



## RESEARCH ARTICLE

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# Test Effectiveness Fertilizer Organic KoHeA+MF with Substance Regulator Grow Experience To Germination and Growth of Red Chili Seeds (*Capsicum Annuum* L.) Varieties Lotanbar

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## Abstract

Chili Plants (*Capsicum annuum* L.) Red chili is one of the leading horticultural commodities, widely consumed by the public for both culinary and medicinal purposes. The demand for red chili continues to increase alongside population growth. Consequently, increased red chili production must be accompanied by improvements in quality. The use of high-quality seeds is a major factor in enhancing both quality and yield. The planting medium is another critical factor influencing plant growth, especially in the nursery stage. Additionally, phytohormones or plant growth regulators (PGRs) affect seed germination. This study aimed to examine the effects of different dosages of the organic fertilizer KoHeA + MF, various types of natural PGRs, and their interactions on the germination and early vegetative growth of red chilli seeds of the Lotanbar variety. The experiment employed a Completely Randomized Design (CRD) factorial arrangement with four doses of KoHeA + MF organic fertilizer (0, 5, 10, and 15 tons/ha) and four types of natural PGRs (no PGR, young coconut water, shallot extract, and bamboo shoot extract), each applied at a 50% concentration. The variables observed included germination rate, maximum growth potential, plant height, leaf length, and number of leaves. Results indicated that KoHeA + MF organic fertilizer significantly influenced vegetative growth of red chilli plants, whereas natural PGRs enhanced seed germination rates. The optimal treatment combined a planting medium mixed with KoHeA + MF at 10 tons/ha and seed soaking in natural PGR derived from young coconut water.

**Keywords:** Bamboo Shoots, Coconut Water Young, Onion Red, Planting Media, Power Germinate

## 1. Introduction

Chilli peppers (*Capsicum annuum* L.) are a leading horticultural commodity widely consumed by the public for cooking and medicinal purposes. Demand for red chilli peppers continues to increase alongside population growth. West Sumatra is one of the 10 provinces in Indonesia that produce red chilli peppers, accounting for 8.20% of total production (Directorate General of Horticulture, 2023). Commonly produced varieties include Kopay and Lotanbar. Red chili production in West Sumatra increased from 2021 to 2023. In 2021, it reached 115,766 tons; in 2022, 123,504 tons; and in 2023, 127,451 tons.

One factor inhibiting the development of red chilli peppers is their low germination rate. Increasing red chilli

pepper production must also be balanced with improvements in quality. The use of quality seeds is a key factor in improving quality and quantity in agriculture (Wiguna, 2013). One indicator of quality seeds is good viability and vigor, which enable them to survive, germinate, and produce plants that grow well in the field (Wartapa & Effendi, 2009).

The growing medium is one of the factors that influence plant growth, especially in nurseries, as it serves as a reservoir for nutrients and water. The most commonly used growing medium in nurseries is soil. However, soil fertility is currently declining due to lower organic matter content. One source of organic matter is organic fertilizer. KoHeA+MF organic fertilizer contains 1.62% N, 3.78%

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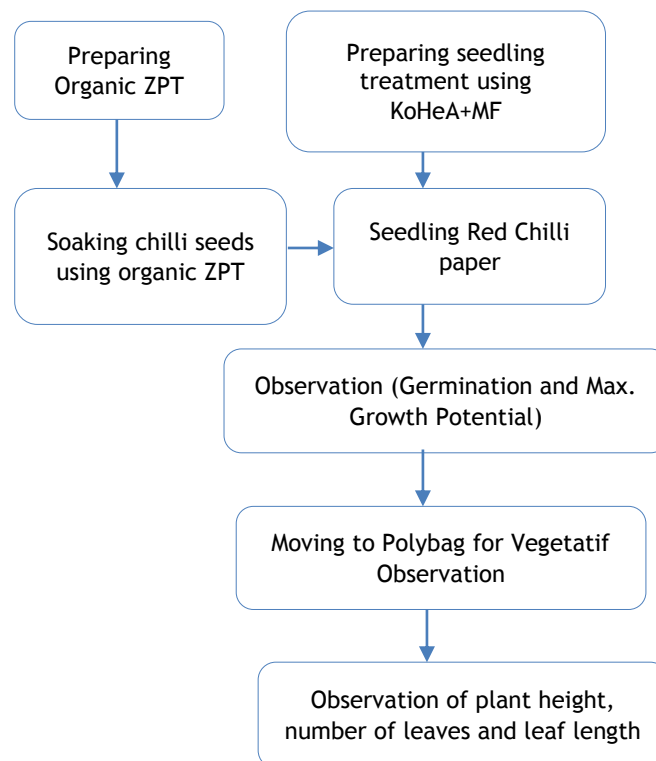
P<sub>2</sub>O<sub>5</sub>, 3.03% K<sub>2</sub>O, 0.80% Mg, 10.1% Ca, and a pH of 8.94 (Central Plantation Services Laboratory, 2022). Application of organic fertilizer KoHeA+MF at 10 tons/ha and NPK at 100 kg/ha in paddy fields results in the highest increase in the number of productive tillers. Giving a combination of KoheA+MF (10 tons/ha) + 3/4 R inorganic fertilizer can increase the growth of leaf length, leaf width, corn cob diameter, number of rows/corn cob, number of seeds/row, weight of corn kernels/plant, and corn kernel production/ha (Sondang et al., 2024).

Plant growth in the early phases, such as germination, is greatly influenced by phytohormones, or Plant Growth Regulators (PGRs). PGRs are organic compounds that, at low concentrations, can affect plant physiological processes (Rahmawati, 2021). The use of natural PGRs is highly recommended because they are easier to obtain, inexpensive, and environmentally friendly. Based on research by Gresiyanti et al. (2023), a combination of PGRs from shallots, bamboo shoots, coconut water, and water at a concentration of 50 ml/l can increase red chilli seed germination by 19.54%. Based on the explanation above, this study aims to determine the effects of the dose of the organic fertilizer KoHeA + MF on the germination and early vegetative growth of red chillies; to assess the effects of natural plant growth regulators (PGRs) on germination and early vegetative growth; and to evaluate the interaction effects between the organic fertilizer KoHeA + MF and natural PGRs on these parameters.

## 2. Material and Methods

This study was done on September to November 2025 located on land test Polytechnic Agriculture Country Payakumbuh with height  $\pm$  500 meters above sea level is at on point coordinates 0 ° 10 ' 14.1 " S and 100 ° 39 ' 55.2 " E. Materials used is seed chilli red varieties Lotanbar, top soil, fertilizer organic KoHeA+MF, onion red, bamboo shoots, coconut water, urea, KCl and TSP. The tools used are a seedbed, polybag, shovel, ruler, hand sprayer, and blender. Research was designed according to a Design Random Complete (RAL) Factorial 4 x 4 with 3 replications, so that 48 experimental units were obtained. The main factor is the dose of organic fertiliser KoHeA+MF at 0, 5, 10/ha, and 15 tons/ha. Factors second: types of natural ZPT, young coconut water, pregnant red, and bamboo shoots. The concentration of each ZPT namely 50%. In every treatment, as many as 50 chilli seeds were planted, and 5 samples were taken from each plant. The research variables in the germination phase were Germination Power (%) and Maximum Growth Potential (%). The research variables in the vegetative phase were plant height (cm), leaf number, and leaf length (cm). The observation results were analysed statistically using the F test at the 5% level, followed by the Duncan Multiple Range Test (DMRT) at the 5% level in SPSS Statistics version 26.

### 2.1. Implementation flowchart



**Figure 1.** Research flow diagram

### 3. Results and Discussion

#### 3.1. Plant Height

The results of observations on the height of red chili

plants with the application of KoHeA+MF organic fertilizer and several types of natural PGRs are presented in Table 1.

**Table 1.** Height of red chili plants with the application of KoHeA+MF organic fertilizer and several types of natural ZPT

Dosage of organic fertilizer KoHeA+MF (ton/ha)	Types of natural ZPT				Average
	Without ZPT	Young Coconut Water	Red onion	Bamboo shoots	
0	6.94 ±1.65	7.61±1.02	8.50±2.20	6.84±2.11	7.47±0.12 C
5	13.56±4.16	15.87±3.90	17.45±4.30	15.31±3.89	15.54±1.60 B
10	20.89±5.92	24.55±5.36	19.95±6.67	23.39±4.40	22.19±2.14 A
15	23.28±5.36	23.17±4.27	21.11±.2.43	17.28±2.06	20.96±2.80 A

Numbers followed by the same lowercase letter in a column and the same uppercase letter in a row indicate no significant difference based on the DMRT test ( $\alpha = 5\%$ ).

Organic fertiliser KoHeA+MF and natural growth regulators (PGRs) did not interact with plant height in red chilli plants. The best treatment was obtained at a dose of 10 tons/ha with natural growth regulators (PGRs) from young coconut water with a plant height of 24.55 cm. The single effect of organic fertiliser KoHeA+MF was observed at a dose of 10 tons/ha, with an average plant height of 22.19 cm. The application of the organic fertiliser KoHeA+MF contributed several macronutrients, including N, P, and K, which function as stimulants of cell division and plant growth. The nutrient-rich planting medium supports rapid vegetative growth triggered by growth regulators during germination. Young coconut water

containing the hormone cytokinin plays a major role in cell division in the meristem. Based on Siregar's research (2024), the provision of cow manure with a dose of 500 g/polybag with 20 ml/l water Gibberellin PGR resulted in a red chili plant height of 25.65 cm at 6 WAP, while using KoHeA+MF fertilizer with a dose of 50 g/polybag with young coconut water natural PGR resulted in a red chili plant height of 24.55 cm.

#### 3.2. Leaf Length

The results of observations on the length of red chilli plant leaves with the application of KoHeA+MF organic fertiliser with natural ZPT are shown in Table 2.

**Table 2.** Length of red chili leaves with the application of KoHeA+MF organic fertilizer and several types of natural PGRs

Dosage of organic fertilizer KoHeA+MF (ton/ha)	Types of natural ZPT				Average
	Without ZPT	Young Coconut Water	Red onion	Bamboo shoots	
0	3.28±1.27	3.39±0.74	3.11±1.14	3.28±0.79	3.26±0.12 C
5	5.22±1.27	5.17±1.47	6.28±1.73	5.17±1.41	5.46±0.55 B
10	7.26±2.13	8.72±1.42	7.87±1.94	6.90±2.53	7.69±0.80 A
15	9.03±1.56	9.11±1.05	7.78±1.09	5.67±1.06	7.90±1.61 A
Average	6.20±2.50 a	6.60±2.77 a	6.26±2.23 a	5.25±1.50 b	

Numbers followed by the same lowercase letter in a column and the same uppercase letter in a row indicate no significant difference based on the DMRT test ( $\alpha = 5\%$ ).

The highest leaf length was obtained at a dose of 15 tons/ha of KoHeA+MF organic fertilizer with a natural growth regulator (PGR) of young coconut water, but the two treatments did not interact. Each treatment had a single effect on the length of red chili leaves. The 10-ton/ha dose was not significantly different from the 15-ton/ha dose, with an average leaf length of 7.69 cm. The natural growth regulator (PGR) of young coconut water was the best treatment for leaf length, with an average of 6.60 cm. Leaf length is a crucial vegetative parameter that determines the efficiency of photosynthesis and biomass accumulation of chili plants. Research shows that applying organic fertiliser can increase soil available N content and is positively correlated with increased leaf length in horticultural crops (Hanafiah, 2005).

#### 3.3. Number of Leaves

Results of observations of the number of leaves on red chili plants using the application KoHeA+MF organic fertiliser with natural ZPT is shown in Table 3.

The application of organic fertiliser KoHeA+MF with several types of natural PGR affects the number of red chilli leaves. A dose of 10 tons/ha with natural PGR young coconut water gives the highest number of leaves, namely 11 strands. Increasing the dose of organic fertiliser KoHeA+MF shows a positive correlation with an increase in the number of red chilli leaves. Organic fertiliser releases N elements through mineralisation, which supports chlorophyll formation. Based on the results of research by Nugroho et al. (2023), a mixed planting medium treatment of topsoil, rice husk charcoal, and goat manure (1:1:2) with natural PGRs, coconut water, and shallot extract yields the highest number of vanilla leaves, namely 7 strands. while using KoHeA+MF fertiliser at a dose of 50

g/polybag, with natural PGR young coconut water, obtained the highest number of leaves, namely 11 strands.

**Table 3.** Number of red chili leaves with the application of KoHeA+MF organic fertilizer and several types of natural PGR

Dosage of organic fertilizer KoHeA+MF (ton/ha)	Types of natural ZPT			
	Without ZPT	Young Coconut Water	Red onion	Bamboo shoots
0	3.67±2 B a	3.99±1.11 B a	3.44±1.67 B a	2.78±0.97 C a
5	5.11±2.32 B a	6.00±2.83 B a	6.33±2.06 B a	6.56±2.24 C a
10	10.00±2.55 A a	11.00±2.18 A a	9.11±3.48 A a	9.87±1.72 A a
15	10.22±3.07 A a	11.00±1.22 A a	8.78±1.56 A a	4.78±1.99 BC b

Numbers followed by the same lowercase letter in a column and the same uppercase letter in a row indicate no significant difference based on the DMRT test ( $\alpha = 5\%$ ).

### 3.4. Germination Power

Germination power is a parameter observed during the

germination phase in calculations I (day 7) and II (day 14).

Germination power observations are presented in Table 4.

**Table 4.** Percentage of germination power of red chili seeds of the Lotanbar variety

Dosage of organic fertilizer KoHeA+MF (ton/ha)	Types of natural ZPT			
	Without ZPT	Young Coconut Water	Red onion	Bamboo shoots
0	86.67±8.08	90.67±11.37	23.33±14.04	92.00±5.29
5	82.67±15.27	96.00±5.29	36.67±15.01	89.33±4.16
10	76.00±31.43	94.67±4.61	58.67±26.10	96.00±6.92
15	93.33±4.16	92.00±13.85	33.33±6.11	96.67±5.77
Average	84.67±7.26 a	93.33±2.43 a	38.00±14.9 b	93.50±3.46 a

Numbers followed by the same lowercase letter in a column and the same uppercase letter in a row indicate no significant difference based on the DMRT test ( $\alpha = 5\%$ ).

The germination rate of Lotanbar variety chili seeds showed no interaction between the dose of KoHeA+MF organic fertilizer and the type of natural PGR. The type of natural PGR had a single effect on germination rate. The highest average germination rate was obtained with the natural PGR from coconut water, at 93.33%. The hormone content in PGRs activates seed metabolism, thereby shortening the dormancy period and accelerating germination.

In line with the opinion of Pamungkas and Puspitasari (2019), optimal auxin administration can increase cell division in meristem tissue, thereby accelerating plant growth and increasing germination time. Based on the results of research by Sulhijah *et al.* (2024), *soaking areca nut seeds in coconut water and banana stump (1:1) for 24 hours resulted in the highest germination rate of 90%*. Based on the results of this study, soaking seeds with young coconut water obtained the highest average germination rate of 93.33%.

The application of KoHeA+MF organic fertiliser did not significantly affect chilli seed germination. This result occurs because the role of organic fertiliser in this phase is to provide a medium for strong, healthy seedling growth by supplying macro- and micro-nutrients. Based on the research by Taryana *et al.* (2019), the composition of the planting medium had no significant effect on the germination of Arabica coffee seeds.

The percentage of germination power is shown in Figure 2.

### 3.5. Maximum Growth Potential

The results of observations of the Maximum Growth Potential (PTM) of red chili seeds of the Lotanbar variety are presented in Table 5.

The maximum growth potential was obtained from observations of normal and abnormal sprouts. The administration of several doses of the organic fertiliser KoHeA+MF with several types of natural PGRs did not interact with the PTM of red chilli seeds, but there was a single effect of the type of natural PGR. Soaking in young coconut water showed the highest PTM, followed by shallot and bamboo shoot extracts. Without natural PGRs, the average germination rate was 84.67% while the PTM increased by 3.33%. The maximum growth potential of red chili seeds soaked with young coconut water PGRs, shallot extracts, and bamboo shoot extracts increased from germination by 2.5%, 7.5%, and 1.5%, respectively. Based on the results of research by Sulhijah *et al.* (2024), *it was shown that soaking in a mixture of natural PGRs had no significant effect on the PTM of areca nut seeds*, with the same germination and PTM values. The dose of the organic fertiliser KoHeA+MF also had no significant effect on the PTM of red chilli seeds of the Lotanbar variety.



**Figure 2.** Appearance of the germination power of red chili seeds of the Lotanbar variety

**Table 5.** Percentage of maximum growth potential for red chili seeds of the Lotanbar variety

Dosage of organic fertilizer KoHeA+MF (ton/ha)	Types of natural ZPT			
	Without ZPT	Young Coconut Water	Red onion	Bamboo shoots
0	92.00±7.21	94.67±7.57	26.67±12.22	94.00±5.29
5	85.33±13.01	98.00±3.46	42.67±16.04	92.00±5.29
10	79.33±27.30	79.33±2.30	65.33±24.4	96.67±5.77
15	95.33±4.16	93.33±11.54	39.33±6.11	97.33±4.61
Average	88.00±7.12 a	95.83±8.24 a	45.50±16.10 b	95.00±2.46 a

Numbers followed by the same lowercase letter in a column and the same uppercase letter in a row indicate no significant difference based on the DMRT test ( $\alpha = 5\%$ ).

#### 4. Conclusion

Based on the research findings, it can be concluded that the application of KoHeA+MF organic fertilizer at various doses influences vegetative phase parameters, specifically plant height and leaf length. Additionally,

soaking red chilli seeds of the Lotanbar variety in various types of plant growth regulators (PGRs) increases their germination rate.

The most effective treatment involved mixing the planting medium with KoHeA+MF organic fertilizer at a

rate of 10 tons per hectare and soaking the seeds in natural coconut water containing ZPT.

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