ANALYSIS OF THE EFFECT OF PGPR FERTILIZER USE ON GROWTH ACCELERATION OF CHERRY TOMATO (*Solanum lycopersicum* var. cerasiforme)

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Abstract

Cherry tomatoes are a type or commodity of horticulture that has a very relatively high economic value compared to ordinary tomatoes. Cherry tomato plants (*Solanum lycopersicum* var,. cerasiforme. It is one of the local plants that is neglected and not used and is often considered as a wild plant. This study aims to determine the effect of PGPR fertilizer application on the growth of cherry tomato plants. This research was carried out in the urban village). Rerewokan, West Tondano sub-district starting from August to November 2021. The method used is a quantitative method with the type of experimental research in the form of a Randomized Block Design (RAK) with five types of treatment, each repeated four times. P1 = without using fertilizer, P2 = 100ml, P3 = 200ml, P4 = 300ml, P5 = 400ml, so there were 20 treatment combinations, and the data obtained were then analyzed using analysis of variance (ANOVA). From the results of this study, it showed that good plant height growth was found in treatment P4 with the application of a mixture of PGPR fertilizer concentration of 300ml / 2 liters of water, because there was the most effective growth, while the growth in the number of leaves and the number of fruits was very good in treatment P2 with the addition of a mixture. PGPR fertilizer concentration 100ml / 2 liters of water.

Key words: *Fertilizer Dosage, Cherry Tomato, PGPR Fertilizer, Cherry Tomato Growth*

INTRODUCTION

Cherry tomatoes are one of the commodities that have a fairly high commercial value. Several types of cherry tomato plants are quite popular, and many are consumed, including green tomatoes, aroma tomatoes, better boy, celebrity tomatoes.(Sari & Murtilaksono, 2018).

Cherry tomatoes have economic advantages over other types of tomatoes. The advantage lies in the high and relatively stable selling price, but the main obstacle is the low production of cherry tomatoes nationally with limited cultivation technology and lack of technological information, such as seeds, nutrients, planting media, fertilizers that are not optimal, branch pruning or regulation of the number of

main branches, fruit thinning or fruit reduction, as well as improper cropping patterns. (Sobari, E., Piarna, R., D, M. A. A., Kunci, K., Nutrisi, D., Cherry, T., & Tetes, I. 2019).

The relatively high price of seeds is also an obstacle for the cherry tomato business. Therefore, it is necessary to find alternatives that can reduce production costs, (Harun, R.M. 1989).

One of the factors that need to be considered in the cultivation of cherry tomatoes is fertilization techniques. In this study, the fertilizer that will be used is biological fertilizer. Biological fertilizer is a product of biotechnology engineering whose main content is microorganisms, the microorganisms contained in biological fertilizers are indispensable, one of which is as a binder or binder of nutrients, decomposing P and K bound to other compounds. Application of fertilizer is one way that can be done to increase crop production. One of the fertilizers that can be used is Plant growth promotion Rhizobacteria (PGPR). (Dewanto dkk. 2013).

PGPR contains Rhizobacteria which is a group of aggressive bacteria that are around the rhizosphere (roots). (Irmawan, D, E, 2008). PGPR is able to produce hormones such as IAA, gibberellins, cytokinins and ethylene. So that it is easy to actively colonize plant roots and is able to increase the growth and production of cherry tomato plants. PGPR that is applied to the soil or as fertilizer that is sprinkled can add nutrients to the soil, so that cherry tomato plant nutrients can be met. (dewi, 2008)

PGPR or RPTT (Rhisobacteria that promote plant growth) affect plants either directly or indirectly. Its direct effect is its ability to provide and mobilize the absorption of various nutrients and change the concentration of growth-promoting phytohormones. While the indirect advantage is its ability to suppress the activity of pathogens by producing various compounds or metabolites such as antibiotics.(Oktaviani & Sholihah, 2018)

The purpose of this study was to explain the effect of giving several concentrations of PGPR fertilizer on the acceleration of cherry tomato plant growth.

MATERIALS AND METHODS

This study uses a quantitative method with the type of research experiment. The research was carried out on August 15 – November 15, 2021 in the Rerewokan Ling 1 sub-district, West Tondano District, Minahasa Regency. In the lowlands with normal environmental temperature conditions.

This research was conducted using a Randomized Block Design (RAK), with five types of treatment, each of which was repeated four times.

P1 : No PGPR fertilizer

P2 : PGPR with 100ml/2 liters of water

P3 : PGPR with 200ml/2 liters of water

P4 : PGPR with 300ml/2 liters of water

P5 : PGPR with 400ml/2 liters of water

Research Implementation Techniques

The implementation of this research is first to prepare the land to be used, namely first to clean around and be given shade so that there is no interference from weeds and plants are not exposed to direct sunlight, then preparation of Seedling Media. Cherry tomato seeds are soaked in water for 30 minutes, then sown on a seed tray with seedbed media in the form of top soil that has been watered so that the soil becomes moist. Then seeding, seeding is done by spreading the seeds on a seedtray that has been given top soil, after that it is covered with a sack so that the condition of the seedling place is always moist, the seeding is done for 21 days. Then planting, planting is done by removing tomato seedlings that have reached 21 DAP or when the seedlings have 2-4 fully opened leaves. Put the planting media into a polybag measuring 35 x 35 to 2/3 of the polybag. Then embroidery, embroidery is done if there are plants that die, this embroidery is done before the plants are 8 DAP. Then the provision of PGPR fertilizer. During the growing season, fertilization is carried out for ten times. The first fertilization was carried out at 1, 2, 3, 4 WAP and at the time of subsequent fertilization it was carried out every 2 weeks until 90 days after planting (HST) using PGPR fertilizer . The application of PGPR fertilizer is carried out in the morning or evening, by flushing the soil close to the roots. Last maintenance, the process of maintaining cherry tomato plants , namely, by watering in the morning and evening. Pruning damaged or wilted leaves or stems and also cleaning weeds on the soil in polybags and around cherry tomato plants. (Ali, I. 2013)

Obeservation Parameter

1). Plant Height(cm)

In this study, the parameters used for measuring plant height were carried out starting from the surface of the plant to the growing point of cherry tomato plants. Cherry tomato plant height measurement data was collected every 30, 60, and 90 days after planting (HST).

2). Number of fruit (helai)

In this study, the parameters used to calculate the number of leaves began in the generative phase which was marked by the appearance of the first flower. The leaves counted are fresh leaves and have fully opened. Data collection for the calculation of the number of cherry tomato leaves was carried out every 30, 60, and 90 days after planting (HST).

3). Number of fruit (jumlah)

In this study, the parameters used to calculate the number of fruit planted after the cherry tomato plants have reached the age of 90 days after planting, namely by picking cherry tomatoes that are green to orange or red, then counting the number of planted fruits/polybags.

Data Analysis

This study used a non-factorial randomized block design (RAK) 5 x 4 replications with a linear model :

$$Y_{ij} = \mu + \alpha_i + \beta_j + \varepsilon_{ij}$$

The data obtained were then analyzed using the analysis of variance (ANOVA), if there was a difference between treatments, a significant difference test would be carried out with Duncan's multiple distance test with a 5% confidence level.

RESULTS AND DISCUSSION

In this study, PGPR was dissolved in water according to the treatment/concentration that had been determined. PGPR fertilizer was given 10 times (10 weeks), the first fertilization was at the age of 14 days after planting. The variables observed were plant height (cm), number of leaves (strands), number of fruit planted (number).

1). Plant height

Based on the results of plant height growth using the Analysis of Variance Test (ANOVA) that the use of PGPR fertilizer was significantly different in the treatment of cherry tomato plant height growth. Fh 44.93 is greater than F 5% = 3.26. So it is necessary to have a test that is significantly different from Duncan's test with a 5% confidence level.

Tabel 1. Duncan test 5% confidence level

Treatment	average	Average DMRT	Symbol
1	17.4	20.63	a
2	22.8	26.19	b
3	27.4	30.88	c
5	30.0	33.54	cd
4	31.0		d

Note: the mean values followed by different letter symbols are declared to be significantly different

Plants that were given PGPR fertilizer had a significant impact on the growth of cherry tomato (*Solanum lycopersicum* var. cerasiforme) plant height . The first measurement was carried out 30 days after planting and the last measurement was carried out at 90 days after planting. The growth of cherry tomato plant height 30 days after planting was obtained by an average concentration of P2=100ml 27.4 cm, P3=200ml 31cm, and P4=300ml 30cm.

The use of PGPR fertilizer affects the growth of cherry tomato (*Solanum lycopersicum* var. cerasiforme) plant height . Because PGPR is a soil microbe found in plant roots that can increase plant growth and protect against various plant pathogens, PGPR is a group of bacteria that is rich in organic matter so that it can accelerate the growth of plant height.

This study conducted an analytical test (Anova) on the growth of cherry tomato plant height to see its effect. Based on the data analysis above for PGPR fertilizer, F h = 44.93 and F table 5% = 3.26 which shows that F h > F table, meaning that the treatment of PGPR fertilizer on the growth of chomat cherry plant height is very different, so it needs to be done Further test using Duncan 5%.

The effect of using PGPR fertilizer on cherry tomato plant height gave good results in each treatment. The letter symbols are different. In each treatment there is a significant growth, in P1 an

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average of 17.4(a) which is given the symbol a, P2 an average of 22.8(b) which is given the symbol b, P3 an average of 27 ,4(c) which is given the symbol c, P4 an average of 31.0(d) which is given the symbol d, and P5 an average of 30.0(cd) which is given the symbol cd. So this shows that the average number followed by a different symbol means that it shows a significantly different treatment

So from the results on plant height growth, namely at P4, the best, because of the application of PGPR fertilizer with a concentration of 400ml there was the best plant height growth.

2). Number of leave

Based on the results of the growth of the number of leaves using the Analysis of Variance Test (ANOVA) that the use of PGPR fertilizer was significantly different in the treatment of the growth of the number of leaves of cherry tomatoes. Fh 5.49 is bigger than F 5% = 3.26. So it is necessary to have a test that is significantly different from Duncan's test with a 5% confidence level.

Tabel 2. Duncan test 5% confidence level

treatment	average	Average DMRT	Symbol
1	9.8	15.92	a
2	13.4	19.81	ab
3	13.6		ab
5	17.7		b
4	19.2		b

Note : the mean values followed by different letter symbols are declared to be significantly different

Based on the observations that have been done on the number of leaves using PGPR fertilizer obtained that day to 30 provide significant growth. The highest average value is in P3 with an average of 1.2 strands, at P4 with an average of 17.6 strands, at P1 with an average of 13.6 strands, at P2 with an average of 13.4 strands, compared to P0 with a mean number of 9.8 strands.

The effect of using PGPR fertilizer on cherry tomato plant height gave good results in each treatment. The letter symbols are different. In each treatment there is a significant growth, in P1 an average of 9.8(a) which is given the symbol a, P2 an average of 13.6(ab) which is given the symbol ab, P3 an average of 13 ,4(ab) which is given the symbol ab, P4 an average of 19.2(b) which is given the symbol b, and P5 an average of 17.6(b) which is given the symbol b. So this shows that the average number followed by a different symbol means that it shows a significantly different treatment

This is because the nutrients in PGPR fertilizer needed for the growth of the number of leaves are used in appropriate quantities and can stimulate the growth of cherry tomatoes. The increase in leaf growth was caused by enlargement and cell division. Plant growth and development is also influenced by internal and external factors. (Leonardy, M. V. 2006)

So from the results on the growth of the number of leaves, namely at P4, which has an effect, because of the application of PGPR fertilizer with a concentration of 300 ml there is the best growth in the number of leaves.

3). Number of fruit planted

This study conducted an analytical test (Anova) on the growth of the number of cherry tomatoes planted to see the effect. Based on data analysis using Analysis of variance (Anova) the effect of PGPR fertilizer application obtained F h = 13.81 and F table 5% = 3.26 which indicates that F h > F table, meaning that the treatment of PGPR fertilizer application on the growth of the number of fruits cherry tomato plantations were significantly different so that further tests were needed using Duncan 5%.

Tabel 3. Duncan test 5% confidence level

treatment	average	Average DMRT	Symbol
1	8.2	16.60	a
2	14.4	23.38	ab
3	17	26.22	bc
5	24	33.38	cd
4	29.4		d

Note : the mean values followed by different letter symbols are declared to be significantly different

The letter symbols are different. In each treatment there is a significant growth, in P1 an average of 8.2(a) which is given the symbol a, P2 an average of 24(cd) which is given the symbol cd, P3 an average of 14.4 (ab) given the symbol ab, P4 averaged 17(bc) which was given the symbol bc, and P5 averaged 29.4(d) which was given the symbol d. So this shows that the average number followed by a different symbol means that it shows a significantly different treatment. So from the results on growth

The effect of the use of PGPR fertilizer on the number of cherry tomatoes yielded good results in the generative phase as it is known, K and P elements are nutrients that are needed by plants in the generative phase. With the K element in PGPR fertilizer, it can help plants to produce fruit with superior quality, such as being able to make the fruit bigger, heavier and also adding to the taste of the fruit being sweeter. The content in this PGPR fertilizer can also help increase the activity of forming seeds or fruit in this cherry tomato plant. ([FAO] Food and Agriculture Organization. 2010)

So this shows that the average number followed by a different symbol means that it shows a significantly different treatment. So from the results on the growth of the number of fruit planted at P4, the best, because of the application of PGPR fertilizer with a concentration of 300 ml there was the best growth in the number of leaves.

CONCLUSION

Based on the results and discussion of the conclusions obtained that PGPR fertilizer can increase the effect of cherry tomato growth on plant height, number of leaves, and number of fruit planted and also good plant height growth is found in P4 treatment by giving a mixture of PGPR fertilizer concentration of 300 ml / 2 liters of water, because there was the most effective growth, while the very good growth in the number of leaves and the number of fruits was found in the P2 treatment by giving a mixture of 100 ml / 2 liters of water with a mixture of PGPR fertilizer concentration.

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