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# EMPOWERMENT OF KARANG TARUNA SARDULO SETO IN THE PRODUCTION OF ORGANIC LIQUID FERTILIZER FROM FOOD WASTE AND TOFU LIQUID WASTE AND ITS EFFECT ON THE GROWTH OF CHILI PLANTS

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***Abstract***

Food waste and tofu liquid waste have great potential to be used as raw materials for organic liquid fertilizer. Food waste contains essential nutrients, such as nitrogen, phosphorus, and potassium, which plants need for optimal growth. Besides that, tofu liquid waste contains nutrients 1.24% N, 5.54% $P_2O_5$, 1.34% $K_2O$, and 5.803% C-Organic which plants need so that tofu production wastewater potential to make organic fertilizer. The potential for tofu liquid waste and food waste around the Sardulo Seto youth group interested the PkM team in training on making organic liquid waste from food waste and tofu liquid waste. In this activity, several stages were carried out, namely (1) Training on Making Organic Liquid Fertilizer, (2) Assistance in the production of Liquid Organic Fertilizer, (3) Testing the Quality of Liquid Organic Fertilizer, and Testing the Growth of Chili Plants. The results show partners can improve partner understanding of utilizing waste and producing organic liquid fertilizer for food waste and tofu liquid waste very well. In addition, the results of the quality test of liquid fertilizer (PCT-14) showed pH 5, C-Organic contain 8.46%, N 4.71%, $P_2O_5$ 5.78%, and $K_2O$ 2.13%. The results showed that chilies that had been treated with PCT-14 were taller than untreatted.

**Keywords:** Organic liquid fertilizer, Food waste, Tofu liquid waste, Growth of Chili.

## INTRODUCTION

In the face of ever-increasing global population growth, providing enough food for everyone is becoming increasingly complex. The need to increase agricultural production is becoming more critical, and one of the key factors in achieving this goal is meeting the need for fertilizer. The high demand for fertilizers in the world has increased the need for chemical fertilizers, so alternative uses of fertilizers are needed, one of which is by producing organic fertilizers (Marian & Tuhuteru, 2019).

Organic fertilizers are fertilizers whose raw materials come from nature, such as animal manure, plant parts, food waste, and others with a high mineral content that can fertilize the soil and add nutrients to plants. (Nur, et al. 2016; Harahap, et al. 2020; Muchtar, 2020) Organic fertilizers are divided into two types, namely solid and liquid organic fertilizers (Damayanti, 2020; Serdani, 2021). Liquid organic fertilizer is a solution resulting from the decomposition of organic materials which can provide nutrients according to plant needs (Putra, 2020; Serdani, 2021). Liquid fertilizer can increase chlorophyll formation, thereby increasing plants' photosynthetic ability and absorbing nitrogen from the air. It can increase plant strength, increase plant resistance, stimulate the growth of production branches, and increase the formation of flowers and fruit. The raw materials for making liquid fertilizer are organic materials that contain nutrients (N, P, K) (Tanti et al., 2020).

Food waste and tofu liquid waste have great potential to be used as raw materials for organic liquid fertilizer. Food waste contains essential nutrients, such as nitrogen, phosphorus, and potassium, which plants need for optimal growth. Besides that, tofu liquid waste contains nutrients 1.24% N,

5.54% $P_2O_5$, 1.34% $K_2O$, and 5.803% C-Organic which plants need (Marian & Tuhuteru, 2019; Pratiwi & Fanani, 2020) so that tofu production wastewater potential to make organic fertilizer. This follows Anggraini's research (2020) which shows that fermenting tofu waste for 28 days produces N levels of 0.1%, P 82.02 ppm, and K 0.68%. Widari's research et al. (2020) also succeeded in making organic liquid fertilizer from tofu liquid waste with a fermentation time of 10 days producing N levels of 1.3%, P 1.21%, and K 3.3%. On the other hand, the potential of food waste and tofu liquid waste as raw materials for organic liquid waste has yet to be utilized by the Sardulo Seto Kediri Youth Organization group.

The Sardulo Seto Karang Taruna group is a youth organization in Kediri that has one vision of preserving the Kediri environment. The potential for tofu liquid waste and food waste around the Sardulo Seto youth group interested the PkM team in training on making organic liquid waste from food waste and tofu liquid waste. The existence of training on making organic liquid fertilizer from household waste and tofu liquid waste at Karang Taruna Sardula Seto is an effort to overcome waste problems around the Kediri area and improve the skills of members of Karang Taruna Sardula Seto.

## METHOD AND PROCEDURES

In this activity, several stages were carried out, namely (1) Training on Making Organic Liquid Fertilizer, (2) Assistance in the production of Liquid Organic Fertilizer, (3) Testing the Quality of Liquid Organic Fertilizer, and Testing the Growth of Chili Plants. The description of activities at each stage includes:

1. Training on Making Organic Liquid Fertilizer

   The method used in training for making organic liquid fertilizer is a modification of the research by Mulyati et al. 2019 and Lailiyah et al. 2020, which begins with a video presentation and presentation on making organic liquid fertilizer. Furthermore, partners' understanding is measured through a questionnaire. The activity continued with the manufacture of waste liquid fertilizer together with partners. The skills of the Sardulo Seto Youth Organization group in making organic liquid fertilizers were measured through an assessment form by the PkM team.
2. Assistance in the production of Organic Liquid Fertilizer

   Assistance in the production of organic liquid fertilizer is carried out by producing organic liquid fertilizer with different variations of curing time. This is done to obtain standard organic liquid fertilizer so the results can be created and sold by the Sardulo Seto Karang Taruna Group. In this activity, the method of making liquid fertilizer modified from research by Widari et al. (2020), namely mixing food waste and tofu liquid waste that has been cooled, a solution of coconut sugar and EM 4 in a ratio of 50: 10: 1. Then the mixture is stirred for 5 minutes. After mixing, put it into the composter and close it. Finally, the mixture was fermented for 5, 7, and 14 days, stirring every two days. The organic liquid fertilizer produced after five days of fermentation is called PCT-5; the next seven days is called PCT-7, while the result of the next 14 days of fermentation is called

PCT-14.

3. Quality Test of Organic Liquid Fertilizer and Chili Plant Growth Test

   The results of liquid organic fertilizer products (PCT-5; PCT-7; and PCT-14) were then tested for pH, organic C content, nitrogen, phosphorus, and potassium at the Laboratory of the Bhakti Wiyata Institute of Health Sciences and Kadiri University. The composition of organic liquid fertilizer with the most standard quality (based on Minister of Agriculture Regulation Number 261 of 2019 concerning Minimum Technical Requirements for Organic Fertilizers, Biological Fertilizers, and Soil Improvers) was then tested for its effect on the growth rate of chili plants.

## RESULTS AND DISCUTION

### 1. Training on Making Organic Liquid Fertilizer

The community service activity program for making organic liquid fertilizer from food waste and tofu liquid waste begins with counseling on the manufacture of organic liquid fertilizer through presentations on the benefits of liquid fertilizer and video showing how to make organic liquid fertilizer to the Sardulo Seto Karang Taruna Group. Efforts were made to measure partner understanding by interviewing partners to fill in an understanding questionnaire (Mulyati et al. 2019 and Lailiyah et al. 2020). The results of the interviews showed that partners' understanding of food waste and tofu liquid waste that could be used to make liquid fertilizer increased as shown in table 1.

**Table 1.** Level of Understanding Before and After Counseling

| Questions | Before Counseling | After Counseling |
|---|---|---|
| Do you know about organic liquid fertilizer? | Yes | Yes |
| Do you know the benefits of organic liquid fertilizer? | Yes | Yes |
| Have you ever made your own organic liquid fertilizer? | No | Yes |
| Do you know how to make organic liquid fertilizer? | No | Yes |
| Do you know the tools and materials for making organic liquid fertilizer? | No | Yes |
| Did you know that food waste and tofu liquid waste can be used as organic liquid fertilizer? | No | Yes |

Then the program continued with training on how to make organic liquid fertilizer from food waste and tofu liquid waste. The training on making organic liquid fertilizer was carried out

by inviting partners to make organic liquid fertilizer. In the tofu industry, there are two kinds of waste, namely solid waste in the form of dregs and liquid waste which is leftover from extortion. This training includes socialization on the preparation of tools and materials, manufacture of fertilizers, and periodic fertilizer mixes. In this activity, partners were also given training on how to pack liquid fertilizer that is ready to be sold. The results of this training can be seen in Figure 1.

**Figure 1.** Making Organic Liquid Fertilizer Together with Partners

**2. Assistance in the production of Organic Liquid Fertilizer**

Assistance in the production of organic liquid fertilizer is carried out by producing organic liquid fertilizer with different variations of curing time. In this activity, the materials used to manufacture liquid fertilizer are food waste and tofu liquid waste, coconut sugar solution and effective Microorganism (EM4) for agriculture. First of all, partners mix food waste and tofu liquid waste, coconut sugar solution and EM4 in a ratio of 50: 10: 1. The addition of EM4 aims to accelerate the process of anaerobic decay through the fermentation process (Widari et al. (2020); Kaswinarni et al. (2020)) while the addition of coconut sugar solution is intended for food from microorganisms and the results of the decomposition of coconut sugar by microorganisms can also add to the nutrient composition of fertilizer (Nur et al. (2016); Putra et al. (2019)). The results of the mixture are then fermented for five days (PCT-5), seven days (PCT-7), and 14 days (PCT-14). During the curing process, partners also stir the fertilizer regularly every two days to avoid phase separation between the mixture of food waste and tofu liquid waste and EM4 so that the mixing is not perfect, which results in mould formation.

To find out the skills of partners, the community service team assesses partners' skills in making organic liquid fertilizer. The results of the assessment show that the partners' skills in making organic liquid fertilizer are very good as shown in Table 2.

**Table 2.** Level of Understanding Before and After Counseling

| Components Observed | Indicators | Assessment |
|---|---|---|
| Material preparation | Skill in measuring materials | Good |
| Manufacture of fertilizers | Skills in mixing and stirring materials | Very Good |
| Fertilizer product | Fertilizer product no fungus | Very Good |

| | | |
|---|---|---|
| Fertilizer packaging | Neatness of product packaging | Very Good |
| Cleanliness at work | Cleanliness of the work environment | Very Good |

### 3. Quality Test of Organic Liquid Fertilizer and Chili Plant Growth Test

Each of the Organic Liquid Fertilizers that have been produced from this training (PCT-5, PCT-7, and PCT-14) will then be tested for quality. The quality tests carried out were pH test, C-Organic content, nitrogen, phosphate and potassium oxide. The quality test results for each organic liquid fertilizer and the comparison of the results with the standards of the Minister of Agriculture Number 261 of 2019 concerning Minimum Technical Requirements for Organic Fertilizers, Biological Fertilizers and Soil Improvers are shown in table 3.

**Table 3**

The Quality Test Results for Each Organic Liquid Fertilizer and The Comparison of The Results with The Standards

| Samples | pH | Content (%) | | | |
|---|---|---|---|---|---|
| | | C-organic | N | $P_2O_5$ | $K_2O$ |
| PCT-5 | 5 | 6.37 | 1.75 | 5.54 | 2.18 |
| PCT-7 | 5 | 5.83 | 3,26 | 5.62 | 2.18 |
| PCT-14 | 5 | 5.46 | 4.71 | 5.78 | 2.13 |
| Standarts* | 4-8 | ≥10 | 2-6 | 2-6 | 2-6 |

*The Minister of Agriculture Number 261 of 2019 concerning Minimum Technical Requirements for Organic Fertilizers, Biological Fertilizers and Soil Improvers.

Table 3 shows that all liquid fertilizers produced with variations in incubation time have the same pH, namely 5. The C-organic content of liquid fertilizers in PCT-5 and PCT-7 increased, but in PCT-14, it decreased to 5.46%. This is due to the use of carbon as an energy source for microorganisms, and the fermentation process causes the decomposition of carbohydrates into $CO_2$ so that the carbon content decreases the longer it takes (Widari et al. (2020); Montalvo et al., 2020; Fernandez-Delgado et al., 2020; Ramesh et al., 2020). The decrease in C-Organic is also followed by a reduction of Potassium, where PCT-14 has the lowest $K_2O_5$ level, namely 2.13 because Potassium is used as an energy source from microbes during fermentation. This is different from the Nitrogen content, where the longer incubation time is shown by the highest PCT-14 level, which is 4.71%. This is because the longer the incubation process takes, the maximum will be the fermentation process, and the NADH production will also increase so that the N level will also increase (Montalvo et al., 2020; Fernandez-Delgado et al., 2020). The maximum fermentation

process was also indicated by increased phosphorus levels, where the highest $P_2O_5$ content was PCT-14, which was 5.78%. A comparison between the quality test of tofu waste liquid fertilizer and quality standards can be seen in Figure 2.

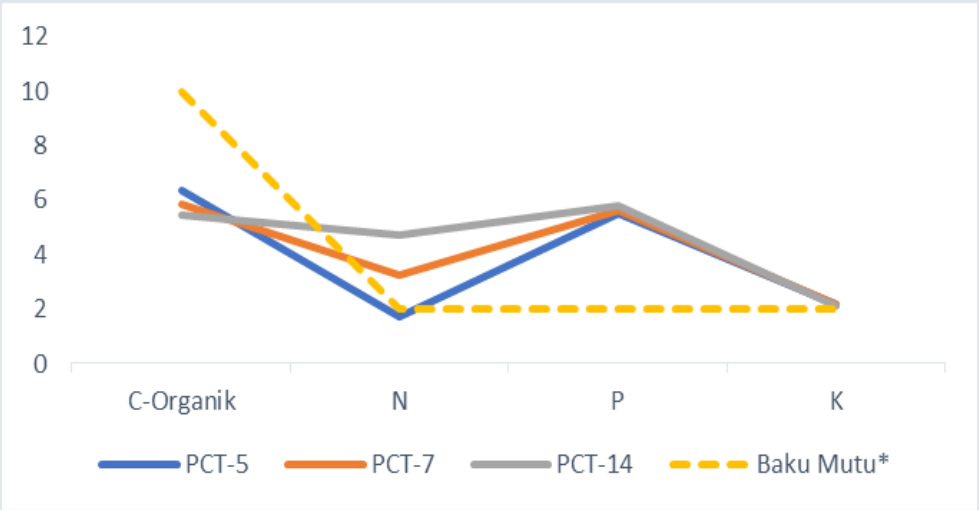


**Figure 2**. Comparison of the Quality of Organic Liquid Fertilizer with Quality Standards

Figure 2 shows that the best quality is PCT-14 but the C-Organic content is still below the quality standard. For this reason, it is necessary to add other raw materials that can increase the C-Organic value such as green plants or livestock manure in the manufacture of organic liquid fertilizer from food waste and tofu liquid waste. The results at the best curing time (PCT-14) were then tested on chili plants as shown in Figure 3. The results showed that chilies that had been treated with PCT-14 were taller (52 cm) and had wider leaves (no treatment 7 cm; treatment with PCT-14 8 cm).

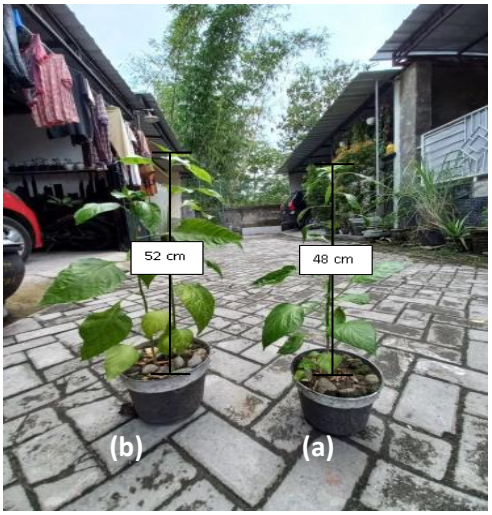


Figure 3. Comparison of Chilli (a) Without and (b) Treatted With Organic Liquid Fertilizer

## CONCLUSION

The results show partners can improve partner understanding of utilizing waste and producing organic liquid fertilizer for food waste and tofu liquid waste very well. In addition, the results of the

quality test of liquid fertilizer (PCT-14) showed pH 5, C-Organic contain 8.46%, N 4.71%, $P_2O_5$ 5.78%, and $K_2O$ 2.13%. The results showed that chilies that had been treated with PCT-14 were taller than untreatted.

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