JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL.4 NO. 1 January 2022

DOI :https://doi.org/ 10.36378/juatika.v4i1.1394
eissn 2656-1727
pissn 2684-785X
Hal : 48 – 60

The Effect Of Paclobutrazol Concentration And Types Of Organic Liquid Fertilizer On The Growth And Production Of Tomató (*Solanum Lycopersicum* L.)

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ABSTRACT

Tomatoes are a horticultural commodity that has the potential to be developed because it has high economic value and great export potential. The increase in tomato needs is often not offset by increased production so that Indonesia has not been able to meet the needs of national tomatoes, in addition to the issue of food quantity has shifted to the issue of food quality and food safety by using natural ingredients. This study aims to determine the concentration of paclobutrazol that can simulate reproductive growth and the best type of liquid organic fertilizer in replacing chemical fertilizers to increase the growth and yield of tomato plants. The combination of paclobutrazol concentration and liquid organic fertilizer is expected to increase tomato yield. This study used a plot design divided into two factors, namely the concentration of paclobutrazol and the type of liquid organic fertilizer with 16 combinations of treatments repeated 3 times. The first factor is the concentration of paclobutrazol with 4 levels, namely 0 ppm, 100 ppm, 150 ppm, and 200 ppm. The second factor is the type of liquid organic fertilizer with 4 levels of NPK fertilizer 25 grams / plant, water hyacinth 150 ml / plant, banana peel 150 ml/plant, and NASA 150 ml / plant. The results showed interactions in the total number of fruits per plant, the total fresh weight of fruit per plant, and the percentage of fruit sets. Paclobutrazol concentration of 100 ppm and the type of liquid organic fertilizer banana skin, 150 ml/ plant showed the highest yield in the number of fruits per harvest period (12 pieces), total fruit count per plant (63 pieces), fresh weight of fruit per harvest period (436.63 grams), total fresh fruit weight per plant (1815.80 grams), and percentage of fruit set (76.83%).

Keywords: Concentration of paclobutrazol, Liquid Organic Fertilizer, Tomatoes

1. INTRODUCTION

A tomato plant is an example of a horticultural commodity that has the potential to be developed because it has a fairly high economic value. Tomato production in Indonesia fluctuates every year. Tomato yields in 2018 were 976,790 tons, while in East Java Province in 2017 it was 66,758 tons and then decreased to 65,585 tons in 2018. (Badan Pusat Statistik Republik Indonesia, 2018)

Efforts to improve the quality and quantity of tomato plants are to use growth regulators from the retardant group that are able to stimulate reproductive growth. Paclobutrazol is a retardant that inhibits cell elongation and stem internode elongation by inhibiting gibberellin biosynthesis, causing a decrease in the rate of cell division. Giving the concentration of paclobutrazol must be at the right concentration because paclobutrazol can accelerate flowering so that plants form buds faster. Paclobutrazol can inhibit plant vegetative growth, one of which inhibits plant height.

According to Nugroho's research in (Ardigusa & Sukma, 2015) paclobutrazol was able to reduce the growth of sunflower plant height on average by 31.3% per week when compared to control plants. With the inhibition of the vegetative phase of the plant, paclobutrazol increases the yield of tomato plants, which is supported by the results of the study (Nazibah et al, 2018) showed that paclobutrazol significantly affected plant height, number of leaves, number of flowers, and number of fruit, giving 50 ppm paclobutrazol to tomato plants could reduce fruit yield so that the best treatment was at a concentration of 100 ppm. The 50 ppm treatment did not show a significant difference in the number of flowers with 100 ppm treatment, namely an average of 6 fruit per plant. Paclobutrazol does not act as a nutrient, so according to Basri's research results in (Fitriani, 2017) the application of paclobutrazol and organic fertilizers at varying doses can increase the average thickness of the stems of chili plants, causing the chili plants to be more resistant to laying down. The application of paclobutrazol can also increase the fall resistance of rice plants by 20% and 37%, respectively.

Plant growth and yields are not only influenced by ZPT but also by the provision of nutrients, one of them is liquid organic fertilizer. In addition, the shift in food issues from issues of food quantity to issues of food quality and food safety includes eliminating or reducing chemical residues, herbicides, pesticides, hormones, and others that are harmful to health. This raises awareness among farmers about the importance of organic and sustainable agriculture which makes farmers start switching to the use of organic fertilizers. The use of more and more inorganic fertilizers can cause a decrease in soil productivity, while the use of liquid organic fertilizers can increase soil fertility. (Neli et al., 2016). Therefore, the use of liquid organic fertilizer is one way that can be used to reduce the use of inorganic fertilizers. Additionally, the use of liquid organic fertilizer for water hyacinth, banana peel, and NASA can have a positive effect on the growth of tomato plants as it provides additional nutrients like nitrogen, phosphorus, and potassium so that they are available for plants. Besides that, there are micronutrients that can meet the needs of plants.

High organic matter in water hyacinth and banana peels has not been used optimally and is only disposed of as useless organic waste. Therefore, the use of liquid organic fertilizer is one way that can be used to reduce the use of inorganic fertilizers. Additionally, the use of liquid organic fertilizer for water hyacinth, banana peel, and NASA can have a positive effect on the growth of tomato plants as it provides additional nutrients like nitrogen, phosphorus, and potassium so that they are available for plants. Besides that, there are micronutrients that can meet the needs of plants.

High organic matter in water hyacinth and banana peels has not been used optimally and is only disposed of as useless organic waste. (Ermawati et al., 2016). Based on the research of Susetya in (Nasution et al., 2014) as for the content contained in the banana peel, namely C-organic 0.55%; N–total 0.18%; P2O5 0.04%; K2O 1.13%; C/N 3.06%; and pH 4.5, NASA liquid organic fertilizer is a fertilizer that is produced from natural ingredients so as to produce a mixture of nutrients that is easily absorbed by plants and can be used to improve land conditions. Therefore, there is a very good interaction between fertilizer and species. This is because when plants are inhibited, the availability of nutrients that cause fruit formation is not ideal, so it needs to be met through the provision of liquid organic fertilizer.

Research result from (Laginda, 2017) showed that the best treatment in this study was the administration of 650 ml of liquid organic fertilizer banana peel

which could produce an average number of tomatoes with an average of 19 fruit per plant. The results of the same study are shown by research (Tuapattinaya & Tutupoly, 2014) showed that the application of liquid organic fertilizer (POC) banana peels led to an increase in the number of curly red chilies. The best treatment in this study was a dose of 100 ml/plant, which could produce an average of 33 fruits/plant. (Ibrahim & Tanaiyo, 2018) that the application of liquid organic fertilizer with banana peels at a dose of 40 ml/plant gave an average yield of 14 grams of mustard greens/plant.

The purpose of this study was to determine the best concentration of paclobutrazol and the type of liquid organic fertilizer for the growth and yield of tomatoes (Solanum Lycopersicum L.).

2. RESEARCH METHOD

Place and Time

This research was carried out at the Experimental Field of the Faculty of Agriculture, National Development University "Veteran" East Java from December 2020 to March 2021.

Tools and materials

The materials used in this study were tomato seeds of the Servo variety, compost, NPK 16-16-16 fertilizer, rice sacks, fungicide, pesticides if needed, paclobutrazol (Goldstar 250 SC), banana peel, water hyacinth, POC NASA, EM4, sugar, and water. Meanwhile, the tools used in this study were a hoe, shovel, sprayer, coop, water hose, scissors, plastic measuring cup, fermentation container, stirrer, plastic tray, pH meter, thermometer, bamboo blade, analytical scale, caliper, and handsprayer.

Research Methods

This study was a factorial experiment based on a Divided Plot Design (RPT) with 2 treatment factors, namely the concentration of paclobutrazol as subplots and the type of liquid organic fertilizer as the main plot. This experiment obtained 16 treatment combinations, which were repeated 3 times so that there were 48 experimental units and 2 plant samples. The first factor is the concentration of paclobutrazol, with 4 levels, namely K0 (0 ppm), K1 (100 ppm), K2 (150 ppm), and K3 (200 ppm). The second factor is the type of liquid organic fertilizer with 4 levels, namely S0 (NPK 25 grams/plant), S1 (150 ml/water hyacinth POC), S2 (150 ml/banana peel POC plant), and S3 (150 ml/NASA POC plant).

Research Implementation

Land preparation includes seeding, planting, application of NPK fertilizer, administration of paclobutrazol, maintenance, control of plant pests and diseases, and harvesting.

Observation Parameter

Observations started when the tomatoes were 14 DAP to 84 DAP with observation intervals once every two weeks. Vegetative observation parameters include plant height (cm), stem diameter (cm). Meanwhile, generative observations started at 62 DAP and continued until the 5th period of harvest. The generative observation parameters included age of flower emergence (days), number of fruit bunches (dompol), number of flowers (fruit), the total number of fruits per plant (fruit), fresh weight of fruit per fruit (grams), fresh weight of fruit per plant (grams), and fruit set (%).

Data analysis

Data were analyzed using variance to determine the effect of treatment on the observed variables and to compare the mean between combination treatments using 5% BNT.

3. RESULTS AND DISCUSSION

Plant Height (cm)

The results of the analysis of variance showed that the combination

treatment of paclobutrazol concentration and liquid organic fertilizer had no significant effect on plant height at the ages of 14 to 84 DAP (days after transplanting). The concentration of paclobutrazol and types of liquid organic fertilizer had a significant effect on plant height at the ages of 28 to 84 DAP. The average value of plant height on the treatment of paclobutrazol concentration and types of liquid organic fertilizer is presented in Table 1.

Table 1. Average Tomato Plant Height against Treatment of Paclobutrazol Concentration and type of liquid organic fertilizer used at ages 14 to 84 DAP.

Treatment	Average Tomato Plant Height (cm)					
Paclobutrazol Concentration (ppm)	dap					
	14	28	42	56	70	84
0	20.67	42.75 b	67.75 b	78.92 b	84.75 b	94.63 b
100	19.46	40.65 ab	57.96 ab	69.33 ab	75.58 ab	85.25 ab
150	17.17	35.46 ab	51.79 a	63.25 a	70.21 a	80.63 a
200	15.96	33.71 a	49.17 a	58.88 a	66.38 a	75.54 a
BNT 5%	tn	8.29	14.07	11.35	12.38	11.77
Types of POC (ml/plant)						
NPK 16:16:16	20.85	45.25 b	67.04 b	76.21 b	82.58 b	94.01 b
Water Hyacinth	16.50	40.13 b	53.83 ab	59.99 a	68.39 a	81.13 ab
Banana Peel	18.56	35.40 ab	57.46 ab	66.46 ab	73.25 ab	82.58 ab
NASA	17.33	31.79 a	49.83 a	64.38 a	71.58 ab	79.71 a
BNT 5%	tn	6.88	10.34	15.71	13.81	14.02

Note: The numbers followed by the same letter in the same column show no significant difference in the 5% BNT test; tn = not real

Based on Table 1, it can be seen that the effect of giving the concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on tomato plant height at all ages except at the age of 14 DAP. The concentrations of paclobutrazol 200 ppm at 84 DAP decreased by 25% when compared to the control. The higher the concentration of paclobutrazol given, the more the plants will experience stem shortening. This is in accordance with research of (Sumadi et al., 2015) which states that paclobutrazol applied to plants causes inhibition of plant height because paclobutrazol inhibits gibberellin biosynthesis which will cause a decrease in the cell division cycle. According to (Purba et al., 2021) which states that gibberellins are able to increase cell growth by accumulating cellulose and eventually the cells only enlarge for growth so that the plant elongates. The application of organic matter can increase plant growth and production so that the application of liquid organic fertilizer by NASA has decreased by 17% when compared to NPK fertilizer.

Age of Flowering (days)

The results of the analysis of variance showed that the combination treatment of paclobutrazol concentration and liquid organic fertilizer had no significant effect on the age of flowering. The concentration of paclobutrazol and the type of liquid organic fertilizer also had a significant effect on the age of flowering. The average age of flowering for treatment with the concentration of paclobutrazol and types of liquid organic fertilizer is presented in Table 2.

Table 2.Average Age of Flowering Tomato Plants on Paclobutrazol Concentration Treatment and Types of Liquid Organic Fertilizer

Treatment	Average Age of Flowering (days)
Paclobutrazol Concentration(ppm)	
0	33.67 a
100	32.92 a
150	34.75 ab
200	35.04 b
BNT 5%	2.04
Types of POC (ml/plants)	
NPK 16:16:16	33.83 ab
Water hyacinth	34.79 b
Banana peel	32.58 a
NASA	35.17 b
BNT 5%	2.16

Note: The numbers followed by the same letter show that they are not significantly different in the 5% BNT test.

Table 3. Average Stem Diameter of Tomato Plants against Treatment of Paclobutrazol Concentration and Types of Liquid Organic Fertilizer Age 14 to 84 DAP

Treatment	Average Diameter of Stem (cm)					
Paclobutrazol Concentration (ppm)	DAP					
	14	28	42	56	70	84
0	0.45 ab	0.75 a	0.72 a	0.79 a	0.89 a	0.97 ab
100	0.48 b	0.89 b	0.81 b	0.85 b	0.95 b	1.01 b
150	0.38 a	0.80 ab	0.80 ab	0.81 ab	0.90 ab	0.96 ab
200	0.46 ab	0.73 a	0.71 a	0.80 ab	0.89 a	0.89 a
BNT 5%	tn	0.13	0.08	0.05	0.05	0.07
Types of POC (ml/tanaman)						
NPK 16:16:16	0.55 b	0.88 b	0.89 b	0.98 b	1.10 b	1.19 b
water Hyacinth	0.42 a	0.73 a	0.70 a	0.85 a	0.84 a	0.90 a
Banana Peel	0.43 a	0.73 a	0.72 a	0.79 a	0.88 a	0.91 a
NASA	0.45 a	0.74 a	0.68 a	0.76 a	0.85 a	0.89 a
BNT 5%	tn	0.07	0.12	0.10	0.09	0.10

Keterangan : The numbers followed by the same letter show that they are not significantly different in the 5% BNT test.

Based on Table 3, it can be seen that the effect of giving the concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on the stem diameter of tomato plants at all ages except at 14 DAP. The concentration of paclobutrazol was 200 ppm at 84 DAP decreased by 9% compared to the control, while at the concentration of paclobutrazol 100 ppm, it increased by 4% compared to the control. Paclobutrazol is an active compound that moves relatively slowly to the subapical meristem and can be absorbed by plants both through leaves and roots, which are then translocated through the xylem to other plant parts such as stems, fruits, and seeds of tomatoes, resulting in gibberellins being more focused on the production phase. This causes the stem to become thicker due to the increase in cell size. This is corroborated with the opinion of (Fitriani, 2017) which stated that the addition of paclobutrazol to black rice plants made the diameter of the stems and roots thicken. NASA's liquid organic fertilizer application decreased by 33% when compared to NPK fertilizer. The larger

the diameter of the plant stem, the greater the total fruit weight per plant.

The number of fruit pods (dompol)

The results of the analysis of variance showed that the combination treatment of paclobutrazol concentration and liquid organic fertilizer had no significant effect on the number of fruit bunches of tomatoes at the ages of 35 to 63 DAP (days after transplanting) and had no significant effect on total fruit bunches. The application of paclobutrazol concentration had a significant effect on the number of fruit bunches at the ages of 35 to 63 DAP, while the application of liquid organic fertilizer did not have a significant effect on the number of fruit bunches. The average value of the number of fruit bunches on the treatment with the concentration of paclobutrazol and types of liquid organic fertilizer are presented in Table 4.

Table 4. Average Number of Tomato Fruits on Paclobutrazol Concentration Treatment and Type of Liquid Organic Fertilizer

Treatment	Average Number of Fruit Buns					
Paclobutrazol Concentration (ppm)	dap 35	42	49	56	63	Total
0	3,42 ab	3,58 b	3,46 b	2,96 b	2,00 b	15,65 b
100	3,52 b	3,44 ab	3,79 b	3,38 b	2,25 b	16,34 b
150	3,31 ab	2,95 a	2,67 a	1,92 a	1,75 ab	12,70 a
200	3,08 a	2,79 a	2,63 a	2,08 a	1,54 a	12,42 a
BNT 5%	0,39	0,32	0,45	0,61	0,25	2,21
Types of POC (ml/plant)						
NPK 16:16:16	3,16	3,46	3,80	2,35	1,72	15,52
Water Hyacinth	3,25	2,22	3,21	2,96	2,01	12,66
Banana Peel	3,60	3,54	2,92	2,54	2,30	14,73
NASA	3,06	2,58	2,67	2,72	1,83	11,59
BNT 5%	tn	tn	tn	tn	tn	tn

Note: The numbers followed by the same letter in the same column show no significant difference in the 5% BNT test; tn = not real

Based on Table 4, it can be seen that the effect of giving the concentration of paclobutrazol had a significant effect on the number of fruit pods at all ages. The concentrations of paclobutrazol 200 ppm at 63 DAP decreased by 29% compared to the control, while at the concentration of 100 ppm it increased by 12.5% compared to the control. The concentration of paclobutrazol also affected the total fruit bunch; at a concentration of 200 ppm, it decreased by 26% compared to the control, while at a concentration of 100 ppm, it increased by 4% compared to the control. This is in line with the opinion (Marshel et al., 2015) which states that the inhibition of plant growth caused by the application of paclobutrazol arises because the components contained in paclobutrazol block three steps for the production of gibberellins in the terpenoid pathway by inhibiting enzymes that accelerate the metabolic reaction process. When the production of gibberellins is inhibited, cell division will still occur, but the new cells will not elongate. The application of organic fertilizers did not have a significant effect on the number of fruit bunches at all ages as well as on the total number of fruit bunches. The taller the plant, the number of the pod will also increase.

Number of Flower (fruit)

The results of the analysis of variance showed that the combination treatment of paclobutrazol concentration and liquid organic fertilizer had no significant effect on the number of tomato plants. The concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect

on the number of flowers. The average value of the number of flowers on the treatment with the concentration of paclobutrazol and types of liquid organic fertilizer is presented in Table 5.

Table 5.Number of Flowers (fruits) Average Number of Flowers of Tomato Plants against Treatment of Paclobutrazol Concentration and Type of Liquid Organic Fertilizer

Treatment	The average number of flowers (fruit)
Paclobutrazol Concentration (ppm)	
0	77,82 b
100	80,35 b
150	71,11 ab
200	63,56 a
BNT 5%	9,10
Types of POC (ml/plant)	
NPK 16:16:16	76,53 ab
Water Hyacinth	70,06 a
Banana Peel	80,71 b
NASA	69,64 a
BNT 5%	8,73

Note: The numbers followed by the same letter show that they are not significantly different in the 5% BNT test.

Based on Table 5, it can be seen that the effect of giving the concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on the number of tomato plant flowers. The concentration of paclobutrazol which was 200 ppm increased by 22% when compared to the control. Paclobutrazol functions to reduce the activity of proteolytic enzymes so that protein degradation is inhibited and suppresses respiration rates but increases RNA, protein, sucrose, starch, and chlorophyll, all of which support flowering. This is in correlation with the opinion of (Harpitaningrum et al., 2014) which stated that a high content of gibberellins would inhibit flowering, whereas gibberellins stimulated growth and increased shoot carbon supply, which when given paclobutrazol, a drastic decrease in gibberellin content would occur so that the plant would induce flowering. In addition, the effect of paclobutrazol on flowering is a secondary effect, while the primary effect is the suppression of vegetative growth. Organic matter plays an important role in increasing soil fertility. The application of organic matter can increase plant growth and production so that the application of liquid organic fertilizer NASA has decreased by 9% when compared to NPK fertilizer.

Total Fruits per Plant (fruit)

The results of the analysis of variance showed that the combination of treatments between the concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on the total number of fruits per plant. The concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on the total number of fruits per plant. The average value of the total number of fruits per plant against the combination treatment between the administration of paclobutrazol concentration and the type of liquid organic fertilizer is presented in Table 6.

Table 6. Average Number of Total Fruits per Tomato Plant against Combination Treatment of Paclobutrazol Concentration and Type of Liquid Organic Fertilizer

Average Number of Total Fruits per plant (fruit)				
Treatment	Paclobutrazol Concertration (ppm)			
Types of POC (ml /plant)	0	100	150	200
NPK 16:16:16	46.67 b	45.67 b	52.33 cd	47.00 b
Water Hyacinth	47.00 b	45.33 b	52.33 cd	42.33 a
Banana Peel	50.67 c	63.00 e	54.67 d	57.33 d
NASA	42.00 a	45.33b	52.67 cd	43.33 ab
BNT 5%	2.81			

Note: The numbers followed by the same letter show that they are not significantly different in the 5% BNT test.

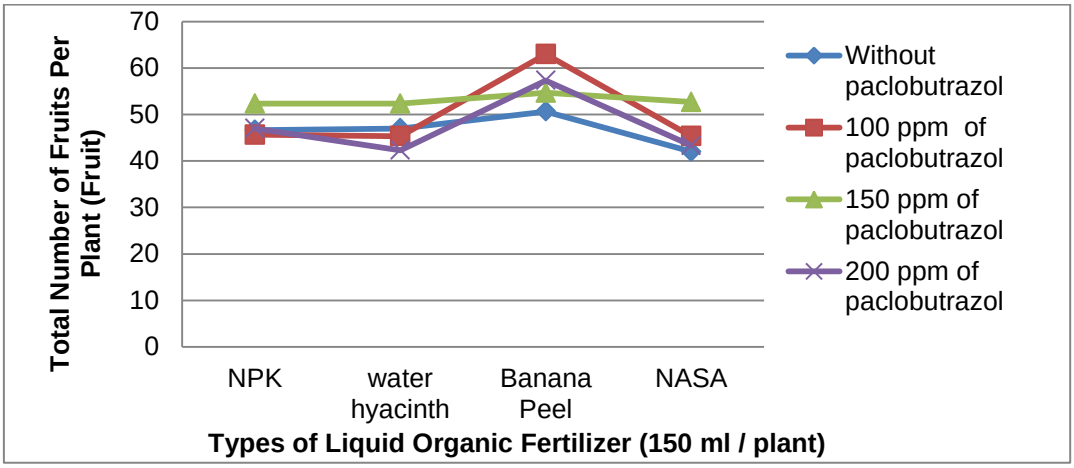

Figure 4.1. Graph of Average Number of Total Fruits Per Plant due to Combination of Paclobutrazol Concentration Treatment and Type of Liquid Organic Fertilizer for 5 Harvest Periods

Based on Table 6, it can be seen that there was an interaction between the treatment concentration of paclobutrazol and the type of liquid organic fertilizer which had a significant effect on the total number of fruits per plant. The highest total number of fruits per tomato plant was found in the combination treatment of 100 ppm paclobutrazol concentration + banana peel liquid organic fertilizer, while the lowest total fruit number per tomato plant was found in the combination treatment without the application of paclobutrazol + NASA liquid organic fertilizer and in the combination treatment with paclobutrazol concentration. 200 ppm + water hyacinth liquid organic fertilizer. This is because the two combinations are not significantly different. The concentration of paclobutrazol was significantly different from the total number of fruits per plant. Because the plants given paclobutrazol have a higher chlorophyll content, the process of photosynthesis and the assimilation that the resulting assimilation also increase. The response of each plant to growth inhibitors is different and depends on the composition of the plant.

chemical compounds and plant species. Therefore, the higher the concentration of paclobutrazol applied, the more fruits will be produced, but it is not balanced by the availability of nutrients. It causes less ideal fruit formation so that the fruit size is smaller than the control. Therefore, the availability of nutrients is met through the application of liquid organic fertilizer.

Fresh Fruit Weight Per Fruit (Grams)

The results of the analysis of variance showed that the combination treatment of paclobutrazol concentration and liquid organic fertilizer did not have a significant effect on fresh fruit weight per tomato in the 1st to 5th periods. The

application of paclobutrazol concentration had a significant effect on the fresh weight of fruit per fruit in the 1st to 4th periods, while the application of liquid organic fertilizer did not have a significant effect on the fresh weight of fruit per fruit.

The average value of fresh fruit weight per fruit in the 1st to 5th periods of treatment with paclobutrazol concentration and types of liquid organic fertilizer is presented in Table 7.

Table 7. Average Fresh Weight of Fruit per Fruit on Treatment of Paclobutrazol Concentration and Type of Liquid Organic Fertilizer for 5 Periods

Treatment	Average Fresh Weight of Fruit per Fruit (grams)				
Paclobutrazol	----------		period	----------	
Concentration (ppm)	1	2	3	4	5
0	34,94 a	36,27 ab	36,05 ab	33,37 a	28,85
100	36,55 b	37,32 b	36,93 b	34,39 b	32,05
150	35,52 ab	36,98 ab	35,41 a	33,83 ab	29,31
200	34,65 a	35,61 a	34,96 a	33,34 a	28,35
BNT 5%	1,20	1,69	1,41	0,77	tn
Types of POC (ml/plant)					
NPK 16:16:16	35,18	35,92	35,90	33,63	30,36
Water Hyacinth	34,42	34,79	35,21	33,30	27,94
POC of Banana Peel	38,70	36,83	36,67	35,29	31,16
NASA	33,65	34,46	35,46	32,72	29,08
BNT 5%	tn	tn	tn	tn	tn

Note: The numbers followed by the same letter in the same column show no significant difference in the 5% BNT test; tn = not real

Based on Table 7, it can be seen that the effect of giving the concentration of paclobutrazol had a significant effect on the fresh weight of fruit per tomato in all periods except the 5th period. The concentration of paclobutrazol at 200 ppm in the 4th period decreased by 1% compared to the control, while at the concentration of 100 ppm it increased by 3% compared to the control. This paclobutrazol treatment can reduce fruit quality visually so that the size of the fruit decreases but the weight of the tomatoes increases. This is supported by paclobutrazol which can suppress the vegetative growth of plants so that they will be more focused on generative growth. Giving the type of organic fertilizer did not have a significant effect on the fresh weight of fruit per tomato in all harvest periods. This could be because the nutrients needed by plants were readily available, so that, according to (Syaputra et al., 2017), if the number of flowers produced in If a plant is large, then the number of fruits will also be large and the weight of the fruit will be heavier and vice versa, if the number of flowers produced is small, the number of fruits will also be small and the weight of the fruit will become lighter.

Total Fresh Fruit Weight per Plant (grams)

The results of the analysis of variance showed that the combination treatment of paclobutrazol concentration and liquid organic fertilizer had a significant effect on total fresh fruit weight per plant. The concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on the total fresh fruit weight per plant. The average value of total fresh fruit weight per plant against the combination of paclobutrazol concentration and types of liquid organic fertilizer is presented in Table 8.

Table 8. Average Total Fresh Fruit Weight per Plant against Combination Treatment of Paclobutrazol Concentration and Type of Liquid Organic Fertilizer

Average Total Fresh Fruit Weight per Plant (grams)				
Treatment	Paclobutrazol Concentration (ppm)			
Types of POC (ml /plant)	0	100	150	200
NPK 16:16:16	1555.48 cd	1309.20 ab	1501.27 c	1346.13 b
Water Hyacinth	1347.93 b	1295.23 ab	1504.37 c	1212.97 a
Banana Peel	1449.40 bc	1815.80 e	1563.27 cd	1645.23 d
NASA	1203.37 a	1301.57 ab	1510.93 c	1244.20 ab
BNT 5%	114.28			

Note: The numbers followed by the same letter show that they are not significantly different in the 5% BNT test.

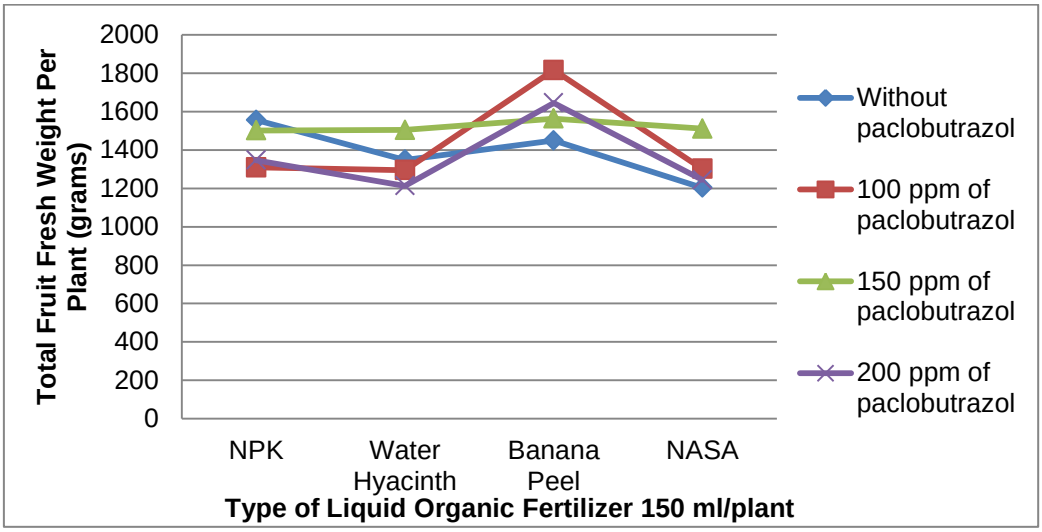

Figure 4.2. Graph of Average Total Fresh Weight of Fruit Per Plant due to Combination Treatment of Paclobutrazol Concentration and Type of Liquid Organic Fertilizer for 5 Harvest Periods

Based on Table 8, it can be seen that there was an interaction between the treatment concentration of paclobutrazol and the type of liquid organic fertilizer that had a significant effect on fresh fruit weight per plant. The highest total fresh fruit weight per tomato plant was found in the combination treatment of 100 ppm paclobutrazol concentration + liquid organic fertilizer banana peel, while the lowest fresh fruit weight per tomato plant was found in the combination treatment without the application of paclobutrazol + NASA liquid organic fertilizer and in the combination treatment concentration paclobutrazol 200 ppm + water hyacinth liquid organic fertilizer, this is because the two combinations are not significantly different. Giving paclobutrazol at high concentrations will cause inhibitors so that fruit formation is inhibited, besides that the fruit becomes less perfect which has an impact on the weight of the fruit produced, therefore the best combination will produce the highest fruit weight besides that liquid organic fertilizer can increase the absorption

process. nutrients by the roots so that the photosynthate produced will also increase. This is in accordance with the opinion (Khodijah et al., 2021) which states that liquid organic fertilizers generally contain quite complete macro and micronutrients, besides that liquid organic fertilizers are also easily soluble in water so that they are likely to be quickly absorbed by plants so that there is no problem in nutrient leaching.

The Percentage of Fruit Set (%)

The results of the analysis of variance showed that the combination

treatment of paclobutrazol concentration and liquid organic fertilizer had a significant effect on the percentage of flowers turning into fruit (fruit set). The concentration of paclobutrazol and the type of liquid organic fertilizer had a significant effect on the percentage of tomato plant fruit set. The average value of the percentage of fruit set in the treatment with the concentration of paclobutrazol and the types of liquid organic fertilizer is presented in Table 9.

Table 9. Average Fruit Set on Treatment of Paclobutrazol Concentration and Type of Liquid Organic Fertilizer

Average Fruitset Percentage (%)				
Treatment	Paclobutrazol Concentration (ppm)			
Types of POC (ml /plant)	0	100	150	200
NPK 16:16:16	68.77 c	48.56 ab	44.89 ab	48.58 ab
Water Hyacinth	46.92 ab	61.24 bc	63.29 bc	59.75 bc
Banana Peel	48.42 ab	76.83 d	60.46 bc	60.16 bc
NASA	43.46 a	66.12 bc	57.18 b	38.13 a
BNT 5%	10.96			

Note: The numbers followed by the same letter show that they are not significantly different in the 5% BNT test.

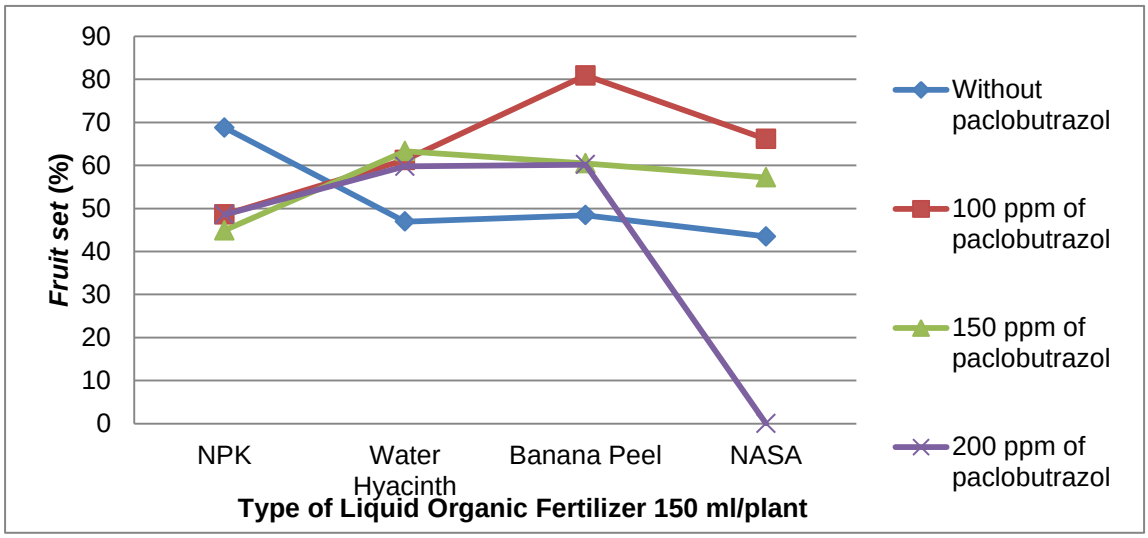

Figure 4.3. Graph of Average Fruit Set due to Combination of Paclobutrazol Concentration Treatment and Type of Liquid Organic Fertilizer for 5 Harvest Periods

Based on Table 9, it can be seen that there is an interaction between the treatment concentration of paclobutrazol and the type of liquid organic fertilizer that has a significant effect on the percentage of fruit set. The highest percentage of fruit set was found in the combination treatment of 100 ppm paclobutrazol concentration + banana peel liquid organic fertilizer, while the lowest fruit set percentage was found in the combination treatment without the application of paclobutrazol + NASA liquid organic fertilizer and in the combination treatment with 200 ppm paclobutrazol concentration + liquid organic fertilizer NASA, this is because the two combinations are not significantly different. However, the response shown by each plant is different, one of which is in terms of fruitset. Low fruitset indicates that there is an influence from the environment that causes fruit formation failure. In addition, high concentrations of paclobutrazol and plants lacking nutrients will also inhibit flower and fruit development. According to (Sambeka et al., 2012), Paclobutrazol is one of the

growth inhibitors that functions to inhibit the growth of the vegetative parts of plants to become smaller and stimulate flower growth. However, if the concentration used is not appropriate, then the plant will show a poor response. This is in accordance with the opinion (Jasmine et al., 2014) which states that high concentrations of paclobutrazol are inhibitors so that plants cannot grow and develop properly.

4. CONCLUSION

Based on the results of this study, it can be concluded that the concentration of paclobutrazol 100 ppm + liquid organic fertilizer banana peel at a dose of 150 ml/plant gave the best results in terms of the total number of fruits per plant (63 fruits), total fruit fresh weight per plant (1815.80 grams), and the percentage of fruit sets (76.83%). Giving paclobutrazol concentration of 0 ppm had a significant effect on all vegetative observation parameters except plant height at 14 DAP and stem diameter at 14 DAP, while at 100 ppm, paclobutrazol concentration gave the best results on total fruit bunches (16 bunches) and fresh fruit weight per fruit (37 grams). While the application of liquid organic fertilizer had no significant effect on plant height at 14 DAP, stem diameter at 14 DAP, number of fruit bunches, and fresh fruit weight per fruit,

ACKNOWLEDGEMENT

Thank you to the lecturers of the Agrotechnology study program, Faculty of Agriculture, UPN "Veteran" East Java for their direction and guidance, which have helped in carrying out research and writing articles so that they can be completed properly.

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