

Liquid Organic Fertilizer Waste Pineapple Skin on Tomato Growth and Production in Alluvial Soil

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ABSTRACT

This study aims to obtain a concentration of POC of pineapple skin waste that can provide the best growth and yield of tomatoes in alluvial soils. The research was carried out from December 1, 2, 2019 to March 05, 2020 at the location located on Jalan Silat Baru, untan komplek. Pontianak City. The study used the Complete Randomized Design (RAL) method with one factor, which consisted of 5 treatments with 5 tests and each test consisted of 4 sample plants. The treatment in question is $k_1 = 10\%$ POC pineapple skin waste, $k_2 = 15\%$ POC pineapple skin waste, $k_3 = 20\%$ POC pineapple skin waste, $k_4 = 25\%$ POC pineapple skin waste, $k_5 = 30\%$ POC pineapple skin waste. The variables observed in this study were plant height, root volume, dry weight of plants, Number of Fruits Per plant, Fruit Weight Per Plant, and Weight Per Fruit. Based on the results of the study, it can be concluded that the application of POC pineapple skin waste with a concentration of 15% and 20% shows good growth at plant height 1 and 2 weeks after planting. Based on the results of the study, it can be concluded that from the administration of PINEAPPLE SKIN WASTE POC, it is not found that the best concentration but an efficient concentration for tomato growth and yield is 10% POC of pineapple skin waste.

Keywords: Alluvial, Pineapple Skin Waste, Liquid Organic Fertilizer, Tomato.

INTRODUCTION

Tomato (*Lycopersicon esculentum*, Mill) is a vegetable crop that is widely consumed by all levels of society in the world. Tomatoes are classified as horticultural crops that are widely used as seasonings for dishes, raw materials for the tomato sauce industry and can be consumed fresh (Arifah & Faizah, 2021). The consumption of fresh and processed tomatoes is increasing along with the increasing public awareness of the importance of balanced nutrition.

Based on the Central Statistics Agency (2018), tomato crop production in West Kalimantan in 2017 was 3,134 tons with a land area of 15 ha. Furthermore, according to Sunarjono (2014) tomato crop production in Indonesia is 25,000 tons with a land area of 4,000 ha. The productivity of tomato plants in West Kalimantan is still relatively low compared to the productivity of tomatoes in Indonesia.

Efforts to increase tomato production in West Kalimantan can be done through intensification and extensification programs. Intensification can be carried out, among others, using high-yielding varieties, fertilization, tillage, irrigation, pest and disease control. Extensification is carried out by expanding the planting area through the opening of new land, one of the lands that can be used is alluvial land.

Based on data from the Central Statistics Agency (2018), West Kalimantan has an alluvial land area of 1,793,771 ha so that this area has the potential to be used as a cultivation of tomato plants in an effort to increase tomato production in West Kalimantan. However, alluvial soils have obstacles, including high clay, poor aeration, low water binding power. In addition, the lack of activity of soil microorganisms, low pH and low nutrients (Khomsah & Zulfikar, 2021).

Tomato plants need nutrients to support growth and will affect production yields. The growth of a plant depends on the amount of nutrients provided to the plant in the minimum amount, so that the provision of balanced nutrients and the completeness of macro and micro nutrients are needed by plants

for the growth and production of these plants (Aziz et al, 2019). One of the efforts that can be done in increasing the productivity of alluvial soils is by providing POC.

POC plays an important role in improving the chemical and biological properties of the soil, for the improvement of soil chemical properties, which can increase nutrients and pH and its biological properties, which can increase the number and activity of microorganisms in the soil (Asakawa 2021). The purpose of this study is to obtain a concentration of POC of pineapple skin waste which can provide the best growth and yield of tomatoes in alluvial soils.

METHOD

This research was carried out on Jalan silat baru, untan complex. Pontianak City, this research started from December 12, 2019 to March 05, 2020. The tools used in this study include lain, shovel, hoe, machete, meter, thermometer, higrometer, analytical scales, buckets for making fertilizer, stationery and cameras. The materials used in this study were alluvial soil, tomato seeds, pineapple peel waste POC, basic fertilizers, dolomite lime, pesticides, and polybags. The study used the Complete Randomized Design (RAL) method with one factor, which consisted of 5 treatments with 5 tests and each test consisted of 4 sample plants. The treatment in question is $k_1 = 10\%$ POC pineapple skin waste, $k_2 = 15\%$ POC pineapple skin waste, $k_3 = 20\%$ POC pineapple skin waste, $k_4 = 25\%$ POC pineapple skin waste, $k_5 = 30\%$ POC pineapple skin waste. The implementation of research from the manufacture of pineapple skin waste POC, preparation of research sites, preparation of seedling media, nurseries, preparation of planting media, planting, giving POC of pineapple skin waste, application of basic fertilizers, maintenance (embroidery, watering, weeding, installation of ajir, pruning, and pest control), and harvesting. The variables observed in this study were plant height (cm), root volume (cm^3), dry weight of plants (g), number of fruits per plant (fruit), weight of fruits per plant (kg), and Weight Per Fruit (g). In addition to observations on plants, observations were also made on environmental conditions, namely air temperature ($^{\circ}\text{C}$), humidity (%) and soil pH. The data obtained were analyzed with test F level of 5%. If the results of test F treatment show a real effect, it is continued with the BNJ test at a level of 5%.

RESULT AND DISCUSSION

Research Results

Based on the results of the diversity analysis, it was shown that the application of POC of pineapple peel waste at various concentrations had a significant effect on plant height of 1 mst and 2 mst but had an unreal effect on plant height of 3 mst and 4 mst, root volume, dry weight of plants, number of fruits per plant, weight of fruits per plant, and weight of fruits per fruit. Furthermore, to find out the difference between treatments that have a real effect on plant height of 1 mst and 2 mst, an Honest Real Difference Test (BNJ) was carried out, the results of which can be seen in Table 1.

Table 1. Honest Real Difference Test The Effect of PINEAPPLE SKIN WASTE POC on Plant Height of 1 mst and 2 mst.

POC Concentration of Pineapple Skin Waste (%)	Average Plant Height	
	1 mst	2 mst
10	17.58 b	30.80 a
15	21.28 a	33.05 a
20	21.60 a	34.15 a
25	19.45 ab	35.20 a
30	17.50 b	31.25 a
BNJ 5%	3,65	4,55

Description: Numbers followed by the same letter in the same column are different from real on the BNJ Test at the level of 5%

The results of the BNJ test analysis in Table 1 showed that the height of tomato plants of 1 mst given POC of pineapple skin waste concentration of 15% and 20% was significantly different from the height of tomato plants given POC of pineapple skin waste concentrations of 10% and 30%, but it was not

significantly different from the height of tomato plants given POC pineapple skin waste concentrations of 25%. Table 1 also shows the height of tomato plants of 2 mst given POC of pineapple skin waste in all treatments did not differ markedly. The highest height of tomato plants of 1 mst is indicated by tomato plants with the application of POC pineapple peel waste with a concentration of 20% which is 21.60 cm. While the height of tomato plants of 2 mst is the highest indicated by tomato plants by giving POC pineapple skin waste with a concentration of 25% which is 35.20 cm.

The average value of tomato plant height of 3 mst ranges from 43.33 to 47.43 cm and the height of tomato plants of 4 mst ranges from 74.08 to 80.65 cm. The value of the volume of the roots of tomato plants ranges from 7.22 to 9.64 cm³. The average dry weight value of tomato plants ranges from 14.79 to 19.81 g. The average value of the number of fruits per tomato plant ranges from 47.40 to 55.20 pieces. The average value of fruit weight per plant ranges from 131.38 to 167.42 g while the average value of fruit weight per fruit ranges from 20.44 to 24.83 g.

Discussion

The root is the main vegetative organ that is important for plants in terms of taking nutrients, water, minerals and other nutrients from the soil. According to Yanuartha (2007), the root functions in the absorption of water and salt-charged liquid substances. Another function is as an absorbent of nutrients for plants which are then circulated to all parts of the plant through wood tissues. The roots also serve as a support for the plant so that it grows strongly.

The results of the diversity analysis showed that the administration of PINEAPPLE skin waste POC had an intangible influence on the volume of roots. This is because the administration of POC pineapple skin waste at various concentrations exerts the same influence in increasing the volume of roots. The highest average value of the root volume of tomato plants given POC pineapple peel waste concentration of 25% is 9.64 cm³. The provision of POC for pineapple skin waste has been effective in improving the chemical properties of the soil so that it becomes better, the increasing ability of the soil to absorb nutrients, the availability of nutrients that will be absorbed by plants is increasing as well (Harjowigeno, 1995). Nutrient availability is also affected by soil pH. Soil pH during the study ranged from 6.0 to 6.5. According to Rismunandar (1995) that the pH required by tomato plants in order to grow and develop properly ranges from 5.5 to 6.5. This means that the pH of the soil during the study is suitable for the growth of tomato plants so that nutrients become available.

Khan et al (2018), stated that roots need sufficient mineral nutrients for their growth and development, an increase in soil fertility will cause the roots to tend to multiply their branching. The more root branches that are formed, the greater the nutrients absorbed by the plant so that it can increase the volume of roots, plant height and dry weight of the plant.

According to Gardner (1985), the growth and development of the root system is influenced by the rate of division and enlargement of cells in the root which can increase the volume of plant roots. Sutejo and Kartasapoetra (1998) added, that for the development of the root system of plants, N and P elements are needed which are part of the protoplasm and cell nucleus. As part of the cell nucleus, the element is of great importance in cell division and the development of meristematic tissues.

Plant height is one of the indicators of plant growth although it is not a leading indicator. Plant height gain is a form of increased cell division from the results of increased plant photosynthetic (Weidenhoeft, 2006). The results of photosynthetic in tomato plants are used for the growth of various plant organs, one of which increases plant height.

The results of the analysis of the Honest Real Difference Test (BNJ) in Table 1 showed that the height of tomato plants with the administration of POC pineapple skin waste concentration of 15% and 20% differed markedly in the administration of POC pineapple waste high tomato plants given POC pineapple skin waste concentrations of 10% and 30%, but it was not significantly different from the height of tomato plants given POC pineapple skin waste concentrations of 25%. Table 1 also shows that tomato plant height of 2 mst had a noticeable influence on all poc concentrations of pineapple skin waste given. The highest tomato plant height of 1 mst is indicated by plants given a POC of pineapple skin waste with a concentration of 20% which is 21.60 cm, while the highest height of tomato plants of 2 mst is indicated by plants given a POC of pineapple bark waste concentration of 25% which is 35.20 cm. In

Nilai the average height of tomato plants of 3 mst ranges from 43.33 cm to 47.43 cm and the average value of tomato plant height of 4 mst ranges from 74.08 cm to 80.65 cm.

The effect of giving POC pineapple skin waste on tomato plant height begins to appear after the plants are 1 mst and 2 mst old, meaning that plants when transplanted already need nutrients for their growth but are still few. But at 3 mst and 4 mst, the poc of the given pineapple peel waste no longer exerts a noticeable influence on the height of the tomato plant. This is thought to be because the need for nutrients by plants is increasing while the nutrients contained in the POC of pineapple skin waste are still low so they have not been able to increase plant height by 3 and 4 mst.

Plant height is influenced by the content of nitrogen and phospat in the formula of a given nutrient. According to Chen and Markham (2021), nitrogen for plants has a role to stimulate the growth of plants as a whole, especially stems, branches, and leaves. Nutrient P mainly plays a role in the transfer and storage of energy, as well as maintaining membrane integrity, cell division and enlargement, the lack of P nutrients in plants also causes plants to become stunted (Aldaour, 2019).

The dry weight of the plant is a description of the translocation of photosynthesis (photosynthetic) results to all parts of the plant that metabolize into organic matter. According to Abas et al, (2020), to find out the results of the photosynthesis process that occurs in plants is with the dry weight of the plant. According to Tjitrosoepomo (2001), the effectiveness of the process of photosynthesis in a plant can be known through the measurement of the dry weight formed during growth, since 94% of the dry weight of the plant comes from photosynthesis.

Tomato plants given POC pineapple peel waste with varying concentrations produce a dry weight of plants that do not differ. The average dry weight value of plants ranges from 14.79 g to 19.81 g. It is suspected that good absorption of solar energy in the administration of POC pineapple skin waste affects the physiological processes of plants, especially the process of photosynthesis will increase. This affects photosynthetic resulting from the process of photosynthesis shown by the dry weight of the plant. In addition, the process of photosynthesis is also influenced by environmental factors such as temperature and air chelemity. The average daily temperature during the study ranged from 27⁰C to 28⁰C. While the average daily air humidity during the study ranged from 80% to 84%. The temperature for the growth and development of tomato plants ranges from 20⁰C to 30⁰C, while the daily air humidity is 80%. This means that the environmental conditions during the study are favorable for the growth and development of tomato plants.

According to Setyati (1988), plant growth is indicated by the increase in size and dry weight of the plant reflecting the increase in protoplasm that may occur due to the increase in the size and number of cells in the plant's body. The increase in cell size and dry weight of the plant are due to cell division in the meristematic area of the shoots and the tips of the roots. According to Agustina (2004), that the dry weight of plants is largely determined by carbohydrates because most of the cell walls are composed of carbohydrates.

The dry weight of the plant is an indicator of the ongoing growth of the plant which is the result of plant photosynthesis. The process of photosynthesis that occurs on the leaves produces photosynthetic which is then translocated to all parts of the plant including to the yield organ so that it affects the number of fruits per plant, the weight of the fruit per plant, the weight of the fruit per fruit of the tomato plant.

The results of the fingerprint analysis showed that the treatment of giving POC for pineapple skin waste had no noticeable effect on the number of fruits per plant, the weight of fruits per plant, and the weight of fruits per fruit of tomato plants. Photosynthetic results translocated to the yield organs produced a number of fruits per plant that did not differ in all treatments. The number of fruits per plant is most produced by tomato plants by giving POC pineapple skin waste with a concentration of 10% which is 55.20 pieces.

The number of fruits per plant that does not differ results in the weight of the fruit per plant and the fruit collar per fruit is also not different. Fruit weight per plant with a POC application of pineapple skin waste concentration of 10% produces the heaviest fruit weight per plant which is 167.42 g. Fruit weight per fruit with the administration of POC pineapple skin waste concentration of 20% produces the heaviest fruit weight per fruit which is 24.83 g. This is thought to be due to the amount of photosynthetic translocated to the resulting organ the amount at each treatment is the same. The more assimilates

available in plant tissues, the more fruits produced and the heavier the weight of the fruit (Hakim et al,1986).

CONCLUSION

Based on the results of the study, it can be concluded that from the administration of PINEAPPLE SKIN WASTE POC, it is not found that the best concentration but an efficient concentration for tomato growth and yield is 10% POC of pineapple skin waste.

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