

# Application of coffee skin compost on the growth of early robusta coffee seedlings in the Sanggabuana Mountains, Karawang

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## Abstract

Application of the use of Sanggabuana coffee skin waste to preserve and develop sustainable agriculture in Karawang Regency, the use of coffee skin waste aimed to reduce agricultural waste where the sustainable agricultural system was to increase environmental damage, maintain productivity, increase farmers' income and improve quality and productivity. quality of life of people in rural areas. The purpose of this study was to determine the effect of the application of Sanggabuana coffee skin waste compost in the pre nursery of Sanggabuana coffee. This study uses an experimental method with coffee skin waste compost as a treatment factor. This research will take place for 4 months, precisely during the main seedling process starting from the age of 1 months to 2 months of coffee seedlings. The treatment factors for coffee skin waste consist of 5 levels, namely A. No Compost Waste (0g/polybag), B. 200 g/polybag of coffee skin compost, C. 400 g/polybag of coffee skin compost, D. 600 g/polybag coffee skin waste compost, E. 800 g/polybag coffee skin waste compost. The design used in this study was a completely randomized design (CRD) which consisted of 1 factor and 5 levels and was carried out 4 times so that there were 20 experimental units. The results obtained were that coffee skin compost had a significant effect on the initial seeding of Sanggabuana robusta coffee. The coffee skin composting dose of 200 grams/polybag had the best effect on plant height parameters at 21 and 28 days after sowing, number of leaves, and root length.

## Keywords

Sanggabuana coffee, Skin waste, Sustainable agriculture

## Introduction

The agricultural sector as one of the economic sectors has great potential in contributing to the growth of national economic development, both in terms of income and employment. Coffee is one of the most important commodities in Indonesia, this can be seen from the many coffee plants cultivated in each province in Indonesia. In general, coffee commodities in Indonesia have several types of coffee, namely robusta

**Published:**  
October 20, 2024

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BIS-STE 2023 Committee

coffee, arabica coffee, and liberica coffee. In Indonesia, coffee producers are the main leading commodities that currently contribute foreign exchange to the country. Seeing the vast potential of coffee in the country, the government invests in the coffee industry to advance the domestic coffee industry [1].

Central Bureau of Statistics (2018) coffee production in Karawang Regency has a land area of 245 ha, and has coffee production of 207.00 tons [2]. The high yield of coffee production in Karawang has the potential to improve welfare for its residents. However, in line with the large number of coffee production, organic waste has also become a serious problem, namely coffee skin waste where the Karawang community still wastes the coffee skin. In general, coffee skin waste is only used as animal feed or just thrown away without processing. With the development of coffee processing, both small-scale or industrial scale, it certainly produces by-products of coffee processing, one of which is coffee skin waste. From this processing, it will produce  $\pm 65\%$  of coffee beans and  $\pm 35\%$  of coffee skin waste, where coffee skin waste can still be used, one of which is compost. The content in the coffee skin itself has the following nutritional content CP 9.94%, SK 18.17%, Fat 1.97%, Ash 11.28%, Ca 0.68%, P 0.20%, GE 3306 Kcal and TDN 50.6%. This is due to the low knowledge and skills of the community to process coffee skin waste into compost. Even though coffee skin waste, both wet and dry processing, contains nutrients that can be used for plant needs [3].

This behavior results in widespread organic pollution, waste pollution. The heaviest environmental impact in the form of organic pollution of coffee waste is in the waters where coffee effluent is released. Meanwhile, the simple impact that can be caused by this condition, namely the stench that quickly appears because the coffee skin still has a high enough water content, which is 75–80% [4]. To reduce coffee waste, it needs to be used as an effort to preserve and develop sustainable agriculture where sustainable agricultural systems are aimed at reducing environmental damage, maintaining agricultural productivity, increasing farmers' incomes and improving the stability and quality of life of rural communities. There are three major indicators that can be seen are a sustainable environment, an improved economy (prosperous) and socially acceptable to the farming community. One way in a sustainable agricultural system is organic farming [5]. Where organic farming systems can provide products that are free from inorganic chemical residues sourced from the use of pesticides and chemical fertilizers [6]. One of the efforts that can be made to reduce coffee skin waste and utilize coffee skin waste is to process coffee skins into coffee skin compost. The results showed that the C-Organic content of coffee fruit peel was 43.3%, nitrogen content 2.98%, phosphorus 0.18% and potassium 2.26% [7].

Hartati's Research [8] said on long bean plants 2, 4 and 6 DAS showed that plant height from several treatments (variations in fertilizer doses) showed that the higher the dose of coffee skin waste compost given, the higher the plant height growth, namely at A4 (600 g coffee skin waste compost) with a size of 61 cm, while the growth of the number of leaves increased to the dose of A2 fertilizer (400 grams of coffee skin waste compost)

as much as 25 strands however, at higher doses, namely A3 and A4, there is a decrease in the growth of the number of leaves. It is likely that this happens because the dose of fertilizer is too high, causing leaf growth to decrease or many to fall off. The purpose of this study was to determine the results of the utilization of Sanggabuana coffee skin waste.

## Methods

The research was carried out on the Mekarbuana Karawang land, Tegalwaru District, in December 2021-April 2022. The materials used are coffee seeds, coffee skin compost. The research method used was experimental with coffee skin waste compost as a treatment factor. This research will last for 4 months precisely during the main nursery process starting from the age of coffee seedlings 3 months to 7 months. The compost treatment factor for coffee skin waste consists of 5 levels, namely A (Without 0-gram Waste Compost / polybag), B (200 grams / polybag of coffee skin waste compost, C (400 grams / polybag of coffee skin compost), D (600 grams / polybag of coffee skin compost), E (800 grams / polybag of coffee skin compost). The environmental design used in this study is the Complete Randomized Design (CRD) consisting of 1 factor and 5 levels of repeated 4 times so that there are 20 experimental units. Observation data will be analyzed using the F test to determine the effect of treatment, and if the results show a real difference, a Least Significant Difference (LSD) follow-up test will be carried out with an error level of 5%.

### *How to make coffee skin compost*

The compost used is waste from dried coffee fruit skins,

1. Coffee skin waste is then chopped into smaller sizes between 0.5-1 cm to facilitate the decomposition process.
2. Coffee skin as much as 5 kg and mixed with bran as much as 0.5 kg, and flattened until evenly distributed. 100 ml of EM-4 solution and 2 tbsp of granulated sugar are dissolved in 5 liters of water.
3. The mixed solution is poured on a pile of coffee skin waste evenly until the water content ranges  $\pm$  30-40%. The pile of waste is turned over so that the materials are evenly mixed.
4. Sufficient water levels are marked by when the material is grasped does not drip water and blooms when the grip is released.
5. The mixed material is put into the sack and then the sack is given a hole with nails for aeration during the composting process.
6. The temperature of the composted material pile is maintained between 40-50%.
7. Sacks are stored in a dry place and protected from rain and direct sunlight.
8. The fermentation process is characterized by the temperature of the compost in warm sacks
9. The finished compost (ready to be composted) is characterized by black, friable, non-hot and odorless color.

### Maintenance

Maintenance carried out on seedlings includes watering carried out every day, namely morning and evening using emprat, or according to soil conditions, if it rains no watering is done, weed weeding is done 1-2x a week, manually by pulling out grass that grows inside the polybag or outside the polybag.

### Planting seedlings

Planting is carried out in the morning using seedlings that have been sown for 3 months. Planting is carried out in polybags measuring 15 cm x 20 cm, each polybag contains a mixture of soil and coffee skin compost in accordance with the treatment that has been set. Each polybag is filled with 1 plant seed, the distance between plants is 20 cm x 20, then labeled according to the treatment that has been determined to facilitate observation (Figure 1).



Figure 1. Coffee plant seeds at polybag

## Results and Discussion

### Plant height

The effect of coffee skin compost dose on the height of early robusta coffee seed plants at the age of 7, 21, 28, 35 das (*day after sowing*) is presented in the results of the Least Significant Difference (LSD) advanced test table and variety analysis as follows.

1. Table Results of Average Test of Least Significant Difference (LSD) Height of Robusta Coffee Seeds 7 das (day)

Table 1. Further test of LSD effect of coffee skin compost on plant height aged 7 das

Coffee skin compost treatment	Average (cm)
0 grams/polybag	3.48 cd
200 grams/polybag	3.80 e
400 grams/polybag	3.72 e
600 grams/polybag	3.00 a
800 grams/polybag	3.00 b

The results of further LSD tests in Table 1 showed that the height of early coffee seedlings aged 7 das in composting as much as 200 grams / polybag was significantly different, but not significantly different from the height of coffee early seed plants in other doses of coffee skin compost (0 grams / polybag, 400 grams / polybag, 600 grams

/ polybag, 800 grams / polybag). The height of the initial coffee seed plant given coffee skin compost as much as 200 grams / polybag has the highest value of 3.8 cm.

This is because plant height growth is influenced by macronutrients in the growing media. Giving coffee skin compost containing these nutrients supports increased availability in planting media absorbed by plants. Based on the results of coffee skin compost analysis showed organic C content of 41.44%, total N 2.85%,  $K_2O$  5.20%,  $P_2O_5$  0.99%, Ca 1.48%. The nutrient content is able to meet the nutrient needs for the growth of early coffee seedlings. This is in line with the statement of Lingga namely the presence of essential nutrients such as nitrogen, phosphorus, and potassium is closely related to plant height growth [9].

### 2. Results of the average table of advanced Test Least Significant Difference (LSD) height of robusta coffee seed plants 21 das

The results of further LSD tests in Table 2 showed that the height of the initial coffee seed plants aged 21 das in composting as much as 200 grams / polybag was significantly different. The results of further LSD tests in Table 2 showed that the height of early coffee seedlings aged 21 das in composting as much as 200 grams / polybag was significantly different, but not significantly different from the height of coffee early seed plants in other doses of coffee skin compost (0 grams / polybag, 400 grams / polybag, 600 grams / polybag, 800 grams / polybag). The height of the initial coffee seed plants given coffee skin compost as much as 200 grams / polybag has the highest value of 5.5 cm.

**Table 2.** Further test of LSD effect of coffee skin compost on plant height aged 21 das

Coffee skin compost treatment	Average (cm)
0 grams/polybag	4.66 cd
200 grams/polybag	5.50 e
400 grams/polybag	5.22 e
600 grams/polybag	3.52 ab
800 grams/polybag	3.32 a

### 3. Results of the average table of advanced Test Least Significant Difference (LSD) robusta coffee seed plant height 28 das

**Table 3.** Further test of LSD effect of coffee skin compost on plant height age 28 das

Coffee skin compost treatment	Average (cm)
0 grams/polybag	6.28 e
200 grams/polybag	5.83 e
400 grams/polybag	5.66 de
600 grams/polybag	3.84 bc
800 grams/polybag	3.52 a

The results of further LSD tests in Table 3 showed that the height of early coffee seedlings aged 28 das in composting as much as 0 grams / polybag was significantly different, but not significantly different from the height of coffee early seed plants in other doses of coffee skin compost (200 grams / polybag, 400 grams / polybag, 600

grams / polybag, 800 grams / polybag). The height of the initial coffee seed plant without composting coffee skin 0 grams / polybag has the highest value of 6.28.

#### 4. Average table results of advanced Test Least Significant Difference (LSD) robusta coffee seed plant height 35 das

**Table 4.** Further test of LSD effect of coffee skin compost on plant height aged 35 das

Coffee skin compost treatment	Average
0 grams/polybag	6.56e
200 grams/polybag	6.26e
400 grams/polybag	4.14bc
600 grams/polybag	6.1de
800 grams/polybag	3.82a

The results of LSD tests in **Table 4** showed that the height of early coffee seedlings aged 35 das in composting as much as 0 grams / polybag was significantly different, but not significantly different from the height of coffee early seeds in other doses of coffee skin compost (200 grams / polybag, 400 grams / polybag, 600 grams / polybag, 800 grams / polybag). The height of the initial coffee seed plant without composting coffee skin 0 grams / polybag has the highest value of 6.56 cm. In the results of coffee skin compost, there are not only macro elements but there are micro elements including Fe 1686.65 ppm, Zn 101.36 ppm, Cu 28.4 ppm. Plants need micronutrients in the growth process even though in small quantities, micronutrients are needed as cell structures that are directly involved in cell metabolism and enzyme activity [10]. The addition of organic matter to the soil can increase C-organic. Coffee skin compost has a high C-organic content of 41.44%. The C-organic function is able to balance the availability of nutrients in plant media so that nutrient needs for plant growth [8].

#### Number of leaves

**Table 5.** Further test of LSD effect of coffee skin compost on number of leaves

Coffee skin compost treatment	Average (unit)
0 grams/polybag	3.06 b
200 grams/polybag	3.44 a
400 grams/polybag	3.18 ab
600 grams/polybag	3.00 b
800 grams/polybag	3.00 b

The results of further LSD tests in **Table 5** showed that the number of leaves in composting 200 grams/polybag was significantly different from other treatments, namely 0 gram/polybag, 600 gram/polybag, and 800 gram/polybag. The average value of the highest number of leaves in composting 200 grams/polybag was 3.44 units of leaf blades. Leaves are plants that function to process food in the process of photosynthesis. Thus, good vegetative growth is very important to support generative growth so that it can produce maximum production, this is certainly supported by soil fertility / planting media. The results of the coffee skin compost analysis contain 41.44% C-organic, the C-organic content in the growing media reflects fertility in the media. The content

obtained from coffee skin compost is high so that the media can be fulfilled to support good plant growth. C-organic is an energy source for microorganisms that will later remodel organic matter for plant nutrition sources [11].

### Length of root

**Table 6.** Further test of LSD effect of coffee skin compost on length of root

Coffee skin compost treatment	Average (cm)
0 grams/polybag	7.32 c
200 grams/polybag	11.66 a
400 grams/polybag	9.16 b
600 grams/polybag	6.52 c
800 grams/polybag	4.70 d

**Table 6** showed the results of LSD tests on root length parameters, i.e., there are significant differences in each treatment. The highest average value in the root length parameter was found in the treatment of 200 grams / polybag of coffee skin compost of 11.66 cm and was significantly different from other treatments (**Figure 2**). This is because the growth of plant root length is strongly influenced by N nutrients, the content of coffee skin compost contains N elements as much as 2.85. Roots require planting media that have nutrients for plant growth. plants that lack N elements can affect root growth, low nutrient concentrations can experience nutrient deficiencies and inhibit nutrient distribution. The expansion and lengthening of the root system is influenced by the growing medium which has a pore space so that the roots can breathe and penetrate the media. the increasing length of roots in plants in absorbing water and nutrients is higher, so that growth is more optimal [12].



**Figure 2.** The length of the roots of coffee seedlings at each treatment

### Conclusion

The results showed that the provision of coffee skin compost had a real effect on the initial robusta coffee seed plant. The coffee skin composting dose of 200 grams/polybag had the best effect on plant height parameters at 21 and 28 days after sowing, number of leaves, and root length.

### Acknowledgments

Thank you to the Institute for Research and Community Service of Singaperbangsa University Karawang for funding this research.

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