Cells Characteristics, Growth, and Quality of Gracilaria Verrucosa Seaweed Production with Different Doses of Vermicompost Fertilizer

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Abstract

G. verrucosa seaweed cultivation is fishpond-featured commodity of Takalar District in South Sulawesi Province. One of the success factors of seaweed farming in fishponds is a fertilizer. G. verrucosa cultivation in fishponds generally use inorganic fertilizers that are not environmental friendly. Thus the use of organic fertilizer is indispensable for the conservation of aquatic environments. Vermicompost fertilizer is organic fertilizer that contains nutrients such as carbon, nitrogen and phosphorus as source of nutrients for the seaweed. The purpose of this study was to analyze the best vermicompost fertilizer dose on the characteristics of cells, growth and quality production of G. verrucosa seaweed. The research methods include tissue culture, the use of a microscope oculer, length and weight measurements, as well as calculate the seaweed production of G. verrucosa during 14 days of observation. Vermicompost fertilizer dose of 450 ppm was the best dose for the characteristics cells, growth and quality of G. verrucosa seaweed.

Keywords: Cell Characteristics, Growth, G. Verrucosa, Production Quality, Vermicompost

I. INTRODUCTION

Aquaculture fishponds productivity can be improved by improving fishpond management techniques, e.g. by using environmental friendly fertilizers. One of the factors that determine the characteristics of the cell, quality and growth of seaweed is fertilizing with the addition of nutrients to the cultivation media. In general, *G. verrucosa* cultivation in fishponds using inorganic fertilizers to improve the growth and quality of seaweed. The use of inorganic fertilizers give negative impacts on soil and water conditions of cultivation. Vermicompost is organic fertilizer which can improve the fertility of seaweed, as well as play a role in preparing the formation of plasma cells of *G. verrucosa*. Therefore, it is necessary to assess the use of vermicompost fertilizer to the characteristics of the cell, production quality and growth of *G. verrucosa* seaweed.

II. LITERATURE REVIEW

G. verrucosa included in the class of Rhodophyceae which is agarofit. The general characteristics of thallus are small, long, flat-shaped, and dark green [1]. Vermicompost is vermicomposting process conducted by earthworms and microorganisms to produce nutrients such as carbon, nitrogen and phosphorus [2]. Nutrients carbon, nitrogen and phosphorus used in the process of plant photosynthesis was aimed to speed up the process of cell division resulting the best growth and quality of the plants [3].

III. METHODS

A. Tissue culture of G. verrucosa:

Sample of seaweed were taken from Takalar District of South Sulawesi with a length of 10 cm and then sterilized with 5% detergent for 10 minutes, rinsed with running water, shaken for 5 minutes with anti-fungal (fungicide) 3 g/l and shaken for 5 minutes with 10% clorox solution. Sea water with salinity of 25 ppt was sterilized then put into Erlenmeyer 0.5 µm through filter paper and placed in an autoclave at a temperature of 121°C for 15 minutes. Then media conway was created and we perform tissue culture in a glass bottle for 14 days.

B. Cell Characteristics of G. verrucosa:

The number, size and shape of cells was counted by using a microscope oculer with 80x magnification.

C. Growth:

1) Length and weight were measured by using a ruler measuring tools and precision analytical balance 0.00 g, respectively. The biomass growth and the specific growth rate of G. verrucosa determined by formula [4]:
   - $Biomass\ growth\ (g) = W_t - W_0$
   - $Spesific\ Growth\ Rate\ (\%) = \frac{Ln\ W_t - Ln\ W_0}{t} \times 100$

D. Production Quality of G. verrucosa:

Quality of the seaweed production is the weight that contained in dried seaweed divided by the weight of raw dried seaweed materials and expressed in percentage [5].

IV. RESULTS AND DISCUSSION

A. Cell Characteristics of G. verrucosa:

The treatment dosing different vermicompost fertilizer, to give effect on changes in cell shape of *G. verrucosa*. Early forms of cells tend to swell, then at the end of the observation cell shape is smaller than its original size (Figure 1). Polygonal cells for observation at different doses of vermicompost fertilizer, tend to be rounded and oval (Table 1). Changes in cell shape was characterized by a number of macro and micro nutrients which are utilized in the process of photosynthesis of plants, that accelerate the process of cell division to generate new cells that were smaller than the original size [6].

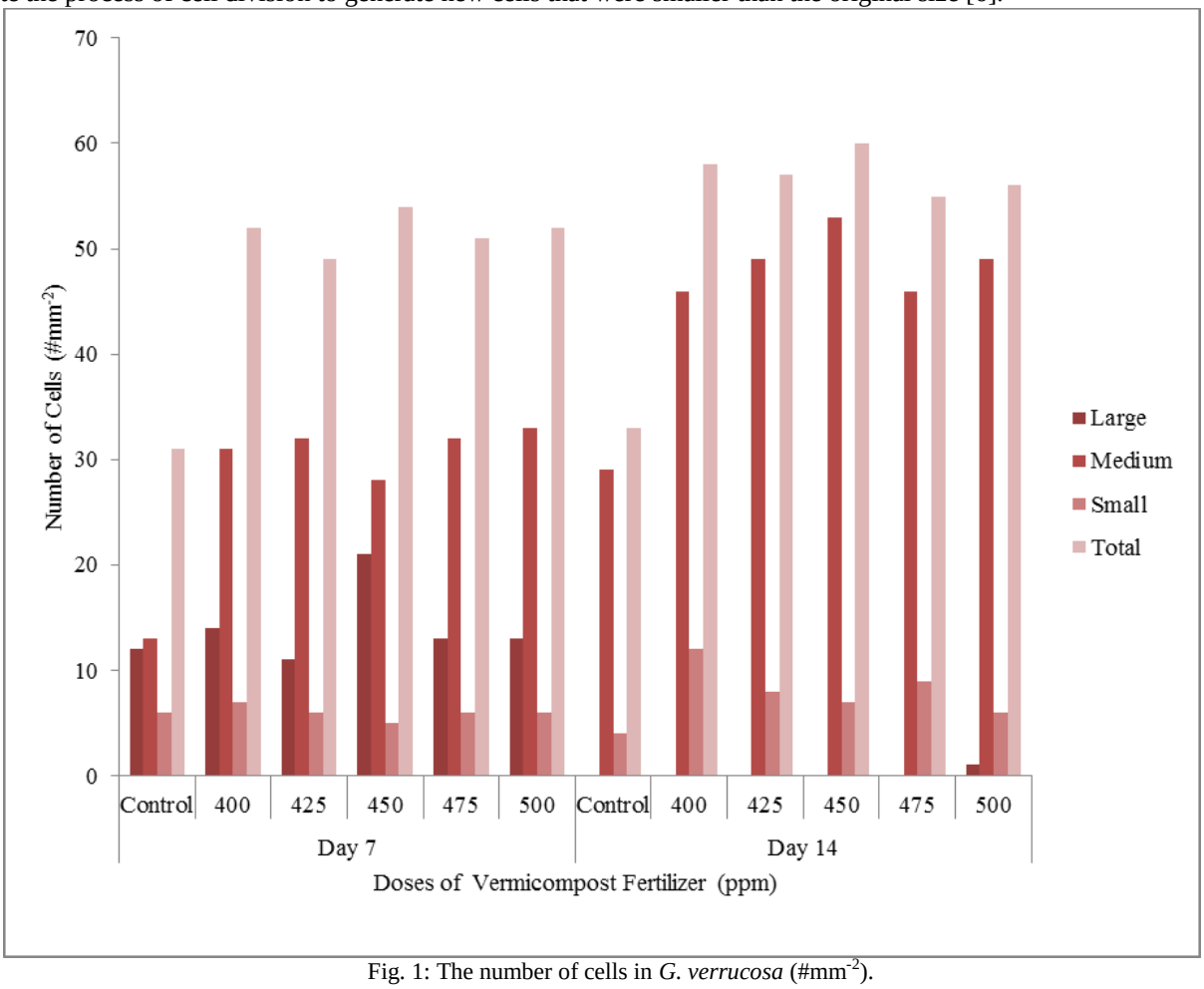
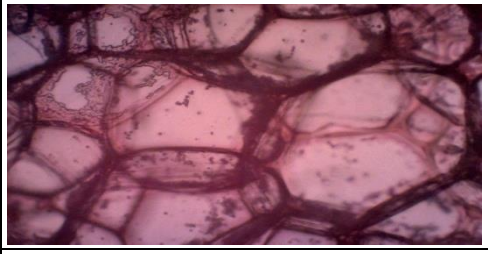
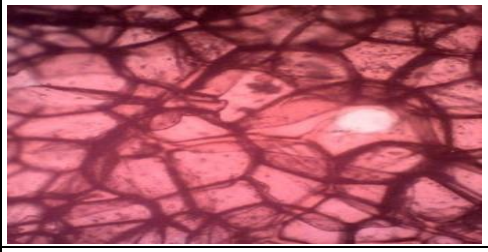
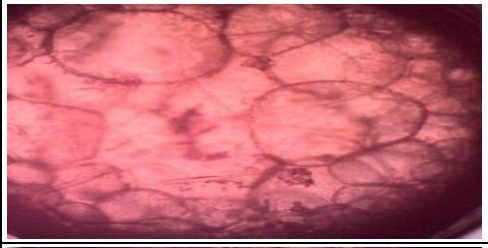
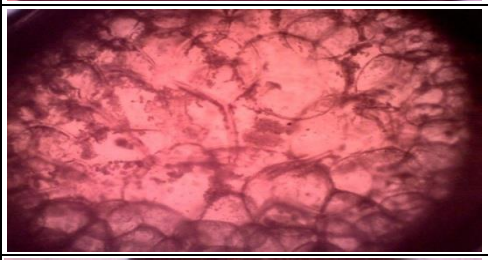
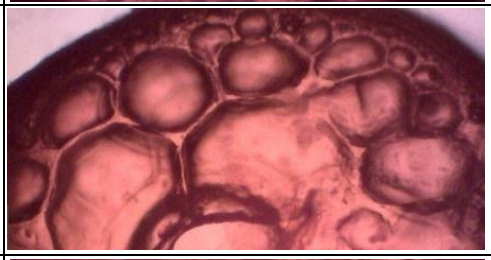
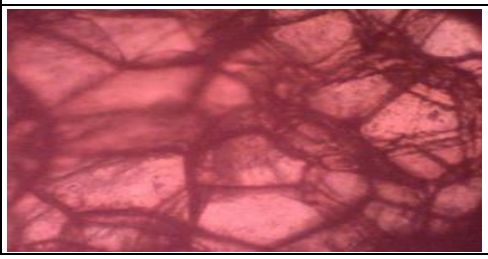


Fig. 1: The number of cells in *G. verrucosa* (#mm^{-2}).

Table – 1
The characteristics cell of Seaweed G. verrucosa

Treatment Doses (ppm)	*Figure Cells*	*Description*
Control		*1. Cells form: Tend oval and smaller than its original size.* *2. Cell Size:* *- Axis Length: 34.121 – 221.263 µm* *- Axis Short: 28.443 – 199.010 µm* *3. Weight Cells:* *- Initial Weight : 0.58 g (20 clumps)* *- Final Weight : 1.21 g (20 clumps)* *4. Maintenance Time : 14 Days.*
400		*1. Cells form: Tend to be rounded and smaller than its original size.* *2. Cell Size:* *- Axis Length: 44.339 - 321.432 µm* *- Axis Short: 38.309 - 302.933 µm* *3. Weight Cells:* *- Initial Weight : 1.57 g (20 clumps)* *- Final Weight : 1.38 g (20 clumps)* *4. Maintenance Time : 14 Days.*
425		*1. Cells form: Tend to be rounded and smaller than its original size.* *2. Cell Size:* *- Axis Length: 45.194 - 310.332 µm* *- Axis Short: 42.201 - 298.665 µm* *3. Weight Cells:* *- Initial Weight : 0.58 g (20 clumps)* *- Final Weight: 1.74 g (20 clumps)* *4. Maintenance Time : 14 Days.*
450		*1. Cells form: Polygonal cells tend to be rounded and smaller than its original size.* *2. Cell Size:* *- Axis Length: 35.736 - 302.224 µm* *- Axis Short: 30.445 - 297.445 µm* *3. Weight Cells:* *- Initial Weight : 0.58 g (20 clumps)* *- Final Weight: 1.64 g (20 clumps)* *4. Maintenance Time : 14 Days.*
475		*1. Cells form: Tend to be oval and smaller than its original size.* *2. Cell Size:* *- Axis Length: 47.430 - 332.132 µm* *- Axis Short: 39.305 - 301.322 µm* *3. Weight Cells:* *- Initial Weight : 0.58 g (20 clumps)* *- Final Weight:1.47 g (20 clumps)* *4. Maintenance Time : 14 Days.*
500		*1. Cells form: Tend to be oval. thick and smaller than its original size.* *2. Cell Size:* *- Axis Length: 45.755 - 340.553 µm* *- Axis Short: 39.443 - 310.660 µm* *3. Weight Cells:* *- Initial Weight : 0.58 g (20 clumps)* *- Final Weight: 1.52 g (20 clumps)* *4. Maintenance Time : 14 Days.*

The best doses to increase cell seaweed G. verrucosa was 450 ppm. Organic material on the best doses of vermicompost fertilizer contribute nutrients to plants, improve the accretion of cells that are directly related to the growth and quality of plants [7].

B. Growth Seaweed G. verrucosa:

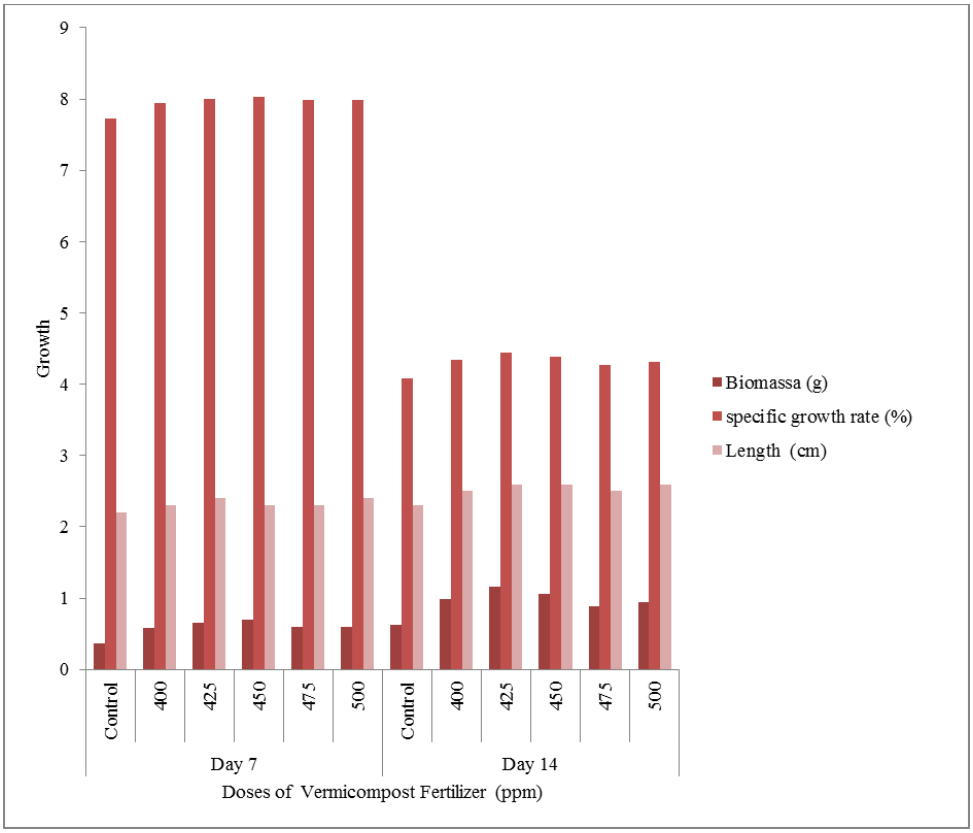


Fig. 2: Growth Seaweed *G. verrucosa*.

The higher doses of fertilizer are in the range of 425-450 ppm will generate higher growth. Vermicompost fertilizer contains many micro and macro elements necessary in the preparation of carbohydrates, proteins, nucleic and other organic compounds that can promote the growth of seaweed, accelerate cell division and formation of photosynthetic pigments [8].

C. The production quality of G. verrucosa:

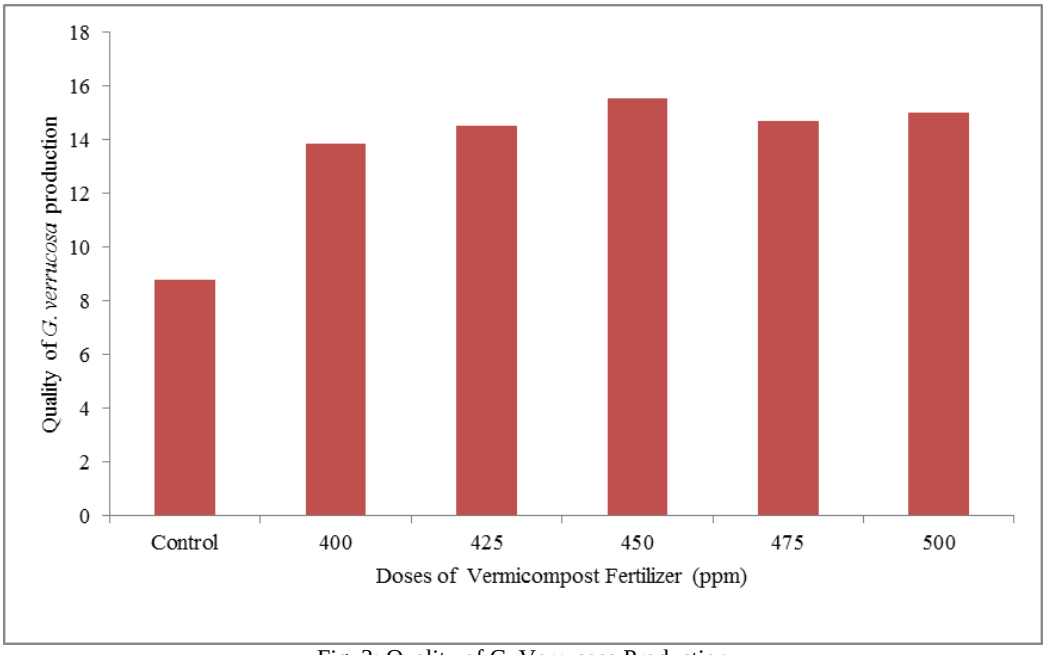


Fig. 3: Quality of G. Verrucosa Production

G. verrucosa is a species at quality yield that ranges from 5-26% [9]. Low quality to produce the seaweed in this study was due to the age of seaweed which was still relatively young at 14 days.

V. CONCLUSION

Vermicompost fertilizer influence on the characteristics of the cell, growth and quality yield of seaweed *G. verrucosa*, with the best fertilizer doses was 450 ppm.

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