

## The Effect Of Giving Manure Type Growth Regulators On The Vegetative Phase Of Chili Plants (*Capsicum Frutescens*)

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### Informasi Artikel

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### Abstract

*Cayenne pepper (*Capsicum frutescens* L.) is a horticultural commodity with high economic value and continuously increasing market demand. The success of cayenne pepper production is largely determined by vegetative growth in the early stages, which is influenced by the availability of nutrients and plant growth regulators. The use of manure as a source of organic matter and natural Plant Growth Regulators (PGRs) is expected to enhance vegetative growth. This study aimed to determine the effect of manure application and natural PGRs on the vegetative growth of cayenne pepper and to identify the treatment that produces the best growth. The research was conducted from December to January 2026 at the land of the Kopbun Suka Tani Sejahtera Business Research Center, Kota Juang District, Bireuen Regency. The study used a factorial Randomized Block Design (RBD) with a 4 × 3 pattern and three replications. The first factor was the dosage of manure consisting of 0 kg (control), 1 kg, 1.5 kg, and 2 kg per plant. The second factor was the type of natural PGR, consisting of shallot extract, rice water, and coconut water. The observed parameters included plant height, number of leaves, leaf width, and number of branches at 15, 30, and 45 days after planting (DAP). Data were analyzed using the F-test and continued with the Honestly Significant Difference (HSD) test at a 5% significance level if the results were significant. The results showed that manure application had no significant effect on all vegetative growth parameters up to 45 DAP. The application of natural PGRs also showed no significant effect at 15, 30, and 45 DAP, as well as on other parameters. There was no significant interaction between manure and natural PGRs on all observed parameters.*

### Keywords:

Cayenne pepper  
Manure  
natural plant growth  
regulators (PGRs)

### Abstrak

Tanaman cabai rawit (*Capsicum frutescens* L.) merupakan komoditas hortikultura yang memiliki nilai ekonomi tinggi dan permintaan pasar yang terus meningkat. Keberhasilan produksi cabai rawit sangat ditentukan oleh pertumbuhan vegetatif pada fase awal, yang dipengaruhi oleh ketersediaan unsur hara dan zat pengatur tumbuh. Penggunaan pupuk kandang sebagai sumber bahan organik serta Zat Pengatur Tumbuh (ZPT) alami diharapkan dapat meningkatkan pertumbuhan vegetatif tanaman. Penelitian ini bertujuan untuk mengetahui pengaruh pemberian pupuk kandang dan ZPT alami terhadap pertumbuhan vegetatif tanaman cabai rawit serta menentukan perlakuan yang memberikan pertumbuhan terbaik. Penelitian dilaksanakan pada bulan Desember sampai Januari 2026 di lahan Pusat Riset Bisnis Kopbun Suka Tani Sejahtera, Kecamatan Kota Juang, Kabupaten Bireuen. Penelitian menggunakan Rancangan Acak Kelompok (RAK) pola faktorial 4 × 3 dengan tiga ulangan. Faktor pertama adalah dosis pupuk kandang yang terdiri atas 0 kg (kontrol), 1 kg, 1,5 kg, dan 2 kg per tanaman. Faktor kedua adalah jenis ZPT alami yang terdiri atas air bawang merah, air beras, dan air kelapa. Parameter yang diamati meliputi tinggi tanaman, jumlah daun, lebar daun, dan jumlah cabang pada umur 15, 30, dan 45 hari setelah tanam (HST). Data

dianalisis menggunakan uji F dan dilanjutkan dengan uji BNJ pada taraf 5% apabila berpengaruh nyata. Hasil penelitian menunjukkan bahwa pemberian pupuk kandang tidak berpengaruh nyata terhadap seluruh parameter pertumbuhan vegetatif hingga umur 45 HST. Pemberian ZPT alami tidak berpengaruh nyata pada umur 15, 30 dan 45 HST serta pada parameter lainnya. Tidak terdapat interaksi yang nyata antara pupuk kandang dan ZPT terhadap seluruh parameter pengamatan.

**Kata Kunci** : Cabai Rawit, Pupuk Kandang, ZPT Alami.

## INTRODUCTION

Cayenne pepper (*Capsicum frutescens* L.) is one of the strategic horticultural commodities in Indonesia with high economic value and continuously increasing market demand. The success of cayenne pepper cultivation is largely determined by plant growth during the vegetative phase, which is the early stage after planting characterized by the formation of roots, stems, leaves, and branches. An optimal vegetative phase will support the success of the generative phase, as photosynthetic capacity and biomass accumulation are strongly influenced by the number and leaf area formed during the early growth stage. According to Rahmawati and Suryanto (2022), the vegetative phase is a critical period that determines the production capacity of horticultural crops because, at this stage, the basic organs that support flowering and fruiting are formed. Therefore, nutrient management and growth stimulation during the vegetative phase are important factors in increasing cayenne pepper productivity. One of the efforts that can be made to enhance vegetative growth is through the application of manure. Manure is an organic fertilizer that contains macro- and micronutrients as well as organic matter that can improve the physical, chemical, and biological properties of the soil. The role of manure is not only as a nutrient source but also as a soil amendment that can increase the activity of soil microorganisms.

According to Hidayat *et al.*, (2021), manure plays a role in increasing nitrogen availability and improving soil structure, thereby supporting sustainable vegetative growth of plants. This indicates that the use of manure can be an alternative in sustainable cultivation systems that reduce dependence on inorganic fertilizers. However, the effectiveness of manure is often influenced by its slow-release characteristics. The decomposition process of organic matter requires time and is highly dependent on microbial activity as well as environmental conditions. According to Prasetyo and Kurniawan (2020), "nutrients in manure are not immediately available to plants but require a mineralization process influenced by temperature, moisture, and soil microbial activity." This condition causes the plant response to manure during the early growth phase to sometimes not be significantly visible.

Therefore, an additional approach is needed to stimulate plant growth more rapidly, one of which is through the application of plant growth regulators (PGRs). Natural plant growth regulators (PGRs) such as shallot extract, rice water, and coconut water are known to contain natural growth hormones such as auxins, cytokinins, and gibberellins. These hormones play important roles in cell division, cell elongation, and tissue differentiation in plants. According to Sari and Utami (2023), shallot extract contains natural auxins that can stimulate root formation and accelerate vegetative growth in horticultural crops. In addition, coconut water is known as a natural source of cytokinins. Nugroho *et al.*, (2021) stated that the cytokinin content in coconut water can enhance cell division activity and shoot growth during the vegetative phase of plants. Meanwhile, rice water contains vitamin B1 and several micronutrients that support plant metabolism during the early growth stage.

The interaction between manure and natural plant growth regulators (PGRs) is an interesting subject to study because both have different yet complementary mechanisms of action. Manure functions as a medium- to long-term nutrient source, while PGRs act at the physiological level to stimulate plant cellular activity. According to Wijaya et al. (2024), “the combination of organic fertilizers and natural plant growth regulators can provide better vegetative growth responses compared to the application of a single treatment.” This indicates the potential synergy between nutrient availability and hormonal stimulation in enhancing the growth of cayenne pepper plants (Maulana et al., 2024). In addition to treatment factors, vegetative plant growth is also influenced by genetic and environmental factors. Plant responses to manure and PGRs greatly depend on the variety used as well as the initial soil fertility conditions. According to Andriani *et al.*, (2020), plant growth is the result of interactions between genetic and environmental factors; therefore, the effectiveness of fertilization is strongly influenced by site-specific cultivation conditions. Thus, empirical testing of the effects of manure and PGRs on the vegetative phase of cayenne pepper is necessary to obtain appropriate recommendations based on field conditions.

Based on the above description, it can be understood that improving the vegetative growth of cayenne pepper requires an integrated approach that considers both nutritional and physiological aspects of the plant. Manure plays a role in supplying nutrients and improving soil fertility, while natural PGRs function to stimulate plant physiological activity during the early growth phase. The combination of these two treatments is expected to enhance vegetative parameters such as plant height, number of leaves, leaf area, and number of branches. Therefore, research on the effect of manure and PGR application on the vegetative phase of cayenne pepper (*Capsicum frutescens* L.) is important to support the development of cultivation technologies that are more effective, economical, and environmentally friendly.

## METHOD

### 1. Time and Place

The study was conducted from December 2025 to January 2026 at the plantation area of the Kopbun Suka Tani Sejahtera Business Research Center, Kota Juang District, Bireuen Regency.

### 2. Tools and Materials

The tools used in this study included a grass cutter, machete, hoe, soil sieve, watering can, labels, stationery, plastic ropes, wooden stakes, scissors, sacks, a 200-liter drum, a camera, and 10-liter capacity buckets. The materials used consisted of cayenne pepper seeds (*Capsicum frutescens* L.) of the BARA variety, 36 kg of manure, and natural Plant Growth Regulators (PGRs) in the form of shallot extract, rice water, and coconut water. All materials were prepared according to the requirements of the treatments in the study.

### 3. Experimental Design

The study employed a factorial Randomized Block Design (RBD) with a  $4 \times 3$  arrangement. The first factor was the dosage of manure (V), consisting of four levels: V0 = control (0 kg), V1 = 1 kg per plant, V2 = 1.5 kg per plant, and V3 = 2 kg per plant. The second factor was the type of natural Plant Growth Regulator (PGR) (D), consisting of three levels: D1 = shallot extract, D2 = rice water, and D3 = coconut water. Thus, there were 12 treatment combinations, each replicated three times, resulting in a total of 36 experimental units. The mathematical model used was:

$$Y_{ijk} = \mu + \beta_i + V_j + D_k + (VD)_{jk} + \epsilon_{ijk}$$

Where  $Y_{ijk}$  is the observed value,  $\mu$  is the overall mean,  $\beta_i$  is the effect of the  $i$ -th replication,  $V_j$  is the effect of manure dosage,  $D_k$  is the effect of PGR,  $(VD)_{jk}$  is the interaction effect, and  $\epsilon_{ijk}$  is the experimental error.

#### 4. Implementation of the Study

Land preparation was carried out by clearing weeds and leveling the soil using a hoe and a grass cutter. Selected cayenne pepper seeds were first sown in polybags before being transplanted to the field. Planting holes were prepared, and each hole was filled with two seeds. Manure was applied as a basal fertilizer according to the treatment doses, while the Plant Growth Regulators (PGRs) were applied based on the respective treatment types. Plant maintenance included watering twice a day (morning and afternoon), replanting dead seedlings, weeding, and controlling pests and diseases.

#### 5. Data Collection Techniques

Data were collected through direct observation of vegetative growth parameters, including plant height, number of leaves, leaf area, and number of branches at 15, 30, and 45 days after planting (DAP). Measurements were taken using a measuring tape and recorded systematically for each sample plant.

#### 6. Data Analysis Techniques

The data obtained were analyzed quantitatively using Analysis of Variance (ANOVA) to determine the effects of the treatments. If the analysis showed a significant effect, it was followed by the Honestly Significant Difference (HSD) test at the 5% significance level. In addition, descriptive analysis was also used to support the interpretation of the research results.

### RESULTS AND DISCUSSION

#### 1. Effect of Manure Treatment on the Vegetative Phase of Cayenne Pepper Growth

This study showed the effect of manure application on the growth of cayenne pepper (*Capsicum frutescens* L.). Observations were conducted on several parameters, namely plant height (cm), number of leaves per plant, leaf width per plant, and number of productive branches per plant.

##### 1. Number of Leaves

The results of observations on the number of leaves of cayenne pepper (*Capsicum frutescens* L.) at 15 days after planting showed that manure application had a highly significant effect on the number of leaves at 15 DAP, but had no significant effect at 30 and 45 DAP. The average data of leaf number for each treatment can be seen in the following table.

Table 1. Average Number of Leaves as Affected by Manure Application on the Growth of Cayenne Pepper Plants.

Manure	Number of Leaves		
	15 DAP	30 DAP	45 DAP
Gr			

Control	33,92	101,92	213,33
1 Kg	40,67	98,58	184,08
1,5 Kg	35,00	110,00	200,33
2 Kg	31,58	69,17	185,92

Based on the results of the F-test in the analysis of variance, manure application had a highly significant effect on the number of leaves at 15 days after planting (DAP), but showed no significant effect at 30 and 45 DAP. This indicates that plant responses to manure are more dominant during the early growth phase compared to the later vegetative stage. At 15 DAP, the 1 kg treatment produced the highest number of leaves (40.67 leaves), followed by 1.5 kg (35.00 leaves), control (33.92 leaves), and 2 kg (31.58 leaves). The 1 kg dose was considered the most optimal as it provided sufficient nitrogen to support cell division and growth during the early stage. At 30 DAP, descriptively, the 1.5 kg treatment showed the highest number of leaves (110.00 leaves), while the 2 kg dose had the lowest (69.17 leaves).

However, statistically, there was no significant difference among treatments. This suggests that during the later vegetative phase, leaf growth is not only influenced by manure application but also by environmental factors such as light, water, and plant genetic factors. Plant responses to organic fertilizers tend to decrease as the plant ages. At 45 DAP, the highest number of leaves was observed in the control treatment (213.33 leaves), while manure treatments showed no significant differences. This may be due to the plants approaching the transition to the generative phase, where the demand for nutrients supporting vegetative growth decreases. Overall, the results indicate that a manure dose of 1 kg per plant is the most effective treatment for increasing leaf number during the early growth phase, highlighting the importance of selecting an appropriate dosage to optimize growth without causing nutrient imbalance.

## 2. Plant Height

The observation results of the height of chili pepper plants (*Capsicum frutescens* L.) at 15, 30, and 45 days after planting (DAP) showed that the manure treatment did not affect plant height growth. The average plant height data for each treatment can be seen in the following table.

Table 2. Average Plant Height of the Effect of Manure on the Growth of Chili Pepper Plants

Manure	Plant Height			
	Gr	15 DAP	30 DAP	45 DAP
Control		15,67	31,25	40,33
1 Kg		16,92	28,42	37,50
1,5 Kg		15,33	30,50	39,00
2 Kg		15,92	27,83	38,42

Based on the F-test results in the analysis of variance, the application of manure fertilizer does not have a significant effect on the height of cayenne pepper plants at 15, 30, and 45 days after planting (DAP). Descriptively, at 15 DAP, the highest plant height was observed at a dose of 1 kg (16.92 cm) and the lowest at a dose of 1.5 kg (15.33 cm). At 30 and 45 DAP, the control treatment showed the highest plant heights of 31.25 cm and 40.33 cm, respectively. Although

there are differences in the average values, the statistical analysis results indicate that these differences are not significant.

The absence of a significant effect is suspected to be because manure has a slow nutrient release property, so it has not been able to meet the plant's nutrient requirements quickly during the early growth phase. In addition, at 15 DAP the plants are still in the adaptation and root formation phase, so height growth is more influenced by genetic factors and the food reserves in the seeds compared to additional nutrients from outside.

At 30 and 45 DAT, plant height growth also did not show significant differences among treatments, indicating that the dosage of manure applied was not yet effective in influencing plant height growth. This may be due to the relatively low nitrogen content in the organic fertilizer and soil conditions that may already be sufficiently fertile, limiting the plant's response to additional fertilizer. Thus, manure tends to play a role in improving long-term soil properties rather than directly increasing plant height growth in the early vegetative phase.

### 3. Leaf Area

The observation results of the Leaf Area of bird's eye chili (*Capsicum frutescens* L.) at 15, 30, and 45 DAP showed that the Manure treatment had no effect on Leaf Width growth. The average leaf area data for each treatment can be seen in the following table.

Table 3. Average Leaf Area of the Effect of Manure on the Growth of Bird's Eye Chili Plants.

Manure	Leaf Area
Gr	15 DAP
Control	4,61
1 Kg	4,04
1,5 Kg	3,45
2 Kg	3,71

Based on the results of the F test in the analysis of variance, the application of manure did not have a significant effect on the leaf area of chili plants at 15, 30, and 45 DAS. Descriptively, at 15 DAS, the largest leaf area was found in the control treatment (4.61 cm<sup>2</sup>) and the smallest at a dose of 1.5 kg (3.45 cm<sup>2</sup>). At 30 DAS, the control again showed the highest value (5.84 cm<sup>2</sup>), while at 45 DAS, the largest leaf area was found at doses of 1 kg and 2 kg (7.03 cm<sup>2</sup>). Although there were differences in average values, statistically, those differences were not significant.

The absence of a significant effect is suspected to be due to the fact that manure has a slow nutrient release characteristic, so it has not been able to provide nutrients optimally during the early growth phase. At 15 DAS (days after sowing), the plants are still in the early vegetative development phase, so leaf area growth is more influenced by genetic factors and nutrient reserves in the seeds than by external nutrients. In addition, the availability of nitrogen, which plays an important role in leaf tissue formation, is suspected to be insufficient due to the gradual mineralization process.

At 30 and 45 DAS, although descriptively there was an increase in leaf area in several treatments, the analysis results still showed no significant differences. This indicates that the

doses of manure applied were not sufficient to effectively increase leaf area growth, and it is possible that the initial soil fertility conditions were already adequate. In general, manure plays a greater role in gradually improving the physical, chemical, and biological properties of the soil, so its effect on plant growth tends to be visible over a longer period.

#### 4. Number of Branches

Observation results on the Number of Branches of chili pepper plants (*Capsicum frutescens* L.) at 45 days after planting (DAP) showed that the manure treatment did not affect branch growth. The average data of the number of branches for each treatment can be seen in the following table.

Table 4. Average Number of Branches Effect of Manure on the Growth of Chili Pepper.

Manure	Number of Branches
Gr	15 DAP
Control	14,92
1 Kg	11,25
1,5 Kg	12,67
2 Kg	11,50

Based on the results of the F test in the analysis of variance, the application of organic fertilizer did not have a significant effect on the number of branches of chili plants at 15, 30, and 45 days after planting (DAP). This indicates that statistically, the organic fertilizer treatment has not been able to increase branch formation during the vegetative phase. At 45 DAP, descriptively, the control treatment produced the highest number of branches (14.92 branches), while doses of 1 kg, 1.5 kg, and 2 kg produced 11.25, 12.67, and 11.50 branches, respectively. Although there are differences in the average values, the analysis results show that these differences are not significant.

The absence of a significant effect is suspected to be related to the slow nutrient release process from manure, which has not yet been able to optimally support branch formation. In addition, branch formation is greatly influenced by the balance of plant hormones, especially auxin and cytokinin, where strong apical dominance can inhibit the growth of lateral buds. Under such conditions, even if additional nutrients are available, the plant's response to branch formation remains limited.

On the other hand, environmental factors such as light intensity, temperature, humidity, and initial soil fertility conditions also play an important role in determining the number of branches. If environmental conditions and soil nutrient content are adequate, the addition of manure does not have a significant effect. In general, manure requires time to decompose before its nutrients become available to plants, so its effect on branch growth tends to be more visible.

#### CONCLUSION

The application of manure at various doses did not have a significant effect on the vegetative growth of chili plants, including plant height, leaf area, and number of branches up to 45 days

after planting (DAP). However, the number of leaves at 15 DAP showed a significant effect from the manure treatment.

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