



## EFFECT OF A VARIOUS OF COMBINATIONS OF PLANTING MEDIA AND DOSES OF NPK FERTILIZER ON THE GROWTH OF THE TURMERIC RHYMPANG (*Curcuma domestica* Val.)

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### Abstract

*The Effect of Various Combinations of Planting Media and NPK Fertilizers on Turmit Tolman Growth This research was conducted on food and horticultural crops. Colomadu Karanganyar December 2022 Essay March 2023. The aim of the study was to determine the effect of different culture media and doses of npk fertilizer on the growth of lymph turmite (curreal domestica val) and look for the composition of the plant media (curreal domestica val.) which is good for the growth of turmeric. This study used a completely randomized design (CRD) consisting of two factors. The first factor to give a variety of plant media (M) consisting of 4 degrees (M0) soil (control), (M1) ground + rice chaff, (M2) soil + charcoal rice chaff, (M3) soil + cocopeat. The second factor is npk (n) fertilization consisting of 4 degrees (N0) without dose (0 g / plant ), (N1) 150kg / ha (5.39 g / plant ), (N2) 200 kg / ha ( 7.19 g / plant ), ( N3 ) 250 kg / ha ( 8.99 g / plant ). Observation data in the analysis using a range of footprint analysis (anova) and continued with a bnj test at a rate of 5%. The results of the study showed that 1) The treatment of planting media has a significant effect on the observation of the wet weight of the stalk, but has no significant effect on plant height, number of leaves, wet weight of rhizomes 2) The treatment of NPK fertilizer has a significant effect on plant height, number of leaves, wet weight of stalks, wet weight of rhizomes 3) The interaction between treatments has a significant effect on the number of leaves, but has no significant effect on plant height, wet weight of stalks, wet weight of rhizomes.*

*Keywords: Turmeric, Grow Media, NPK Fertilizer.*

## 1. Introduction

Turmeric (*Curcuma domestica* Val.) is not only commonly used as a coloring agent and seasoning but also has the potential to become a medicinal plant and raw material for pharmaceuticals. Results from a 2020 survey indicate high demand for turmeric in East Java, ranking the plant as the most-needed ingredient in traditional medicine, and as a top-five ingredient in Central Java. According to the Statistical Bureau of Indonesia (BPS), the country produced 184.00 million kilograms (kg) of turmeric in 2022. This year's total weight of turmeric is 184.83 million kg, a 0.44% reduction from the previous year. The amount of turmeric produced in Indonesia in 2021 was 184.82 thousand tons, which marks a decrease of 4.52% compared to the previous year when turmeric production reached 193.58 thousand tons. These statistics were recorded by the Central Bureau of Statistics (BPS).

Turmeric is a highly sought-after spice plant known for its numerous benefits. The wonogiri area in southern central Java, Indonesia, is a region where turmeric is commonly found. One of the properties of turmeric is its antipyretic effect (Abdurrahman, 2019). Turmeric was initially discovered in Southeast Asia and is widely used in Indonesia as a complementary ingredient in spices, herbs, and for the maintenance of health and beauty.

The use of planting media is crucial for plant survival, particularly in horticultural settings where pot or polybag media are employed for planting. An effective planting medium is characterized by both macro and micro nutrients, in addition to a suitable aeration and drainage system that helps prevent disease and maintain soil moisture. Coconut skin produces a planting medium known as cocopeat, which is obtained by crushing the skin to obtain fiber and fine powder. Cocopeat is widely used as planting media due to its ability to bind and retain moisture, as well as its abundance of important nutrients for plant growth,



including potassium, phosphorus, calcium, magnesium, and sodium (Irawan, 2015). Not only does cocopeat serve as a planting medium, but there are also other options, such as husk charcoal and rice husks. Husk charcoal is particularly advantageous due to its porousness, cleanliness, water retention capability, and light weight. According to Kusmarwiyah and Erni (2011), a soil medium mixture containing charcoal can regulate the respiratory axis of plant roots, and the elements in coal support the growth of beneficial microorganisms. Rice husk planting material can serve as a valuable biomass resource across agricultural, industrial, and livestock sectors. It can be utilized as industrial raw material, animal feed, and as planting medium offering various benefits.

Fertilization plays a crucial role in plant cultivation. One effective method for promoting plant growth is the application of inorganic fertilizers, specifically NPK fertilizers. NPK fertilizers contain three primary macro-nutrients: nitrogen (N), phosphorus (P), and potassium (K). Additionally, they also include trace elements such as manganese, sulfur, and boron chloride. The use of inorganic NPK fertilizers ensures the availability of all essential macro-nutrients required by plants. (Ismayani, 2013).

## 2. Methods

The research was conducted at the Screen House of the Tohudan Food and Horticultural Plant Seed Garden located in Colomadu District, Karanganyar Regency between December and March of 2023. The planting site is situated at approximately 105 masl altitude on gray regosol soil with a sandy loam texture and a soil pH of 6.5 -7. The equipment and materials utilized in this research included a hoe, meter, shovel, paddle, scales, pamphlet, rope, stationery supplies, mobile phone, turmeric rhizome, NPK fertilizer, 40x40 cm polybag, soil, rice husk, cocopeat, and rice husk charcoal.

The experimental design employed a Factorial Randomized Complete Block Design (CRD) with 2 factors and 3 replications. The first factor consisted of multiple combinations of planting media (M), including M0 (soil control), M1 (soil + rice husk), M2 (soil + burnt husk), and M3 (soil + cocopeat). The second factor incorporated NPK fertilizer (N), encompassing N0 control (0 g/plant), N1 150kg/ha (5.39g/plant), N2 200kg/ha (7.19 g/plant), and N3 250kg/ha (8.99 g/plant). The total number of combinations reached 16 treatment combinations and 3 replicates.

To begin, the necessary tools and materials must be prepared for research, focusing on the turmeric rhizomes. First, select turmeric seedlings that yield turmeric rhizome seeds weighing 16g-20g and measuring 6-9cm, with at least 2 buds. The turmeric rhizomes should then be cleaned and soaked in fungicide and zpt solutions to prevent mold and spur growth. The following phase of the land preparation entails clearing the area of weeds and plant residues to ensure it is clean. Subsequently, the planting process employs a mixture of soil, rice husk charcoal, rice husk, and cocopeat as the planting medium. The next step involves planting turmeric rhizomes, with one plant per hole. Regular watering is carried out every three days to maintain optimal conditions in the polybag. If any seedlings are dead or rotten, they are promptly replaced with healthy ones. The next phase of fertilization is divided into two stages based on the dosage of each treatment and is carried out at 14 days after treatment (DAT) and 30 DAT. Moreover, technical abbreviations are defined upon first usage, and the writing stays objective with clear, neutral language. Citation follows established style guides while avoiding filler words. Finally, subject-specific vocabulary is used, and language adheres to American English conventions in grammar and spelling. Pest and disease control

are performed until the final stage of the study, which is harvesting 100 days after planting. The text uses formal language while retaining logical progression and causal connections between statements. In the data analysis using ANOVA (analysis of variance) test data processing and continued with the "Honest Differential Test" (BNJ) at the 5% level.

### 3. Results and Discussion

#### 3.1 Plant Height (cm)

**Table 1.** Average plant height due to treatments and their interactions

NPK fertilizer	Planting Media				Mean M
	N0	N1	N2	N3	
M0	87.33 a	91.67 a	94.20 a	94.00 a	91.80 A
M1	88.67 a	91.17 a	95.33 a	97.00 a	93.04 A
M2	90.50 a	92.20 a	98.17 a	97.63 a	94.63 A
M3	90.75 a	90.50 a	95.17 a	98.00 a	93.60 A
Mean N	89.31 A	91.38 AB	95.72 B	96.66 B	

Keterangan: angka yang diikuti huruf sama pada baris yang sama berbeda tidak nyata pada taraf peluang 95%(Uji DMRT).

There was no significant effect on plant height for each treatment in the combined interactions parameter. M2N2 had the highest value in combined interactions with an average of 98.17 cm, while M0N0 obtained the lowest average value with 87.33 cm. Average data indicated that M did not significantly affect turmeric plant height at the end of the observation period. Treatment M2, which consisted of rice husk charcoal, had the highest value in the table at 94.63 cm. This result was not significantly different than treatment M0, the control soil, which obtained a height of 91.80 cm. Treatment M1, containing rice husk, achieved a height of 93.04 cm, and treatment M3, utilizing Cocopeat, yielded a height of 93.60 cm. The high nutrient absorption of rice husk charcoal, along with the content of NPK fertilizer and Cocopeat planting media, can encourage shoot growth. It is believed that an increase in nutrient levels leads to elevated photosynthesis processes, which, in turn, positively impacts nutrient absorption, Esto (2020).

The application of Npk (N) fertilizer treatment was found to significantly impact the final height of cucumber plants in our observation. Treatment N0, which received 0g/plant of NPK fertilizer, yielded an average height of 89.31 cm. There were no significant differences in results compared to Treatment N1, which received 5.39g/plant NPK fertilizer and produced a height of 91.38 cm. However, Treatment N2, which received 7.19g/plant NPK fertilizer, produced a height of 95.72 cm, indicating significant differences. Treatment N3, which received 8.99g/plant NPK fertilizer, had the highest yield at 98.00 cm. Organic and inorganic fertilizers are essential for enhancing rhizome yields, leading to improved texture, drainage, and soil fertility, including NPK fertilizers. According to Wasis (2010), NPK compound fertilizers are required to increase the nitrogen supply in the soil, promoting plant growth.

#### 3.2 Number of Leaves (strands)

**Table 2.** Average number of leaves (strands) of plants due to treatments and their interactions

NPK fertilizer	Planting Media				Mean M
	N0	N1	N2	N3	
M0	6.17 a	6.50 a	6.83 a	6.67 a	6.57 A
M1	6.50 a	6.70 a	6.50 a	6.83 a	6.58 A
M2	5.83 a	6.83 ab	7.17 ab	7.67 b	6.87 A
M3	5.67 a	7.00 ab	6.67 ab	7.33 b	6.67 A
Mean N	6.00 A	6.75 B	6.79 B	7.13 B	

Keterangan: angka yang diikuti huruf sama pada baris yang sama berbeda tidak nyata pada taraf peluang 95%(Uji DMRT).

The combined interaction had a significant effect on the number of leaves, with M2N3

and M3N3 having average values of 7.67 and 7.33 strands, respectively, which were not significantly different from each other but significantly different from the other treatments. On average, the planting media (M) had no significant effect on the number of leaves of turmeric plants. The M2 treatment obtained the highest value, with an average of 6.92 strands, which is not significantly different from the M0 treatment that obtained an average value of 6.42 strands. The M1 treatment obtained a value of 6.46 strands, and the M3 treatment obtained an average value of 6.79 strands for the number of leaves of turmeric plants. The ingredients in the cocopeat medium and NPK fertilizer are readily absorbed by turmeric, promoting increased growth in food plants. Kelik (2010) suggests that adequate nutrition accelerates vegetative growth in plants.

On the average dose of NPK fertilizer (N) shows that there is a real effect on the number of leaves of turmeric plants, treatment N0 which obtained the highest value with 6.00 strands, significantly different when compared to treatment N1 which obtained a value of 6.75 strands, treatment N2 which obtained a value of 6.79 strands, and treatment N3 which obtained an average value of 7.13 strands. This indicates that the dose of NPK fertilizer has a real effect on the maximum growth parameters of turmeric plants. Cell division and division occur in the main part of plant cultivation. Increases the synthesis of vegetable proteins obtained from organic matter. knowledge According to Magfira, et al (2022) The addition of organic substances affects the growth of plant nutrients. It can also increase the rate of photosynthesis in plant cells. This allows plants to grow well and photosynthesize to their full potential.

### 3.3 Stem Wet Weight

**Table 3.** Average Stem Wet Weight of plants due to treatments and their interactions

NPK fertilizer	Planting Media				Mean M
	N0	N1	N2	N3	
M0	168.53 a	247.75 a	314.88 a	306.20 a	259.34 A
M1	167.53 a	273.63 a	290.43 a	320.25 a	262.96 AB
M2	204.35 a	224.42 a	306.22 a	358.23 a	273.30 AB
M3	235.25 a	365.95 a	333.75 a	347.80 a	320.69 B
Mean N	193.92 A	277.94 B	311.32 B	333.12 B	

Keterangan: angka yang diikuti huruf sama pada baris yang sama berbeda tidak nyata pada taraf peluang 95%(Uji DMRT).

Wet turmeric was found to be a safe attachment in large quantities indicating that the growth medium (M) has a great influence on the wet weight of the parameters of turmeric (*Curcuma domestica* Val.), The dose of npk fertilizer (N) has a very real chance effect on the growth of turmeric seedlings. (*Curcuma domestica* Val.), the combined interaction is not significantly different in each treatment of wet weight of stalks. The quality of planting media greatly affects soil fertility, good soil is soil that contains many nutrients and microorganisms that help fertilize the soil, Dewi (2023)

On average, the planting media (M) has a significant effect on the wet weight of turmeric plant stems (*Curcuma domestica* Val.). The M3 treatment obtained the highest value, with 320.69g, which is significantly different from the M0 treatment that obtained an average of 259.34g, the M1 treatment with 262.96g, and the M2 treatment with an average of 273.30g. Technical term abbreviations are explained upon first use, and clear, objective language is used throughout the paper. The paper follows conventional structure, with common academic sections and consistent citation style. The language maintains a formal register, avoiding contractions, colloquialisms, and unnecessary jargon. This indicates that the wet weight of both the stems and the bran is dependent upon the amount of plant nutrient uptake and the nutrient content in the media that affects plant growth. To ensure optimal

photosynthesis, a balanced level of nutrient availability is necessary, as noted by Burhanuddin (2010).

The analysis of NPK fertilization dosage revealed a significant influence on the wet weight yield of *Curcuma domestica* Val. The treatment with N3 fertilization dosage of 250kg/ha (8.99g per plant) obtained the highest average value of 333.12g. This result is statistically different from the N0 treatment without any NPK fertilization dosage (0g per plant), which obtained an average value of 277g. 94g, but not significantly different compared to the N1 treatment of NPK fertilizer dosage at 150 kg/ha (5.83 g/plant) with an average yield of 277.94g, and the N2 treatment of NPK fertilizer dosage at 200 kg/ha (7.19 g/plant) with an average yield of 311.32g. 94g, but not significantly different compared to the N1 treatment of NPK fertilizer dosage at 150 kg/ha (5.83 g/plant) with an average yield of 277.94g, and the N2 treatment of NPK fertilizer dosage at 200 kg/ha (7.19 g/plant) with an average yield of 311.32g. The application of NPK fertilizer can improve plant nutrition, resulting in healthy plant growth. Plant wet weight is highly dependent on the process of photosynthesis. Increased absorption of organic compounds that will be channeled to the plant parts enhances the process of photosynthesis. (Nuridin , 2011).

### 3.4 Rhizome Wet Weight

**Table 4.** Average wet weight of rhizomes of plants due to treatments and their interactions

NPK fertilizer	Planting Media				Mean M
	N0	N1	N2	N3	
M0	49.05 a	68.30 a	71.13 a	75.83 a	66.08 A
M1	54.63 a	83.25 a	58.25 a	86.18 a	70.58 A
M2	53.92 a	62.08 a	87.67 a	83.20 a	71.72 A
M3	74.70 a	60.37 a	96.78 a	76.78 a	77.16 A
Rerata N	54.49 A	65.83 AB	84.71 B	80.50 B	

Keterangan: angka yang diikuti huruf sama pada baris yang sama berbeda tidak nyata pada taraf peluang 95%(Uji DMRT).

The wet weight parameters of turmeric rhizomes (*Curcuma domestica* Val.) were examined to determine the effects of planting media (M) and NPK fertilizer doses (N). It was found that planting media did not have a significant effect on the wet weight of the rhizomes, while NPK fertilizer doses had a significant effect on the growth of the number of buds on turmeric plants. However, the combined interaction of both variables did not significantly differ in the rhizome wet weight parameters for each treatment. While there is no significant difference in the mean weight of rhizomes among the treatments, supplementing turmeric plants with nutrients is adequate in promoting growth. While there is no significant difference in the mean weight of rhizomes among the treatments, supplementing turmeric plants with nutrients is adequate in promoting growth. While there is no significant difference in the mean weight of rhizomes among the treatments, supplementing turmeric plants with nutrients is adequate in promoting growth. Moreover, providing complete nutrients yields excellent results. While there is no significant difference in the mean weight of rhizomes among the treatments, supplementing turmeric plants with nutrients is adequate in promoting growth. According to Lakitan (2012), when plants receive adequate nutrients, metabolic outcomes improve significantly.

In the examination of NPK fertilizer dose (N), it is evident that there is a significant impact on the wet weight of *Curcuma domestica* Val. rhizomes. Treatment N0, without any NPK fertilizer (0 g/plant), produced an average yield of 54.49g, which is not significantly different from treatment N1, which involved the application of a 150kg/ha dose of NPK fertilizer (5.83 g/plant), with an average yield of 65. The average value of 83g is noticeably distinct from the N2 dose treatment of NPK fertilizer at 200 kg/ha (7.19 g/plant) with an

average of 84.71g, whereas the N3 dose treatment of NPK fertilizer at 250 kg/ha (8.99 g/plant) yielded the highest average value at 80. 50 grams of phosphate and potassium are essential nutrients for the formation of turmeric rhizomes. These nutrients aid in root growth, the formation of carbohydrates and proteins, and enhance the resistance of main plants in the roots. Samniri (2019) notes that nutrient deficiencies can negatively impact the overall health and resistance of plants, specifically certain parts.

#### 4. Conclusion

The treatment of planting media has a significant effect on the observation of the wet weight of the stalk, but has no significant effect on plant height, number of leaves, wet weight of rhizomes. NPK fertilizer treatment has a significant effect on plant height, number of leaves, wet weight of stalks, wet weight of rhizomes. The interaction between treatments has a significant effect on the number of leaves, but has no significant effect on plant height, wet weight of stalks, wet weight of rhizomes. This research is the basis for further research regarding the use of NPK fertilizer on plants.

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