Optimization of Potassium Sulfate (K_2SO_4) Against Disease and Results curly leaf varieties Red Chili (*Capsicum annuum* L.)

Muhammad Al qamari
Program Studi Agroekoteknologi Fakultas Pertanian UMSU
Email : alqamari@umsu.ac.id

Abstract.
This research was conducted in the experimental field of the Faculty of Agriculture, University of Muhammadiyah North Sumatra with a height of ± 27 meters above sea level carried out in July to November 2012. This study aims to determine the best dose and frequency of K_2SO_4 to support the yield of red chili varieties. Doses of K_2SO_4 used: 0, 1.5, 3, 4.5 g / liter and frequency of administration of K_2SO_4 6, 9, 12 times the administration during planting. This study uses a divided factor design (RPT) with two factors designed, the first child plots factor is the temporary factor the second factor with the main plot of chili varieties with 3 replications. The results showed the fact that the application of K_2SO_4 to critical leaf disease binds significantly to variety and the dose and frequency of K_2SO_4 as well as to significantly affect plant height, and weight of perplot fruit. The average treatment of plants attacked by most leaf criticism for each variety was in the application of potassium sulfate (K_2SO_4) with an average percentage of attacks of 77.07%. In each variation the average plant was attacked by the least leaf criting in the application of potassium sulfate (K_2SO_4) at a concentration of 4.5 gr / liter and the frequency of administration 12 times in high plants of chilli plants at K9 dose (4.5 g / l air) had plant height is higher than with other doses. the highest weight of plot plots in Landung varieties, the highest fruit weight at 4th harvest was 2903.19 g, from the table it can be seen that according to the 5th harvest the crop fruit weight increased, whereas in TM 999 varieties and Lado the fruit weight per crop experienced an increase from harvest 1 to 5
Keywords: K_2SO_4, dose, variety, frequency

A. PRELIMINARY

Red chili pepper (Capsicum annuum) is a horticultural crop which is quite important in Indonesia and is one type of fruit vegetables that have pontesi to be developed because the demand is high, especially in tropical countries which be eaten be fresh or dried (Hariyantini and Santoso, 2001; Sarker and Fazlur (2003)

Needs red chili from year to year even more increases with the increase in population and the development of a wide range of food industries that require raw materials chili (Sumarni and Rosliani 2001) such as flour chili and sauces as well as the pharmaceutical industry, the chili is one commodity exports are still pontensial but the chili production was still not sufficient, even productivity is still very likely to be developed. Chilli production in Indonesia is still low (3.5 ton/ ha) compared to Malaysia (12 tons/ha).

One of the main causes of low production of chilli in the country is the vulnerability of this plant to flower and fruit fall prematurely and pests and diseases. Based on the research report, only 52.6% success rate into pieces where 500 flower is formed only 263 flowers become fruit (Haryantini and Santoso, 2001; Setiadi, 2005).

The main function of potassium (K) is to assist the formation of protein and carbohydrates. Potassium also plays a role in strengthening the body so that the leaves of plants, flowers, and fruit is not easily fall as well as resistance to pests (Lingga and Marsono, 2004).

The purpose of this study K_2SO_4 To determine the effect on disease resistance curly leaf and red chili results.

B. MATERIALS AND METHODS

Place and time

The research was conducted in field trials in Jalan Tuar UMSU, district of Medan Sandpaper with altitude ± 27 meters above sea level. This study will be conducted in July to November 2012. The materials used in this study are: chili seeds, cow manure, calcium sulphate, silver black plastic mulch, polybag, bamboo, fungsida and insecticides. The tools used in this research are: hoes, machetes, yells, handsprayer, scales, board sample plot, meter, calculator and stationery.

Research methods

This study was conducted using Grid Design Divided (RPT) with two factors studied, namely: The concentration factor K_2SO_4 as a subplot with 3 levels of treatment are: K0 = 0; K1 =1.5 g / liter of frequency 6 x during the growing season; K2 =1.5 g / liter of frequency 9 x during the growing season; K3 = 1.5 g / liter of a frequency of 12 x during the growing season; K4 = 3 g / liter of frequency 6 x during the growing season; K5 = 3 g / liter of frequency 9 x during the growing season; K6 = 3 g / liter of a frequency of 12 x during the growing season; K7 = 4.5 g / liter frequency 6 x during the growing season; K8 = 4.5 g / liter frequency 9 x during the growing season; K9 = 4.5 g / liter frequency of 12 x during the growing season. While the varieties as main plot factor with three (3) the standard of treatment that is: V1 = TM 999; V2 = Lado; V3 = Landung

Of the two factors were obtained 30 plots combination treatment where each treatment was repeated three (3) times in order to obtain 90 (ninety) units that each unit terdiari trial of eight (8) plants so that the total population of this plant is 810 plants. At each study unit 3 (three) plants as a sample.

Implementation research. Land used measured with a land area of 50 x 12 m. Nurseries and nursery held within polybag sized 8x12 cm and placed in the nursery building keseluruannya covered with gauze. The upper part was given or sago palm leaves to protect the plant from excessive sunlight, exposure to rainwater .Areal seedbed sprayed with insecticides and fungicides, before planted, chilli seeds soaked first in warm water (50 ^{0}C) for 1 (one) hour for eliminating pests and attached to the disease and speed up the germination of seeds. even more the research plots carried out after tillage. Research plot size is 280 cm long and 120 cm wide with the number of plots 30 plots / replay. Number of replicates as much as 3, the distance between replications of 100 cm, and the distance between the plot of 50 cm. Planting hole made by punching holes in the plastic mulch using tin cans of milk infused with charcoal that had been burned with a spacing of 70 cm x 50 cm. After the seeds are 18 days old, they are ready to be planted in the field. Planted seedlings have been selected with the main criteria for growth uniformity both

height and number of leaves. The move was made in the afternoon starting at 15:00 pm to avoid evaporation is high. The parameters observed in this research, the percentage of plants attacked curly leaf (%), plant height (cm) and weight make perplot (g)

C. RESULTS AND DISCUSSION

Pesentase Curly leaf (%)

Mean curly leaves of some varieties of chili with potassium sulphate treatment Application (K_2SO_4) listed in Table 1.

Table 1. curly leaves of three varieties of red pepper with application of potassium sulfate ((K_2SO_4) (%)

	varieties			
Treatment	V1	V2	V3	the average
K0	66,22a	76,11a	88,89a	77.07
K1	61,00b	69,89b	84,44a	71.78
K2	52,56c	61,11b	70,00b	61.22
K3	52,33c	42,22c	56,67c	50.41
K4	45,56d	26,67d	44,44d	38.89
K5	35,56d	14,33e	30,00d	26.63
K6	20,00e	8,78e	28,89e	19.22
K7	13,22e	8,89e	24,33f	15.48
K8	8,78f	4,44f	16,67g	9.96
K9	1,11f	3,33f	15,67g	6.70
Mean	35.63	31.58	46.00	37.74

Description: The figure followed by the same letter in the same column no real effect on the level DMRT 0:05.

In Table 1 can be seen on the average infected plants curly leaf varieties most in any application contained in without potassium sulfate (K_2SO_4) with the average - average percentage of 77.07% attack. At each variety were infected plants curly leaf averaging the fewest on the application of potassium sulphate (K_2SO_4) in the treatment of 4.5 g / liter and the frequency of 12 times (K9) with the average - average percentage of 6.70% searangan on each variety. According Imas (1999) potash plant required for a variety of

physiological functions, including metabolism therein is karbohihidrat, enzyme activity, osmotic regulation, water use efficiency, nitrogen uptake, protein synthesis, and assimilates translocation. Potassium also has a role in binding resistance to certain plant diseases and improving the quality of crop yields.

Histogram between infected plants curly leaves with (K_2SO_4) application can be seen in Figure 1.

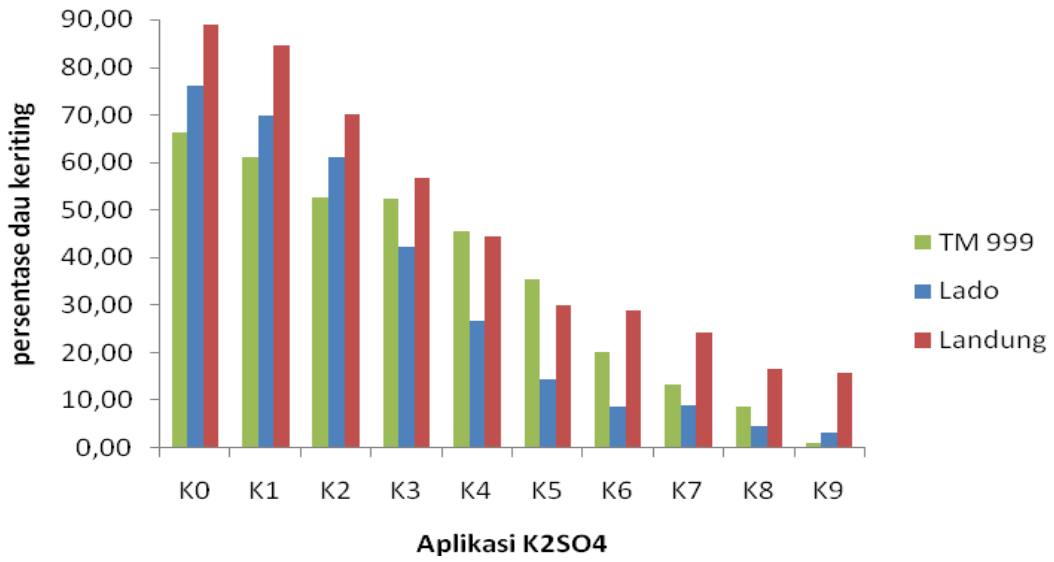

Figure 1. Histogram between curly leaf infected plants with application K_2SO_4 **Plant heigh (cm)**

From Figure 1 memperlihatakan Award (K_2SO_4) percentage curly leaves on infected plants K9 dose (4.5 g / l of water) has affected the level of curly leaf fewest from those of other doses.

High average of varieties of chili with dose treatment with potassium frequency shown in Table 2.

The results in Table 2 shows the differences in the response of each varieties of chili with dosage and frequency of K_2SO_4. Each variety has a different adaptation to the environment, both elements of the climate as well as to the growing medium. Each variety is composed of a number of different genotypes, each genotype have a certain ability to adapt to the environment in which it grows.

Table 2. High Three varieties of red chili with treatment concentration and frequency of K_2SO_4 at the age of 12 MST (cm)

Treatment	Varieties			
	TM 999 (V1)	Lado (V2)	Landung (V3)	Mean
K0	68.96e	56.78e	58.33c	61.36
K1	74.33c	66.11c	66.55b	69.00
K2	82.45c	67.22c	66.33b	72.00
K3	91.78cb	79.22ab	67.22b	79.41
K4	93.78cb	72.00b	74.56ab	80.11
K5	100.00ab	77.78ab	77.89a	85.22
K6	101.78ab	75.11b	79.11ab	85.33
K7	107.33a	81.22ab	77.44a	88.67
K8	110.78a	86.89a	73.56ab	90.41
K9	111.33a	89.89a	77.11a	92.78
Mean	94.25	75.22	71.81	80.43

Description: The figure followed by the same letter in the same column no real effect on the level DMRT 0:05.

In general, the highest average concentration of each variety are the treatment of 4.5 g/liter and the frequency of 12 times (K9). Potassium is a nutrient that is very necessary number three plants after N and P. The specialty of this nutrient compared to N and P are rare plants showing symptoms of deficiency or eksesis. High gain a better chili on K9 compared with eight treatment concentration and other K_2SO_4 frequencies thought to be caused by the plant gets enough K. It is known that protein synthesis in plants urgently need potassium. Proteins are the basic ingredients of the formation of new cells, so that the plant material sufficient discount to its growth (Marschner, 1995).

Histogram between plant height with K_2SO_4 application can be seen in Figure 2.

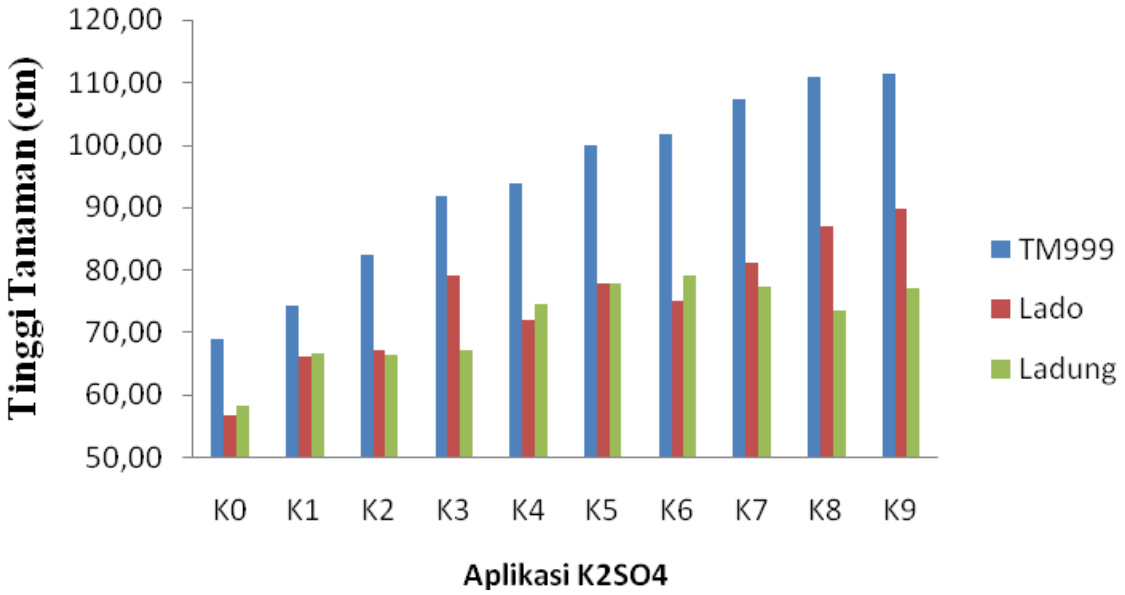

Figure 2. Histogram Plants High in red chili varieties with application K_2SO_4

Figure 2 shows the provision of high K_2SO_4 pepper dosing K9 (4.5 g / l of water) has the highest plant height is compared with other doses.

Fruit weight per plot (g)

The average weight of the fruit perplot several varieties of chili with frequency treatment with potassium concentrations shown in Table 2.

Effect of K_2SO_4 application perplot fruit weight ratio are presented in Table 2 above shows the weight of the largest varieties of fruit perplot Landung, the highest fruit weight at harvest to 4, namely 2903.19 g, of the table can be seen that the weight of the fruit crop planting 5 to decrease, whereas the TM 999 varieties of fruit crops and heavy Lado undergo an increase of harvest 1 to 5. This is due to the ability of plants to absorb nutrients is affected by the use of varieties. The use of superior varieties, the varieties will lead to high ability to absorb nutrients. This causes the plant to grow well. In addition, according to Apandi (1991), said polagenetik a standard dose that determines its potential to grow up in a favorable environment, so the low

ability of a variety to adapt to the environment will affect the reduction in productivity or the ability to produce.

Table 2. Weight of fruit perplot three varieties of red pepper K_2SO_4 at harvest applications to 1-5 (g)

Treatment	fruit weight per plot to-Harvest				
varieties	1	2	3	4	5
V1	444.90b	1252.18b	1765.40b	1837.40b	2711.00a
V2	800.43a	1417.93a	1759.09b	1954.12b	2442.77c
V3	472.17b	1156.03b	2651.83a	2903.19a	2587.59b
Concentration					
K0	356.11	580.29	967.07	689.73	535.51
K1	520.83	1038.21	1481.70	1083.48	929.70
K2	404.44	987.42	1756.58	1543.24	1529.02
K3	422.33	1295.98	2042.89	2207.93	1816.82
K4	574.92	1280.52	2271.58	2440.47	3084.47
K5	532.92	1247.21	2084.35	2351.01	3180.35
K6	647.09	1443.08	2685.49	3183.27	3528.97
K7	715.46	1617.87	2358.14	3041.58	3841.58
K8	731.10	1656.23	2425.42	2906.12	3679.45
K9	819.82	1606.98	2514.51	2868.89	3678.67

Description: The figure followed by the same letter in the same column no real effect on the level DMRT 0:05.

D. CONCLUSION

1. The use of wide varieties showed significant effect on the percentage of curly leaf, plant height, weight of fruit perplot.
2. Concentration and frequency K_2SO_4 showed a real effect on plant growth and production of good red chili on kesentrasi and frekuesi K_2SO_4 on providing 4.5 g / liter, a frequency of 12 x during the growing season.
3. Treatment concentration and frequency of calcium sulfate to control fertilizer effect on all treatments.

REFERENCES

Apandi. M, 1984. Fruit and Vegetable Technology. Alumni Bandung.

Imas, P, 1999. Integrated Nutrition Management in Potato. Paper Presented at the Global Conference on Potato, December 1999, New Delhi, India.

Haryatini, BA and Muji Santoso 2001. Growth and Yield of Hot Pepper (Capsicum annuum) in Andisol that DiberiMikrorza, Phosphorus Fertilizer and plant growth regulator. Biosain. 3: 50-7

Phallus, P and Marsono. 2002. Instructions for Use Fertilizer. Governmental spreader. Jakarta.

Marschner, H. 1986. Mineral Nutrient in Higher Plants. Academic Press, Harcourt Broce Javanovich, Publishers., New York.

Sarker, NKHJU, and AHMFazlul Kabir.2003. Respose of Chilli Fertilizer to Integrated Management in Nort-eastern Brown Hill Siols of Bangladesh. OnLine Journal of Biological Sciencc 3 (9): 797-801

Setiadi, 2005. Planting Chili. Sower Swadaya, Jakarta.