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Effectiveness of Using Liquid Organic Fertilizer Rice Wash and Coffee Grounds to Increase the Growth of Tomato Plants (*Allium ascalonicum* L.)

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ABSTRACT

Tomato plants (*Allium ascalonicum* L.) are horticultural vegetable plants that are included in the eggplant group. Tomato plants are very much needed in the community because tomatoes are one of the most important vegetable ingredients in several types of vegetables. This study observed the growth of tomato plants under the influence of POC treatment of Rice Water and Coffee Grounds Waste. The method used in this study was a non-factorial Randomized Block Design (RAK) with three replications to see how the POC of rice washing water and coffee grounds waste affected the growth of tomato plants (*Allium ascalonicum* L.). With three types of treatment concentrations 0 (control), 100, 200ml POC and 0 (control), 75g, and 150g coffee grounds waste. The results of this research show that plants with a dose of 200ml POC have a high growth rate compared to other doses. With the same plant age, plant stem height occurred at a dose of 200ml, while the lowest number of leaves occurred at a dose of 0. This study found that administering a 200ml POC dose at 3MST showed a significant dose level, compared to other dose treatments. The results of this research show that a dose of 200ml POC of rice washing water is very suitable for the growth process of tomato plants, and the findings of this research can be used as a condition for getting tomato plant growth results.

Keywords: *Coffee Grounds Waste, Development, Plant Growth, POC Rice Washing Water, Tomato (Allium ascalonicum L.)*

1. INTRODUCTION

Tomato (Solanum lycopersicum) is a plant from the Solanaceae family that produces fruit which is usually used as a vegetable mixture in cooking. Even though tomatoes are fruit, because their taste is slightly sour and their texture is more like a vegetable, tomatoes are often considered and used like vegetables in cooking. Tomatoes are one of the horticultural products that are important for humans. Tomatoes are generally enjoyed fresh or in processed form such as juice, sauce, or a mixture of cooking spices, and are also used as raw materials for the cosmetics and medicine industry (Roni Setiawan, 2019).

The need for tomatoes continues to increase, but production always fluctuates every year due to several obstacles faced in cultivating tomato plants in the lowlands, including relatively high temperatures, pest and disease attacks, low soil fertility, and high levels of soil acidity due to the use of inorganic fertilizers. continuously. Another problem faced in tomato cultivation is a decrease in the quality of tomato fruit which is commonly known as blossom-end rot or fruit end rot which is caused by a lack of calcium. Increasing tomato production can also be done through an irrigation cultivation system. According to research by Sari et al ., (2017), tomato plants are a commodity that is sensitive to excess and lack of water during the growth period, excess water will cause the plant stems to rot, and Lack of water will cause plants to wilt and grow abnormally. Land that lacks water will cause aeration in the soil to be disturbed so that the supply of oxygen in the soil is not smooth, as a result, the growth and development of plants is delayed or stunted.

According to the Central Statistics Agency (2022) tomato production in Indonesia in 2020 was 1,084,993 tonnes with a harvest area of 57,304 Ha (18.9 tonnes/ha), in 2021 tomato production was 1,114,399 tonnes with a harvest area of 59,401 Ha (18, 7 tons/ha) and in 2022 it will be 1,168,744 tons with a harvest area of 63,078 Ha (18.5 tons/ha). The same thing happened in Aceh Province, where tomato production in 2020 was 20,781 tons with a harvest area of 687 Ha (30.2 tons/ha), and in 2021 tomato production experienced a decline, namely 11,706 tons with a harvest area of 503 Ha (23.2 tons /Ha). However, in 2022 tomato production will increase by 8,846 tons with a harvest area of 575 Ha (15.3 tons/ha).

As the need for tomatoes increases, this will also affect the productivity of tomato plants. Fertilizer plays an important role in increasing world crop productivity and increasing profits for farmers. Fertilization recommendations should be able to produce the desired product and plant quality, as well as to avoid mismanagement of fertilizer application that causes environmental damage. So fertilizer recommendations must be carefully considered for their level of productivity with environmental protection (Efendi et al . 2017).

Vegetable plants, especially leaf and short-lived vegetables (annuals) require large amounts of N as their main nutrient. Therefore, N fertilization is an important thing in vegetable cultivation. Things that increase N efficiency and the quality of vegetable crops will be important to know so that the effectiveness of fertilization becomes higher and N losses from vegetable crop fields can be reduced (Efendi et al, 2017). According to Kurniawan and Titiek (2017), plants that lack the nutrient K can cause plants to experience a decrease in the number and size of leaves, which affects the process of photosynthesis and the photosynthate that will be produced. By applying nitrogen fertilizer.

According to Wulandari et al. (2023) the content of coffee grounds and its function, namely phosphorus which is useful for transporting energy resulting from metabolism in plants, stimulating flowering and fruiting, stimulating the

growth of 3 roots, stimulating seed formation, and stimulating plant cell division and enlarging cell tissue. Potassium functions to maintain plant immunity from disease attacks, strengthen the woody parts of plants, improve fruit quality, and increase pest and disease resistance and drought. Magnesium as an activator plays a role in energy transportation for several enzymes in plants, facilitating the photosynthesis process. Calcium is the element that plays the most important role in cell growth.

Based on the description above, the author tried to conduct research with the title "The Effect of Giving POC Rice Wash and Coffee Ground Waste on the Growth and Yield of Tomato Plants".

2. MATERIAL AND METHODS

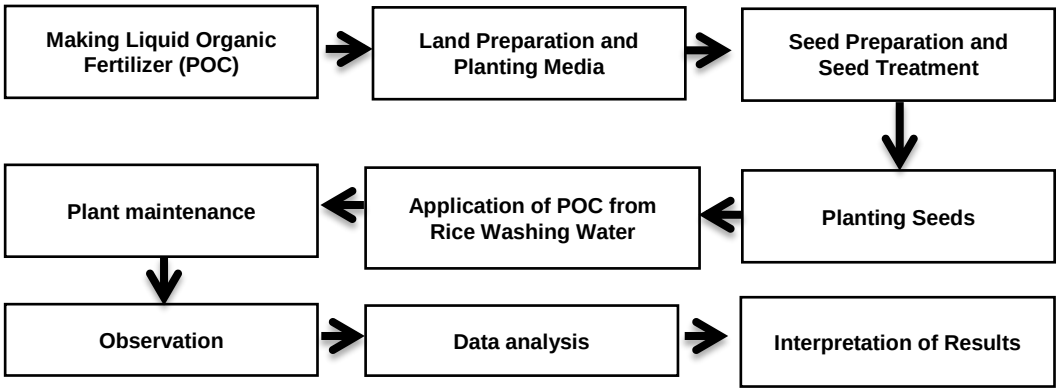
This research was carried out in the front yard of the house, Lake Balai A, Rantau Selatan District, Labuhanbatu Regency 2º27'09.6" N 100º11'09.6" E with a height of 30 meters above sea level. This research was carried out for three months starting from the middle of June until the end of June 2024. The seed-sowing process was carried out in trays for 14-15 days. Then after that, the seeds that had gone through the sowing period were transferred to 5kg (35 x) polybag planting media. 40cm), the application of POC and coffee grounds waste was carried out when the plants were 5 HST, and observation data began to be measured at 7 HST.

The materials that will be used are tomato seeds of the Servo F1 variety, POC rice washing, 5 kg polybags (35 cm × 40 cm), coffee grounds waste, and water. The tools used were a hoe, measuring tape, machete, plastic rope, scissors, tray, member, measuring cup, caliper, nameplate, camera, stationery, nameplate, and laptop.

This research was carried out using the Randomized Group Design (RAK) research method, with three types of treatment concentrations 0 (control), 100ml, 200ml POC and 0 (control), 75g, 150g kop pulp waste with three replications. Observations of tomato plant growth were carried out on vegetative characters, namely the percentage of growth power, plant height, and number of leaves. The calculation of growth capacity is calculated based on the formula according to (Tefa, 2017), namely:

$$\textbf{Percentage of growing power (}\%\textbf{)} = \frac{\sum \boldsymbol{n}}{\boldsymbol{N}} \times \mathbf{100}\%$$

Information:
$\sum \boldsymbol{n}$ = Number of seeds growing normally
$\boldsymbol{N}$ = Total seeds planted



Figures 1 . Research flow diagram

3. RESULT AND DISCUSSION

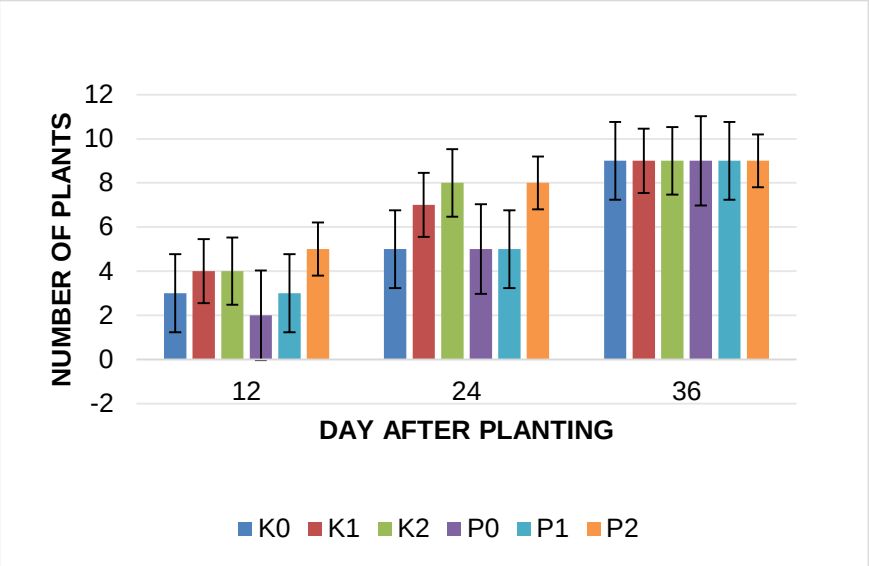
Based on the results of the research carried out, data was obtained based on 3 parameters, namely plant growth capacity, tomato plant height, number of plant leaves using POC of rice

washing water and coffee grounds waste on the growth and development of tomatoes (*Allium ascalonicum L.*).

From the results of the ANOVA test, the effect of using POC from rice washing water and coffee grounds waste showed differences in the growth of tomato plants (*Allium ascalonicum L.*) in the treatments. The differences observed in all parameters (plant growth capacity, plant height, number of leaves) each parameter showed a value of 0.05. In other words, the treatment given to growth is significantly different or significantly different.

3.1 Percentage of Growing Power (%)

The growth of tomato plants (*Allium ascalonicum L.*) can be seen based on the ability of the tomato plants to survive. The percentage of life is influenced by the number of live tomatoes and dead or contaminated tomatoes. The results of the study showed that dose treatment with POC rice washing water could affect the percentage of tomato plant life (Figure 2).



Description: K0 (control), K1 (Coffee 75g), K2 (Coffee 150g), P0 (Control), P1 (POC 100ml), P2 (POC 200ml)

Figure 3. Percentage of Growing Power

Figure 4. Tomato Plants 2 WAP

Table 1. Average Plant Percentage (%) treated with POC rice washing water

Dosage (ml)	Crop Percentage (%)	
0	Life	Dead
0	100	0
100	100	0
200	100	0

Description: Percentage of living plants and dead plants

Table 2. Mean Plant Percentage (%) treated with coffee grounds

Dosage (ml)	Crop Percentage (%)	
0	Life	Dead
0	100	0
100	100	0
200	100	0

Description: Percentage of living plants and dead plants

The average growth capacity of tomato plant seeds is shown in Table 1 and the comparison of additional doses of POC and coffee grounds waste does not have a different effect on the growth capacity of tomatoes (*Allium ascalonicum L.*).

The treatment of giving 150 grams of coffee grounds and 200 ml of POC produced the highest growth capacity in tomato plants. This is due to the macro and micro nutrient content available in the POC and coffee grounds, the macronutrient content includes N, P, K, Mg, S, C, H, and O, as well as the availability of microelements in the POC of rice washing water (Wardiah, 2014).

The results of this study are in line with the results of research reported by Wijayanti *et al.* (2019) who explained that giving POC to plants will increase germination and vegetative growth of plants.

3.2 Plant Height (cm)

Tomato plant height data was measured when the tomato plants were 1 WAP and carried out once a week until the first flowers appeared on the tomato plants. Plant height was measured from the base of the soil to the tip of the highest leaf. Based on the analysis of variance, it showed that the dose of POC and coffee grounds waste had an effect on the average height of tomato plants for each observation once a week. The results of the analysis of variance showed that the Liquid Organic Fertilizer factors were significantly different at 2 weeks after planting (MST).

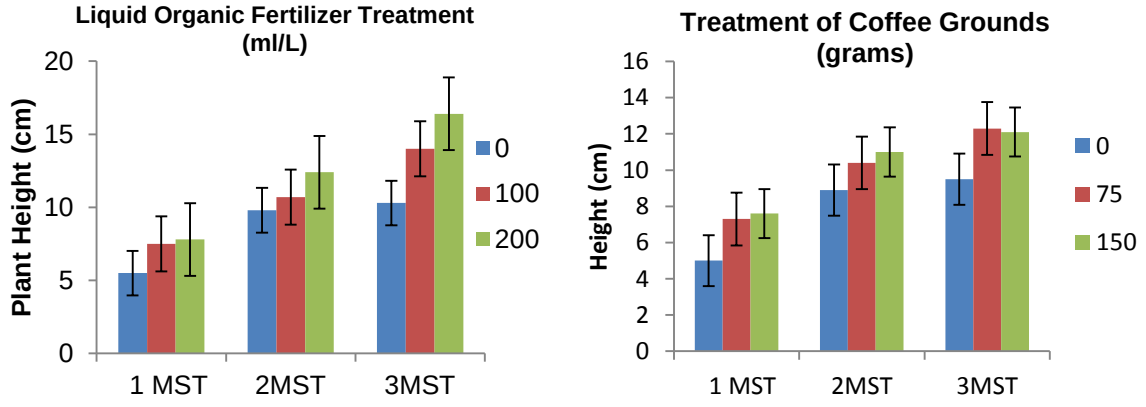


Figure 2. Average plant height with POC treatment of rice washing water and coffee grounds.

The tallest plants were in the POC rice water treatment with a dose of 200ml with an average value of 16.4 cm, and the plants with the lowest height were at the P0 concentration (control) namely 10.3 cm. In tomato plants treated with POC, the P1 rice water dose (100ml) was higher, while plants without treatment were shorter.

Giving 200 ml POC/plant and 150 grams of coffee grounds produced plants with the best plant height compared to other treatments, this shows that giving POC can provide the nutrients needed to support the photosynthesis process which will result in growth in cells and organs (Saputri, 2021).

The results of this study can be compared with the results of research reported by Hanifah *et al.* (2022) explained that the use of rice washing water and waste dregs will be a source of nutrients that can increase plant growth, especially for tomato plants.

Figure 3. 3MST Tomato

3.3 Number of leaves of tomato plants (*Allium ascalonicum L.*)

The number of leaves is an important factor in plant growth because leaves are one of the important organs of plants for photosynthesis and also data on the number of leaves of tomato plants is calculated when the tomato plants are 1 week after transplanting. Data is taken once every 1 week

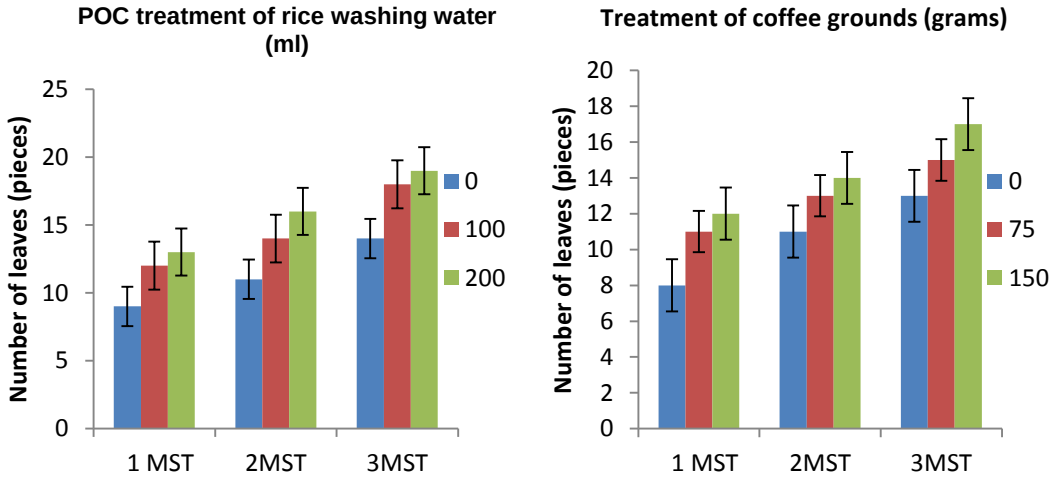


Figure 4 . Average number of leaves on tomato plants (*Allium ascalonicum* L.)

Figure 4 shows that in line with the height of the tomato plants studied, there are differences. With different administrations, the POC dose of rice washing water affected the number of leaves during the experiment. This is due to the availability of nitrogen nutrients in the POC content of rice water. It can be seen in Figure 4 that giving a 200ml POC dose shows a significant difference compared to giving a 100ml POC dose and coffee grounds waste (Winanti *et al* . 2022).

When compared with previous research, the results of this research show similarities, such as the research results reported by Putra *et al.* (2021) explained that giving POC rice washing water and coffee grounds can increase the growth and number of leaves on lettuce plants (*Lactuca sativa* L)

4. CONCLUSION

The conclusion obtained from the results of the discussion is that the POC dose of rice washing water and coffee grounds waste and their interaction

influence the growth of tomato plants. The higher the dose given, the more effect it will have on plant height, number of plant leaves, and plant stem diameter.

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