

THE EFFECT OF PLANTING MEDIA COMPOSITION AND HORMONAL ZPT DOSAGE ON THE GROWTH AND YIELD OF LARGE RED PEPPERS (*Capsicum Annum.L*)

Muktisar¹, Rahmah Hayati*², Savitri³

Department of Agrotechnology, Faculty of Agriculture, Abulyatama University, Aceh, Indonesia

Correspondence Email: rahmah.hayati_agroteknologi@abulyatama.ac.id

Abstract: *The Effect of Growing Medium Composition and Hormonic ZPT Dosage on the Growth and Yield of Red Chili Peppers (*Capsicum annum L*) Under the supervision of Dr. Rahmah Hayati, S.TP, M.Agr, as the principal supervisor and Savitri, S.P., M.P., as the co-supervisor. The objective of this study was to examine the effect of varying growing medium composition and hormonal growth regulator (ZPT) dosage, as well as to observe the interaction between these treatments. The research design used was a randomized block design (RBD) consisting of 2 treatments and 3 replications. For the first treatment, T0 = control, T1 = soil: charcoal husk, T2 = soil: manure, and T3 = soil: charcoal husk: chicken manure. For the second treatment, the following were used: Z0 = control, Z1 = 1 ml/l water, Z2 = 2 ml/l water, and Z3 = 3 ml/l water. The parameters observed in this study were plant height, stem diameter, and fruit weight. The results of the study indicate that the interaction between the type of growing medium and the dose of ZPT in chicken manure and the dose of 2 ml/l water affects plant height at 10 days after sowing (DAS). There is a significant interaction in the observation of plant height of large red chili peppers at 10 DAS in the combination of soil and chicken manure growing medium composition and 0 ml/l water hormone dose (T2Z0).*

Keywords: *Red Chili, Media, Dosage, Hormonic, ZPT.*

1. Introduction

Red chili peppers (*Capsicum annum L.*) are horticultural plants belonging to the Solanaceae family. Red chili peppers have high economic and nutritional value. The nutritional content of red chili peppers, such as protein, fat, carbohydrates, calcium, and vitamins (A and C), makes them a commodity that is needed by the community for cooking ingredients (Andani *et al.*, 2020).

Red chili peppers are widely cultivated in various regions of Indonesia and are one of the vegetable crops with high market value both locally and internationally. Many farmers in Indonesia rely on red chili pepper harvests as their primary source of income. In the food industry, red chili peppers are commonly used as an ingredient to add spiciness to dishes. Chili pepper plants require good growing media to thrive. Choosing the right growing medium is very important for successful plant growth. Chili peppers are plants with shallow root systems, so chili plants require a growing medium rich in organic matter. The growing medium must provide nutrients and water in accordance with the plant's needs. The growing medium serves as a substrate for root development, supporting the plant's upright growth, supplying nutrients

and water, and providing a habitat for microorganisms. Growth regulators play a very important role in plant growth and development. Growth regulators, or plant hormones, are organic compounds that are not nutrients but in small amounts can stimulate, inhibit, and alter plant physiological processes (Ernita *et al.*, 2023).

2. Literature Review

Large red chili peppers (*Capsicum annuum* L.) are one of the most important horticultural commodities in Indonesia. Large red chili peppers are nutritionally complete and have high economic value. Large red chili peppers and Indonesian culture are inseparable, especially when it comes to cooking. Almost all dishes contain red chili peppers, even if only in small amounts (Fassya *et al.*, 2020).

2.1 Morphology of Chili Plants (*Capsicum Annum.L*)

Red chili (*Capsicum annuum* L.) is a horticultural plant belonging to the Solanaceae family. Red chili is widely cultivated in various regions of Indonesia and is one of the vegetable crops with high market value in both local and international markets. The taxonomy of red chili plants is as follows:

Kingdom	: Plantae
Divisio	: Spermathophyta
Subdivision	: Angiospermae
Klas	: Dicotyledonae
Sub klas	: Sympetaleae
Ordo	: Tubiflora
Family	: solanaceae
Genus	: Capsium
Spesies	: <i>Capsicum annum</i> L.

2.2 Growing Requirements for Red Chili Peppers (*Capsicum Annum.L*)

Red chili plants can grow in various types of soil, provided that drainage and aeration are adequate and water is sufficiently available during the plant's growth and development. Red chili plants can be cultivated at elevations of up to 1,400 meters above sea level. The most suitable soil for red chili plants is loose, well-drained, not too clayey, and not overly porous, with a high organic matter content. Growing media, also known as growing medium, is generally soil for plants. Dozens of different materials are used in various combinations to make homemade or commercial growing media. Rice husk Charcoal is rice husks that have been burned incompletely. In the soil, charcoal husks can work by improving the physical, chemical, and biological structure of the soil. manure is a fertilizer derived from solid and liquid waste from livestock. manure is an organic fertilizer that can increase the availability of nutrients in the soil, as well as promote plant growth and production. Plant Growth Regulators (PGRs) are organic compounds that can be active at low concentrations and can stimulate, inhibit, or alter plant growth and development (Deandra *et al.*, 2023). Plant growth regulators play a very important role in plant growth and development.

3. Method

This study used a 4x4 factorial randomized block design (RBD) with two replicates. The treatments studied were the first treatment of planting media composition consisting of four levels of treatment and the second treatment of hormonal ZPT dosage consisting of four levels of treatment tested in the study. There were 16 treatment combinations, each repeated three times, resulting in 48 experimental units. Each unit was repeated twice, resulting in 96 experimental units. The factors tested were:

First factor: growing medium composition

T ₀	: Soil (control)
T ₁	: Soil: Charcoal husks
T ₂	: Soil: manure
T ₃	: Soil: manure: Charcoal husks

The second factor is the dose of hormonal ZPT.

Z ₀	: 0ml/l
Z ₁	: 1ml/l
Z ₂	: 2ml/l
Z ₃	: 3ml/l

Observation data analysis uses ANOVA testing if it shows significant results, then it is analyzed using further testing, honest significant difference testing at a level of 5% (BJN 0.05%) for The comparison of the average BNJ0.05% formula is as follows $BNJ_{0,05} = q(p; dbA) \sqrt{\frac{KTA}{r}}$

The statistical analysis for the randomized block design (RBD) is as follows:

$$Y_{ijk} = \mu + \beta_i + T_j + Z_k + (TZ)_{ijk} + \varepsilon_{ijk}$$

Y_{ijk} = The value of the observation results of group I that received the planting medium treatment (T) at level j with a growth regulator (Z) dose at level k

μ = Average value

β_i = Block influence value to-I (I : 1,2,3)

T_j = The value of the influence of the planting medium level to-j (j=1,2,3)

Z_k = The value of the influence of the ZPT dose level k (k=1,2,3)

$(TZ)_{ijk}$ = Effect of growing medium on I and ZPT dose j in group k

ε_{ijk} = The effect of experimental error due to planting medium I and ZPT dose j on group k.

4. Finding and Discussion

4.1 Plant Height

The average height of red chili plants 10, 20, and 30 days after planting can be seen in Table 1.

Table 1. Average height of red chili plants 10, 20, and 30 days after planting as a result of applying several soil composition mixtures.

Treatment	Plant Height (cm)		
	10 DAP	20 DAP	30 DAP
T ₀ (control)	30,50 ^a	45,83 ^a	53,42 ^a
T ₁ (soil:biochar)	32,75 ^a	40,42 ^a	45,17 ^a
T ₂ (soil:manure)	33,25 ^a	56,50 ^c	53,33 ^a
T ₃ (soil:biochar:manure)	30,67 ^a	48,08 ^a	58,42 ^b
BNJ			

Table 1 shows that the composition of the planting medium had no significant effect at 10 days after planting, had a very significant effect at 20 days after planting, but had a significant effect at 30 days after planting. At 10 days after sowing, the best plant height was found in treatment T₂ (soil: manure), which was not significantly different from all other treatments tested. At 20 DAP, the best plant height was observed in treatment T₂ (soil: manure), which was significantly different from all other treatments tested. At 30 DAP, the best plant height was observed in treatment T₃ (soil:rice husk charcoal: manure), which was significantly different from all other treatments tested. Of the various types of planting media compositions used in this study, treatments T₂ (soil:manure) and T₃ (soil: charcoal husk: manure) were the best planting media because they contained sufficient nutrients and nitrogen. This aligns with Tarigan *et al.*'s (2024) statement that manure fertilizer contains more nutrients compared to cow manure fertilizer and goat manure fertilizer because it plays a role in altering the physical, chemical, and biological conditions of the soil. Additionally, manure fertilizer can also contain the highest levels of macronutrients such as N, P, and K when compared to other manure fertilizers like goat manure and cow manure.

Diameter of red chili stem

Average stem diameter of red chili plants aged 10, 20, and 30 days after planting due to the treatment of planting media composition.

Table 2. Average diameter of red chili plant stems at 10, 20, and 30 days after planting due to treatment with different types of planting media.

Treatment	Stem Diameter		30 DAP
	10 DAP	20 DAP	
T ₀ (kontrol)	6,55 ^a	6,43 ^a	7,24 ^a
T ₁ (soil:biochar)	6,09 ^a	6,03 ^a	6,35 ^a
T ₂ (soil:manure)	6,56 ^b	6,47 ^a	7,23 ^a
T ₃ (soil:biochar:manure)	6,36 ^{ab}	6,74 ^a	7,67 ^a
BNJ			
	1,35	2,63	3,60

Table 2 shows that the diameter of the red chili plant stem has a significant effect at 10 and 30 days after planting. At 10 days after planting, the highest stem diameter of red chili plants was observed in treatment T₂ (Soil: manure), which was not significantly different from treatments T₀ (control) and T₃ (Soil: rice husk charcoal: manure), but was significantly different from treatment T₁ (Soil: rice husk charcoal). According to (Koibur *et al.*, 2024) manure is a rich source of organic fertilizer, including nitrogen, phosphorus, and potassium.

These nutrients are essential for chili plants to grow and produce well. Improving soil fertility: Chicken manure can improve soil fertility and soil structure quality. This will enable chili plants to absorb nutrients more effectively and promote root growth. At 20 days after planting, the widest stem diameter was found in treatment T₃ (soil: charcoal husk: manure), which was not significantly different from all other treatments tested. At 30 days after planting, the widest stem diameter was found in treatment T₃ (soil: charcoal husk: manure), which was significantly different from all other treatments tested.

Fruit Weight

Average fruit weight due to the composition of the planting medium in red chili plants.

Table 3. Average fruit weight due to the composition of the planting medium in red chili plants.

Treatment	Fruit Weight
T ₀ (kontrol)	13,88 a
T ₁ (soil:biochar)	21,88 a
T ₂ (soil:manure)	18,33 ab
T ₃ (soil:biochar:manure)	19,54 b
BNJ	2,31

Table 3 shows that the heaviest fruit weight was found in treatment T₁ (soil: charcoal husk), which was not significantly different from treatments T₂ (soil; manure) and T₃ (soil; manure; charcoal husk) but was significantly different from T₀ (control). This is likely because the composition of the growing medium in treatment T₁ (soil: charcoal husk) improves the physical, structural, and biological properties of the soil.

4.2 The Effect of Hormonal Growth Regulator Dosage

Plant Height

The average height of red chili plants at 10, 20, and 30 days after planting due to the effect of ZPT Hormonik application can be seen in Table 4.

Table 4. Average height of red chili plants at 10, 20, and 30 days after planting due to the effect of hormonal ZPT application

Treatment	Plant Height (cm)		
	10 HST	20 HST	30 HST
Z ₀ (kontrol)	29,00 a	41,92 a	55,58 a
Z ₁ (1m/l)	31,83 ab	48,50 ab	53,83 a
Z ₂ (2m/l)	32,75 ab	51,42 b	52,25 a
Z ₃ (3m/l)	33,58 b	49,00 ab	49,17 a
BNJ0,05	3,98	7,18	-

Table 4 shows that plant height at 10 days after sowing (DAS) due to the application of the highest concentration of hormonal growth regulators was observed in treatment Z₃ (3 ml/L water), which did not differ significantly from Z₁ (1 ml/L water) and Z₂ (2 ml/L water) but differed significantly from Z₀ (control). At 20 days after sowing, the highest plant height was observed in treatment Z₂ (2 mL/L water), which was not significantly different from Z₁ (1 mL/L water) and Z₃ (3 mL/L water) but was significantly different at each level of hormonal growth regulator treatment.

Diameter of red chili stem

The average diameter of red chili plant stems at 10, 20, and 30 days after planting due to the effect of hormonal ZPT dosage is shown in Table 5.

Table 5. Average diameter of large red chili peppers as a result of ZPT Hormonik dosage

Treatment	Stem Diameter (cm)		
	10 HST	20 HST	30 HST
Z ₀ (kontrol)	6,23 a	6,45 a	7,72 a
Z ₁ (1m/l air)	6,31 a	6,26 a	7,13 a
Z ₂ (2m/l air)	6,72 a	6,39 a	6,95 a
Z ₃ (3m/l air)	6,29 a	6,58 a	7,13 a
BNJ0,05	-	-	-

Table 5. Data shows that at 10 days after planting, the widest stem diameter was found in treatment Z₂ (2 m/l water), which was not significantly different from all other treatments tested. At 20 HST, the widest stem diameter was found in treatment Z₃ (3 m/l water), and at 30 HST, the widest stem diameter was found in treatment Z₀ (Control), which was not significantly different from all other treatments tested.

Fruit Weight

The average weight of red chili peppers at 10, 20, and 30 days after planting due to the effect of the hormonal ZPT dosage is shown in Table 6.

Table 6. Average weight of large red chili peppers as a result of ZPT Hormonik dosage

Treatment	Fruit Height (gram)
Z ₀ (kontrol)	16,63 a
Z ₁ (1m/l Water)	20,17 a
Z ₂ (2m/l Water)	16,42 a
Z ₃ (3m/l Water)	20,42 a
BNJ0,05	-

Table 6 shows that the heaviest chili fruit weight due to the application of hormonal ZPT was found in treatment Z₃ (3m/l), which was not significantly different from all other treatments tested. This is thought to be due to the physical condition of the chili plants themselves, which showed signs of poor health due to several factors, such as pest and disease infestation and insufficient concentration. The suboptimal productivity of cayenne pepper is partly due to high levels of pest and disease infestation, which can reduce productivity in economic terms.

The Influence of Interaction

Plant Height

The average height of large red chili plants at 10 days after planting (DAP) can be seen in Table 7.

Table 7. the Average height of large red chili plants due to the application of doses of hormonal growth regulators

	Z0	Z1	Z2	Z3
T0	20,67(a) A	32,33(a) A	36,67(b) A	32,33(a) A
T1	30(a) A	34(a) A	31,33(a) A	35,67(a) A
T2	33,67(a) B	36,67(a) A	33(a) A	29,67(a) A
T3	31,67(a) A	28(a) A	33,33(a) A	29,33(a) A

Table 7 shows that the best observation diameter of red chili plants was found in the combination of soil:chicken manure planting medium composition and a hormone dose of 0 ml/l (T_2Z_0), which was significantly different from all other treatments, but the soil treatment (control) and hormone concentration of 2 ml/l were not significantly different from the treatment (T_0Z_1).

5. Conclusion and Recommendation

The conclusions that can be drawn from this study are:

1. The treatment of planting media composition had a very significant effect on plant height at 20 days after planting (DAP) but had a significant effect at 30 DAP. For stem diameter, it had a significant effect at 10 and 30 DAP. It also has a very significant effect on fruit weight and harvest age but does not have a significant effect on the number of fruits.
2. The application of hormonal ZPT doses has a very significant effect on plant height at 10 and 20 days after sowing (DAS) but does not have a significant effect on plant height at 30 DAS in terms of stem diameter, fruit weight, number of fruits, and harvest period.
3. There is a significant interaction in the observation of plant height of large red chili peppers at 10 HST. In the combination treatment of soil medium type: chicken manure and hormonal dose of 0 ml/l water (T_2Z_0)

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