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Effect of Paclobutrazol and Gandasil Fertilizers on the Growth and Yield of Cayenne Peppers (*Capsicum frutescens* L.) in Urban Farming

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ABSTRACT

Cayenne pepper cultivation in urban areas faces several obstacles, including infertile soil, irregular watering due to busy daily activities, pests and diseases that spread more easily in urban areas, and high temperature changes. This study aims to obtain the optimal concentration of paclobutrazol and Gandasil fertilizer for the development and production of cayenne pepper. This study used a factorial completely randomized design with two factors, namely paclobutrazol concentration consisting of 4 levels (0 ppm, 75 ppm, 100 ppm, and 125 ppm) and Gandasil B/D fertilizer consisting of 4 levels (1 g/L, 2 g/L, 3 g/L, and 4 g/L). Results showed that treatment combination of paclobutrazol 100 ppm and Gandasil 3 g/L gave the best results on the number of flowers per plant (822.0), number of fruits per plant (144.5), and fruit weight (156.77 g/plant). This combination may, however, result in low fruit yield and inhibit vegetative development, including leaf number and plant height. The fastest flowering age was obtained at combination paclobutrazol 125 ppm and Gandasil concentrations of 4 g/L with a value of 39.33 days.

1. INTRODUCTION

Cayenne pepper (*Capsicum frutescens* L.), locally called *cabai rawit*, is a shrub from the eggplant family (*Solanaceae*) which is easy to grow both in the lowlands and highlands. The content of cayenne pepper constitutes fat (9-17%), carotenoids, protein (12-15%), vitamin C, vitamin A, and essential oils in very small levels. This plant also contains 1.5% capsaicin dihydrocapsaicin which gives cayenne peppers a spicy taste, fat, protein, carbohydrates, phosphorus (P), calcium (Ca), vitamins, iron (Fe), and alkaloid components such as flavonoids and capsaicin (Nurhasanah *et al.*, 2022). According to BPS (2023), cayenne pepper production fluctuated every year, namely 5,360,977 quintals in 2019, 6,849,429 quintals (2020), 5,788,830 quintals (2021), and 6,124,089 quintals (2022). One of the obstacles in growing cayenne pepper is the lack of agricultural land which can affect agricultural productivity. Along with population growth, the demand for cayenne pepper is increasing; but land conversion results in the decreasing available agriculture land.

The amount and quality of suitable land does not always correlate with the efforts made to develop and improve the cayenne pepper industry. Therefore, cayenne pepper cultivation in urban areas is one way to meet the household food needs of city dwellers. Cayenne pepper can be grown in urban areas by utilizing yards or vacant land and planted in pots or polybags. Cayenne pepper plants can be marketed as a side business by families in addition to being used for daily needs. However, planting cayenne pepper in urban areas faces several obstacles, including less fertile urban soil, irregular watering due to daily activities, pests and diseases that spread more easily in urban areas, and high temperature changes. This has an impact on the health of the cayenne pepper plants being cultivated. Cayenne plants will experience etiolation, yellowing leaves, and stunted fruit. To increase yields, intensification efforts can be made by modifying the environment, such as using growth regulators and fertilizers. Growth regulators are organic

substances that are exogenously applied to plants to inhibit, stimulate, or change their physiological processes without functioning as nutrients known as growth regulators (Harpitaningrum *et al.,* 2014).

Growth regulators are classified into two categories based on their nature, namely growth promoting and inhibiting. Paklobutrazol is a plant growth regulator (PGR) found in growth inhibitors (Desta & Amare, 2021). Paklobutrazol, a triazole derivative, causes metabolic changes in cytokinins, ethylene, and abscisic acid and inhibits the formation of gibberellic acid, by altering the rate of photosynthesis and phytohormone levels, these substances can impact plant growth and development (Tesfahun, 2018). The mechanism of action of paclobutrazol involves blocking the oxidation process of kaurene to kaurenoic acid, which can further slow down cell division and prevent vegetative growth (Chandra & Roychoudhury, 2020). Nutrient availability has a major impact on how plants respond to PGR applications.

Optimal fertilization is a way to overcome nutrient deficits. A foliar fertilizer called gandasil can provide more nutrients to plants when they are in the generative and vegetative growth stages. Another inorganic fertilizer that content consists of micro and macro nutrients in crystalline form is called gandasil foliar fertilizer. There are two types of Gandasil fertilizer, namely Gandasil B fruit fertilizer and Gandasil D leaf fertilizer. Each form of fertilizer has its own advantages (Maulani, 2018). Gandasil D fertilizer functions to encourage the development of new shoots and vegetative growth (Munauwar *et al*., 2019). Meanwhile, Gandasil B fertilizer used during the generative growth phase can prevent flowers from falling off the plant and encourage the growth of flowering plants, thereby accelerating the time for the plant to bear fruit. This study aims to determine the effect of the optimal concentration of Gandasil fertilizer and paclobutrazol on the production and growth of cayenne pepper.

2. MATERIALS AND METHODS

2.1. Materials

This research took place in January to May 2024, on agricultural land owned by the Faculty of Agriculture Universitas Pembangunan Nasional (UPN) "Veteran" East Java with an altitude of 6 m above sea level. The materials used in this study included seeds of cayenne pepper of ORI 212 variety, PGR paclobutrazol (Goldstar), Gandasil D and B fertilizers, NPK 16:16:16 fertilizer, Regent 50 SC and Demolish pesticides. Gandasil B and Gandasil D fertilizers are two types of leaf fertilizers formulated for different stages of plant growth. Gandasil D is used in the vegetative phase (early growth, leaf and stem formation), while Gandasil B is used in the generative phase (flowering and fruiting phase). Table 1 provides the nutrient content of Gandasil D and B fertilizers.

Table 1. Macronutrient content of Gandasil D and B fertilizers (Hendarto *et al*., 2021)

Nutrients	Gandasil D	Gandasil B
N	20%	6%
P	15%	20%
K	15%	30%
Mg	1%	3%

2.2. Design of Experimental

This study was performed according to completely randomized design (CRD) consisting of three repetitions and two factors. The first factor was Goldstar paclobutrazol concentration (P) consisting of four concentration levels, namely 0 ppm (P0), 75 ppm (P1), 100 ppm (P2), and 125 ppm (P3). The second factor was Gandasil D and B fertilizer concentration (G), consisting of four concentration levels, including 0 g/L (G1), 2 g/L (G2), 3 g/L (G3), and 4 g/L. The two factors formed 16 treatment combinations and were performed with three repetitions, resulting in 48 experimental units. All plants were cultivated in polybag where each pot consisted of two plants.

Cayenne pepper cultivation begins with the preparation of planting media with a composition of husk charcoal, soil, and compost at a weight ratio of 1:1:1. The planting medium was put into 40x40 cm polybags those were arranged with a distance 60 cm. The prepared growing media were sprayed with fungicide Antracol fungicide, Regent

50 SC, and Demolish pesticide to avoid pest and disease attacks. After preparing the planting media, each polybag was installed. Good cayenne pepper seedlings (14 days old) were transplanted, and basic fertilization was carried out with NPK 16:16:16 fertilizer at a dose of 10 g/plant by sowing. Paclobutrazol and Gandasil as well as NPK fertilizers were applied during cultivation at different time as detailed in Table 2. Paclobutrazol was applied three times, gandasil D fertilizer was applied 4 times, gandasil B fertilizer was applied 6 times, and NPK 16:16:16 fertilizer was applied 6 times. NPK 16:16:16 fertilizer as a supplementary fertilizer was given 3 g/plant for 10 times when the plants were 14 DAT (day after transplanting) with an interval of 7 days. At the age of 14 to 28 DAT, the NPK fertilizer was applied twice a week. However, at the age of 35 to 77 DAT the NPK fertilizer was applied once a week. Watering took place in the morning and afternoon at 200-300 ml/plant. Disease and pest control was carried out with the application of Regent 50 SC, Demolish pesticide, and Antracol fungicide. Harvesting began when the plants were 98 DAT and was done five times. Harvesting was done by selecting cayenne pepper fruits having characteristics of 75% ripe. This was characterized by dark green, reddish green, or red fruit.

Table 2. Application schedules for NPK, paclobutrazol, Gandasil D, and Gandasil B

PGR/ Fertilizer	Day after transplanting (DAT)											
	0	**7**	**14**	**21**	**28**	**35**	**42**	**49**	**56**	**63**	**70**	**77**
NPK (g/pot)	10	-	6	6	6	3	3	3	3	3	3	3
Paclobutrazol (ppm)	-	-	-	As design	-	As design	-	As design	-	-	-	-
Gandasil D (g/L)	-	-	As design	As design	As design	As design	-	-	-	-	-	-
Gandasil B (g/L)	-	-	-	-	-	-	As design	As design	As design	As design	As design	As design

2.3. Measurements and Methods

Parameter observed during this study included the number of leaves and plant height at the age of 7 to 133 DAT, flowering age (days), total flower number of each plant, total fruit number of each plant, total fruit weight of each plant (g), and percentage of fruit formation (fruitset). The percentage of fruitset was calculated by dividing the total number of fruits per plant by the total number of flowers, and was calculated by the following formula:

$$Fruit\ set = \frac{\sum Fruits}{\sum Flowers} \times 100\% \quad (1)$$

2.4. Analysis Method

Observational data were analyzed using ANOVA through the linear additive model (Mattjik & Sumertajaya, 2006):

$$Yijk = \mu + \alpha i + \beta j + (\alpha\beta)ij + \varepsilon ijk \quad (2)$$

where Y_{ijk} is the observation value at the i-th level treated with paclobutrazol, j^{th} level treated with D and B Gandasil fertilizers, and k is the replication, μ is the general mean, αi is the effect of the i^{th} level on the main factor, β_j is the effect of the jth level to the second factor, $(\alpha\beta)_{ij}$ is the interaction effect between the i^{th} level treated with paclobutrazol and the j^{th} level treated with gandasil fertilizer, ε_{ijk} is the experimental error. The Honest Significant Difference test (HSD) analysis was conducted when there was a significant impact at the 5% level.

3. RESULTS AND DISCUSSION

Figure 1 shows the cayenne pepper plants ready for harvest in this study which were produced from treatment combinations of varying doses of paclobutrazol and Gandasil D and B fertilizers.

3.1. Plant Height

The results of data analysis stated that the combination of Gandasil and paclobutrazol fertilizer concentrations had a significant effect on the height of cayenne pepper plants aged 70 to 133 DAT (days after transplanting). The average height of cayenne pepper plants given a combination of paclobutrazol and Gandasil fertilizer is shown in Table 3.

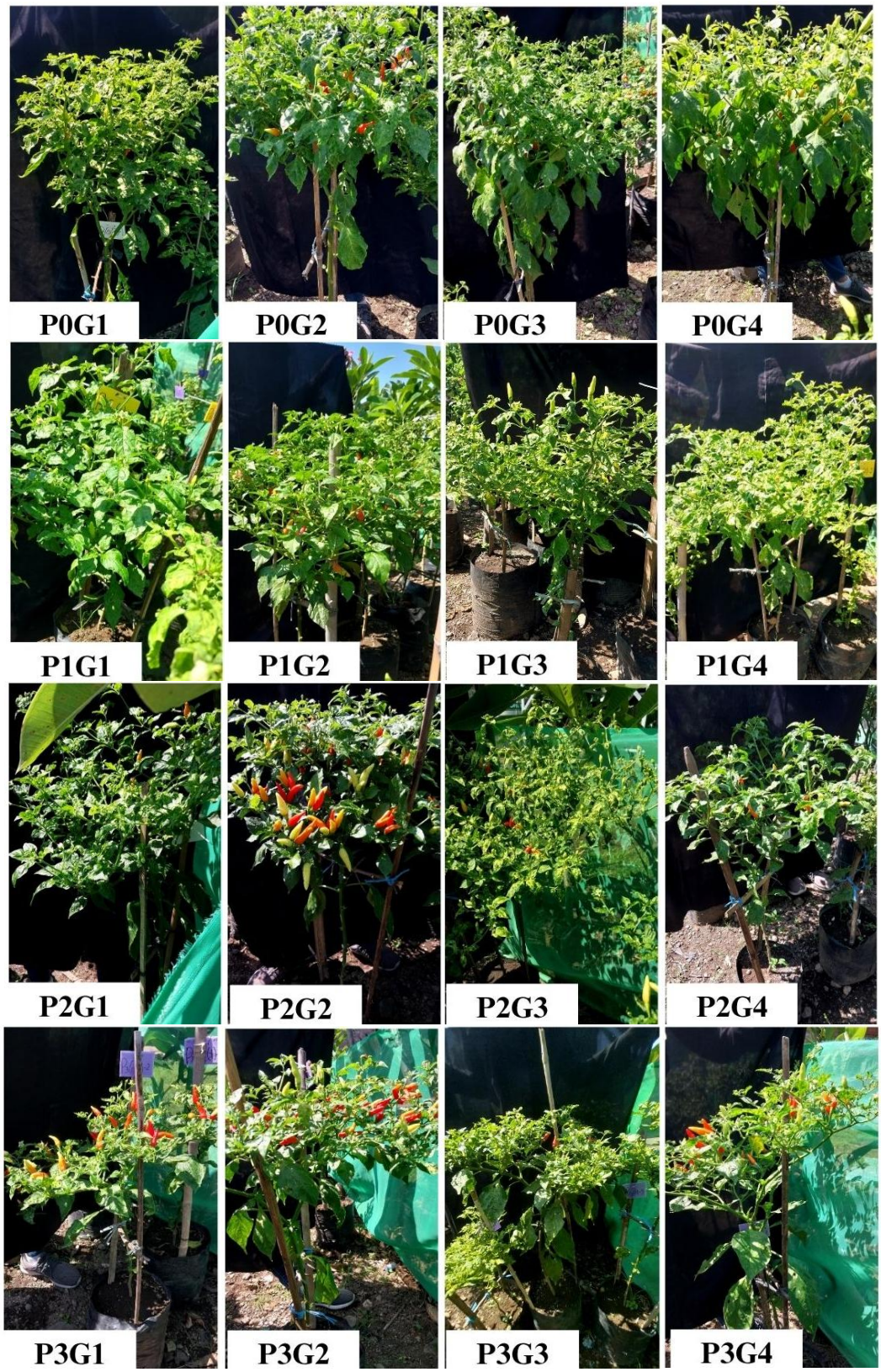

Figure 1. Visual of cayenne pepper plants resulted from different treatment

Table 3. Effect of treatment combinations of paclobutrazol and Gandasil fertilizer on the plant height (cm) of cayenne pepper at the age of 70 to 133 DAT.

Age (DAT)	Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
		P_0 (0)	P_1 (75)	P_2 (100)	P_3 (125)
70	G_1 (0)	59.17 fg	57.50 e	56.17 d	50.43 a
	G_2 (2)	61.83 hi	59.00 f	57.50 e	53.28 c
	G_3 (3)	62.42 i	59.92 g	58.45 f	56.50 d
	G_4 (4)	61.13 h	58.22 ef	56.82 de	51.50 b
	HSD 5%		0.84		
91	G_1 (0)	72.78 gh	71.00 f	68.42 d	60.83 a
	G_2 (2)	76.13 i	72.33 g	70.83 f	65.25 c
	G_3 (3)	77.08 i	73.08 gh	71.33 f	68.12 d
	G_4 (4)	73.33 h	71.73 fg	69.62 e	62.08 b
	HSD 5%		0.95		
112	G_1 (0)	87.57 j	85.43 h	80.42 d	72.55 a
	G_2 (2)	89.12 k	87.62 j	83.30 f	78.18 c
	G_3 (3)	91.33 l	88.75 k	84.33 g	80.57 d
	G_4 (4)	88.28 jk	86.22 i	82.40 e	77.00 b
	HSD 5%		0.72		
133	G_1 (0)	112.00 j	101.40 fg	95.83 d	89.97 a
	G_2 (2)	114.90 k	104.72 h	98.65 ef	93.23 c
	G_3 (3)	117.75 l	109.00 i	100.17 f	94.57 cd
	G_4 (4)	113.62 k	102.28 g	97.75 e	91.42 b
	HSD 5%		1.61		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

The combination of 0 ppm paclobutrazol and 3 g/L Gandasil fertilizer produced cayenne pepper plants with an average height of 117.75 cm at the age of 133 DAT. The lowest average plant height value was 89.97 cm, produced at the age of 133 DAT with a combination of 100 ppm paclobutrazol and 0 g/L Gandasil fertilizer used. The plant height given 3 g/L Gandasil fertilizer was the highest compared to the control treatment. This means that the plants benefited from the additional nutrients provided by Gandasil fertilizer as a foliar fertilizer. Growth was inhibited when the 4 g/L concentration of Gandasil fertilizer was applied. The application of 4 g/L Gandasil fertilizer inhibited plant growth, as excessive nutrients resulted in phytotoxicity, which inhibited growth and reduced production. Plants that were not applied paclobutrazol grew taller than plants that were given paclobutrazol. When paclobutrazol is given at the maximum concentration, it will reduce the growth of plant height, the lowest plant height is obtained when giving paclobutrazol 125 ppm. This shows that giving paclobutrazol with the right concentration will have a positive effect on plant height parameters, but if the higher the concentration of paclobutrazol given to plants, the growth will be increasingly suppressed. In line with the research of Nazibah *et al.* (2018), that when compared to the control treatment, the lowest plant height results were at a dose of paclobutrazol 150 ppm.

3.2. Number of Leaves

The result of data analysis showed that the combination of Gandasil fertilizer and paclobutrazol concentration significantly affected the number of leaves of cayenne pepper plants aged 49 to 133 DAT (days after transplanting). The average number of leaves of cayenne pepper plants given a combination of paclobutrazol concentration and Gandasil fertilizer is shown in Table 4. The combination of 0 ppm paclobutrazol and 3 g/L Gandasil fertilizer produces cayenne pepper plants with the largest number of leaves at the age of 133 HST, which is 106.17 strands. However, the treatment combination of 125 ppm paclobutrazol concentration + 0 g/L gandasil fertilizer, which is 88.50 strands with the lowest average value. This is in line with the findings of Rahmawati *et al.* (2022), which suggested that the application of 125 ppm compared to the control treatment caused a decrease in the number of plant leaves. Application of paclobutrazol at the right concentration will increase the number of leaves. However, excessive application of paclobutrazol can result in accumulation in the vacuole. Compared to other plant parts, leaf cells show the fastest

reaction rate. As a result, the resistance of leaves to paclobutrazol is reduced. In response to the decreased toxicity of paclobutrazol, plants will shed leaves, resulting in a reduced number of leaves. In contrast to the control treatment, plants treated with paclobutrazol showed thicker and greener leaves. This is in line with the research of Rahmah *et al.* (2021), that the application of paclobutrazol can make plant leaves greener. When compared to the control treatment, the application of Gandasil 3 g/L fertilizer also produced the highest number of leaves on cayenne pepper plants. From this it can be concluded that the concentration of Gandasil fertilizer at 3 g/L has met the nutritional needs of plants.

Table 4. Effect of combinations of paclobutrazol and Gandasil fertilizer treatment on the number of leaves of cayenne pepper at age 49 to 133 DAT.

Age (DAT)	Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
		P_0 (0)	P_1 (75)	P_2 (100)	P_3 (125)
49	G_1 (0)	47.33 l	41.17 h	34.67 d	29.33 a
	G_2 (2)	48.00 lm	43.67 j	37.00 f	33.33 c
	G_3 (3)	48.67 m	45.17 k	39.17 g	34.00 cd
	G_4 (4)	47.83 lm	42.50 i	36.00 e	31.33 b
	HSD 5%		0.84		
70	G_1 (0)	58.83 l	55.00 i	49.17 e	44.83 a
	G_2 (2)	59.83 m	57.50 k	52.00 g	46.67 c
	G_3 (3)	61.17 n	58.50 l	53.67 h	47.83 d
	G_4 (4)	59.00 l	55.83 j	50.67 f	45.83 b
	HSD 5%		0.71		
91	G_1 (0)	70.00 l	66.67 h	63.33 d	59.17 a
	G_2 (2)	72.17 m	68.50 j	65.67 f	62.17 c
	G_3 (3)	73.17 n	69.33 k	66.17 g	63.17 d
	G_4 (4)	71.50 o	67.33 i	64.50 e	60.50 b
	HSD 5%		0.47		
112	G_1 (0)	85.83 m	80.33 i	76.00 e	72.50 a
	G_2 (2)	88.00 o	82.50 k	78.17 g	74.50 c
	G_3 (3)	90.17 p	84.67 l	79.17 h	75.50 d
	G_4 (4)	87.00 n	81.67 j	77.00 f	73.50 b
	HSD 5%		0.46		
133	G_1 (0)	103.33 m	98.33 i	94.33 e	88.50 a
	G_2 (2)	105.17 o	100.17 k	96.33 g	90.50 c
	G_3 (3)	106.17 p	102.50 l	97.33 h	91.50 d
	G_4 (4)	104.33 n	99.50 j	95.33 f	89.50 b
	HSD 5%		0.40		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

3.3. Flowering Time (days)

The data analysis showed that paclobutrazol concentration and gandasil fertilizer concentration together had a significant effect on the flowering age of cayenne pepper plants. The average flowering age of cayenne pepper plants given a combination of Gandasil fertilizer and paclobutrazol concentration is shown in Table 5. The combination of paclobutrazol 125 ppm + gandasil fertilizer concentration 4 g/L has the fastest value, which is 39.33 days. Meanwhile, the combination of paclobutrazol 0 ppm + gandasil fertilizer concentration of 0 g/L produced the longest average value of cayenne pepper flowering age with an average value of 49.33 days. This is possible because paclobutrazol and Gandasil fertilizer provide a balance of nutrients that can spur the generative growth of cayenne pepper plants. When the concentration is given appropriately, paclobutrazol will cause the assimilation results to shift from vegetative growth to generative growth. The amount of phosphorus (P) in Gandasil fertilizer (Table 1.) is very important for plants during their generative period. Flowering induction in cayenne pepper plants is accelerated by the availability of minerals, especially phosphorus which is important for the generative growth of plants (Saputra & Sutriana, 2022).

Table5. Effect of treatment combinations of paclobutrazol and Gandasil fertilizer on the flowering age (days) of cayenne pepper.

Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
	P_0 (0)	P_1 (75)	P_2 (100)	P_3 (125)
G_1 (0)	49.33 p	46.50 l	44.00 h	41.83 d
G_2 (2)	48.50 o	46.33 k	43.67 g	40.50 c
G_3 (3)	48.17 n	45.67 j	43.17 f	39.83 b
G_4 (4)	47.50 m	45.00 i	42.33 e	39.33 a
HSD 5%		0.46		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

3.4. Total Number of Flowers per Plant

The results of data analysis showed that the combination of Gandasil and paclobutrazol fertilizer concentrations had a significant effect on the total number of flowers per cayenne pepper plant. The average total number of flowers per plant given a combination of Gandasil and paclobutrazol fertilizer concentrations is shown in Table 6. The treatment of paclobutrazol and Gandasil fertilizer has a significant effect on the total number of flowers produced by each cayenne pepper plant, which is shown in Table 6. The combination of 100 ppm paclobutrazol + 3 g/L Gandasil fertilizer concentration produced the greatest yield, with an average of 822.00 pieces. However, the combination of 0 ppm paclobutrazol + 0 g/L gandasil fertilizer concentration had the lowest total number of flowers plant with a value of 582.50 pieces. Photosynthetic effects are diverted from vegetative needs to generative growth, leading to flower production, when gibberellin biosynthesis is inhibited. Paclobutrazol application also has an effect on the number of flowers. Research conducted at 133 DAT showed that plants can produce more flowers when given 100 ppm paclobutrazol. Research by Sugianto *et al.* (2022), which shows that as the concentration of paclobutrazol increases, it can increase the number of flowers produced. Paclobutrazol can induce flowering, which explains the increase in flowering. However, large concentrations of paclobutrazol can cause flowers to wilt and die before they have a chance to fully bloom. The flower count parameter also has to do with the element potassium found in a fertilizer called Gandasil (Table 1). Potassium serves to accelerate flowering, which then affects the number of flowers produced by cayenne pepper plants (Astutik & Sumiati, 2019).

Table 6. Effect of treatment combinations of paclobutrazol and Gandasil fertilizer on the number of flowers per plants

Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
	P_0 (0)	P_1 (75)	P_2 (100)	P_3 (125)
G_1 (0)	582.50 a	704.50 i	776.83 m	647.67 e
G_2 (2)	611.00 c	736.33 k	806.17 o	673.17 g
G_3 (3)	624.50 d	759.33 l	822.00 p	693.83 h
G_4 (4)	596.83 b	725.00 j	789.83 n	664.50 f
HSD 5%		5.14		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

3.5. Total Number of Fruits per Plant

The result of data analysis showed that the combination of gandasil and paclobutrazol fertilizer concentrations significantly affected the total number of fruits per cayenne pepper plant. The average total number of fruits per cayenne pepper plant given a combination of Gandasil and paclobutrazol fertilizer concentrations is shown in Table 6. The combination of paclobutrazol 100 ppm + gandasil fertilizer concentration of 3 g/L has the highest value, namely 144.50 pieces. Meanwhile, the combination of 0 ppm paclobutrazol + 0 g/L gandasil fertilizer concentration produced the lowest average value of total fruit number per cayenne pepper plant with a value of 104.00 pieces.

The combination of 100 ppm paclobutrazol concentration with 3 g/L concentration of gandasil fertilizer is the best way to produce the highest total number of fruits per plant. The results of our research are in line with Sugiharto *et al.* (2023), who reported that the application of paclobutrazol at concentration of 150 ppm combined with NPK fertilizer at 27.5 g/plant produced the highest results for the number of tomato fruits per plant, while the treatment of paclobutrazol concentration of 450 ppm combined with NPK fertilizer at 12.5 g/plant produced the lowest results. The

Table 7. Effect of treatment combinations of paclobutrazol and Gandasil fertilizer on the total number of fruits per plant

Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
	P_0 (0)	**P_1 (75)**	**P_2 (100)**	**P_3 (125)**
G_1 (0)	104.00 a	123.67 i	135.00 m	115.00 e
G_2 (2)	109.67 c	127.83 k	141.83 o	118.67 g
G_3 (3)	112.17 d	130.50 l	144.50 p	121.67 h
G_4 (4)	106.83 b	125.33 j	139.50 n	116.50 f
HSD 5%		0.87		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

increase in the number of fruits stated that vegetative growth was inhibited due to the application of paclobutrazol which did not inhibit the yield of cayenne pepper plants. Pinto *et al.* (2005) explained that paclobutrazol can suppress stem elongation by inhibiting its physiological activities without inhibiting the production of assimilate translocating to other organs. The use of Gandasil fertilizer at 3 g/L produced the highest number of fruits per plant. These results are in line with the research of Rinoto *et al.* (2017), that cayenne pepper plants given 3 g/L gandasil fertilizer produce more fruit than plants given gandasil fertilizer at doses of 0 g/L, 1 g/L, and 2 g/L. This is due to the potassium and phosphorus content of the fertilizer. This is because the potassium and phosphorus content in Gandasil fertilizer (Table 1) is ideal or the concentration is in accordance with the needs of the plant, allowing it to produce more fruit.

3.6. Total Fruit Weight per Plant (g)

The results of data analysis showed that the combination of Gandasil and paclobutrazol fertilizer concentrations had a significant effect on the total fruit weight per cayenne pepper plant. The average total fruit weight per plant of cayenne pepper plants given a combination of Gandasil and paclobutrazol fertilizer concentrations is shown in Table 8. The treatment of paclobutrazol and gandasil fertilizer had a significant effect on the total weight of fruit produced by each cayenne pepper plant, which is shown in Table 8. The combination of paclobutrazol 100 ppm + Gandasil fertilizer concentration of 3 g/L produced the largest yield, with an average of 156.77 g. However, the combination of paclobutrazol 100 ppm + gandasil fertilizer concentration of 0 g/L had the lowest total fruit weight per plant with an average of 101.57 g. However, the combination of 0 ppm paclobutrazol + 0 g/L gandasil fertilizer concentration had the lowest total fruit weight per plant with a value of 101.57 g.

Table 8. Effect of treatment combinations of paclobutrazol and Gandasil fertilizer on the total fruit weight (g) per plant

Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
	P_0 (0)	**P_1 (75)**	**P_2 (100)**	**P_3 (125)**
G_1 (0)	101.57 a	130.38 i	142.65 m	116.45 e
G_2 (2)	109.97 c	136.73 k	152.30 o	123.78 g
G_3 (3)	112.83 d	139.32 l	156.77 p	126.97 h
G_4 (4)	106.32 b	133.43 j	147.45 n	119.88 f
HSD 5%		0.59		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

Maximum overall fruit weight per plant was achieved with the combined treatment of 100 ppm paclobutrazol and 3 grams of Gandasil fertilizer per plant. This supports the results of research by Sakanti *et al.* (2024), which showed that the application of paclobutrazol concentration had a significant effect on overall fruit weight per plant. This is because paclobutrazol can increase fruit assimilation which can affect fruit weight. Fruit weight can also be increased by applying paclobutrazol before the generative period because assimilation absorption occurs more evenly throughout the ripening process than in the vegetative phase. The use of Gandasil 3 g/L fertilizer, the total fruit weight parameter in plants has the highest value. This happens because the macro elements will be more effective if the P and K elements are fulfilled by macro nutrients in Gandasil fertilizer (Table 1). This is in line with the statement of Qibtyah (2015), that phosphate plays an important role in plant metabolism. In particular, the fulfillment of P and K needs ensure the smooth photosynthesis and production of cayenne peppers have large fruits

Table 9. Effect of treatment combinations of paclobutrazol and Gandasil fertilizer on the fruit set (%) of cayenne pepper.

Gandasil Fertilizer Concentrations (g/L)	Paclobutrazol Concentrations (ppm)			
	P_0 (0)	P_1 (75)	P_2 (100)	P_3 (125)
G_1 (0)	79.69 d	78.52 c	76.92 b	79.31 cd
G_2 (2)	80.34 de	77.01 b	76.87 b	78.59 c
G_3 (3)	80.70 e	75.87 a	76.05 a	77.99 c
G_4 (4)	80.02 d	76.89 b	78.15 c	78.45 c
HSD 5%		1.19		

Note: Numbers followed by the same letter in the same column indicate no significant difference in the 5% HSD test.

3.7. Fruit set (%)

The results of data analysis showed that the combination of Gandasil and paclobutrazol fertilizer concentrations significantly affected the fruitset of cayenne pepper plants. The average plant fruitset of cayenne pepper plants given a combination of paclobutrazol and Gandasil fertilizer concentrations is shown in Table 9. The combination of 0 ppm paclobutrazol + 3 g/L gandasil fertilizer concentration (80.70%) and 0 ppm paclobutrazol + 2 g/L gandasil fertilizer (80.34%) was not significantly different in producing the highest yield. Meanwhile, the combination of 75 ppm paclobutrazol + 3 g/L gandasil D and B fertilizer (75.87%) and 100 ppm paclobutrazol + 3 g/L gandasil D and B fertilizer (76.05%) were not significantly different in producing the lowest yield.

Paclobutrazol treatment on cayenne pepper plants has an impact on the percentage of flowers that become fruit on cayenne pepper plants that have low yields. Environmental variables and the proportion of flowers that bloom affect the percentage of flowers that become fruit (Sugiharto *et al.,* 2023). In this study, the total number of flowers and fruits per plant increased significantly after paclobutrazol treatment, although this was not directly proportional to fruitset yields. Plants will naturally shed excessive leaves or flowers for them, so that even though the total number of flowers and fruits per plant is large, it is not possible to get good fruitset yields. This is in line with the findings of Khafie *et al.* (2021), which found that the most flowers were produced by the 200 ppm treatment but the least fruitset. This is because plants are unable to maintain their flowers at a concentration of 200 ppm, resulting in a decrease in the proportion of flowers that turn into fruit.

4. CONCLUSION

Cayenne pepper can be explored for urban farming cultivation supported by application of PGR paclobutrazol and Gandasil fertilizers. A paclobutrazol concentration of 100 ppm and 3 g/L Gandasil fertilizer concentration gave the best results in total flower number per plant (822.00), total fruit number per plant (144.50), and total fruit weight per plant (156.77 g) obtained when paclobutrazol concentration and gandasil fertilizer concentration were combined.

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