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Application of Coffee Grounds Organic Fertilizer on The Growth and Production of Cucumber Plants (*Cucumis sativus* L)

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ABSTRACT

Cucumis sativus L, commonly known as cucumber, is a creeping vine plant and a member of the Cucurbitaceae family known for producing fruit-bearing vegetables. Cucumis sativus plants originate in the Asian continent, specifically in North and South Asia. The primary objective of this study is to investigate the development and yield of cucumber plants, focusing particularly on the impact of varying doses of organic fertilizer derived from liquid coffee grounds. Specifically, the study seeks to assess the effects of these treatments on plant height, time to flowering, time to harvest, and the weight of the fruit produced by cucumber plants. This study was conducted within the idyllic housing complex from March to May 2024. The research used a factorial randomized block design (RAK) with a single factor. The dosage parameters for coffee grounds fertilizer are as follows: P0 serves as the control group, P1 involves a dosage of 25 ml per plant, P2 utilizes a dosage of 50 ml per plant, and P3 applies a dosage of 75 ml per plant. The findings indicated that the various fertilizer treatments had a noteworthy impact on plant height, flowering age, harvest time, and fruit weight, suggesting a significant interaction between the two variables. Applying 75 ml of coffee grounds fertilizer per cucumber plant yields the best outcomes in promoting increased plant height, earlier flowering, shortened harvest time, and greater fruit weight in cucumber plants.

Keywords: *Application, Coffee Grounds, Cucumber, Growth, Organic Fertilizer, Production*

1. INTRODUCTION

The cucumber (*Cucumis sativus* L), a member of the Cucurbitaceae family, is a fruit vegetable plant widely embraced by the general population, and its creeping vines characterize it. The origins of cucumber plants can be traced back to the Asian continent, specifically North Asia and South Asia. The provinces of West Java, Aceh, Bengkulu, East Java, and Central Java are the distribution areas for cucumbers in Indonesia. (Purnomo et al., no date). Cucumber plants show promising potential for growth due to their significant economic value, relatively brief harvest period, and straightforward cultivation methods. The expansion of cucumber farming has the potential to enhance the economic well-being of individuals involved in vegetable cultivation. Raising cucumber production is crucial in order to fulfill the demands of both domestic and international markets, particularly for exports. As the population grows, there is a corresponding rise in the market demand for vegetables, particularly cucumbers. (Ginting et al., 2018).

Cucumbers are widely consumed by Indonesian society in their fresh form. Cucumbers have a good nutritional value as they are a source of minerals and vitamins. They are believed to contain saponins, proteins, fats, calcium, phosphorus, iron, sulfur, vitamins A, B1, and C. In 100 g of cucumber, there are 15 calories, 0.8 g of protein, 0.19 g of starch, 3 g of carbohydrates, 30 g of phosphorus, and 0.5 mg of iron. Cucumbers are also recognized in the health world as a remedy for coughs and fever reduction. (Daniel et al., 2019).

Improving cucumber yields requires efforts to increase production with good fertilization technology. Chemical fertilizers are becoming scarce in the current situation, with government subsidies decreasing, resulting in high fertilizer prices. Additionally, the damage caused by chemical fertilization can threaten the sustainability of the agricultural system. Therefore, maintaining production stability necessitates the adoption of appropriate and easily obtainable technologies as an alternative to synthetic fertilizers. One solution for fertilizer issues is using organic fertilizers (Purwaningrum & Sinaga, 2019).

Coffee grounds are an alternative that can be used as a substitute for inorganic fertilizers (chemical fertilizers) because coffee grounds also have nutrients that are quite good for plants, such as nitrogen content of 2.28%, phosphorus of 0.06%, and 0.6 potassium. The pH of coffee grounds is around 6 on the pH scale. In addition, coffee grounds also contain magnesium, sulfur, and calcium, which are useful for plant growth. The importance of coffee grounds in plants, notably phosphorus, is that they are useful for transporting energy from plant metabolic products, stimulating flowering and fertilization, root growth, seed formation, plant cell division, and enlarging cell tissue. Potassium maintains plant immunity from disease attacks, strengthens plant stems, and improves fruit quality. Magnesium is an activator that plays a role in the energy transportation of several enzymes in the plant and facilitates the process of photosynthesis. Calcium is the element that plays the most role in cell growth (Wulandari et al., 2023).

Coffee grounds are the essence of coffee with a use value or benefit as a good organic fertilizer for plants because coffee grounds contain various substances and are environmentally friendly, but people lack knowledge and awareness. The use of coffee grounds as an organic fertilizer has not been maximized because some people think that coffee grounds are garbage that can no longer be used, and there is a low level of knowledge and public awareness about reusing materials that are considered useless. Coffee grounds as organic fertilizer help the environment to be better maintained due to the use of

natural materials that do not harm the environment, and simple technology in making liquid organic fertilizer from coffee grounds underlies the need to convey to the community regarding the use of coffee grounds as a liquid organic fertilizer that is cheaper and more affordable, as well as healthy for the agricultural ecosystem (Agam & Muntazori, 2020).

Liquid organic fertilizer offers the benefit of addressing nutrient deficiencies without causing harm to the soil and plants, even with frequent application. Additionally, it contains a binding agent that enables plants to readily utilize the fertilizer solution when applied to the soil surface.(Cergia & Sawir, 2019).

2. MATERIAL AND METHODS

2.1 Research Location

This research was carried out on Jln. Simpang Mangga, perfectly beautiful housing complex, Rantau Selatan sub-district, Labuhan Batu Regency, North Sumatra, 2°05'04.2"N 99°50'57.5"E.

2.2 Tools and Materials

The materials used are cucumber seeds, coffee grounds, rice wash water, polybags, label paper, soil, and other materials that support the implementation of this research. The tools used in this study are a hoe, machete, watering can, measuring cup, measuring tape, and writing tools.

2.3 Research Methodology

This study is an experimental research conducted based on a Randomized Complete Block Design (RCBD) with six replications, examining the effects of used coffee grounds (UCG) on the growth and yield of cucumber plants at four dosage levels: No UCG application (Control), UCG application at 25, 50, and 75 ml per plant.

2.4 Research Procedure

2.4.1 Preparing Land

The planting location should be chosen in an area with sufficient water supply and flat soil. Land preparation should ideally be done at least two weeks before planting or can be done simultaneously with the seed planting process. Before starting the seedling process, the first step is to clean the land by controlling weeds and fencing off the area to prevent pest infestations. Land clearing should be done a week before planting cucumber plants; the first step is to sow the seeds in small polybags. The polybag medium consists of a mixture of soil and organic fertilizer in a 1:1 ratio; the seedlings should be watered in the morning and evening. Transplanting should be done after the seedlings are 8-10 days old. Seed sowing should occur before direct planting in the field by filling 5 kg polybags with topsoil at a 0-20 cm depth. Seed sowing should be done before planting directly in the field. Trellis should be installed before transplanting to prevent damage to the plants.

2.4.2 Application of Coffee Dregs POC Fertilizer on Cucumber Plant Growth

Coffee Dregs POC fertilizer is applied by sprinkling it on the soil around the plant according to the research dose.

2.4.3 Maintenance

Watering is done twice a day in the morning and evening. Watering maintains water availability for fertilizing plants starting from 10, 17, 24, and 31 HST. For cucumber plants that already have fruit, fertilizer is given twice a week to maximize the nutrients the plant absorbs for good fruit production. Pest and disease control is carried out based on the types of pests and diseases that attack and are controlled daily.

2.5 Observation Parameter

2.5.1 Plant Height (cm)

Plant height was measured using a meter and when the cucumbers were 1 week after planting. Observations were made at 1 MST, 2 MST, 3 MST, 4 MST, 5 MST, and 6 MST.

2.5.2 Flowering Age (HST)

Flowering age is calculated from 75% of cucumber plants that show flowers. Flowering time ranges from 20-30 HST.

2.5.3 Harvest Age (HST)

Cucumber harvesters are usually harvested when the plants are 35-45 days after planting. The characteristics of cucumbers ready to harvest are that they are about 15-20 cm long with a diameter of 1.5 cm. They have nice fruit shapes, smooth skin, and are fresh.

2.5.4 Fruit Weight (gram)

The weight of the fruit planted is measured using a scale. The fruit weighed is harvested from the sample plants and then averaged.

2.6 Data Analysis

Data analysis used analysis of variance (ANOVA) and DMRT (Duncan Multiple Rane Test) at the 5% level. Data analysis using SPSS Version 29 and Excel.

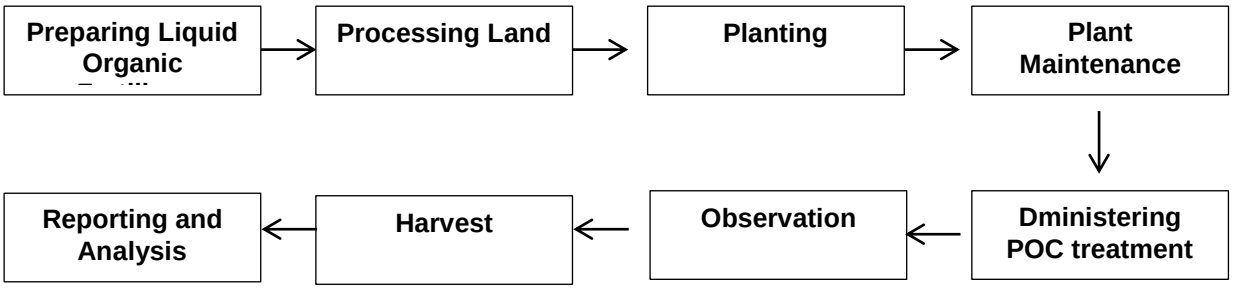

Figure 1. Research Flow Diagram

3. RESULT AND DISCUSSION

3.1 Plant Height (cm)

Based on the results of the analysis of variance (ANOVA) with Randomized Complete Block Design, it is evident that the administration of coffee grounds POC differs significantly in 4MST, 5MST, and 6MST. Therefore, a subsequent DMRT (Duncan Multiple Range Test) was conducted at a 5% significance level (Table 1). However, in 1MST, 2MST, and 3MST, it was found that the administration of coffee grounds POC did not show significant differences.

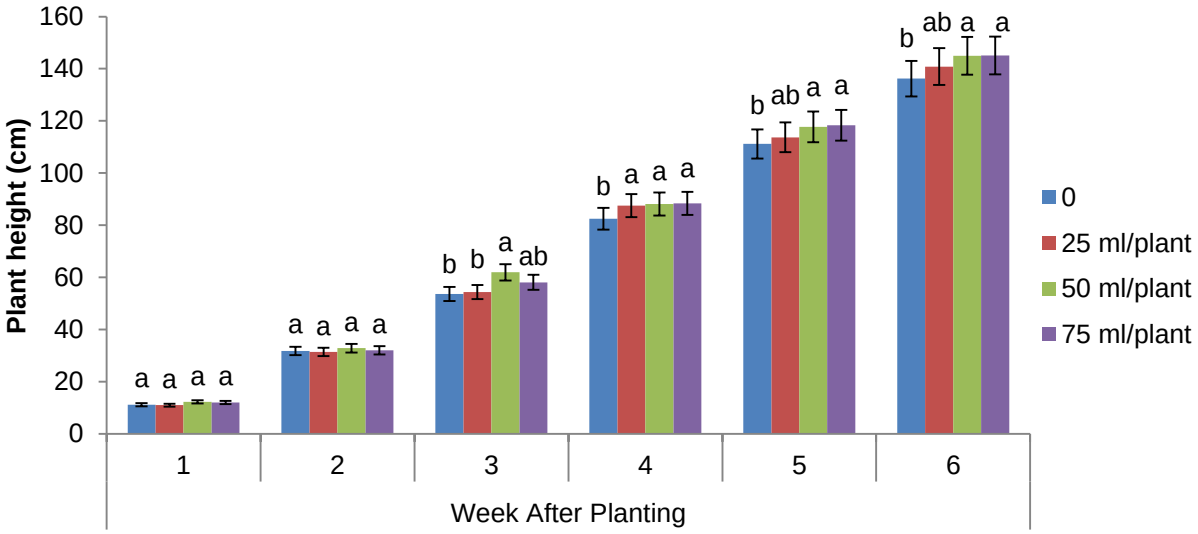

Figure 2. Average plant height the week after planting (cm) of cucumber plants (*Cucumis sativus* L.)

The results of further tests showed that the highest growth of cucumber plants at 1 WAP was obtained in treatment P2 (12.2 cm) while the lowest was in treatment P1 (10.97 cm). At the age of 2 WAP, the highest growth was obtained in treatment P2 (32.82 cm), while the lowest was in treatment P1 (31.4 cm). At the age of 3 WAP, the highest growth was obtained in treatment P2 (61.92 cm), while the lowest was in treatment P0 (53.63 cm). At the age of 4 WAP, the highest growth was obtained in treatment P3 (88.35 cm), while the lowest

was in treatment P0 (82.48 cm). At the age of 5 WAP, the highest growth was obtained in the P3 treatment (118.3 cm), while the lowest was in the P0 treatment (111.15 cm). At the age of 6 WAP, the highest growth was obtained in P3 (145.08 cm), while the lowest was in the P0 treatment (136.22 cm).

Giving different doses of POC coffee grounds really affects the height of cucumber plants because coffee grounds contain Nitrogen. Nitrogen functions in the vegetative growth of plants, which plays a role in cell division and plant cell extension, because Nitrogen is a constituent of protoplasm found in many tissues such as plant growing points. (Undut et al., 2023)

3.2 Flowering Age

The analysis of variance (ANOVA) with a Randomized Block Design showed that the administration of POC coffee grounds was not significantly different.

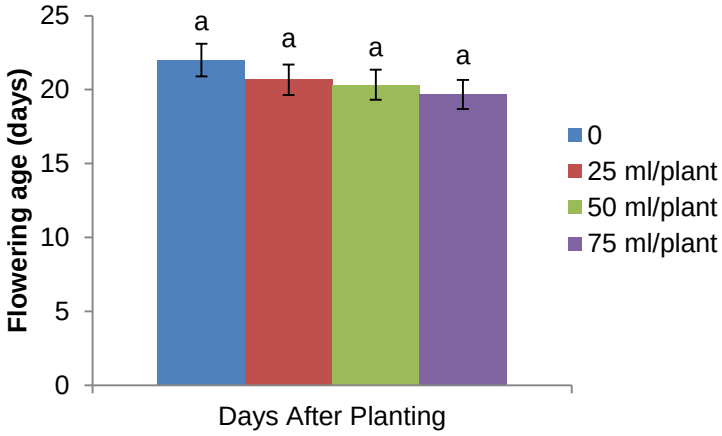

Figure 3. Average Age of Flower Appearance (days) of cucumber plants (*Cucumis sativus* L.)

In Figure 3 it can be seen that the highest flowering age for cucumber plants was in the P3 treatment (19.67 DAP), and the lowest was in the P0 treatment (22 DAP). POC coffee grounds contain N and P&K solvents, naturally increasing macro and micronutrients. Plants need this quickly to stimulate the process of root emergence, growth, flowering, and fruiting. If the interaction effect is not significantly different, it can be concluded that the treatment factors act independently (Ungu, 2017).

3.3 Harvest Age

Based on the results of analysis of variance (ANOVA) with a non-factorial Randomized Block Design, it showed that the administration of POC coffee grounds was significantly different in treatments P3 and P0, a further DMRT (Duncan Multiple Rane Test) test was carried out at the 5% level. (Table 3). However, treatments P1 and P2 showed that the administration of POC coffee grounds was not significantly different.

In Figure 4 it can be seen that the highest harvest age for cucumber plants was obtained in the P3 treatment (34.5 DAP) while the lowest was in the P0 treatment (37.5 DAP). The fast harvest time in the P3 treatment is because giving POC coffee grounds at the right dose can have a positive influence on the soil structure as a plant growing medium, where this can make the soil fertile and is supported by the nutrient content contained in the POC coffee grounds so that Plants can grow and develop well, which ultimately results in a faster crop harvest life (Anggara,B. 2022).

3.4 Fruit Weight

The analysis of variance (ANOVA) with a Randomized Block Design showed that the administration of POC coffee grounds was not significantly different.

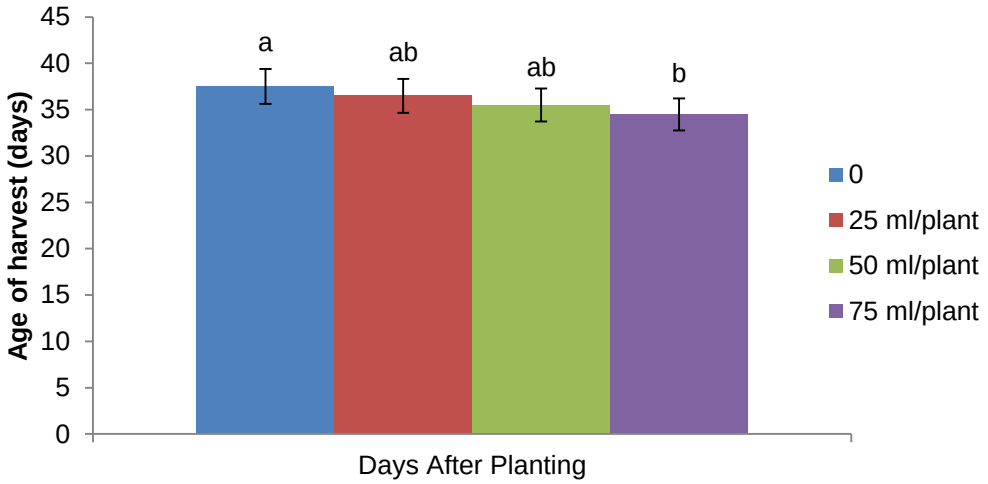

Figure 4. Average Age of Harvest (days) of cucumber plants (*Cucumis sativus* L.)

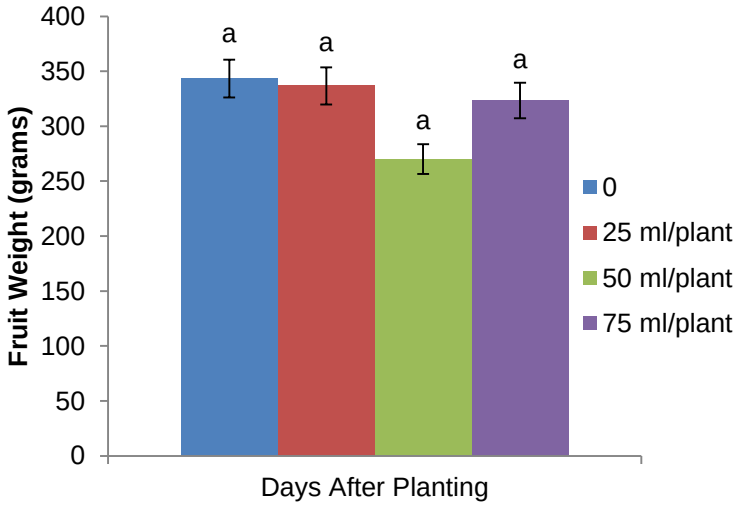

Figure 5. Average fruit weight (grams) of cucumber plants (*Cucumis sativus* L.)

Figure 5 shows that the highest fruit weight of cucumber plants is obtained in the P0 treatment (343.33 grams), while the lowest is in the P2 treatment (270 grams). According to (Lisa & Sari, 2021). The fruit weight of cucumber plants is the vegetative growth of plants that utilize sunlight for the maximum photosynthesis process. The genetic factors of the plant itself can control the results of the fruit weight of a plant.

4. CONCLUSION

Based on this research, it can be concluded that applying POC coffee grounds can enhance the vegetative growth of cucumber plants. The significant effects on cucumber growth were plant height and harvest age with treatment P3 (75ml), but they had less impact on flowering age and fruit.

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