



Effect of Npk Dosage and Type of Ameliorant on Growth and Yield of Large Red Chili Plants (*Capsicum annum L*)

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Abstract

This study aims to study the interaction between NPK doses and types of ameliorant on the growth and yield of red chili plants and to obtain the optimum dose of NPK for each type of ameliorant that gives maximum yield of red chili. The experiment was conducted in the experimental garden of Padjadjaran University, Jatinangor District, Sumedang Regency from September to December 2021. The method used in this study was verification with an experimental approach using the Split Plot Design (SPD) consisting of two treatment factors. The first factor as the main plot was pearl NPK Fertilizer (N) which consisted of 3 treatment levels namely n1 (5 g L⁻¹), n2 (7.5 g L⁻¹), and n3 (10 g L⁻¹). The second factor was the type of ameliorant (P) as a subplot consisting of 3 treatment levels, namely p0 (without ameliorant), p1 (amelioran 4 tons Ha⁻¹), p2 (bioamelioran 4 tons Ha⁻¹) so that there were 9 combinations of treatments each in repeat 3 times. There was an interaction between NPK dose and type of ameliorant on growth (plant height, number of leaves, stem diameter 3 and 4 WAP, root length 5 WAP and root decay ratio) and yield of chili plants (fruit weight per plant).

Keywords: Chile, NPK, Amelioran, Bioamelioran

1. Introduction

Red chilies (*Capsicum annum L.*) are one of the agricultural commodities needed in everyday life. The compounds contained in chili include: kapsaikin, flavenoids, capsicidin, capsicol, and essential oils. Chili is also one of the important horticultural commodities in Indonesia Indonesia which cannot be separated from the daily needs of the house household without paying attention to social level, where the need for chilies continues to increase every year in line with the increase in population and the development of industries that require chili raw materials (Astuti et al., 2016). Efforts to maintain chili plant production are by paying attention to factors that influence plant growth such as seed preparation, land processing, fertilization, maintenance, controlling plant pest organisms until harvest. One of the factors that is usually the most important to pay attention to is fertilization to fulfill nutritional requirements according to plant needs. Providing nutrition is usually done through fertilization using organic or inorganic fertilizers. The combination of NPK dosage and ameliorant type is expected to have an influence on plant growth and improve soil quality.

2. Methods

The method used in this research is verification so that experiments are carried out in the field. The experiment was carried out in the experimental garden of the Faculty of Agriculture, Padjadjaran University, Jatinangor District, Sumedang Regency from September to November 2022. The materials used in this experiment were crown seeds of the Smooth Cayenne variety pineapple, the materials used in this experiment were red chili seeds of the Lingga variety, fertilizer Pearl NPK 16:16:16, ameliorant and bioameliorant, husk charcoal. The equipment used is tray, hoe, mulch, measuring cup, bamboo stake,



machete, meter, bucket, emrat, stationery, plastic and digital scales, raffia, ruler, digital caliper. The research was carried out using an experimental approach using a Split Plot Design (RPT) pattern or also called Split Plot Design (SPD) consisting of two treatment factors. The first factor as the main plot is NPK pearl fertilizer (N) which consists of 3 treatment levels, the second factor is the type of ameliorant (P) as a subplot consisting of 3 treatment levels so that there are 9 treatment combinations, each repeated 3 times, $3 \times 3 \times 3 = 27$. Each plant plot consists of 6 plants. The plants used as sample plants were 3 sample plants.

Table 1. Variable Operationalization

Variable type	Variable concept	Variable indicators
NPK dosage	Nutrients are used in all processes that support plant life	n1= 5 g L-1 n2= 7.5 g L-1 n3= 10 g L-1
Jneis amelioran	Nutrients and soil improvers that come from natural materials are used to support plant life	p0= Control p1= Ameliorant 4 tons Ha-1 p2= Bioameliorant 4 tons Ha-1
Growth	Plant growth is the result of a complex interaction between internal factors (genetic traits/heredity, hormones, enzymes) and external factors (climate, soil water and nutrients).	1. Plant height 2. Number of leaves 3. Stem diameter 4. Root length 5. Plant wet weight 6. Plant dry weight 7. Root loss ratio (NPA)
Result components	The part of the plant that influences the size of the plant yield and the final resultant of all physiological processes during the plant growth phase or period	8. Weight per fruit 9. Fruit length 10. Fruit weight per plant

Table 2. Combination of Organic Fertilizer and NPK Dosage Treatment

NPK (N)	Organic Fertilizer (P)		
	p0 = Control	p1= ameliorant 4 tons Ha-1 -1	p2= bioameliorant 4 tons Ha-1
n1= 5 g L-1	n1p0	n1p1	n1p2
n2= 7.5 g L	n2p0	n2p1	n2p2
n3= 10 g L-1	n3p0	n3p1	n3p2

Table 3. Variety Analysis List

Variety sources	DB	JK	KT	Fh	F0.05
Test	2	JKu	JKu/DBu	KTu/KTGn	
N (NPK)	2	JKn	JKp/DBn	KTP/KTGn	
Error (n)	4	JKG (n)	JKg(n)/DBG(n)	KTg/KTGg	
P (organic)	2	JKp	JKp/DBp	KTN/KTGp	
P x N	4	JK (PN)	JKnp/DBnp	KTNp/KTGnp	
Error (p)	12	JKG (p)	JKGn/DBGn		
Total	26	JK tot			

Source: Paiman (2015).

3. Results and Discussion

3.1 Observation of Plant Height

The results of plant height analysis showed that there was an interaction between the NPK dosage treatment and the type of ameliorant on chili plant height at 3 WAP.

Table 4. Effect of NPK dosage and type of ameliorant on plant height at 3 WAP

Treatment	Plant height 3 WAP		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1= 5 g L-1	12.83a A	19.44b B	9.29a A

n2= 7.5 g L-1	14.79a A	16.89ab A	17.84b A
n3= 10 g L-1	15.78a A	14.22a A	17.00b A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

3.2 Observation of Number of Leaves

The results of the analysis of the number of leaves showed that there was an interaction between the treatment dose of NPK and the type of ameliorant on the number of chili leaves at 3 WAP.

Table 5.Effect of NPK Dosage and Type of Ameliorant on Number of Leaves 3 WAP

Treatment	Number of Leaves 3 WAP		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1 = 5 g L-1	7.44a A	10.78b B	6.58a A
n2 = 7.5 g L-1	11.11b A	10.56ab A	11.22b A
n3 = 10 g L-1	10.44b A	8.56a A	9.89b A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

3.3 Stem Diameter Observation

The results of the stem diameter analysis showed that there was an interaction between the treatment dose of NPK and the type of ameliorant on the stem diameter of chili plants at 3 WAP and 4 WAP.

Table 6.Effect of NPK Dosage and Type of Ameliorant on Stem Diameter at 3 WAP

Treatment	Stem diameter 3 MST		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1 = 5 g L-1	2.02ab A	2.23a A	2.12a A
n2 = 7.5 g L-1	2.49b A	2.28a A	2.28a A
n3 = 10 g L-1	1.79a A	2.08a A	2.08a A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

Table 7.Effect of NPK dosage and type of ameliorant on stem diameter at 4 WAP

Treatment	Stem diameter 4 MST		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1 = 5 g L-1	2.94444a A	3.78889a A	2.39167a A
n2 = 7.5 g L-1	2.86667a A	3.40a A	5.52222b B
n3 = 10 g L-1	3.31111a A	3.08889a A	2.66667a A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

3.4 Root Length Observation

The results of the root length analysis showed that there was an interaction between the treatment dose of NPK and the type of ameliorant on the root length of chili plants at 5 WAP.

Table 8. Effect of NPK Dosage and Type of Ameliorant on Root Length at 5 WAP

Treatment	Root Length 5 WAP		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1 = 5 g L-1	34.33a B	26.57a B	11.43a A
n2 = 7.5 g L-1	28.30a A	28.87a A	32.23b A
n3 = 10 g L-1	24.77a AB	30.93a B	20.17a A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

3.5 Observation of Root Loss Ratio

The results of the analysis of the root decay ratio showed that there was an interaction between the treatment dose of NPK and the type of ameliorant on the plant root decay ratio.

Table 9. Effect of NPK Dosage and Type of Ameliorant on Root Pudding Ratio

Treatment	Number of Leaves 5 WAP		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1 = 5 g L-1	2.18a A	4.22b B	2.02a A
n2 = 7.5 g L-1	3.63b A	5.52c B	3.99b A
n3 = 10 g L-1	4.485c B	2.15a A	2.15a A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

3.6 Observation of fruit weight per plant

The results of the analysis of fruit weight per plant showed that there was an interaction between the treatment dose of NPK and the type of ameliorant on the weight of chili fruit.

Table 10. Effect of NPK dosage and type of ameliorant on fruit weight per plant

Treatment	Fruit weight per plant		
	p0 = control	p1 = ameliorant 4 tons Ha-1	p2 = bioameliorant 4 tons Ha-1
n1 = 5 g L-1	292.581a A	453.031ab C	297.091a B
n2 = 7.5 g L-1	401.626b A	465.536b A	407.222b A
n3 = 10 g L-1	409.584b A	371.383a A	415.122b A

Note: The average number followed by a lowercase letter in the vertical direction and a capital letter in the horizontal direction with the same letter indicates that it is not significantly different according to the Least Significant Difference (BNT) test at the 5% level.

3.7 Optimum dose of NPK for each type of ameliorant that gives the highest fruit weight value

Based on the results of quadratic regression analysis, it shows that there is an interaction between the NPK dose and the type of ameliorant.

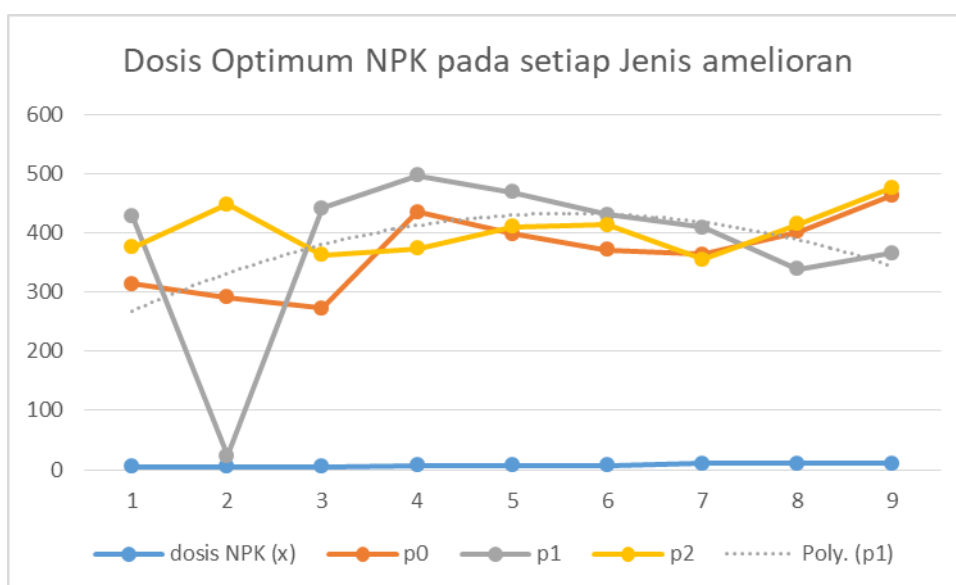


Figure 1. Regression curve of the optimum dose of NPK for each type of ameliorant on the highest fruit weight per plant

4. Conclusion

There was an interaction between the NPK dose and the type of ameliorant on growth (plant height, number of leaves, stem diameter 3 and 4 WAP, root length % WAP and root drop ratio) and chili plant yield (fruit weight per plant). The optimum NPK dose at p0 is 8.94 g L⁻¹ giving an optimum value of 358.53 grams per plant, p1 is 7.85 g L⁻¹ with a weight per plant of 468,172, p2 is 5.43 g L⁻¹ with an optimum weight of 395,268 grams per plant. Giving NPK and ameliorant types has a real effect on chili plants, but experiments need to be carried out in the same place with different plants or in different places with similar and different plants. The use of NPK in combination with soil amendments, in this case the ameliorant type, needs to be applied to overcome soil damage and obtain optimal results.

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