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EFFECT OF LIQUID ORGANIC FERTILIZER FROM MARKET WASTE AND RICE WASHING WATER ON THE GROWTH OF LAND KANGKUNG (*Ipomoea raptans)*

Arin Makassa*[1], Orbanus Naharia[2]

[1]Biology Student, Faculty of Matehematics and Natural Science, Universitas Negeri Manado, Indonesia
[2]Biology Departement, Faculty of Matehematics and Natural Science, Universitas Negeri Manado, Indonesia

**Corresponding author: arinmakassa@gmail.com*

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Abstract

Some of Indonesia's agricultural countries produce many types of vegetables; for example, mustard greens, cabbage, spinach, kale, and so on are usually cultivated in Indonesia. Market waste and rice washing water can make liquid organic fertilizer (POC). This research was structured to know the effect of rice washing water on land kangkung plants' growth and the concentration required in one planting period. The research location is Maesa Unima housing, Tondano District, Minahasa Regency, North Sulawesi Province. This study uses quantitative methods with the implementation of experiments. Using the RAL technique or Completely Randomized Design totaling four treatments and each repeated seven times With liquid organic fertilizer (POC) using four treatments, namely: P0: Control (Using plain water), P1: POC with a concentration of 15%, P2: POC with a concentration of 30% and P3: POC with a concentration of 45% and the parameters measured were the growth of water spinach plants, namely: land kale plant height, number of land kale plants and leaf length on land kale plants. The results showed that rice washing water affected the growth of kale plants, namely plant height, number of leaves, and leaf length, and the required concentration was 45%. The research is due to the large amount of organic and household waste in the market, which can pollute the environment if not utilized.

Keywords: Liquid Organic Fertilizer (POC), Growth of Land Kangkung

INTRODUCTION

Indonesia is one of the many countries that have earned the nickname of an agricultural country. This nickname is based on the fact that Indonesia produces various types of vegetables. Vegetables are a choice of food ingredients needed by earthlings because of the many nutritional contents in them. Therefore, many kinds of vegetables are produced for export abroad. Meanwhile, in Indonesia itself, vegetables are traded in modern markets or traditional markets. Mufandi et al. (2018) stated that this conventional market has advantages and disadvantages. More than a thousand traditional markets carry out buying and selling operations in Indonesia, which causes an abundance of vegetables sent to these markets. Behind the benefits that exist in vegetables, vegetables also have their drawbacks, namely the

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shelf life of vegetables is not long, so if they rot, they will cause organic waste.

Waste problems are still a problem that often occurs in Indonesia. Yani et al. (2018) state that organic waste comes from vegetable waste, for example, mustard greens, cabbage, spinach, kale, and other waste. The waste is vegetable material that has been thrown away due to decay. Disposal is done to improve the appearance of vegetables marketed for sale. Spinach is a vegetable that quickly withers and rots to reach as much as 5% of waste daily. This is because the spinach condition is unsuitable for resale and cannot be repaired. Therefore, the final step that can be done is to throw away the wilted and rotting vegetables.

Furthermore, Yani et al. (2018) stated that waste that accumulates in markets could cause air pollution, disrupt daily activities, and cloud the landscape. Apart from the organic waste in the market, there is also household waste, such as rice washing water. Rice washing water is waste from cleaning rice cooked by the community. The content of rice washing water is very much and needs to be realized by the community. Wardih et al. (2014) stated that the content in rice washing water consists of carbohydrates, the presence of nitrogen, then phosphate, potassium, sulfate, iron, and vitamin B1. This aligns with Yani et al. (2018), who stated that market waste could be used as organic fertilizer to avoid excessive waste.

Waste originating from the market can still be processed because it has the potential to be used as POC or Liquid Organic fertilizers. Inorganic fertilizers are considered unhealthy if they are continuously used, so to anticipate this, POC can be used to minimize harmful fertilizers. Pranata (2017) states that inorganic fertilizers are at risk because they can hurt the soil's chemical, physical and biological properties. The price of inorganic fertilizers is also not economical because the price is relatively high. Kale plant is one of the plants belonging to the type of vegetables and is divided into two types, namely land kale and water spinach. According to Suratman et al. (2000) mentions that kale is famous for processing because it tastes good and is unique.

Kale distribution areas in Indonesia are generally located in the lowlands. And its distribution in countries, namely Malaysia, Australia, and Southeast Asia (Rukmana, 1994). Market waste that is organic in the form of vegetables and fruit, as well as rice washing water waste as organic fertilizer, which is used to grow kale vegetables. The selected kale is ground kale. Based on the explanation mentioned in the background, the researcher is interested in studying the use of rice-washing water for land kale plants and the concentration needed in one planting period. Hence, the researcher arranges research with two problem limitations: the effectiveness of rice washing water and the concentration required in one cropping period. The purpose of the research related to this is to determine the effectiveness of rice washing water waste and the concentration level needed in one growing season of kale.

RESEARCH METHODS

The research was conducted on an experimental basis using two variables, namely the independent variable and the dependent variable. The research location is in the Maesa Unima housing complex,

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Tondano District, Minahasa Regency, North Sulawesi Province. The duration of the research was carried out from November to December 2021. Data analysis using quantitative research is a Completely Randomized Design; four treatments were repeated seven times. Liquid organic fertilizer (POC) using four treatments, namely:

P0: Control (not using POC)

P1 : 15%: 150 ml of POC added 850 ml of water

P2 : 30%: 300 ml of POC added 700 ml of water

P3 : 45%: 450 ml of POC added 550 ml of water

The polybags used were arranged randomly using a lottery system with 28 polybags. In this study, the experiments used were homogeneous experiments such as laboratories, greenhouses, and fields. (Tanujaya 2013).

Data retrieval

Retrieval of data from the growth of kale plants, taken once a week. Plant measurements were carried out 14 days (2 weeks) after planting by measuring from the base of the stem to the tip of the shoot using a ruler, after which the height of the plant was written or recorded. Then the number of leaves is calculated based on the total number of leaves in the plantation. Then the leaves that are counted are whole or intact leaves, leaves that are not intact are not counted. Counting the number of leaves when the plants are two weeks old and the number of leaves after reaching three leaves (3 strands) and measuring the root length of the kale plant.

Figure 1. Growth of KaleGambar
Source: Personal Documentation

Figure 2. Measurement of Leaf Length
Source: Personal Documentation

Figure 3. Data collection
Source: Personal Documentation

Figure 4. Leaf measurement
Source: Personal Documentation

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Analysis Method

Data obtained based on observations (plant height of ground kale, number of leaves, and leaf length) were analyzed using the One-way and Duncan's tests, included in ANOVA (Analysis of Variances).

RESULTS AND DISCUSSION

Vegetable waste is waste originating from the market which will increase every day and will accumulate more and more. Vegetable waste that contains water easily decomposes and can leave an unpleasant odor. This causes respiratory problems that can affect everyone. In addition, the accumulated waste also makes the sight unsightly to look at, so it can affect the mood for the worse too. Waste that continues to pile up requires a solution to overcome this; efforts are needed that can utilize waste so that it does not pile up and become waste that is not useful. One of the uses that can be done is turning the existing waste in the market into organic waste and reprocessing it into liquid fertilizer.

Vegetable waste has macro and micronutrients. This element is needed by plants in large or small amounts. In addition to the use of less-than-optimal waste in processing, currently, farmers are still very dependent on the use of chemical fertilizers. If the use of chemical fertilizers is consistently carried out continuously, it will harm soil conditions. Over time, the nutrients in the soil will run out. So we need the latest innovations that do not damage the soil but are also beneficial to plant fertility so that innovation is found by using rice washing water to increase the growth of ground kale plants. According to (Sitompul and Guritno, 2010), plants can influence. Environmental agents are critical in growth, namely planting media, and good planting media will provide optimal plant growth. Agree with Saputra, 2013). On land growth, kale plants affect not only the growing media but the addition of fertilizer to the soil media.

The basic ingredient in making this liquid fertilizer is using vegetable waste on the market, such as cabbage, chicory, and green mustard. In the process, it is added to the rice-washing water. Then this fertilizer must be fermented for two weeks in a closed container as a form of fermentation. When the organic fertilizer is brown, the fertilizer is ready to be sprinkled on the ground kale plants.

Height of groundwater spinach

In the research process, measuring land kale plants becomes a calculation in determining the success or failure of the experiments. This measurement is carried out on plants when they grow within two weeks of age or 14 days after planting and is carried out 5x times daily. Retrieval of data on height gain in kale plants was carried out repeatedly with a duration of six times. The measurement was carried out using a ruler starting from the base of the stem to the top. Plant height was observed on each measurement day. The height gain of each plant stem has its differences in each measurement. The lowest growth average is 4 cm, and the highest is 25.2 cm.

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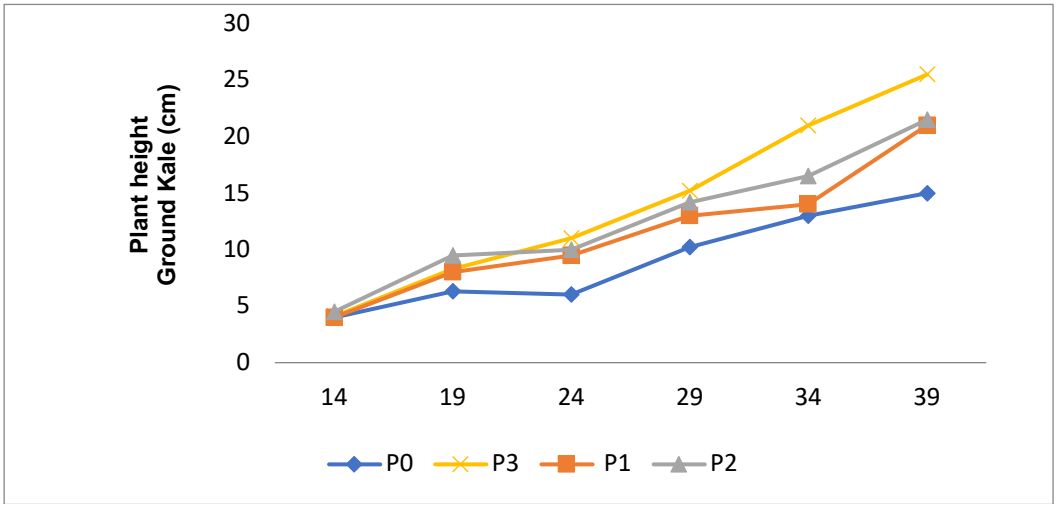

Figure 1. Graph of Kale Plant Growth Results

Information:

P0 : Control (Using Plain Water)

P1 : 15%: 150 ml of POC added 850 ml of water

P2 : 30%: 300 ml of POC added 700 ml of water

P3 : 45%: 450 ml of POC added 550 ml of water

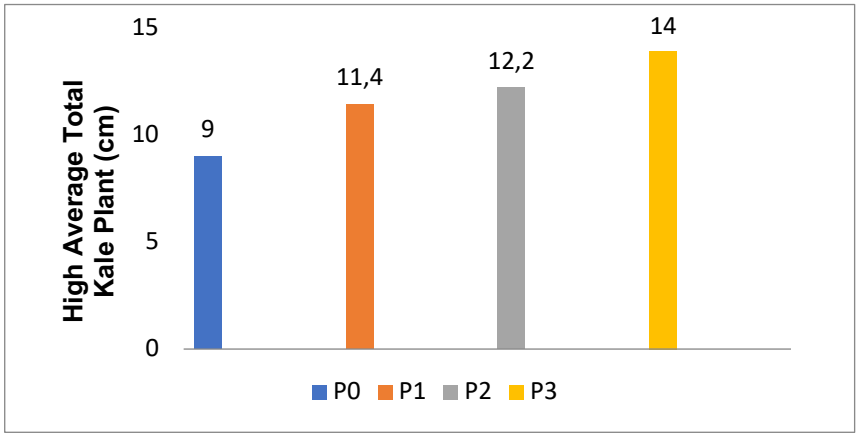

Figure 2. Graph of average height of watercress in each treatment

From Figure 2. It is known that the highest average height of the kale plant was in the P3 treatment with a height of 14 cm. After that it was followed by the P2 treatment with a height of 12.2 cm and the P1 treatment which had a slight difference of up to 11.4 cm. Meanwhile, the low growth in height of the land spinach plant was found in the P0 treatment which only had a height of 9.0 cm.

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Growth in the Number of Leaves of the Land Kale Plant

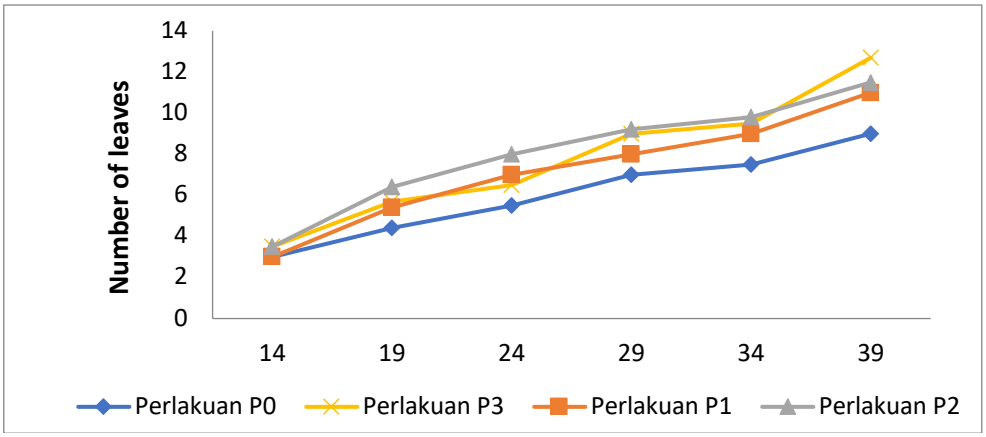

Figure 3. Graph of growth in the number of leaves

Information:

P0 : Control (Using Plain Water)

P1 : 15%: 150 ml of POC added 850 ml of water

P2 : 30%: 300 ml of POC added 700 ml of water

P3 : 45%: 450 ml of POC added 550 ml of water

The second calculation to measure treatment success is the measurement of the number of leaves. This measurement was carried out on water spinach plants when they were two weeks old or 14 days after planting and carried out every five days apart. Data on the number of leaves were collected six times from the 14th to the 39th day. This calculation is done manually. Leaves that have opened completely are considered a benchmark for calculating the number of leaves. Giving POC is considered effective against the growth of the number of leaves that show results of 7 to 6 leaves. The height of the plant influences the increase in this amount. This indicates that the provision of 45% POC benefits the growth of kale plant leaves.

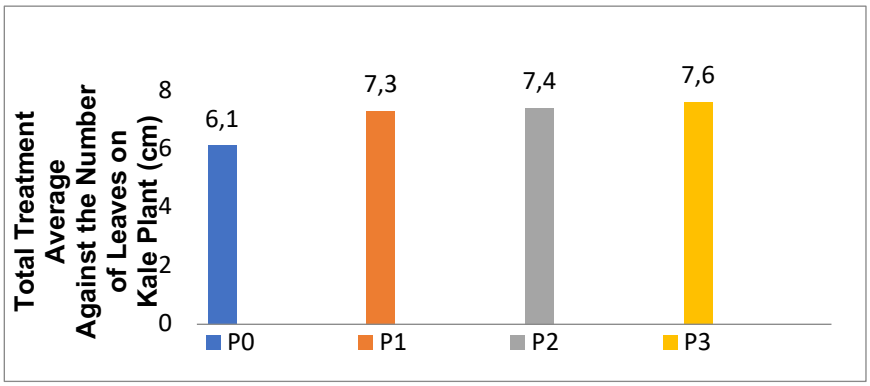

Figure 4. Graph of Average Number of Leaves in Each Treatment

From Figure 5. It is known that the number of kale plants has a different average leaf blade in each treatment. From each treatment, we can see the average growth of the kale plant varies, the first from

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treatment 3, which has 7.6 leaves, followed by treatment P2, which is 7.4 leaves, and P1, which has 7.3 leaves, then finally, treatment P0, i.e., only 6.1 leaves.

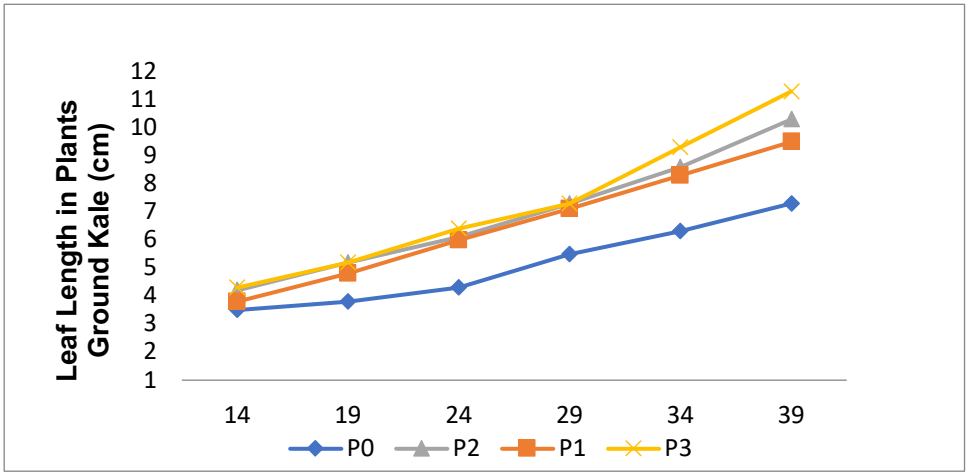

Figure 5. Image of long leaf growth results

Information:
P0 : Control (Using Plain Water)
P1 : 15%: 150 ml of POC added 850 ml of water
P2 : 30%: 300 ml of POC added 700 ml of water
P3 : 45%: 450 ml of POC added 550 ml of water

Long Growth of Land Kale Plant Leaves

The third calculation measures the length of ground kale leaves starting at the plant's age two weeks after planting. Data collection was carried out on the 14th and 39th days. Length measurement is carried out using a measuring device starting from the base of the leaf axil. Measurements were made using a ruler and using units of measurement in cm. The growth of leaf length has differences depending on the treatment given. The lowest growth is 4 cm, and the highest is 12.5 cm. The lowest average increase in leaf length was in treatment P0, which was 4.1 on day 19. On day 24, the most inferior treatment was P0, 4.1, followed by P1 and P3, 6 cm. At the same time, the highest was found in treatment P2, namely 6.1 cm. On the 39th day, the lowest was the P0 treatment, which was 8 cm; the P1 and P2 treatments had the same average, 11 cm, and the highest was the P3 treatment, 11.3 cm.

According to Haryadi, 2015, two factors influence the growth of land kale plants, namely external factors and internal factors. From each calculation that has been done, it can be seen that using organic fertilizer in planting water spinach plants has benefits and has a function that can be used to help the plant growth process.

Figure 6. Displaying the measurement results, this measurement obtained different data for each treatment. This result was from treatment P0, which was only 5.1 cm, followed by treatment P1 which was 6.6 cm, then P2, which was 6.9 cm, and the highest was in treatment P3 which reached 7.2 cm.

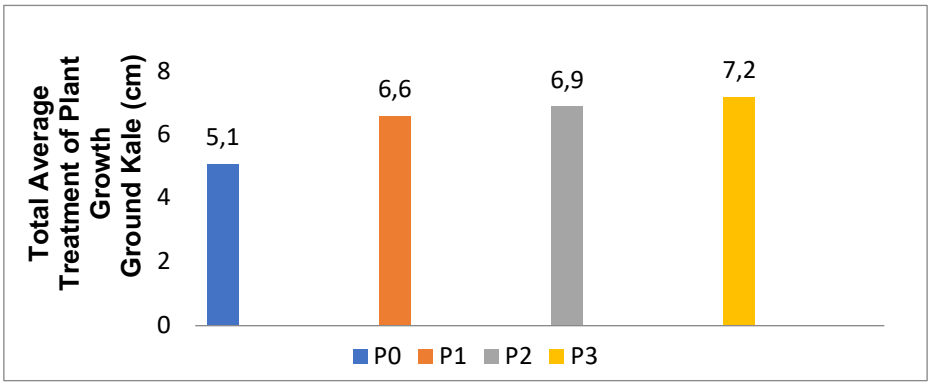

Figure 6. Graph of Average Number of Leaf Lengths in Each Treatment

The three observation results with different indicators show that water spinach plants can react positively by spraying organic waste.

CONCLUSION

Organic fertilizer from rice washing water influences plant growth at a concentration of liquid organic fertilizer (POC) of 45%. The research results show that organic waste can be valuable as a fertilizer, giving nutrients to watercress. This is an effective effort to overcome the accumulation of debris that occurs in the market.

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