.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>
3.3. Specific Growth Rate (SGR)

Specific Growth Rate Data (SGR) of seaweed (*E. cattonii*) along the research shown on Table 3 and Figure 4 bellow:

<table>
<thead>
<tr>
<th>No</th>
<th>Treatment</th>
<th>Specific Growth Rate Per Week (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CV</td>
<td>M I 6,593 M II 7,533 M III 8,389 M IV 8,715</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>M I 5,160 M II 7,052 M III 7,760 M IV 8,507 M V 8,754</td>
</tr>
<tr>
<td>3</td>
<td>B</td>
<td>M I 6,001 M II 7,394 M III 7,977 M IV 8,651 M V 8,810</td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td>M I 5,471 M II 7,172 M III 7,838 M IV 8,570 M V 8,774</td>
</tr>
</tbody>
</table>

Based on Table 1 and figure 2 shows that the average growth of seaweed *Eucheuma cattonii* increased by the time along with the observation for each treatment. The highest weight growth obtained on Treatment B (dosage 300 cc) with final weight on V week around 576,222 gram, followed by Treatment C (dosage 350 cc) was 569,444 gram and Treatment A (dosage 250 cc) around 565,889 gram. While on control variable the growth only reached around 558,778 gram.

The increasing of *Eucheuma cattonii* weight by the induction of fluid fertilizer green tama super dosage 300 cc with soaking period around 6 hours probably the dosage fulfil the need of nutrient of the seaweed *Eucheuma cattonii* itself that could be utilized by the seaweed *Eucheuma cattonii* to perform a growth process. This also has been explained by Heddy (1986) *in* Kadir.S (2010) if the plant stimulated with a growth stimulant substances, it would stimulated the cell division of meristematic cells, so that the cell grew faster. The growth list could be seen on attachment 1.

### Absolute Growth Rate

Based on Table 2 and Figure 3 revealed that the highest absolute growth rate was on V week on Treatment B (dosage 300 cc) around 546,222 gram. The followed by Treatment C (dosage 350 cc) around 539,444 gram and Treatment A (dosage 250 cc) around 535,889 gram. While on control variable, the growth only reached 528,778 gram.
The research result revealed that seaweed *Eucheuma cattonii* that induced with fluid fertilizer with dosage 300 cc (Treatment B) was the ideal dosage towards the growth of seaweed besides the other supporting factor like water quality. This was in line with Aslan (2006) in Kadir S (2010) stated that the most important nutrient that playing role in growth of Seaweed *Eucheuma cattonii* were phosphor, nitrogen dan sulphur that playing role in protein formation. On Treatment C (dosage 350 cc) was showing increasing on the weight of seaweed *Eucheuma cattonii* that quite not significant. This refers to the absolut growth rate of seaweed *Eucheuma cattonii* on the first time until the end of the research showing a decreasing compare to Treatment B (dosis 300 cc). The decreasing in weight of seaweed *Eucheuma cattonii* on treatment C (dosis 350 cc) probably because the seaweed absorbed too much bigger nutrient than it could bear so that it causes the saturated effect and then causing cell damage that impacting the weight of seaweed *Eucheuma cattonii* this was also stated by Sutejo (2002) along with the growth process plant need at least 16 essential nutrient (macro and micro), if one of the nutrient were unavailability or even available in bigger amount therefore causing the growth and development and also the productivity of the plant itself postponed or delayed. Based on the Analysis of Variance (ANOVA) towards the absolut weight growth on week V shows that F test was higher than F table, so that means it has a significant influence that could be accessed on attachment 4. Specific Growth Rate (SGR) From the specific growth rate measurement result, obtained the highest average SGR along the research was on Treatment B (dosis 300 cc) around 7,767 %, diikuti pada perlakuan C (dosis 350 cc) yaitu 7,565 %, dan yang terendah terdapat pada perlakuan A (dosis 250 cc) yaitu 7,447 %. Sedangkan pada variabel control LPS hanya mencapai 6,984 %. To know the SGR each week, shown on Table 3 and Figure 4. The high in specific growth rate that obtained on Treatment B (dosis 300 cc) probably because of the ability of seaweed *Eucheuma cattonii* to absorb the fluid fertilizer as energy supply being used to perform growth along the research. This was also stated by Efendi (1997) in Kadir.S (2010) that enegry obtained from nutrient absorption the very first place being used to maintain cell or the body condition and renew the damaged cells and the rest of it being used for growth. The result of Analysis of Variance (ANOVA) revealed that difference in concentration of fluid fertilizer that has been used until the end of the research or at week V shows that F tested greater than F table so the influence was quite significance, that shown on attachment 7. Water Quality Temperature playing an important role in life and growth of the seaweed. The fluctuation of temperature from each observation caused by the difference in sun energy penetration to the coast area. The coast temperature on the research station could be categorized as ideal towards the growth rate that was around 28°C - 29 °C. This was in line with the result of Aslan (1998) that revealed that the optimum temperature for the cultivation of seaweed *Eucheuma cattonii* was almost around 27°C – 30°C, also clearly stated by Suparman (2013) that the coastal temperature range that was quite good for cultivation of seaweed was around 27°C – 30.2°C. The coastal salinity was quite important for sea creature mainly in order to adjust and adapt the osmotic pressure of the organism with the environment. The coast salinity measurement result along the research was on range around 36 - 37 ppt, from the salinity value, it was more likely to be constant because probably affected by the coast current that balanced so therefore it shows that the salinity of the coast area was supportive and compatible for growth and development of seaweed *Eucheuma cattonii*. This was supported by Aslan (1998) that the optimum salinity for growth of seaweed *Eucheuma cattonii* was on range around 30 – 37 ppt and and stated also by Suparman (2013) that the best salinity range for growth of seaweed was on 31 – 35,8 ppt. pH measurement has been used illustrate intensity of acidity condition or base condition of a solution, pH was quite related with the activity of photosynthesis. The absorption of CO2 from water in the photosynthesis process will actually increase pH to be more likely base. Coastal pH along the research was 7. Along the observation, coastal pH relatively stable and on the normal range in order to support the life and growth of seaweed. This was compatible with the statement of Aslan (1998) that the pH range that optimum for cultivation of seaweed was on the base range, pH range that compatible for the cultivation of seaweed was on range around 7,0 – 8,5 and also backed up by Suparman (2013) that stated that the optimum pH range was on 7,2 – 8,2. The coastal area brightness quite related to how far the sunlight penetration on that area that needed for photosynthesis. The result on brightness measurement of the research location shown that, sunlight could penetrated deeply to 5 meter. From the research result above, shows that the brightness condition on coastal area of the research was categorized as good for growth of seaweed, this was supported by the weather condition of Buru regency especially the Saliong area where along the research there were no rain either day or night. Stated by Khan and Satam (2003) that coastal brightness or clearance that quite good for cultivation of seaweed was more than 1 meter. Current speed was the factor that determined how long the existence of gas substances, dissolved nutrients and solid particle on a habitat and water column. Current speed indirectly determined the nutrient supply, cleaning or transport of solid particle that stuck to the seaweed itself and overcome the whole coastal temperature. Current speed along the research on the cultivation area of seaweed *Eucheuma cattonii* was around 0,46-0,57 m/second. this was supported by Aslan (1998) that stated that the optimum current speed for the growth of seaweed *Eucheuma cattonii* was around 20 – 40 meter each minute and stated also by Suparman (2013) that the current speed must be on 0,41 – 0,45 m/second. 4. Conclusion From the result this research, therefore we can conclude that the induction of green tama super fluid fertilizer giving a significant influence towards the growth rate of...
seaweed, either weekly growth, absolute growth, or the specific growth where the best growth was on Treatment B (dosage 300 cc) with soaking time around 6 hours.

5. REFERENCES


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