

Analysis of Nitrogen, Phosphorus and Potassium Concentration in Modified Liquid Organic Fertilizers of Vegetable Waste, Charcoal and Snails

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| ARTICLE INFO | ABSTRACT |
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| ORCHID ID Author 1:- Author 2:- Author 3: http://orcid.org/0000-0003-2663-8232 | Nitrogen, phosphorus and potassium concentration in liquid organic fertilizer can be obtained from organic materials. Liquid organic fertilizer can be made from vegetable waste, charcoal, and gold snail (<i>Pomacea canaliculata</i> L.). This study aimed to know the concentration of nitrogen, phosphorus and potassium in liquid organic fertilizers of waste vegetable, charcoal and snail. Methods used to test nitrogen was the Kjeldahl method, while potassium and phosphorus tested with spectrophotometer. The results showed that the concentration of nitrogen, phosphorus and potassium in liquid organic fertilizers of waste vegetable, charcoal and snail were 0,2612 percent; 0,0334 percent; and 0,1421 percent. This concentration didn't meet the standard of liquid organic fertilizers quality based on MOA No. 70 of 2010 which is 3 until 6 percent. |
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1. Introduction

Organic farming has been promoted in Indonesia to increase crop productivity while being safer for plants and the environment. Generally, organic farming is farming that uses an organic-based fertilization system. There are two types of organic fertilizers, which are solid and liquid. Both organic fertilizers can improve soil fertility because they are rich in macro and micronutrients. However, liquid organic fertilizer is more readily available to plants than solid organic fertilizer (Prayitna, 2017).

The macro elements most needed by plants are nitrogen, phosphorus, and potassium. Nitrogen functions to support the nutritional content of plants, accelerate plants' growth, make plant leaves green, and help plants to absorb water optimally. Phosphorus is needed by plants to support growth, strengthen roots and stems, stimulate the formation of flowers and fruit, and give sweetness to the fruit. While potassium is useful for stimulating the formation of flowers, fruits, and seeds and making seeds fleshy (Kustono, 2019; Tando, 2019; Wahyudi et al., 2019)

Nitrogen, phosphorus, and potassium concentration in liquid organic fertilizer can be obtained from organic materials. Liquid organic fertilizer (LOF) can be made from vegetable waste, charcoal, and gold snail (*Pomacea canaliculata* L.). Liquid organic fertilizer from vegetable waste contains elements of nitrogen (N), phosphorus (P), and potassium (K) of 0.205%; 0.0074%; and 0.1138% so that it can supply the nutrients needed by plants (Nur et al., 2018). In addition, fertilizer from vegetable waste can increase plant root growth because

it can stimulate soil microbial activity and increase the process of N mineralization in the rhizosphere (Ji et al., 2017). Activated charcoal added to the soil neutralizes the soil and increases the cation exchange capacity of the soil. Sasmita, et al. (2017) mentioned that organic fertilizer combined with charcoal can increase pH, total nitrogen, and microbial respiration (Sasmita et al., 2017).

Gold snail has a protein content of 12.2 mg (Siregar AZ et al., 2017). This protein will be degraded into nitrate by *Nitrobacter* bacteria that will be absorbed by plants (Prayitna, 2017). In addition, gold snail (*Pomacea canaliculata L.*) also contains 60 mg of phosphorus and 17 mg of potassium (Siregar AZ et al., 2017). This phosphorus element is needed by plants to accelerate N fixation by encouraging flowering and seed and fruit formation and accelerating pod maturation (Barus et al., 2014). While the potassium element will help in closing and opening the stomata (Prayitna, 2017). The liquid organic fertilizers that will be developed utilize vegetable waste, charcoal, and snails. The concentration of nutrients that was needed by plants in that modified liquid fertilizer is not yet known. Therefore, this study was conducted to know the concentration of nitrogen, phosphorus, and potassium in modified liquid organic fertilizer of vegetable waste, charcoal, and conch.

2. Method

2.1 Fertilizer Preparation Method

The liquid organic fertilizer was made from vegetable waste, charcoal, and conch. Then, the LOF was added with EM 4 (Effective Microorganism) as a decomposer and mole solution as an energy substance for decomposing bacteria. The tools that were used in making this fertilizer were plastic drums, 1.5-liter bottles, 8 mm diameter pipes, mashing tools, chopping tools, measuring cups, and scales. The stages of manufacture were: (1) sorting materials, (2) chopping materials, (3) weighing materials for making fertilizer (2.5 kg of vegetable waste, 0.5 kg of husk charcoal, and 5 kg of conch), (4) dissolving mole and EM 4 in a bucket filled with water (1:1: 0.4), (5) mixing all ingredients into a plastic drum by stirring evenly, (6) tightly closing the drum that had been perforated and given a hose, then one end of the hose was inserted into a jerry can bottle that contained water. It fermented for up to 10 days, (7) after 10 days, the maturity level of liquid organic fertilizer was checked by smelling the odor.

2.2 Fertilizer Testing Method

The test method used to determine the concentration of nitrogen in liquid organic fertilizer is the Kjeldahl method. Meanwhile, phosphorus and potassium concentration were tested using spectrophotometry.

3. Result and Discussion

Liquid organic fertilizer is a fertilizer in the form of extraction of various organic wastes (livestock waste, plant waste, and other natural wastes) which are processed biotechnologically (Kartika et al., 2013). Liquid organic fertilizer contains both macro and micronutrients. The nutrients it contains are more easily available and more quickly absorbed by plants. The elements most needed by plants for growth are nitrogen, phosphorus, and potassium (Bhatla et al., 2018; Nurhidayati & Sholihah, 2022). The test results of nitrogen, phosphorus and potassium content in liquid organic fertilizer from vegetable waste, charcoal and conch are shown in Table 1.

Table 1. The Result of Nitrogen, Phosphorus and Potassium's Concentration in Modified Liquid Organic Fertilizers of Vegetable Waste, Charcoal and Snails

| | Nitrogen | Phosphorus | Potassium |
|---------------|----------|------------|-----------|
| Concentration | 0.2612% | 0.0334% | 0.1421% |

Based on Table 1, liquid organic fertilizer contains a nitrogen element of 0.2612%. When compared to Latifah, et al. (2015) and Nurgama, et al. (2015) studies, the nitrogen concentration of this fertilizer is greater. Meanwhile, the nitrogen concentration still does not meet the quality standards based on MOA No. 70 of 2011 (Nurgama et al., 2015). The phosphorus concentration in this liquid organic fertilizer also has a greater amount than Latifah, et al. (2015) and Nurgama, et al. (2015). Nevertheless, that amount also does not meet the quality standards based on MOA No. 70 of 2011 (Nurgama et al., 2015). The potassium content in this fertilizer is 0.1421. This potassium content is lower than the research of Latifah, et al. (2015) and Nurgama, et al. (2015) which are 0.25% and 2.080% respectively and does not meet the fertilizer quality standards based on MOA 70 of 2011.

The low concentration of nitrogen, phosphorus, and potassium is likely due to the small number of ingredients used. In addition, the fermentation time is not long enough, so the microorganisms have not decomposed optimally. Based on research by Fahri, et al (2018), microorganisms in 10-day fermentation are still experiencing the adaptation phase. During the adaptation phase, changes in cell mass occur but are not followed by changes in cell number. The best fermentation time for liquid organic fertilizer with EM4 assistance is 13 days because microorganisms have entered the exponential phase at this time. The exponential phase is the occurrence of perfect cell division by microorganisms (Fahri et al., 2018), (Rasmito et al., 2019). Therefore, bacteria can break down the content of fertilizer materials optimally.

4. Conclusion

Based on the results of this study, it can be concluded that liquid organic fertilizer (LOF) from vegetable waste, charcoal, and conch has nitrogen, phosphorus, and potassium contents of 0.2612%; 0.0334%; 0.1421% respectively, but these three elements do not meet the quality standards of MOA No. 70 of 2010.

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