

Application of Various Doses of Chicken Manure on the Growth and Production of Japanese Cucumber (*Cucumis sativus* L. var. Japanese)

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Abstract. Japanese cucumber is a horticultural plant from the Cucurbitaceae family. This plant is quite popular among Indonesians because of its taste and nutritional benefits. This study was conducted to determine the effect and optimal dosage of chicken manure fertilizer on the growth and yield of Japanese cucumbers. This research was conducted over two months from June to July 2025 in Lasang, Benteng Suru Village, Kuwus District, West Manggarai Regency, East Nusa Tenggara. This study used a non-factorial randomized block design consisting of 6 treatments and 4 replicates, resulting in 24 experimental units. Each treatment had 5 sample plants, resulting in 120 sample plants. The treatment levels in this study were P0 (no fertilizer), P1 (20 tons per hectare), P2 (30 tons per hectare), P3 (40 tons per hectare), P4 (50 tons per hectare), and P5 (60 tons per hectare). The results showed that the application of chicken manure fertilizer affects the number of leaves, flowering age, number of fruits per plant, fruit length, and fruit weight per plant. The P3 treatment with a chicken manure fertilizer dose of 40 tons per hectare in the P3 treatment is the optimal dose for increasing the growth and yield of Japanese cucumber plants.

Keywords: Chicken manure fertilizer, Japanese cucumber, production

1 Introduction

Japanese cucumber is a vegetable variety from the Cucurbitaceae family, also commonly known as squash [6]. Cucumbers are generally very popular in Indonesia. The delicious taste and benefits of this vegetable make Indonesians interested in consuming it. The rapid growth of Japanese culture and the public's interest in Japanese cuisine have created opportunities for the development of Japanese cucumbers [3]. Japanese cucumbers are a type of cucumber that is very popular among the Japanese. However, research on this topic is still minimal in Indonesia. This is due to the lack of understanding among Indonesians about this topic, even though there

is great potential for development and unique characteristics compared to local cucumbers, in terms of color, shape, taste, and texture [2].

[4] shows a decline in cucumber production in West Manggarai in 2022 and 2023, from 22,29 quintals in 2022 to 18,99 quintals in 2023. This decline is thought to be caused by excessive use of inorganic fertilizers and poor cultivation methods, which have reduced soil fertility and adversely affected cucumber production. Results of interviews with farmers in Benteng Suru Village, West Manggarai. Residents tend to choose chemical fertilizers and inefficient cultivation methods. Excessive use of synthetic fertilizers can have negative effects on the environment, such as a reduction in organic matter in the soil, an increased risk of soil erosion, and a reduction in the soil's ability to absorb water [10]. One method that can be applied to increase agricultural yields in cucumber crops is to use organic fertilizer derived from chicken manure. [8] Chicken manure contains three times more N than other manure, namely 1.70%, five times more P_2O_5 than other manure, namely 1.90%, and four times more K_2O than other manure, namely 1.50%. The nutrient content of chicken manure fertilizer is 1.7% N, 1.9% P, and 1.5% K [17]. Chicken manure fertilizer was chosen because it has a higher P content and provides better results as it decomposes easily and has better nutrient content [9].

2 Method

This study was conducted from June 2025 to July 2025 in Lasang, Beteng Suru Village, Kuwus Subdistrict, West Manggarai Regency. The equipment used in this experiment included shovels, buckets, dippers, watering cans, ropes, rulers, scissors, labels, bamboo, cameras, measuring tapes, and writing instruments. The materials used in this study were chicken manure and Roberto 92 Japanese cucumber seeds. The method used in this experiment was a non-factorial randomized block design consisting of 6 treatments and 4 replicates, resulting in 24 experimental units. The treatment levels in this study were P0 (no fertilizer), P1 (20 tons per hectare), P2 (30 tons FaHP3 (40 tons per hectare), P4 (50 tons per hectare), and P5 (60 tons per hectare). The number of plants in each experimental plot was 10, resulting in a total of 240 plants. Each treatment had 5 sample plants, resulting in a total of 120 sample plants. The observation results were analyzed using variance or ANOVA (Analysis of variance). If there were significant differences between the treatment means and the apparent effects, the DMRT test at the 5% level was then performed to determine the best treatment for each parameter observed. This process was carried out using SPSS software version 25.0.

3 Results and Discussion

3.1 Number of Leaves

Table 1. Average number of leaves on Japanese cucumber plants

Treatment	Number of leaves			
	7 DAP	14 DAP	21 DAP	28 DAP
P0	2,65 ^a	4,40 ^d	5,65 ^a	8,60 ^a
P1	2,80 ^a	4,90 ^{bc}	6,40 ^b	8,80 ^{ab}
P2	2,75 ^a	5,70 ^d	6,90 ^{bc}	9,20 ^{ab}
P3	2,80^a	6,50^d	8,20^d	11,45^c
P4	2,75 ^a	5,20 ^c	7,55 ^{cd}	9,95 ^b
P5	2,75 ^a	4,70 ^{ab}	7,60 ^{cd}	9,35 ^{ab}

Note: Numbers followed by the same letter indicate no significant difference, while numbers not followed by the same letter indicate a significant difference based on Duncan's 5% level post hoc test.

Leaves are the part of the plant that performs photosynthesis, a process that produces assimilates, which are used by plants in the vegetative and generative phases [2]. Table 1 shows that 7 days after planting (DAP), there was no significant difference in the number of leaves in all treatments. However, the number of leaves began to show significant differences at 14 DAP and continued to increase until 28 DAP. As the plants aged, the number of leaves increased, thereby increasing nutritional requirements. The application of manure increased the number of leaves. This is supported by the research of [16], who found that the application of bokashi chicken manure increased the number of cucumber plants. Treatment P3 with 40 tons per hectare of chicken manure produced the highest number of leaves compared to other treatments, namely 11.45 leaves at 28 days after planting. This shows that the dose in P3 provides adequate nutrients to optimize the formation of Japanese cucumber leaves. When the fertilizer applied was less than 40 tons per hectare, fewer leaves were produced (Table 1).

[5] growth can reach its maximum without a decrease in yield if supporting factors such as balanced elements, appropriate dosage, and nutrients are fulfilled. [13] stated that high fertilizer doses cause the soil solution to become concentrated, making it difficult for plants to absorb nutrients. An increase in the dose of manure applied is inversely proportional to the growth results obtained because the dose is not in accordance with the needs of the plants.

3.2 Flowering Age

Table 2. Average flowering age of Japanese cucumber plants

Treatment	Flowering age (days)
P0	32,25 ^c
P1	31,50 ^{bc}
P2	30,50 ^{bc}
P3	28,25^a
P4	30,25 ^b
P5	31,25 ^{bc}

Note: Numbers followed by the same letter indicate no significant difference, while numbers not followed by the same letter indicate a significant difference based on Duncan's 5% level post hoc test.

Generally, cucumber plants begin to flower around 28.50-31.33 days after planting (DAP) [20]. P3 at a dose of 40 tons per hectare resulted in a faster flowering time compared to other treatments, namely 28.25 days after planting. This dose is effective in accelerating flowering. Table 2 shows that when manure was applied at less than or more than 40 tons per hectare on P3, flowering was slower. The table shows that nutrients affect plant growth and development, including flowering. Efficient nutrient use is closely related to flowering time and crop yield [23].

3.3 Average Number, Length, and Weight of Fruits per Plant

Table 3. Average number of fruits, fruit length, and weight of Japanese cucumbers

Treatment	Harvest		
	Number of fruit	fruit length (cm)	Weight of Fruit (g)
P0	2,30 ^a	19,80 ^a	705,00 ^a
P1	2,30 ^a	25,50 ^b	720,00 ^a
P2	2,45 ^a	25,95 ^{bc}	895,65 ^b
P3	3,20^b	29,80^d	1305,15^c
P4	2,90 ^b	27,20 ^c	1209,35 ^c
P5	2,55 ^a	26,65 ^{bc}	1172,20 ^c

Note: Numbers followed by the same letter indicate no significant difference, while numbers not followed by the same letter indicate a significant difference based on Duncan's 5% level post hoc test.

Treatment P3 with 40 tons of chicken manure per hectare produced the highest number of fruits per plant with an average of 3.20 fruits, the longest fruits with an average of 29.80 cm, and the heaviest fruits with an average of 1,305 g. The dosage in treatment P3 was sufficient to optimize the number, length, and weight of the fruit, as shown in Table 4. When the dosage was increased in P4 (50 tons per hectare) and P5 (60 tons per hectare), the results were actually lower. This is supported by the results of a study by [7], which showed that high fertilizer doses did not increase the growth or yield of cucumber plants. Similar findings were reported in a study by [15], which showed that increasing the dose of a combination of chicken manure and NPP fertilizer did not result in significant differences in fruit weight and length between treatments. Based on this, P3 is thought to be the appropriate dose for optimizing cucumber yields. The

right dose can increase fertilization efficiency and optimize the utilization of nutrients provided [18]. [12][11] that integrated nutrient management increases fertilization efficiency by ensuring that nutrients are provided in the right amounts and at the right time to meet plant needs.

The number, length, and weight of cucumber fruits produced in Table 3 were influenced by the type, variety, fertilizer dose, and environment. This indicates that the results obtained differed from those in the study by [22], despite the use of the same treatments. The results of the [21] study show that different doses of chicken manure fertilizer produce variations in the number of cucumber fruits per plant. In addition, this component is influenced by the photosynthesis process. [19] found that photosynthesis in cucumber fruits contributes significantly to fruit growth through direct fixation of atmospheric CO₂ and reabsorption of released CO₂, as verified through 14CO₂ absorption and gas exchange, providing an important contribution to fruit growth.

This study differs from previous studies in several ways. First, research on the dosage used is still limited. In general, previous studies or other studies have used a maximum chicken manure fertilizer dosage of 35 tons per hectare. There is one study with the same treatment dose as this study, but not on the Japanese cucumber variety Roberto 92. Second, this study is the first to test chicken manure fertilizer doses above 40 tons per hectare, namely up to a dose of 60 tons per hectare, on Japanese cucumber varieties. Third, this study discusses the relationship between organic fertilizer doses, particularly chicken manure, and the flowering age of cucumber plants. Fourth, this study found that the optimal chicken manure fertilizer dose for the Japanese cucumber variety Roberto 92 is 40 tons per hectare. When the dose was lower or higher than 40 tons per hectare, growth and yield were lower. This shows that the increase in dose is inversely proportional to the results obtained, which is different from other studies, which generally show that growth and yield are directly proportional to the increase in organic fertilizer doses, especially chicken manure on cucumber plants.

4. Conclusions and Suggestions

4.1 Conclusions

Chicken manure has a significant impact on the growth and yield of Japanese cucumbers, including increased leaf number, accelerated flowering, higher fruit number per plant, longer fruit length, and increased fruit weight per plant. Organic nutrients, such as nitrogen, phosphorus, and potassium, in this fertilizer support photosynthesis and the gradual development of flowers and fruits, resulting in more productive and higher-quality plants. The optimal dose was found in the P3 treatment of 40 tons per hectare, which balances the benefits of nutrients without the risk of over-fertilization, resulting in optimal vegetative and generative growth for yields. The 40 tons per hectare treatment in this study increased yields by 85% in Japanese cucumbers. Overall, this approach supports sustainable agriculture by reducing reliance on synthetic chemicals.

4.2 Suggestions

A dose of 40 tons of chicken manure per hectare can be used as a recommendation for organic fertilization of Japanese cucumbers. Further research is needed to apply the fertilizer dosage in

this study to other varieties of Japanese cucumbers, testing them in multiple locations, and increasing the harvest frequency to two or three times to determine the maximum yield achieved in a single growing season.

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