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UTILIZATION OF MACKAREL TUNA IN LIQUID ORGANIC FERTILIZER AGAINST PHOSPHORUS AND CALCIUM CONTENT

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ABSTRACT

Mackarel tuna is one of the fish that is quite abundant in Banyuwangi, its existence in the Java and Bali seas is found throughout the month, therefore the use of mackerel tuna fish into processed food products is often made by the community. In addition to being a valuable product, mackerel tuna fish bones can be processed into other products that are useful in agriculture, namely organic liquid fertilizer. This study was conducted on a laboratory scale with four different treatments (length of fermentation time) including 5, 10, 15, and 20 days, where each treatment was repeated 4 times. The purpose of the study was to find out the best phosphorus and calcium content from four different treatments. The results of the study found that the best fermentation period of liquid organic fertilizer was on the 20th day of fermentation with a value of phosphorus (P) content of 0.091%, calcium (Ca) of 0.377%.

Keywords: Mackarel Tuna, Bones, Organic Liquid Fertilizer, Phosphorus, Calcium

INTRODUCTION

Fish consumption is currently increasing among the community, especially in Banyuwangi. This has resulted in business development, especially the fishing industry, also continues to experience significant growth. As in the Muncar area, there are many processed fishery products made from mackerel tuna fish found such as pindang mackerel tuna, smoked mackerel tuna, salted mackerel tuna, nugget mackerel tuna, shredded mackerel tuna, and mackerel tuna meatballs. The existence of these products can create by-products in the form of fishery waste, and if waste treatment is not managed properly, it will have a negative impact on the surrounding environment.

The waste disposal products of the fishing industry have various types such as bones, heads, scales, tails, viscera, and fish skin (Koli et al., 2012). Therefore, the need for waste handling by optimizing the utilization of waste produced during the mackerel tuna fish processing process. Often fish bone waste is wasted without being treated properly, simple utilization of fish waste can be used, one of which is to become fish meal. Fishmeal is actually a semi-finished product and can be reprocessed into liquid organic fertilizer.

Fertilizer is a material added to the planting media or plants to meet the nutrient needs of plants so that they can produce properly. Liquid organic fertilizer is a fertilizer whose basic ingredients come from animals or plants that have undergone fermentation and the form of the product is liquid, has the function of increasing plant growth and can help improve soil structure and quality (Mansyur, et., al, 2021). To determine the good quality of liquid organic fertilizer, testing of nutrients in making fertilizer is needed, one of which is the addition of mackerel tuna fish waste.

Liquid organic fertilizers contain essential macro and micronutrients. Macro nutrients are nutrients needed by plants in large quantities when compared to micronutrients. According to Afandi (2005)

stated that there are elements classified as macronutrients are phosphorus (P), calcium (Ca), carbon (C), hydrogen (H), oxygen (O), nitrogen (N), sulfur (S), potassium (K), and magnesium (Mg), whereas, elements classified as micronutrients for plants are manganese (Mn), copper (Cu), boron (B), molybden (Mo), zinc (Zn), and iron (Fe). Therefore, the research carried out is the use of mackerel tuna fish bones into organic liquid fertilizer, to ensure its quality, phosphorus and calcium testing is carried out. Phosphorus and calcium testing is done because these two elements are contained in many mackerel tuna fish, on the other hand are needed for the process of plant growth.

The method carried out in this study used a complete randomized design of four different treatments. The difference in treatment is done by comparing the difference in fermentation time, namely 5, 10, 15, and 20 days, each treatment is repeated as many as four pieces so that there are 16 samples of liquid organic fertilizer to be tested. The formulation of liquid organic fertilizer refers to Muhidin's (2020) modified research, while the formulation used includes 400 grams of mackerel tuna fish bone meal, 20ml EM-4, 20ml molasses, and 1L of water.

RESEARCH METHODS

Time and Place of Research

This research was conducted in September-December 2022 and the manufacture of liquid organic fertilizer and testing were carried out at the Laboratory of the Faculty of Agriculture, PGRI BanyuwangiUniversity and the Bioscience Laboratory of Jember State Polytechnic.

Materials and tools

Tools used in making fertilizer include glass bottle containers, pots, scissors, blenders, flour filters, digital scales, spoons, glass jars, small funnels. Tools used in testing the content of phosphorus (P) and calcium (Ca) include analytical balances, digestion apparatus (electric heater or block digestor Kjeldahl therm), kjeldahl flask, vapodest 50s (gerhardt), vortex mixer, and spectrophotometer.

Materials used in making fertilizer include mackerel tuna fish bones (*Euthynnus affinis*), EM_4 bioactivators, molasses, water, plastics, gloves. Phosphorus and calcium testing materials include HNO_3, $HClO_4$, and H_2O.

Research methods

Here is the process of making liquid organic fertilizer:

Collection and cleaning of mackerel fish bones:

1. Material collection: mackerel tuna fish bones used in the form of head bones to fish tails.
2. Crushing and drying: mackerel tuna fish bones are crushed by brushing and washing thoroughly, then dried using a room dryer to dry for easy crushing.
3. Crushing bones into flour: dried bones are cut into small pieces first to facilitate the crushing process carried out using a blender. After crushing, the bones are filtered using a 60mm mesh sieve to obtain fishsmith's flour whose texture is similar to flour in general.

Fertilizer Manufacturing (fermentation):

1. Mixing materials:
   400 grams of mackerel tuna fish bone meal is put into a 2-liter airtight glass jar container, then added with other mixtures, among others, 20ml EM_4, 20ml molasses and 1L clean water.
2. Fermentation time treatment
   The fermentation process is carried out in different periods of time, namely during P1 (5days), P2 (10days), P3 (15days), and P4 (20days) with 4 repetitions each. The observation process begins with each treatment being put into a glass container as much as 30ml. The first observation was made on

the fifth day, to see changes in fertilizer characteristics and then phosphorus and calcium tests. Furthermore, the media is allowed to stand again (fermented) until the 10th, 15th and 20th days in the same way and the same test is carried out on the respective test treatment.

Phosphorus and Calcium Testing

Testing of phosphorus and calcium canotnet refres to the AOAC Interntaional method quoted from William Horwitz in 2000

RESULTS AND DISCUSSION

Phosphorus Content (P)

The results of testing the phosphorus (P) content of liquid organic fertilizer with mackerel tuna fish bone material show different average results in each treatment (fermentation duration), can be seen in Figure 1.

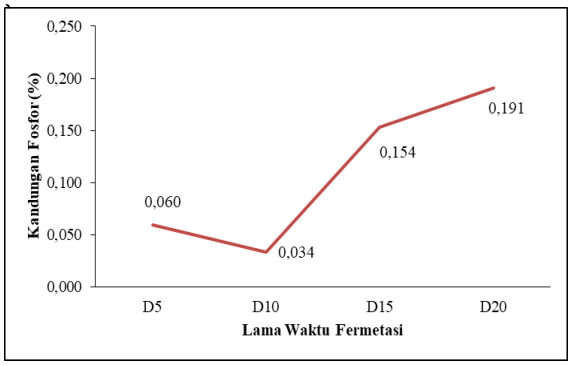

Figure 1. Phosphorus Content (P)

Based on Figure 1, it shows that there is an increase in phosphorus (P) content in organic liquid fertilizer with a difference in the length of fermentation time ranging from 0.034-0.191%. The highest phosphorus content occurred on day 20 at 0.191 and the lowest on day ten at 0.034. On the fifth day to the tenth day there is a decrease, but on the fifteenth to the twentieth day the womb continues to rise. The increase in phosphorus content is caused by microorganisms that have undergone the exponential phase, namely rapid cell division where phosphate solvent bacteria will produce phosphatase enzymes that function to dissolve phosphate in the substrate and are able to break the bound phosphate so as to produce an increase in value. In addition, the phosphorus content is also influenced by the high nitrogen content, the higher the nitrogen, the multiplication of microorganisms that remodel phosphorus will increase so that the phosphorus content will increase (Yuli, *et al.*, 2011). The statistical results obtained that the duration of fermentation have a different effect is very real in each treatment. Further testing using BNT concluded that the fermentation duration of day 15 and day 20 in each treatment differed markedly from the length of fermentation on day twelve and day ten

Calcium Content (Ca)

The results of testing the calcium (Ca) content in liquid organic fertilizer with mackerel tuna fish bone material show different average results in each treatment (fermentation duration), can be seen in Figure 2.

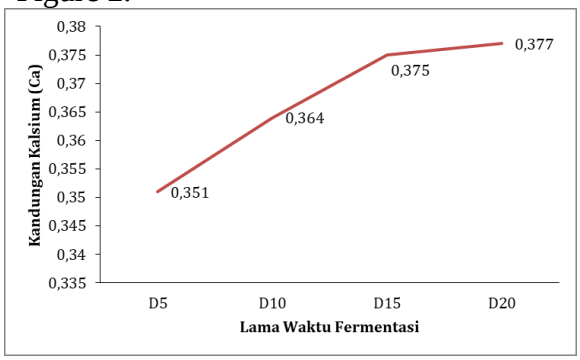

Figure 2. Calcium Content (Ca)

Based on Figure 2, it shows that there is an increase with the addition of the length of fermentation time carried out with a value range of 0.351-0.377%. The highest calcium content occurred on the twentieth day of 0.377% and the lowest value was the length of fermentation time for 5 days of 0.351%. The increase in calcium content is related to the microbial activity of the EM_4

bioactivator which plays a role in the fermentation process. In addition, the factor that increases calcium levels in liquid organic fertilizers is the substrate that is a source of nutrients for microbes. The nutritional content of glucose comes from molasses added to the fertilizer formula before fermentation and the organic calcium content comes from the bones of mackerel tuna fish. Glucose derived from molasses is converted into lactic acid through the process of glycolysis by the bacterium Lactobacillus sp. thus causing the condition of the fertilizer to become acidic (Amanillah, 2011). The statistical results obtained that the duration of fermentation is not significantly different in each treatment. The increase in the value of calcium content along with the longer the fermentation time carried out results in a higher value of calcium content.

IV. CONCLUSION

The conclusion that can be drawn from this study is that the content of phosphorus (P) and calcium (Ca) in liquid organic fertilizer of mackerel tuna fish bone occurs on the twentieth day, namely with a value with a phosphorus (P) value of 0.091%, calcium (Ca) of 0.377%.

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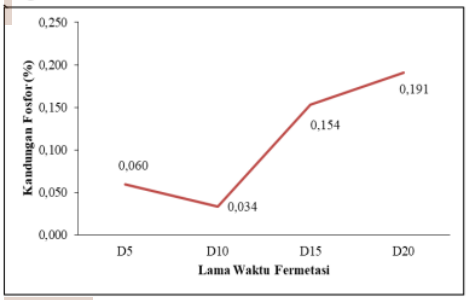

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The results of testing the calcium (Ca) content in liquid organic fertilizer with mackerel tuna fish bone material show different average results in each treatment (fermentation duration), can be seen in Figure 2.

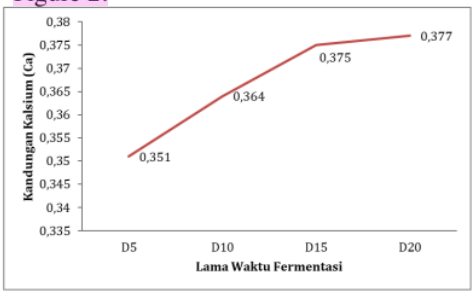

Figure 2. Calcium Content (Ca)

Based on Figure 2, it shows that there is an increase with the addition of the length of fermentation time carried out with a value range of 0.351-0.377%. The highest calcium content occurred on the twentieth day of 0.377% and the lowest value was the length of fermentation time for 5 days of 0.351%. The increase in calcium content is related to the microbial activity of the EM4

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