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ANALYSIS OF NITROGEN PHOSPHAT POTASSIUM IN LIQUID ORGANIC
FERTILIZER BASIC WASTE LIQUID TOFU
WITH VARIATION OF TOMATO MOLE

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ABSTRACT

Utilization of tofu liquid waste can be used as a new alternative to fertilizer because the tofu liquid waste it has the availability of nutrients needed by plants with the addition of Tomato Mole. The purpose of this study was to determine the quality of liquid organic fertilizer using tofu liquid waste as raw material with the addition of a variety of MOL Tomato (*Solanum Lycopersicum*) bioactivator.

This type of research is experimental research with a posttest only design. This study used tomato MOL variations (15 ml, 20 ml, 25 ml) with 3 repetitions in each treatment within 14 days of fermentation. Data collection techniques used pre-experimental and documentation methods. result analysis technique with table adds parameters to analysis.

Nitrogen, Phosphate, and Potassium content in liquid organic fertilizer using 1 liter of tofu liquid waste as raw material with the addition of various moles of tomatoes fermented for 14 days, namely 15 ml (1.5%), 20 ml (2%) and 25 ml (2.5%). In the variation of 15 ml (1.5%) the resulting Nitrogen, Phospat, and Potassium Nitrogen, Phospat, and Potassium content of (2.10%), variation of 20 ml (2%) resulted in the content of Nitrogen, Phospat, and Potassium of (2.33%), and in the variation of 25 ml (2.5%) resulted in the content of Nitrogen, Phospat, and Potassium of (3.45%) of the three variations already meeting the quality standards, namely PERMENTAN RI NO. 261/KPTS/ SR.310/ M/ 4/2019 ie 2- 6 %.

In this study, it is necessary to conduct further research by reviewing the length of fermentation time to obtain optimal results of Nitrogen, Phospat, and Potassium content, laboratory examination of the MOL content of tomatoes before the research process is carried out to determine the levels of N, P, K in tomato MOL.

Keywords: *Liquid organic fertilizer, Tofu Liquid Waste Utilization, Tomato MOL*

BACKGROUND

Waste is the result of a process or activity either from industry or domestic or household. Waste can cause pollution to the environment and can cause disease germs so that human health is disturbed. Waste can contaminate soil, and water and cause a bad smell and aesthetically can reduce the beauty of the environment.

The tofu industry is one of the food processing industries with the basic ingredients of soybeans which produce a protein source. According to data from the Central Statistics Agency for Magetan Regency in 2020, as many as 115 tofu factories are currently operating. The existence of the tofu industry causes the waste from processing soybeans. The waste generated by the tofu industry is in the form of solid waste and liquid waste.

Tofu liquid waste contains high enough organic compounds that will pollute the environment and endanger human health if discharged into rivers without undergoing a waste treatment process (Antika et al., 2020).

According to Kustiani & Saptorini research, (2019) liquid organic fertilizer whose basic ingredients come from animals or plants that have undergone fermentation and the product form is in the form of liquid. The chemical content in it is a maximum of 5%.

Liquid organic fertilizer is a solution from the decomposition of organic materials derived from plant residues, animal waste, and humans containing one or more carriers of elements needed by plants. The method that can be used in the process of making organic fertilizer for tofu liquid waste is the anaerobic fermentation method as a method that is easy to do, inexpensive, does not require large land, and can increase the nutrient content of tofu liquid waste.

This research was conducted in Suratmajan Village, Maospati District, Magetan Regency, the survey results were at the Tofu Industry Factory produced approximately 8 quintals of soybeans per day. A lot of tofu liquid waste that is wasted can hurt the health of the local community.

In the process of making liquid organic fertilizer, namely by using local microorganisms (MOL). MOL is a local microorganism found in various types of decaying organic matter and can usually be used to accelerate the degradation process of organic waste in the manufacture of organic fertilizer.

According to Juanda et al, (2011) suggested that local microorganisms are a collection of microorganisms that can be bred, which serves as a starter in the manufacture of organic fertilizers where the raw materials also come from the agricultural environment such as straw, animal waste, fruit and vegetable waste, one of which can be using tomatoes as raw material for local microorganisms (MOL).

The increasing production of tomatoes has not been matched by adequate post-harvest handling and optimal storage methods, because tomatoes are easy to rot if not used immediately. The community's post-harvest tomato management is not optimal, causing rotting tomatoes to be found in various traditional markets which eventually become part of the market waste.

Tomato MOL (*Solanum lycopersicum*) is a local microorganism found in decaying organic matter and can usually be used to accelerate the degradation process of organic waste in the manufacture of fertilizers. (Shim et al., 2018).

Based on the problems in the field, it is necessary to treat tofuand tomato (*Solanum lycopersicum*) liquid waste as liquid organic fertilizer.

Liquid organic fertilizer from tofu and tomato waste (*Solanum lycopersicum*) can later be used as an alternative to inorganic fertilizers because it contains organic compounds that can increase nutrient availability, stimulate plant root growth and leaf growth (Puspawati et al., 2016)

RESEARCH METHODS

Type of Research

The type of research used is pre-experimental research with a research design using a *posttest only design* there is no control and only one group is measured and observed after being given *posttest treatment*.

Population and Sample

this study is tofu liquid waste water and uses 3 variations of tomato mole volume (15 ml, 20 ml, 25 ml). Each of the variations will be tested for 3 replications so that a total of 9 samples will be obtained. This research was conducted in Suratmajan Village, Maospati District, Magetan Regency, Ruang Workshop Sanitation Study Program Diploma III Campus Magetan Poltekkes Ministry of Health Surabaya, as well as the examination of Nitrogen, Phospat, and Potassium content in Liquid Organic Fertilizer in Laboratory and Soil Fertility Faculty of Agriculture, Sebelas Maret University (UNS) Surakarta.

Research variable

The independent variable in this study was the volume concentration of the Tomato MOL (15 ml, 20 ml, 25 ml). While the dependent variable in this study is the physical quality of organic fertilizer, levels of. The Confounding Variables include the presence of odor, color, texture, and pH.

Research site

The location of this research is in the Darso tofu factory, Suratmajan Village, Maospati District, Magetan Regency, East Java, Indonesia, Workshop room for Sanitation Study Program Diploma III Campus Magetan Health Polytechnic Ministry of Health Surabaya, Indonesia and Laboratory and *Soil Fertility Faculty of Agriculture Sebelas Maret University (UNS) Surakarta*, Indonesia.

Data collection technique

1) Observation, by making direct observations of conditions in the field regarding information obtained directly from data sources in writing and can be trusted in truth, 2) Interviewing , through direct questioning and answering to the owner of the tofu industry who is responsible for processing the tofu production process 3) Laboratory Examination Checking samples of liquid organic fertilizer after the fermentation process to check the levels of Nitrogen, Phospat, and Potassium 4) Documentation: support research data obtained from the photo, review from notes, files and another document that is following this research. Taking pictures are obtained During observation.

Data analysis method

the data is analyzed from the quality of organic fertilizers seen physically and chemically, namely based on color, odor, pH N, P, K in tabular form based on PERMENTAN RI NO. 261 of 2019 concerning Minimum Technical Requirements for Organic Fertilizer, Biological Fertilizer, and Soil Improvement.

RESEARCH RESULTS

No	Code	Results		
		N(%)	P(%)	K (%)
1.	15.1	0,10%	0,16%	1,86%
2.	15.2	0,09%	0,15%	1,86%
3.	15.3	0,10%	0,16%	1,87%
4.	20.1	0,09%	0,21%	2,03%
5.	20.2	0,11%	0,22%	2,02%
6.	20.3	0,12%	0,22%	2,03%
7.	25.1	0,12%	1,24%	2,06%
8.	25.2	0,12%	1,29%	2,06%
9.	25.3	0,12%	1,28%	2,06%

Source: Laboratory and Soil Fertility Faculty of Agriculture Sebelas Maret University (UNS) surakarta 2022

Table 1. Table of Recapitulation of Examination Results Nitrogen, Phosphate, and Potassium LIQUID ORGANIC FERTILIZER

No.	Code	Results			N+P+K (%)
		N(%)	P(%)	K (%)	
1	15	0,09%	0,15%	1,86%	0,39%
2	20	0,10%	0,21%	2,02%	0,47%
3	25	0,12%	1,27%	2,06%	0,58%
Information		MS			
Quality Standards		2-6%			

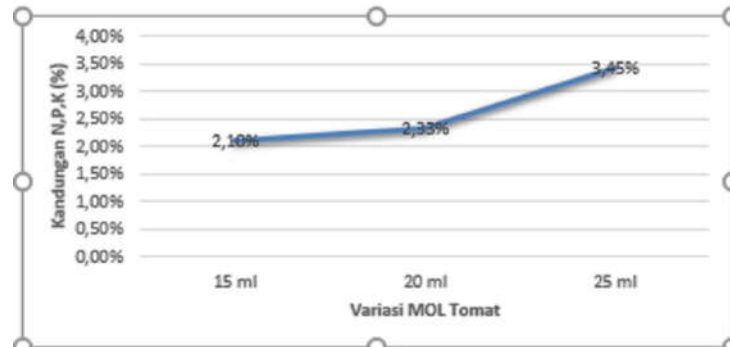


Figure 1. Graph of Recapitulation of Examination Result for macro Element Nitrogen, Phospat, and Potassium LIQUID ORGANIC FERTILIZER

Based on the results of the above recapitulation on the examination of liquid organic fertilizer with variations in the volume of tomato MOL (15 ml, 20 ml, 25 ml) that the content of Nitrogen (N), Phosphorus (P) and Potassium (K) has met the quality standards based on PERMENTAN RI NO. 261/KPTS/ SR.310/ M/ 4/2019 .

DISCUSSION

1. Nitrogen (N)

Liquid organic fertilizer is fermented anaerobically for 14 days with 1 liter of tofu wastewater added with 15 ml (1.5%) MOL variation of tomatoes has an average nitrogen content of 0.09%, and the tomato MOL variation of 20 (2 %) ml has an average nitrogen content of 0.10%, in the variation of MOL tomato 25 (2.5) ml has an average nitrogen content of 0.12%. There was an increase in the nitrogen content of liquid organic fertilizers in this study, but the nitrogen content of liquid organic fertilizers in this study did not meet the requirements or was not following PERMENTAN RI NO. 261/KPTS/ SR.310/ M/ 4/2019 ie 2-6 %. The low nitrogen content may be caused by reduced nitrogen during fermentation and preparation for testing the nutrient content in the laboratory (Handayani, 2017).

The nitrogen element in liquid organic fertilizer is needed for the growth and development of vegetative parts of plants such as leaves, stems, and roots, plays an important role in the formation of green leaves for the implementation of the photosynthesis process, the formation of proteins, fats and various organic compounds, improving the quality of leaf-producing plants, breeding microorganisms in the soil (Rasyid, 2017).

2. Phosphorus (P₂O₅)

Liquid organic fertilizer is fermented anaerobically for 14 days with 1 liter of tofu wastewater added with a variation of MOL tomato 15 (1.5%) ml has an average phosphorus content of 0.15%, and the MOL variation of tomato 20 (2 %) ml has an average phosphorus content of 0.21%, in the MOL variation of tomatoes 25(2.5) ml has an average phosphorus content of 1.27%.

the phosphorus content of liquid organic fertilizer in this study, but the phosphorus content is not following the Minister of Agriculture of the Republic of Indonesia NO. 261/KPTS/ SR.310/ M/ 4/2019 ie 2-6 %. The low phosphorus content in liquid organic fertilizer in this study was probably due to the relationship between P content and other elements in the fermentation process.

The length of fermentation determines the level of P concentration, but the longer the fermentation time does not mean that the P concentration is also increasing. This is following the opinion of Hidayati, et al (2011), which states that the phosphorus content is related to the N content in the substrate.

3. Potassium (K₂O)

The liquid organic fertilizer in this study which had been fermented for 14 days anaerobically with 1 liter of tofu wastewater added with 15 (1.5%) ml MOL variation of tomatoes had an average potassium content of 1.86%, and the MOL variation of tomatoes 20(2%) ml have an average potassium content of 2.02%, in the MOL variation of tomatoes 25(2.5%) ml have an average potassium content of 2.06%.

According to (Putra & Ratnawati, 2019a) the number of bacteria or binoculars found in tomato waste is *Actinomyces bacteria* that live above Ph 6 (neutral) in anaerobic conditions which have a role in the decomposition of organic matter and increase nutrient reserves in the soil and form humus that can work effectively in the process of fermenting organic matter.

the potassium content of liquid organic fertilizer in this study, but the potassium content did not meet the requirements or not following the RI Minister of Agriculture NO. 261/KPTS/SR.310/ M/ 4/2019 ie 2-6 %. The possibility of this happening is due to the slow activity of microorganisms so the potassium content of liquid organic fertilizer in this study tends to be low. The element of potassium functions in helping the formation of proteins and carbohydrates, accelerating plant growth, increasing plant resistance to drought and disease, and improving the quality of seeds or fruit.

4. The Relation of Laboratory Results Nitrogen, Phospat, and Potassiumwith the Minister of Agriculture of the Republic of Indonesia No. 261 the Year 2019

Nitrogen, Phosphate, and Potassium content in liquid organic fertilizer using 1 liter of tofu liquid waste as raw material with the addition of 15 ml (1.5%), 20 ml (2%), and 25 ml (2.5%). In the variation of 15 ml (1.5%) the resulting N,P,K content of (2.10%), the variation of 20 ml (2%) resulted in the content of N,P,K of (2.33%), and in the variation of 25 ml (3.45%) resulted in N,P,K content of (0.577%) and it can be seen from the graph that there was an increase in N,P,K macronutrients from this study but all three of the tomato mole variations had met the standard quality, namely the Minister of Agriculture of the Republic of Indonesia NO. 261/KPTS/ SR.310/ M/ 4/2019 ie 2-6 %.

5. Results of Measurements or Physical Observations

Based on the table of observations and measurements of pH in the first week and second weeks, the pH was 8. In a stable neutral condition, because the organic matter had been decomposed and there was a decrease in the activity of microorganisms. According to the Regulation of the Minister of Agriculture of the Republic of Indonesia No. 261/KPTS/SR.310/M/4/2019, the minimum technical requirement for the pH value of liquid organic fertilizer is 4-9. Based on the table of observations and measurements in the first week and second week, it is known that the odor in liquid organic fertilizer from tofu liquid waste and tomato mole bioactivator. The smell at the beginning of the fermentation process shows a very strong odor, but at the end of the fermentation, the pungent odor is slightly reduced.

CONCLUSION

1) Based on the results of the analysis of the N, P, K content of 1 liter of tofu liquid waste with variations in tomato moles (15 ml, 20 ml, 25 ml) Ministry of Agriculture of the Republic of Indonesia NO. 261/KPTS/ SR.310/ M/ 4/2019. 2) The results of physical observations and measurements for 14 days of fermentation, pH of 8 which indicates a neutral and stable condition According to the Minister of Agriculture of the Republic of Indonesia NO. 261/KPTS/ SR.310/ M/4/2019, the minimum technical requirement for the pH value of liquid organic fertilizer is 4-9. The smell of liquid organic fertilizer from tofu liquid waste and tomato mole bioactivator at the beginning of the fermentation process showed a very strong odor, but at the end of the fermentation the pungent odor was slightly reduced and smelled like tape and brownish with a liquid texture.

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