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The Effect of Nitrogen and Phosphorus Fertilizer on the Vegetative Growth of Red Chili (*Capsicum annuum* L.)

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ABSTRACT

Red chili peppers (Capsicum annuum L.) is a type of vegetable that has economic value high and contains various compounds that are useful for human health. The aim is to determine the extent of the effect of Nitrogen and phosphore on the vegetative growth of red chili plants. This study used a two- factor factorial Randomized Block Design (RAK) method. The first factor is the dose of Nitrogen Fertilizer consisting of three levels, namely N1 (5 gr/plant), N2 (10 gr/plant), and N3 (15 gr/plant), the second factor is the dose of Phosphore fertilizer with two levels, namely P1 (10 gr/plant) and P2 (15 gr/plant). Observation variables include plant height, number of leaves, and number of branches. The results showed that there was a real interaction between nitrogen and phosphore fertilizers. Nitrogen Fertilizer treatment was significantly different from plant height, number of leaves and number of branches. The best Nitrogen Fertilizer treatment was at the N3 dose level (15 gr/plant). Furthermore, in the Phosphore fertilizer treatment, the best results were obtained at the P2 level (15 gr/plant) which affected plant height, number of leaves, and number of branches.

Keywords: Red Chili Peppers, Nitrogen, Phosphorus, Vegetative Growth.

1. INTRODUCTION

Red chili pepper (*Capsicum annum* L.), is a plant originating from America. Chili can be widely consumed as a source of fresh, dried and fermented food. This plant is widely grown and at the global level generates huge income for producers. Chili contains carotenoid compounds, ascorbic acid (vitamin C), tocopherol (vitamin E), a large amount of minerals, lipids, proteins, and carbohydrates making it the healthiest food among vegetables (Warsino and Dahana, 2010). Red chili (*Capsicum annuum* L.) is one type of vegetable that has high economic value. Chili contains various compounds that are useful for human health. Chili contains antioxidants that function to protect the body from free radical attacks. The largest content of this antioxidant is in green chili. Chili also contains Lasparaginase and Capsaicin which act as anti-cancer substances (Iri et al., 2023).

Chilies can be planted easily so they can be used for daily needs, without having to buy it in the market (Syarbiah, 2019). In general, red chilies have many nutritional and vitamin contents, including calories, protein, fat, carbohydrates, calcium, vitamins A, B1 and vitamin C. Red chilies are rich in protein, lipids, fiber, mineral salts (Ca, P, Fe, K), vitamins (A, D3, E, C, K, B2, and B12)

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and capsaicin. In addition, chilies can also be used as a diet and to treat stomach and colon cancer (Badriyah et al., 2015).

Red chili cultivation has many challenges because this plant is susceptible to weather conditions and pests and diseases. Selection of superior seeds and fertilization are also factors in the success of red chili cultivation. The prospect of red chili is on the rise, this plant should be managed with proper, intensive, and pre-pattern cultivation. One of the efforts to increase chili productivity is increasing cultivation techniques through the fertilization system.

Fertilization is one of the main keys to success in increasing chili production in Indonesia. The impact of effective fertilization will be seen in optimal plant growth and significantly increased production. The nutrients N, P, and K are macronutrients that are very much needed by chili plants (Dwicaksono et al., 2014). Nitrogen (N) is one of the most essential macronutrients and has a role in stimulating plant growth in general, especially in the vegetative phase, plays a role in the formation of chlorophyll, forming fat, protein and other compounds.

Phosphor (P) is also included in the macronutrients that are often an obstacle to plant growth, especially in acidic soils, because P elements are often not available for plants. Fertilizing with a combination of N and P is expected to increase the availability of nutrients for chili plants because the roots contain root nodules that are colonized by rhizobium japonicum bacteria that form in the roots, which can bind N, in symbiosis with plants. Land that can be planted with chilies has sufficient water and plant nutrients for growth. The absorption of P elements by plants is also influenced by the presence of N elements. The administration of P elements combined with N can increase P absorption by plants (Rao, 1994). This study aims to determine the extent of the effect of Nitrogen and phosphor administration on the vegetative growth of red chili plants.

2. RESEARCH METHODS

The research was conducted at the Experimental Garden of the Faculty of Agriculture, Merdeka University of Surabaya, in Karah Village, Jambangan District, Surabaya. The altitude is ± 5 meters above sea level. The experiment was conducted from April to July 2024. The materials and tools used were red chili seeds, soil planting media, sand and compost, 40 x 40 cm polybags, Urea and Phosphorus fertilizers. The equipment used was a hoe, trowel, hand sprayer, measuring ruler, and stationery.

This study used a factorial Randomized Block Design (RBD) with two factors and three replications of sample plants. Factor 1 is the dose of Nitrogen Fertilizer consisting of three levels, namely N1 (5 gr/plant), N2 (10 gr/plant), and N3 (15 gr/plant). While factor 2 is the dose of

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Phosphor fertilizer with two levels, namely P1 (10 gr/plant) and P2 (15 gr/plant). So that six treatment combinations were obtained with each combination repeated three times.

The study began by sowing chili seeds in 5 x 10 cm polybags. At the age of 5 weeks, the seedlings were transplanted into 40 x 40 cm polybags, which had previously been filled with sifted soil and compost as basic fertilizer with a ratio of 2:1 with a soil volume of approximately 15 kg. Then watered according to field capacity. Plants were maintained by watering, weeding, controlling weeds and pests, and fertilizing according to the treatment. Phosphor fertilization was given at planting time, while Nitrogen fertilizer was given twice, namely half at planting time and the rest was given 20 days after planting (DAP). Fertilization was done by immersing and circling the plants.

Observation variables include plant height, number of leaves, and number of branches. Plant height, observed starting from 10 days after planting with an interval of 10 observations for the next 10 days. Number of leaves, counted all leaves that have opened starting from 10 days after planting with an interval of 10 observations for the next 10 days. Number of branches, counted the number of branches that formed and observed when 10 days after planting (DAP) with an interval of 10 days. Data were analyzed using the BNJ (Honest Significant Difference) test or often referred to as the Tukey Test with a level of 5%. If significantly different.

3. RESULTS AND DISCUSSION

Plant Height

Statistical results on plant height showed an interaction between the treatment of Nitrogen fertilizer doses and Phosphor fertilizer at 30 days after planting (DAP). Separately, the treatment of Nitrogen fertilizer doses had a significant effect on plant height at observation ages of 20, 30, and 40 DAP. The average value of the results of observations of plant height due to the treatment of Nitrogen and Phosphor fertilizer doses is presented in table 1 and table 2.

Table 1. Average Plant Height (cm) of Red Chili Peppers in Combination of Nitrogen Fertilizer Doses and Phosphor

Treatment	Plant Age
N1P1	16.86 a
N2P1	19.06 ab
N3P1	24.56 cd
N1P2	18.86 ab
N2P2	23.40 cd
N3P2	35.40 cd
BNT 5%	4.84

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Note: Numbers accompanied by the same letters do not indicate significant difference. Real on 5% BNT Test.

In table one it can be seen that the highest plant height was produced by the N3P2 treatment combination of 35.40 cm and the lowest result was achieved by the N1P1 combination of 16.68 cm. While in table 2 it can be seen that in the N3 Nitrogen fertilizer treatment the results were higher than N2 and N1, and the highest Phosphore fertilizer treatment was achieved by P2

Table 2. Average Plant Height (cm) of Red Chili in Nitrogen and Phosphor Fertilizer Dose Treatments

Treatment	Observation Age (DAP)			
	10	20	30	40
N Fertilizer Dosage				
N1	12,25	16,45	21,46	25,76
N2	13,59	18,24	23,23	25,66
N3	15, 46	20,16	23,33	26,07
BNT5%	tn	tn	tn	tn
P fertilizer Dosage				
P1	14,80	16,50	18,50 a	24,89
P2	15,46	18,16	21,41 ab	25,33
BNT5%	tn	tn	3,04	tn

Note: Numbers accompanied by the same letters do not indicate significant differences. Real on 5% BNT Test. . (tn = not significantly different)

From the statistical results, it is known that the combination of Nitrogen fertilizer dose and phosphor fertilizer dose treatments has a significant interaction effect on plant height variables at the age of 30 HST (N3) with the highest results in the combination of Nitrogen fertilizer doses and P2 phosphor fertilizers but not significantly different from other treatment combinations (Sari et al., 2020). This is because in the early growth, the elements Nitrogen, Phosphor are very much needed by normal growth, as a result of the provision of Nitrogen and phosphor fertilizers and other elements will cause the growth of the number of leaves and plants to be good. So that if the number of leaves is greater, the possibility of the photosynthesis process produced is greater. This is in accordance with the opinion of Dwijosepoetro (2012) that the elements N and P that are available in sufficient quantities will be able to help the growth and development of plants. Furthermore, Lingga (1994) explained that the nutrients available to plants through the photosynthesis process will produce carbohydrates which will then be transported to the apical meristem and the growing point of the plant. This will stimulate the growth rate, elongation and cells which result in better plant development and growth.

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Number of Leaves

The results of statistical analysis of the number of leaves did not show any interaction between the treatment of Nitrogen fertilizer doses and Phosphor fertilizer. The average observation of the number of red chili leaves due to the treatment of Nitrogen fertilizer doses and Phosphor fertilizer at various observation ages is presented in table 3.

Table 3. Average Number of Red Chili Leaves in Nitrogen and Phosphor Fertilizer Dose Treatments

Treatment	Observation Age (DAP)			
	10	20	30	40
N Fertilizer Dosage				
N1	14,25	39,45	49,46	56,76
N2	15,59	40,24	50,23	59,66
N3	17, 46	45,16	53,33	64,07
BNT5%	tn	tn	tn	tn
P fertilizer Dosage				
P1	14,80	36,50	45,50 a	53,89
P2	18,46	47,16	57,41 ab	60,33
BNT5%	0,959	2,879	2.857,04	2,766

Note: Numbers accompanied by the same letters do not indicate significant differences. Real on 5% BNT Test.

In table 3 it appears that the dose of Nitrogen fertilizer N3 produces a greater number of leaves compared to N1 and N2, for the treatment of phosphor fertilizer dose the highest number of leaves was achieved by P2 at all observation ages. The results of the statistical analysis of the number of leaves did not show any interaction between the treatment of Nitrogen fertilizer dose and Phosphor fertilizer. However, separately the treatment of Nitrogen fertilizer dose gave a significant effect on the number of leaves at all observation ages, while for the treatment of phosphor fertilizer dose only gave a significant effect on the number of leaves, where P2 produced the number of leaves 60.33 compared to P1 53.89 in the treatment of Nitrogen fertilizer dose N3 significantly different from all doses of Nitrogen fertilizer at the age of 10, 20, days after planting (DAP), while at the age of 40 DAP the dose of Nitrogen fertilizer N3 was significantly different from N1 but not different from N2 and N3.

Number of Branches

The results of statistical analysis of the number of branches did not show any interaction between the treatment of Nitrogen fertilizer doses and Phosphor fertilizer. However, separately, the treatment of Nitrogen fertilizer doses had a significant effect on the number of branches at the age of 30 days after planting (DAP), while the treatment of Phosphor fertilizer doses did not provide a

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significant difference at all observation ages. The average results of observations of the number of red chili branches for the treatment of Nitrogen fertilizer doses and Phosphor fertilizers at various observation ages are presented in Table 4.

Table 4. Average Number of Red Chili Branches in Nitrogen and Phosphor Fertilizer Dose Treatments

Perlakuan	Observation Age (DAP)			
	10	20	30	40
N Fertilizer Dosage				
N1	1,25	2,45	5,47	8,76
N2	1,59	2,24	5,23	8,66
N3	2, 98	4,16	7,33	9,07
BNT5%	tn	tn	tn	tn
P fertilizer Dosage				
P1	1,80	3,50	5,50 a	7,89
P2	2,46	4,16	6,41 ab	8,33
BNT5%	tn	tn	tn	tn

Note: Numbers accompanied by the same letters do not indicate significant difference. Real on 5% BNT Test.

In table 4 it can be seen that Nitrogen fertilizer (N3 9.07) at the observation age of 40 days after planting (DAP) produced a greater number of branches compared to N1 and N2. For The highest dose of Phosphor fertilizer treatment was achieved at (P2 8.33) at an observation age of 40 days after planting (DAP).

The results of the statistical analysis of the number of branches did not show any interaction between the Nitrogen fertilizer dose treatment and the Phosphor fertilizer, but separately the Nitrogen fertilizer dose treatment had a significant effect on the number of branches at the age of 30 days after planting (DAP), in the phosphor fertilizer dose treatment there was no significant difference, but there was a tendency for the P2 phosphorus fertilizer side to have the largest number of branches compared to other phosphor fertilizer dose treatments.

Based on the results of the analysis of variance, it can be seen that the combination of Nitrogen and Phosphor fertilizer doses shows an interaction with plant height parameters at the age of 10, 20 30, days after planting (DAP) and the number of leaves at the observation age of 10, 30, 40 days after planting but on the number of branches only at the age of 10 days after planting. The interaction between the dose of Nitrogen fertilizer and the dose of Phosphor fertilizer on plant height, number of leaves and number of branches at that age is because the nutrients contained in Nitrogen and Phosphor fertilizers are available to plants and are able to increase plant growth. Because Nitrogen fertilizer contains very important macro nutrients that are needed for growth.

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Sutejo (2002) stated that N nutrient is one of the nutrients that are needed by plants, to support plant growth and development and its needs are needed in large quantities. This is supported by the opinion of Lingga (2012) that with proper and correct fertilization it will be able to help in providing nutrients continuously so that plants grow shoots faster. Separately, the treatment of Nitrogen fertilizer doses has a significant effect on the variable number of leaves. While the treatment of phosphor fertilizer doses has a significant effect on the variables of plant height, number of leaves and number of branches.

4. CONCLUSION

Based on the results of the study, it can be concluded that there is a real interaction between the combination of Nitrogen and Phosphor treatments on the observation of Plant Height. The treatment of the right (highest) dose of Nitrogen fertilizer is shown by the N3 treatment and is significantly different from the N1 and N2 treatments on the parameters of plant height, number of leaves and number of branches. The treatment of the right (highest) dose of Phosphor fertilizer is shown by the P2 treatment and is significantly different from the P1 treatment on the parameters of plant height, number of leaves and number of branches.

REFERENCES

Badriyah, L., Algafari, B., & Maggara. (2015). Determination of Vitamin C Levels in Red Chilies (*Capsicum Annuum* L,) Using the Uv-Vis Spectrophotometry Method. Wiyata. 2(1): 26- 28.

Dwicaksono, Marsetyo RB, Bambang S, And Liliya DS. (2014). The Effect of Adding Effective Microorganisms in Liquid Waste from the Fisheries Industry on the Quality of Organic Liquid Fertilizer. Journal of Natural Resources & Environment 1(1): 7–11.

Iri WO, Nurmas A, Arief N, Muh LO, Kilowasid H, Arsyad MA and Madiki A. (2023). Response Growth and Production of Chili Plants (*Capsicum annuum* L.) Given Liquid Organic Fertilizer of Gamal Leaves with Different Doses. Agroteknos Journal. 13 (2): 56-63

Sari, I. P., Hidayati, S., Ali, M., & Purwanti, S. (2020). Application of Urban Waste Organic Fertilizer on the Growth of Mustard Plants (Brassica Juncea L.). *Agricultural Science*, *4*(1), 74–84.

Lingga, P and Marsono. (2012). Instructions for Using Fertilizer. Penebar Swadaya, Jakarta.

Rao, S. (1994). Soil Microorganisms and Plant Growth (Second Edition). University Indonesia, Jakarta.

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https://agriculturalscience.unmerbaya.ac.id/index.php/agriscience/index

Syarbiah, S. (2019). Efficiency of Use of Fertilizer Production Factors in Chili Plants in the Village Linonggasai, West Wonggeduku District, Konawe Regency. Close Champion. 4(2): 107-122.

Warisno & Dahana K. (2010). Business Opportunities and Chili Cultivation. PT Gramedia Pustaka Utama. Jakarta

DOI: https://doi.org/10.55173/agriscience.v8i1.150