Analysis of macro nutrient content in biofouling waste organic fertilizer pearl oyster (*Pinctada maxima* L.)

J I Nendissa¹,*, M H Makaruku¹, V L Tanasale¹, A K Kilkoda¹, J Taribuka¹

¹ Agrotechnology Study Program, Faculty of Agriculture, Universitas Pattimura, Ambon, Indonesia

* E-mail: jinendissa@gmail.com

Abstract. Biofouling development is a major problem in bivalve aquaculture around the world. The purpose of this study was to obtain macro nutrient analysis data for organic fertilizer from pearl oyster (*Pinctada maxima* L.) biofouling waste. Where is the manufacture of solid organic fertilizer products that have quality equivalent to other commercial organic fertilizers by utilizing pearl oyster (*Pinctada maxima* L.) biofouling waste so that high quality solid organic fertilizers are produced which are in accordance with the Quality Standards for solid organic fertilizers and the Indonesian National Standard. Organic fertilizer from pearl oyster biofouling waste is obtained by using pearl oyster biofouling waste which is taken from the results of cleaning microorganisms attached to the pearl oyster shell area. Another major concern regarding biofouling is the potential for food competition caused by the attachment of the filter-feeder. Besides, the waste of biofouling pearl oysters is extracted and soaked in fresh water for one week at a time. Afterward, the pearl oyster biofouling waste is dried in the sun to dry, odorless, blackish brown in color. Analysis of macro nutrient content using Atomic Absorption Spectrophotometer and UV-Vis Spectrophotometer. The results of the analysis of macro nutrient content were Water Content (5.76%), C (14.48%), Organic Matter (24%), N-total (0.92%), P-total (0, 25%), K-total (1.02%), C/N ratio (15.72).

1. Introduction

One of the Indonesian exports to Marine farming and its high selling value is pearl oysters (*Pinctada maxima* L.) that produce pearls. Pearl oyster (*pinctada maxima*) is so highly prized by society, that so many newly interested ones from pearl oysters (*pinctada maxima*) and have the prospect of future development.

The high market demand for pearls both from within and outside the country has prompted cultivators to increase production. In addition, pearl oysters are one of the mainstay marine biota for marine cultivation that has developed in several locations in Indonesian waters and their production is increasing but their supply in nature is not proportional to the rapid market demand, so that the pearl oyster population is decreasing and the price continues to increase.

Biofouling development is a key issue in bivalve aquaculture worldwide [1]. Among the problems faced in raising pearl oysters are attacks of parasitic organisms on shells that can interfere with such vital functions as opening and closing the shell or reducing the economic value of pearl oysters and may prevent streams in and out of the crowding as well. Many synthesizing organisms can compete with such cultured organisms as pearl oysters for food. The negative effect of this downdraft can be greater in the tropics. Generally, harmful traits are attributed to stamping organisms and a way to minimize their effect especially on pearl oyster farming.
Besides another barrier to the pearl oyster culture is the biofouling or the organisms (phytoplankton or zooplankton) attached to shells or nets and thus having an effect on the quality of the pearl or the oyster productivity [2]. Physical damage would result if fouling organisms such as mushrooms or porifera disturbed nutiara oysters, thus reducing pearl production. Barnacles also interfere with mechanical functions such as opening and closing valves of pearl oysters in the mouth or hinges so as to have a negative impact by being a proxy (phytoplankton) [3].

The waste from pearl oyster shell (*Pinctada maxima* L) is left over from the pearl clam treatment industry. If it is not cared for and run properly, it is potentially a waste that accumulates and results in environmental harm. Based on the observations I have made of coastal areas especially on the western shore, the village of stone trees has become a pile of untreated, untreated, *pinctada maxima*. If it is not cared for and run properly, it is potentially a waste product and adverse to the environment.

Waste can be used as organic fertilizer, compost, and others. The production of organic fertilizer from the effluent of pearl oysters has never been done, but results found to contain high edible nutrients that can be used to promote plant growth and productivity. Growing crop production [4] is recommended.

### 2. Methods

Basically, before organic fertilizer was made, the solid waste of the pearl oyster was analyzed. The test for macro nutrient content of pearl oyster biofouling waste was carried out at the Integrated Research and Testing Laboratory of Gadjah Mada University. The removal of a sample of the pearl oyster biofouling waste was taken from the remnants of the pest and pearl oyster that attacked the shell. The cleaning was done using both manual and spray. After that the sewage is taken and soaked in fresh water for a week. Soaking water is replaced every day. The goal of submersion is to remove seawater. Then the waste of biofouling pearl oysters was left to dry in the sun for one week. Observations are made of color, smell and water content. It should be dark brown, dry and odorless (SNI 19-7030-2004). Before organic fertilizer was made, the solid waste of the pearl oyster was analyzed. The gynecological exam of macrowaste biofouling oysters was done in the research lab and integrated test of Gadjah Mada University. After that the sewage is taken and soaked in fresh water for a week. Soaking water is replaced every day. The goal of submersion is to remove seawater. Then the waste of biofouling pearl oysters was left to dry in the sun for one week. Observations are made of color, smell and water content. It should be dark brown, dry and odorless (SNI 19-7030-2004).
3. Results and discussion

Table 1 shows that the nutrient content contained in pearl oyster biofouling waste can be used as material for the manufacture of organic fertilizers.

Table 1. Data from analysis of macro nutrient content of pearl oyster biofouling waste

| No. | Parameter       | Result   | SNI 19 – 7030- 2004 |
|-----|-----------------|----------|----------------------|
| 1.  | Water Content   | 5.76 %   | 0 – 50 %             |
| 2.  | Organic Matter  | 14.48%   | 15 – 25 %            |
| 3.  | Carbon-organic  | 24.96 %  | 9.8 – 32 %           |
| 4.  | N-Total         | 0.92 %   | Minimum 4 %          |
| 5.  | P-Total         | 0.25 %   | Minimum 1 %          |
| 6.  | K-Total         | 1.02 %   | Minimum 2 %          |
| 7.  | C/N ratio       | 15.72    | 10 - 25              |

Source: Integrated Research and Testing Laboratory of Gadjah Mada University and SNI-2030-2004 in Wellang (2015)

Based on Indonesian National Standardization SNI-19-7030-2004, analysis of the waste biofouling pearl oyster (LBTM) was obtained that the macro-contained nutrients contained within them qualify them for use as dense organic fertilizer. Organic fertilizer is the result of decomposition of organic materials both dry (humus) and sewage from disstored livestock manure by microbes to the point that it provides the nutrients that plants need for their growth and development. It means so much as a buffer of the physical, chemical, and biological properties of the soil that it can increase the efficiency of soil fertilizer and productivity [5]. The pearl oyster biofouling, deeper than it is, contains a considerable number of macro nutrients and a potential in organic fertilizer. It is thought to contain multiple microorganisms attached to the shell. According to [6] 36 types of biofouling from the two great kingdoms of the animal kingdom of 21 types came from six phyla (arthropoda, bryozoa, annelida, cnidaria, porifera and mollusca), and a 15-type plant world of Divisio Spermatophyta and Thallophyta. Found 14 varieties of Thallophyta and one of Spermatophyta. Of the Arthropoda are found 11 types, three types of the Bryozoa, four of Annelida, and one of Phyla Cnidaria, Porifera and Mollusca. [7] stated that plants will thrive when nutrients needed by plants are available in a balanced proportion to particularly macro nutrients such as N, P and K. This element has a specific role to play in plant growth. In the growth of the nitrogen (N) elements, plants play a role in the production of chlorophyll in photosynthesis, where photosynthesis is good, more carbohydrates will be produced [8]. The function of phosphorus (P) as one of the elements of protein reduction, needed for the formation of flowers, fruit and seeds, stimulates the growth of roots to lengthen and grow strong so that plants will survive drought. A deficiency of phosphorus would cause the plant to dwarf, impeding and stunted seed growth. The potassium element (K) has a role in characteristics such as photosynthesis...
and respiration that are essential to plant growth. C-organic produced from the waste of biofouling pearl oysters at table 1 is 24.96%. When compared with Indonesia's National Standard of 15-25%, it can meet the standard of organic fertilizer. C-organic has a function that enhances soil fertility and provides micro-nutrients and other growth factors. The level of water contained in the biofouling waste of 5.76% suggests that the level of maturity in organic fertilizer is higher. The ripe organic fertilizer smells like soil, as the material it contains resembles dark, brown soil, which is formed by the influence of stable organic material. The organic material formed from the waste of biofouling pearl oysters is 14.48%.

The C / N ratio of pearl oyster biofouling waste is in the range of the C / N ratio indicated by SNI 19-7030-2004, namely 15.72. This is due to the pearl oyster biofouling waste consisting of constituent materials containing algae, worms, plants and other microorganisms that can increase soil fertility. This is due to the pearl oyster biofouling waste consisting of constituent materials containing algae, worms, plants and other microorganisms that can increase soil fertility. This is due to the pearl oyster biofouling waste consisting of constituent materials containing algae, worms, plants and other microorganisms that can increase soil fertility. This is due to the pearl oyster biofouling waste consisting of constituent materials containing algae, worms, plants and other microorganisms that can increase soil fertility. This is due to the pearl oyster biofouling waste consisting of constituent materials containing algae, worms, plants and other microorganisms that can increase soil fertility. The latter disintegrates because it is destroyed by the natural breakdown of the microorganisms that live inside it. This conforms to SNI Standards 19-7030-2004. The price of LPG in 12-kg and 50-kg containers in the second quarter of 2007 stood at us $58.9 million, he said. This is because the effluent of pearl oysters consists of shrink material containing algae, worms, plants and other microorganisms that can increase soil fertility.

4. Conclusion

The quality of organic fertilizer produced from the pearl oyster wastes are those: the stuff at macro, P and K are 0.92%, 0.25%, and 1.02%. Nisbah C/N 15.72, C-organic 24.96%, 14.48% Organic Matter and Water Levels of 5.76% have met the established standard of organic fertilizer.

References

[1] Lacoste E, Le Gilles G, Moullac, Levy P, Gueguen Y, and Gaertner-Mazouni N 2014, Biofouling development and its effect on growth and reproduction of the farmed pearl oyster Pinctada margaritifera Aquac. J. 434 18–26.
[2] Pit J H and Southgate P 2003 Should slow growing pearl oyster (Pinctada margaritifera) spat (Runts) be discarded.
[3] Southgate and Lucas 2008 Seasonal fouling stress on the farmed pearl oyster, Pinctada fucata, from southeastern Arabian sea J. World Aquac. Soc. 43 514–525.
[4] Juliutomo D, Mirawati B, and Imran A 2018 Media tanam campuran limbah cangkang kerang mutiara (Pinctada maxima) untuk pertumbuhan tanaman jagung (Zea mays) J. Ilm. IKIP Mataram 5 ISSN:2355-6358.
[5] Wijana N Y and Adyana G M 2012 Aplikasi jenis pupuk organik pada tanaman padi sistem pertanian organik E-jurnal Agroekoteknologi Trop.
[6] Jefri Y, Yasir I, and Syaifuluddin 2017 The composition of biofouling types in pearl oysters (Pinctada maxima L.) on the cultivation land of Pt. Autore Pearl Culture Lombok Spermonde J. 2 9–16.
[7] Priangga and Suwargo 2013 Pengaruh Level Pupuk Organik Cair Terhadap Produksi Bahan Kering dan Imbangan Daun-Batag Rumput Gajah Defoliasi Keempat. Fakultas Peternakan Universitas Jenderal Soedirman Purwokerto.
[8] Kurniawati H Y, Karyanto A, and Rugayah 2015 Pengaruh pemberian pupuk organik cair dan dosis pupuk NPK (15:15:15) terhadap pertumbuhan dan produksi tanaman mentimun (Cucumis sativus L.) J. Agrotek Trop. 3 30–35.