The Effect Of Npk 16 16 16 Fertilizer And Time Of Application On The Growth Of Red Chili Plants In Afdeling 2 Plantation, West Bilah District, Labuhanbatu Regency

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Abstract.
The need for curly red chili plants for nutrients can be met with appropriate fertilization according to the needs of the plant itself, fertilization aims to improve plant fertility to plant growth. The purpose of this study was to determine the effect of npk16-16-16 fertilizer and application time on red chili plant growth. . The research was conducted in Afdeling 2 plantation area, West Bila Subdistrict, Labuhanbatu Regency. This research was carried out from October 2021 to February 2022. The design used in this study was a randomized block design (RAK) and used a 3x3 factorial consisting of 2 factors. The first factor was the application of NPK 16 16 16 fertilizer with 3 levels, P1: a dose of 3 g/plant, P2: a dose of 6 g/plant, P3: a dose of 9 g/plant. The second factor is the application time of NPK 16-16-16 fertilizer with 3 levels, K1: once a week, K2: once every 2 weeks, K3: once every 3 weeks. Observational data were analyzed with a 5% level of variance to determine whether there was a significant difference between treatments. Followed by Duncan's New Multiple Range Test (DMRT) level 5% if there is a significant difference in each treatment. The results showed that the treatment at a dose of 9 g/plant gave a good trend in plant height growth. while the dose of 6 g/plant gave a tendency of good yields in all yields and several observations of the growth of flowering age and leaf area.

Keywords: *Red Chili, 16-16-16 NPK Fertilizer, Application Time, Horticulture, Growth*

I. INTRODUCTION

Red chili (Capsicum annum L.) is one of the important commodities known as a flavoring and complement to Indonesian cuisine. The need for chili increases in line with the increasing variety of types and menus of dishes that use red chili, Indonesian people also really like this one vegetable (Barus, 2006).Chili or lombok is included in the eggplant tribe (Solanaceae) and is a plant that is easily grown in the lowlands or in the highlands. Chili plants contain lots of vitamin A and vitamin C and contain capsaicin essential oil, which causes a spicy taste and provides warmth when used for spices (kitchen spices). Chili can be planted easily so that it can be used for daily needs without having to buy it in the market (Wahyudi, 2019) Indonesia as an agricultural country relies on the agricultural sector as a sector that plays an important role in supporting the national economy. The development of the agricultural sector, especially in the horticultural crop sector, is a very prospective sector to be developed, the need for the domestic market for horticultural crops is very high. One of the horticultural crops in Indonesia is red chili (Capsicum annuum L.) (Hayati et al., 2012) Curly chili is one of the important types of vegetables that are cultivated commercially in tropical countries. only Capsicum annuum L. and C. frutescens L. have huge economic potential (Sulandari, 2001).Curly red chili (Capsicum annum l.) has a smaller size than other red chilies. However, the taste is spicier and the aroma is sharper. The physical form is winding so it is called curly chili. Curly red chili plants can grow in the lowlands and highlands and also curly red chili plants are suitable for planting on loose and not waterlogged soil with an ideal soil pH of around 5-6 (Setiadi, 2002). In this case, vegetables and red chili are needed daily by the community as a kitchen spice, red chili has a spicy taste and contains a lot of vitamin C.

Many factors can cause chili prices to fluctuate, including the habit of farmers growing chilies following the pattern of the growing season so that supplies to the market are not continuous (Hapsoh,

2017).The decline in red chili production is due to the low knowledge of young people today about chili plants. Young people now do not know how to apply the correct cultivation techniques and have not provided balanced fertilization, improving the condition of the land for red chili cultivation which can be done through increasing soil fertility with balanced phonska fertilization. The effect of dosage and application must be considered in increasing growth in curly red chili production. According to (Murwito, et al. 2010) fertilization provides a very broad contribution in increasing production and product quality. There are many types of fertilizers used in chili plants. Inorganic fertilizer is one that is widely used in chili plants, namely NPK Mutiara fertilizer.Several types of diseases that predominantly attack chili are anthracnose, bacterial wilt and viruses. Jaundice, downy mildew and dwarf disease caused by the gemini virus are the main diseases that cause low chili productivity in South Sumatra (Rachmah, 2015). In addition to the problem of pests and diseases, chili plants also affect crop production, namely soil fertility. According to (Nugraha, 2013), one of the factors that must be considered in soil fertility in good growth and high yields is to want soil that is fertile, loose, contains sufficient nutrients and has good aeration and drainage. both organic and inorganic According to (Samekto, 2006), fertilization is the application of fertilizer to increase the supply of nutrients needed by plants to increase production and quality of crop yields. NPK fertilizer is a type of compound fertilizer containing more than one nutrient which is used to increase soil fertility. Compound fertilizers that are often used are NPK fertilizers because they contain compounds of ammonium nitrate (NH4NO3), ammonium dihydrogen phosphate (NH4H2PO4), and potassium chloride (KCl). According to (Saribun, 2008), the use of NPK fertilizer is expected to provide convenience in its application in the field and can increase the content of nutrients needed in the soil and can be used directly by plants. In line with the opinion (Sutedjo, 2002) that the application of inorganic fertilizers into the soil can increase the availability of nutrients quickly for plants. The elements in NPK fertilizer are expected to be easily absorbed by plant roots and will be able to meet the nutritional needs of cultivated plants so that chili plant production increases.

Fertilizing red chili plants in the right and balanced and efficient former land is basically giving fertilizer in various types and forms according to the needs of the plant, in the right way according to the needs and in accordance with the vegetative and generative phases of the red chili plant. (Kusnadi, 2019). Excessive application of fertilizers can affect the soil and soil media to become acidic so that the texture tends to be harder and not friable and is a waste, can disrupt the balance of nutrients in the soil and can pollute the environment. Fertilization of Npk Mutiara16-16-16 on curly red chili plants can stimulate fruit and candidate growth in chili plants. And this fertilizer is recommended for plants aged 30 to 50 days (Elizabeth, 2014). Chili plants require manure 20 tons/ha and NPK Mutiara 16:16:16 between 200-250 kg/ha which are given in the first week after planting in a ditugal way (Modification of Balittra, 2015). NPK fertilizer is a compound fertilizer containing more than one nutrient which has a function to meet the nutritional needs of plant growth and development. Phosphorus (P) has an important role in plant physiological processes (photosynthesis and plant respiration), energy transfer, constituent of nucleic acids, fitins and phospholipids. While the nutrient potassium (K) functions as an enzyme activator. Adequacy of potassium causes plants to grow healthy and strong, more resistant to pests and diseases (Ma'shum, 2005). The need for curly red chili plants for nutrients can be met with proper fertilization according to the needs of the plant itself, where fertilization aims to improve plant fertility to the growth of the plant itself, the most important nutrients that must be added to the soil are Nitrogen, Phosphorus and Potassium. This is because these three nutrients are needed by plants in large quantities and their availability in the soil in limited quantities, this slows the release of nitrogen from fertilizers and can reduce environmental pollution because nitrogen in the form of nitrate that enters the waters is one source of water pollution. Darmono, 2009). The purpose of this study was to determine the effect of npk16-16-16 fertilizer and application time on the growth of red chili plants

II. RESEARCH METHODS

Time and place

This research was carried out on plantation land Afdeling 2, Bila Barat sub-district, Rantauprapat, Labuhanbatu Regency. This research was carried out from October 2021 to February 2022. The research area is one of the places where farmers apply the use of NPK 16-16-16 fertilizer on chili growing media.

Tools and Materials

The materials used in this study were patent chili seeds, compost and NPK16-16-16 fertilizer (phonska and pearls). The tools used for this research are polybags, hoe, scissors, ballpoint pen, marker, ruler, meter, marker, raffia rope, water hose, gembor, analytical scale, bucket or bucket, digital camera

Research design

The design used in this study to process data in this experiment was a completely randomized block design (CRD) and used a 3x3 factorial consisting of 2 factors. The first factor is the application of NPK 16-16-16 fertilizer with 3 levels, namely: P1: dose of 3 g/plant, P2: dose of 6 g/plant, P3: dose of 9 g/plant. The second factor is the application time of NPK 16-16-16 fertilizer with 3 levels, namely: K1: once a week, K2: once every 2 weeks, K3: once every 3 weeks. The total of all combinations was 9 and added 1 control, each combination was repeated 3 times so that 30 treatment plots/beds were needed, each bed consisted of 10 plants. So the total of all plants is 300 plants

Data analysis

Observational data were analyzed with a 5% level of variance to determine whether there was a significant difference between treatments. Followed by Duncan's New Multiple Range Test (DMRT) level 5% if there is a significant difference in each treatment. Observations were made at the age of 0, 3, 6, 9, and 12 weeks after planting (MST), on plant height (cm), leaf area (cm2), flowering age (HST), number of chilies planted (fruit).

III. RESULTS AND DISCUSSION

Red chili plant height (cm)

Table 1. Average Plant Height at various doses of NPK 16-16-16 fertilizer and application time (cm)

	Waktu pengamatan (HST)				
Perlakuan	**0**	**3 (MST)**	**6 (MST)**	**9 (MST)**	**12 (MST)**
Dosis pupuk NPK (g/tanaman)					
3 g/tanaman	13,30 a	20,77 a	30,71 a	67,68 a	77,35 a
6 g/tanaman	12,60 a	20,80 a	30,95 a	69,20 a	78,85 a
9 g/tanaman	13,05 a	21,10 a	31,70 a	69,70 a	78,90 a
		Waktu aplikasi (minggu)			
1 minggu	13,10 b	21,40 b	32,90 b	71, 87 b	81,00 b
2 minggu	12,95 b	21,15 b	30,80 b	68,65 b	79,40 b
3 minggu	12,90 b	20,10 b	29,70 b	66,11 b	74,75 b
Interaksi	(-)	(-)	(-)	(-)	(-)
Perlakuan	12,99 x	20,90 x	31,35 x	68,85 x	78,37 x
Kontrol	13,45 x	20,35 x	30,60 x	61,70 x	71,05 x

Note: The mean number followed by the same letter in the column and row shows that there is no significant difference between treatments based on the DMRT test at 5% level.

(-) : No interaction

Based on Table 1. the results of the analysis of variance of DMRT at 5% level above show that there is no interaction between the treatment of various doses of fertilizer and the time of application of NPK fertilizer. The treatment of various doses of NPK fertilizer did not significantly affect the plant height of red chili plants, while the treatment time of application of NPK fertilizer had a significant effect on the height of red chili plants.

Leaf area of red chili (cm)

Based on the results of analysis of variance, there was no interaction between the treatment of various doses of fertilizer and the time of application of NPK fertilizer. The treatment of various doses of NPK fertilizer had no significant effect on leaf area, as well as the time of application of fertilizer on leaf area. The average leaf area can be seen in Table 2.

Flowering age (days)

The results of analysis of variance showed that there was no interaction between the treatment of various doses of fertilizer and the time of application of NPK fertilizer. Treatment with various doses of NPK fertilizer had no significant effect on flowering age, as well as the time of application of fertilizer on flowering age. The average flowering age can be seen in Table 3. Below

Table 2.Average leaf area of red chili plants at various doses of NPK 16-16-16 fertilizer and application time (cm)

Waktu pengamatan (HST)					
Perlakuan	**0**	**3 (MST)**	**6 (MST)**	**9 (MST)**	**12 (MST)**
Dosis pupuk NPK (g/tanaman)					
3 g/tanaman	4,50 a	10,05 a	18,10 a	31,75 a	34,10 a
6 g/tanaman	4,65 a	8,40 a	17,50 a	32,98 a	36,25 a
9 g/tanaman	4,15 a	9,15 a	18,00 a	33,65 a	35,25 a
Waktu aplikasi (minggu)					
1 minggu	4,80 b	10,30 b	18,90 b	33,90 b	36,60 b
2 minggu	4,45 b	9,42 b	17,80 b	33,05 b	36,10 b
3 minggu	4,05 b	7,92 b	16,91 b	31,40 b	32,85 b
Interaksi	(-)	(-)	(-)	(-)	(-)
Perlakuan	4,45 x	9,20 x	17,87 x	32,80 x	35,19 x
Kontrol	4,43 x	8,20 x	14,30 x	25,85 x	29,75 x

Note: The mean number followed by the same letter in the column and row shows that there is no significant difference between treatments based on the DMRT test at the 5% level of significance.

(-): No interaction

Tabel 3. Rata-rata umur berbunga tanaman cabai merah pada berbagai dosis pupuk NPK 16-16-16 dan waktu aplikasi

Waktu aplikasi (minggu)	**Dosis pupuk NPK g/tanaman**			
	3	**6**	**9**	**Rata-rata**
1	7,20	7,65	7,65	7,50 b
2	5,70	7,35	7,00	6,68 b
3	5,30	6,00	5,67	5,65 b
Rata-rata	6,06 a	7,00 a	6,77 a	(-)
Perlakuan				6,50 x
Kontrol				4,40 x

Note: The mean number followed by the same letter in the column and row shows that there is no significant difference between treatments based on the DMRT test at the 5% level of significance.

(-): No interaction

Number of chili peppers (fruit)

Based on the results of analysis of variance, it showed that there was no interaction between treatments of various doses of fertilizer and the time of application of NPK fertilizer. The treatment of various doses of NPK fertilizer had no significant effect on the number of chilies planted, as well as the time

of application of fertilizer on the number of chilies planted. The average number of chilies planted can be seen in Table 6.

Tabel 4. Rata-rata jumlah cabai pertanaman pada berbagai dosis pupuk NPK 16-16-16 dan waktu aplikasi

Waktu aplikasi	**Dosis pupuk NPK g/tanaman**			
(minggu)	**3**	**6**	**9**	**Rata-rata**
1	25,35	24,80	22,30	24,15 b
2	22,70	26,40	24,30	24,46 b
3	22,25	22,24	21,57	22,03 b
Rata-rata	23,43 a	24,48 a	22,72 a	(-)
Perlakuan				23,55 x
Kontrol				21,25 x

Note: The mean number followed by the same letter in the column and row shows that there is no significant difference between treatments based on the 5% DMRT test.

(-) : No interaction

The application of various doses of fertilizer and various times of application of NPK fertilizer to red chili plants showed significant differences at plant heights of 6, 9, and 12 WAP. Different doses of fertilizer for each plant can affect the vegetative growth of different plants. This shows that NPK fertilizers can increase plant growth, especially plant height, presumably because of the role of N, P and K fertilizers which can stimulate plant vegetative growth.The growth phases that showed no significant difference were the parameters of leaf area, flowering age, plant height, and the number of chili peppers planted. Allegedly environmental factors that affect the growth of red chili plants that affect the process of respiration, photosynthesis, and reproduction. Temperature is a factor that affects growth and development. Temperature is positively correlated with solar radiation, high and low temperatures are factors that determine growth and development, reproduction, and also the survival of plants. (Wiraatmaja, 2017)

Another factor besides temperature that affects plant growth and development at the research site is the intensity of rainfall which is still high enough to cause leaching of nutrients in the soil and fertilizers applied to plants, thus affecting plant growth and yield. its effect on crop production is quite significant. Similar to the conditions at the research site where rainfall fluctuates are still quite high, so that nutrients in the soil are carried away by rainwater and cannot be absorbed by roots optimally, thus affecting the growth and production of plants (Asis, 2017). Sunlight affects plant growth through the length of irradiation (day length), also affects plant flowering through three factors, namely quality, intensity and photoperiodism. Indonesia is a country with a tropical climate, so the length of day and night is almost the same, namely the length of irradiation reaches 12 hours (Sutoyo, 2011).

IV. CONCLUSION

Based on the results of the analysis and discussion in this study, some conclusions can be drawn as follows:

1. Treatment with a dose of 9 g/plant gave a tendency to good yields on the variable plant height growth. while the dose of 6 g/plant gave a tendency of good yields on all yield variables and several observations of the growth variables of flowering age and leaf area.
2. The treatment time of application every 1 week gave a tendency of good results in observing plant height, flowering age, and leaf area, while the time of application every 2 weeks gave a tendency for good results in observing the number of chilies planted.
3. There is no interaction between the treatment of giving various doses and time of application of NPK 16:16:16 fertilizer on the growth and yield of red chili plants in the research area located in the Afdeling 2 plantation.

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