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The effect of Biofertilizer Application and Shoot Pruning on the Growth of chili plants on sandy media

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Abstract. This study aims to determine the effect of PGPR, *Trichoderma* sp and shoot pruning treatment on the growth and production of red chili plants. This study used a complete randomized block design (CRD) factorial consisting of 2 factors. The first factor was the provision of biological agents consisting of 4 levels of treatment: 1) control, 2) PGPR, 3) *Trichoderma* sp, and 4) PGPR and *Trichoderma* sp. The second factor was the time for cutting shoots, consisting of 3 levels of treatment: 1) without pruning; 2) Pruning shoots at the age of 14 days after planting, 3) Pruning shoots at the age of 21 days after planting in pots. The observation variables included plant height, fruit weight per sempel, number of fruits per sample, fruit length, and fruit diameter. The result shows of combination treatment PGPR and *Trichoderma sp* and pruning 14 DAP is the highest growth and production.

1. Introduction

Sandy medium has the characteristics of very fast soil drainage, very low salinity, low CEC, acidic to neutral pH, very low organic C, very low total N and moderate phosphate [1]. Therefore, it is necessary to optimize the use of sandy land to be used as a place for plant production with various applications of technology to create conditions that are conducive to plants, as well as to increase tolerance and adaptability of plants to stresses, including climate change [2].

Rhizobacter are included in the microbial group which is commonly known as PGPR. Several types of microbes included in the PGPR group are *Azotobacter sp., Azospirillum sp., Pseudomonas sp., Bacillus sp., And Acetobactersp* [3], PGPR has the ability to increase productivity and plant growth.

Trichoderma sp. is one of the useful microorganisms and is a symbiotic fungus that is not dangerous, even mutually beneficial between soil-borne fungi and plant roots. *Trichoderma sp.* Serves as a root growth stimulant, because *Trichoderma sp.* It has the ability to increase growth hormones in plants such as auxins and cytokinins [4]. Besides functioning to improve the root structure of plants, *Trichoderma sp*. Also has a role as an antagonistic fungi against pathogens. *Trichoderma sp.* can inhibit the growth of several disease-causing fungi in plants, including *Rigidiforus lignosus, Fusarium oxysporum, Rizoctonia solani, Sclerotium rolfsi* [5].

The phenomenon of growth in the shoots or canopy is more dominant than in the lateral or other parts influenced by the hormone auxin, causing the growth of lateral / axilary shoots to become dormant and stunted. The shoots will start their growth after the primary apical bud meristem has become a permanent organ, such as a flower or flowering meristem [6]. This has an impact on the low production

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per plant. Therefore, to stimulate the growth of lateral shoots, the effect of apical dominance needs to be inhibited [7] [8]. One way in which restricted lateral shoot growth can be increased is removal. Pruning aims to streamline plant growth and development in a more productive direction. Another goal is to increase the efficiency of nutrient use [9]. Pruning can encourage more rapid growth of new shoots, which have the potential to flower.

2. Material and Methods

2.1. Material

Chili seeds, organic fertilizers, anogranics, mulch, PGPR, *Trichoderma sp*. Ruler, calipers, scissors, colling box, calipers, stationery, sprinkler, cameras, wires, hoes, buckets, analytical scales, gauges and knives.

2.2. Methods

This study used a complete randomized block design (CRD)

Factor I : Pruning times :

P0 : Without Pruning
P1 : Pruning 14 Day After Planting
P2 : Pruning 21 Day After Planting

FactorII : Provision Biological Agents

H0 : Control
H1 : PGPR
H2 : *Trichoderma sp*
H3 : PGPR + *Trichoderma sp*

3. Result and Discussion

The results of observations and research data varieties of The effects of giving PGPRenriched and shooting Pruning on the growth and production of chili plants in sandy media can be seen in Table 1.

Tabel 1. Lists of various types of PGPR enrichment and pruning on plant height and number of chili branches

Source of Diversity	Plant height 2 WAP	Plant height 4 WAP	Plant height 6 WAP	Number of branch
P	ns	**	ns	**
H	ns	ns	ns	ns
P x H	ns	*	ns	ns

Noted: P = Pruning, H = PGPR enriched, * = Sgignificant, ** = Very Significant, ns = Non Significant
WAP = Week After Planting

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Table 2. Average Plant Height Effect of Pruning at Several Age Levels

Treatment	Plant Height (cm)		
	2 WAP	4 WAP	6 WAP
P0 (Without Pruning)	14,78 a	30,86 a	50,83 a
P1 (Pruning 14 day after planting)	13,93 a	25,89 b	58,38 a
P2 (Pruning 21 day after planting)	15,08 a	27,92 b	44,63 a

Note: The mean followed by the same letter is located in the same column, indicating that it is not significantly different at LSD 5% and the mean followed by different letters in the same column shows significant differences at LSD. %.

The test results of the mean high value of chili plants due to the effect of pruning in Table 2 showed a significant difference at the age of the plant at 4 WAP in treatment P0 with plant height of 30.86 cm, this is because pruning was not performed in P0 treatment, causing height in P0 plants. higher than other treatments. Pruning action has no significant effect on the growth of chili plants [10].

Table 3. Average Plant Height Effect of Biofertilizer at Several Age Levels

Treatment	Plant Height (cm)		
	2 WAP	4 WAP	6 WAP
H0 (Control)	14,80 ab	28,22 a	46,21 a
H1 (PGPR)	14,42 ab	26,34 b	44,36 a
H2 (*Trichoderma sp*)	15,14 a	29,42 a	64,88 a
H3 (PGPR+ *Trichoderma sp)*	14,01 b	28,92 a	49,67 a

Note: The mean followed by the same letter is located in the same column, indicating that it is not significantly different at LSD 5% and the mean followed by different letters in the same column shows significant differences at LSD. %.

Based on Table 3. the average plant height of the effect of biological fertilizers at several age levels showed significant differences at 2 WAP H2 treatment, namely the treatment of Trichoderma sp. has the highest plant height of 15.14 cm, this indicates that the Trichoderma gauze treatment can affect plant growth effectively. This is the same as the results of research by Sepwanti et.al, which showed that *Trichoderma harzianum* can increase the growth of chili plants [11].

Table 4. Average Number of Branches as a result of Pruning Effect

Treatment	Number of Branch
P0 (Without Pruning)	2,72 c
P1 (Pruning 14 day after planting)	3,36 b
P2 (Pruning 21 day after planting)	4,36 a

Note: The mean followed by the same letter is located in the same column, indicating that it is not significantly different at LSD 5% and the mean followed by different letters in the same column shows significant differences at LSD. %.

The average number of branches due to the effect of pruning is in Table 4. It shows that the P3 treatment, pruning 21 days after planting has the largest number of branches, this is because after the plants are pruned it will stimulate the growth of new shoots to grow, so that they can produce more branches, this will be followed by an increase in the productivity of the chili plant.

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Table 5. Average plant height resulting from the interaction of the effect of Pruning treatment and biofertilizer

Treatment	Average Pelant Height (cm)		
	2 WAP	4 WAP	6 WAP
P0H0	15,37	30,91 ab	50,10
P0H1	13,68	27,53 bcd	45,26
P0H2	15,37	31,33 ab	51,48
P0H3	14,70	33,64 a	56,49
P1H0	13,33	26,50 cd	45,72
P1H1	14,19	25,34 cd	43,77
P1H2	14,96	27,73 bcd	45,39
P1H3	13,23	23,98 d	44,44
P2H0	15,71	27,24 bcd	42,80
P2H1	15,40	26,16 cd	44,06
P2H2	15,11	29,16 cd	43,58
P2H3	14,09	29,13 bc	48,07

Note: The mean followed by the same letter is located in the same column which shows that it is not significantly different at DMRT 5% and the mean followed by different letters in the same column shows significant differences in DMRT 5%.

Table 5 shows that the interaction of pruning and application of biological fertilizers has a significant effect on the average plant height at 4 WAP, the highest average is in the P0H3 treatment of 33.64 cm, this is because without pruning in this treatment and the provision of PGPR + *Trichoderma sp.* can spur the growth of plant height better. This is the same as the research of Lisa et.al, that the provision of PGPR and Trichoderma has a significant effect on root wet weight, fruit weight per plant, number of fruit planted, and fruit diameter of chili [12].

4. Conclusion

In this study, it was concluded that the parameter of the treatment plant height had the highest average, P1 treatment, without pruning treatment with a height of 30.86 cm at 4 WAP. The biological fertilizer treatment showed significantly different results at 2 WAP on H2 treatment, by giving Trichoderma sp. Has a plant height of 15.14 cm. Then there was an interaction on the plant height parameters of pruning treatment and the provision of biological fertilizers, on the P0H3 treatment, without pruning and giving PGPR + Trichoderma sp. with a plant height of 33.64 cm.

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