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THE EFFECT OF PACLOBUTRAZOL CONCENTRATION AND NPK FERTILIZER DOSAGE ON THE PRODUCTION OF LONG BEANS (VIGNA SINENSIS L) BASED ON QUANTITY AND QUALITY

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Abstract

The production of long bean plants is still relatively low compared to other countries. Factors that can cause low production of long bean plants and decrease yearly include limited knowledge of farmer cultivation techniques, using local varieties with low yield potential, and inappropriate or unbalanced fertilization so that long bean plants have low productivity. This research was conducted from December 2023 - to February 2024 at Dander Village Land, Dander District, Bojonegoro Regency, East Java. This experiment was arranged using RPT (Divided Plots Design) with two treatment factors, namely the frequency of NPK fertilizer application as a subplot and paclobutrazol as the main plot so that there are two factors. The first factor is paclobutrazol concentration (P), which includes four treatment levels: 0 ppm (P0), 125 ppm (P1), 150 ppm (P2), and 175 ppm (P3). Meanwhile, the second factor is the dose of NPK fertilizer (N), which consists of 4 treatment levels: 300 kg/ha (N1), 350 kg/ha (N2), 400 kg/ha (N3), and 450 kg/ha (N4). The combined treatment of paclobutazol concentration of 175 ppm and NPK fertilizer dose of 18 g/plant gave the best results in the parameters of pod length (76,00 cm), pod weight (41,93 g) and number of seeds (18,00 seeds). The treatment of paclobutrazol concentration of 150 ppm gave the best results in the parameters of the number of pods per plant from week 2 to week 4 (557,57 g, 340,00 g and 312,26 g), the total number of pods per plant (68,83), weight of pods per plant week 2 and 3 (557, 57 g and 340,00 g), total pod weight per plant (1766,39 g), pod weight per plot week two and week 5 (4,29 kg and 2,03 kg), total pod weight per plot (11,53 kg), pod weight per hectare (44,16) and fruit set (80,01%). The treatment of NPK fertilizer dose of 18 g/plant gave the best results in weight per pod (41,93 g) and pod weight per plot in week 1 (1,45 kg).

Keywords: Production, Paclobutrazol, NPK Fertilizer

INTRODUCTION

Long bean is a type of shrub that grows creeper and is widely used by Indonesians as a vegetable that is consumed daily. Long bean (Vigna sinensis L.) is a vegetable with a high nutritional content of vitamins A, B, and C and minerals in its pods, especially in young pods. Long beans also have protein, fat and carbohydrates in the seeds.

The production of long bean plants is still relatively low compared to other countries. Based on BPS data in 2022, Indonesia's long bean crop has decreased yearly; in 2021, it was 383,685 tons, and in 2022 it was 360,871 tons (BPS, 2022). Factors that can cause low production of long bean plants and decline from year to year include poor long bean cultivation methods, limited knowledge of farmer cultivation techniques, the use of local varieties with low yield potential and inappropriate or unbalanced fertilization so that long bean plants have low productivity. Therefore, a solution must be

found to increase the productivity of long bean plants. Solutions to increase the production of long bean plants include using the ZPT Paclobutrazol and NPK fertilizer to cultivate long bean plants.

Paclobutrazol is a growth regulator that can inhibit gibberellin biosynthesis so that plant vegetative growth is inhibited but can stimulate flowering. Paclobutrazol can be a stimulant in flower formation so that plant productivity can increase (Saputra et al., 2017). Meanwhile, fertilization in agricultural activities plays a vital role in meeting the nutritional needs of plants so that they can grow optimally. Giving doses of NPK fertilizer affects the growth and production of long bean plants. According to Afifi et al. (2017), the nitrogen element is needed to produce protein, helping in the metabolic process for photosynthesis and leaf growth. Phosphorus is needed to spur growth and form a sound root system, the building block of cell nuclei (nucleic acids), fats, and proteins. Potassium is responsible for helping the formation of carbohydrates and proteins, as well as improving plant quality. Applying the correct dose of NPK fertilizer and understanding the plant's needs can increase the productivity of long beans, creating abundant yields and positively contributing to local food security and the agricultural economy.

The use of paclobutrazol ZPT is expected to inhibit the growth of long bean plants and can stimulate flowering so that plant productivity increases. Adding NPK fertilizer is also expected to positively affect the growth and yield of long bean plants as a fulfillment of nitrogen, phosphorus, and potassium nutrients for plants. The combination of paclobutrazol ZPT concentration treatment and NPK fertilizer dosage is expected to increase the production of long bean plants and become a solution to overcome problems regarding the decline in long bean plant production. Therefore, it is necessary to research the provision of paclobutrazol and the dose of NPK fertilizer in producing long bean plants (*Vigna sinensis* L) in quantity and quality.

LITERATUR REVIEW

Paclobutrazol Growth Regulators

Paclobutrazol is a growth regulator that functions to inhibit gibberellin biosynthesis. Giving this substance inhibits the elongation of the stem and can stimulate flower induction. Retardants whose role is to cause plant nutrients and energy to be directed to reach the generative phase more quickly, so giving ZPT paclobutrazol can increase production, especially in fruit size (Saputra et al., 2016).

Paclobutrazol can inhibit plant growth, causing plants to become shorter and increase leaf chlorophyll content so that photosynthetic activity can run well and increase production. Paclobutrazol can be applied through leaves (spray) or the soil (drench). Plants can absorb Paclobutrazol well by spraying it through leaves or directly into the planting media (Gusmawan & Wardiyati, 2019). Widaryanto et al. (2011) stated that the earlier the administration of ZPT paclobutrazol is given to the plant, the greater the inhibitory properties will be; on the contrary, if the longer the administration of ZPT paclobutrazol is given to the plant, the smaller the inhibitory properties will be.

NPK Fertilizer

Fertilization is the provision of nutrients that aim to increase plant yields. Fertilization aims to maintain and improve soil fertility by providing nutrients to the soil with organic and inorganic fertilizers (Rahmawan et al., 2019). Plants need several vital nutrients to grow well. The primary nutrients include nitrogen (N), phosphorus (P), and potassium (K). These three nutrients are referred to as NPK, the main component in plant fertilization. NPK fertilizer is an inorganic fertilizer commonly used by farmers in cultivation activities. The elements N, P and K have different roles in the metabolic process of plants (Khafie et al., 2021). NPK fertilizers contain primary macronutrients, essential nutrients for plants and can increase the uptake of N, P and K elements and help increase crop production. A lack of these elements will cause the fruit to grow imperfectly, tiny, of poor quality, low yield, and not durable (Lingga & Marsono, 2013).

Nitrogen (N) is nutrient plants require in large quantities because nitrogen functions as part of many plant cell components, such as amino acids and nucleic acids (Utomo et al., 2016). According to Handayanto et al. (2017), nitrogen is an ingredient in the preparation of protein, stimulating vegetative growth in plants, giving plants a green color, and regulating and influencing the application of other nutrients. Plants that experience a lack of nitrogen nutrients will have yellowish leaves (chlorosis), and the development of the root system is inhibited, stunting the plant's growth. Plants that experience excess nitrogen nutrients can cause plants to remain in the vegetative phase and delay the formation of flowers or fruits. In addition, excess nitrogen also causes plants to become soft and succulent, making them more sensitive to certain plant diseases.

Efendi et al. (2017) state that the nutrient Phosphorus (P) functions to stimulate growth in plant roots, especially in the roots of seeds or young plants, as a raw material for the formation of specific proteins, helps assimilation and respiration and accelerates the ripening of seeds and fruit. Meanwhile, the nutrient potassium (K) plays a role in helping the formation of proteins and carbohydrates, strengthening leaves, flowers and fruits so that they do not fall easily and can be a source of strength in the face of drought and disease.

METHOD

This research was conducted in December 2023 - March 2024 in Dander Village Land, Dander District, Bojonegoro Regency, East Java, with an altitude of 250 - 500 meters above sea level, temperature of 22 - 32˚C, humidity 57-96% and average rainfall 1500 mm/year. The tools used in the study were mulch, hoe, picks, measuring cups, analytical scales, woolen yarn, raffia, sprayer, syringe, calculator, bucket, hand sprayer, plastic, meter, label, and polybag. The materials used in this study were long bean seeds of the Katon Tavi variety, NPK Mutiara 16-16-16 fertilizer, manure, Regent, Antracol fungicide, Sanvit adhesive and paclobutrazol Gobest 250 SC.

This experiment was arranged using RPT (Divided Plots Design) with two treatment factors, namely the frequency of NPK fertilizer application as subplots and paclobutrazol as the main plot, so there were two factors. The first factor is paclobutrazol concentration (P), which includes four treatment levels: 0 ppm (P0), 125 ppm (P1), 150 ppm (P2), and 175 ppm (P3). Meanwhile, the second factor was the dose of NPK fertilizer (N), which consisted of 4 treatment levels: 300 kg/ha (N1), 350 kg/ha (N2), 400 kg/ha (N3), and 450 kg/ha (N4). There were 16 treatment combinations of the two factors, with each level predetermined. The predetermined treatment combinations were repeated thrice, resulting in 48 experimental units. The length of the plot was 1.5 m, and the width of the plot was 1 m.

The observation parameters in this study included the number of pods per plant, the weight of pods per plant, the weight of pods per plot, the weight of pods per hectare, pod length, pod weight, the number of seeds and the fruit set (%). The observation data were analyzed using the Anova divided plot design (RPT) and further tested using BNT 5%.

RESULTS AND DISCUSSION

Number of Pods Per Plant

The analysis of variance showed that the combined treatment of paclobutrazol concentration with the dose of NPK fertilizer did not significantly interact with the number of pods per plant of long bean plants. The single factor of paclobutazol concentration treatment had a significant effect on the number of pods per plant from week 1 to week five and the total number of pods per plant, while the single NPK dose treatment did not significantly affect the number of pods per plant of long bean plants (Table 1).

Table 1

Number of Pods Per Plant of Long Bean Plants in the Treatment of Paclobutrazol Concentration and Doses of NPK Fertilizer

Treatment	Number of Pods Per Plant of String Beans					
Paclobutrazol Concentration (ppm)	Harvest Week					Total
	1	2	3	4	5	
0	9,67 a	17,26 a	10,58 a	9,42 a	7,42 a	54,35 a
125	11,83 b	19,96 b	12,75 b	12,25 b	9,17 b	65,96 b
150	12,00 b	21,42 b	14,17 b	12,58 b	8,67 b	68,83 b
175	13,83 c	20,21 b	11,75 b	12,25 b	8,83 b	66,88 b
BNT 5%	1,28	2,44	1,94	2,30	0,98	3,61
Dose of NPK Fertilizer (g/plant)						
12	11,50	18,50	12,25	11,25	8,42	61,92
14	11,92	20,01	12,92	11,50	8,58	64,93

16	11,50	20,75	12,00	12,08	8,25	64,58
18	12,42	19,58	12,08	11,67	8,83	64,58
BNT 5%	tn	tn	tn	tn	tn	tn

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The single factor of paclobutrazol concentration treatment showed significant differences in the number of pods per plant of long bean plants for five weeks of harvest. The highest average number of pods per long bean plant was obtained in week 1, P3 (175 ppm paclobutrazol) at 13,83 pods, week 2, P2 (150 ppm paclobutrazol) at 21,42 pods, week 3, P2 (150 ppm paclobutrazol) at 14,17 pods, week 4, P2 (150 ppm paclobutrazol) at 12,58 pods and week 5, P1 (125 ppm paclobutrazol) at 9,17 pieces. At the same time, the lowest average number of pods per plant of long bean plants is in the treatment of P0 (0 ppm paclobutrazol) consecutively for five weeks, namely 9,67 pods (week 1), 17,26 pods (week 2), 10,58 pods (week 3), 12,58 pods (week 4) and 7,42 pods (week 5). The single factor of NPK fertilizer dose treatment did not significantly affect the number of pods per plant of long bean plants.

The single factor of paclobutrazol concentration treatment showed significant differences in the number of pods per plant of long bean plants for five weeks of harvest. The highest average number of total pods per plant of long bean plants was obtained in the P2 treatment (150 ppm paclobutrazol) of 68,83 pods. At the same time, the lowest average number of total pods of long bean plants is in the P0 treatment (0 ppm paclobutrazol), reaching 54,35 pods. The single factor of NPK fertilizer dose treatment does not significantly affect the total number of pods of long bean plants per plant.

Plant Pod Weight

The analysis of variance showed that the combined treatment of paclobutrazol concentration with the dose of NPK fertilizer did not significantly interact with the weight of pods per plant of long bean plants. The single factor of paclobutazol concentration treatment significantly affected the weight of pods per plant from week 1 to week five and the total pod weight per plant. In contrast, the single NPK dose treatment did not significantly affect the weight of pods per plant of long bean plants (Table 2).

Table 2

Weight of Pods per Plant of String Beans in the Treatment of Paclobutrazol Concentration and Dosage of NPK Fertilizer

Treatment	Pod Weight Per Plant (g)	
Paclobutrazol Concentration	Harvest Week	Total

(ppm)	1	2	3	4	5	
0	272,92 a	394,78 a	268,26 a	261,57 a	194,63 a	1392,14 a
125	309,70 a	554,41 c	314,38 b	312,26 b	244,85 b	1735,60 b
150	315,97 a	557,57 d	340,00 c	310,43 b	242,42 b	1766,39 b
175	338,08 b	529,57 b	321,15 b	310,50 b	252,42 b	1751,71 b
BNT 5%	43,09	2,50	24,52	18,71	17,00	42,49
Dose of NPK Fertilizer (g/plant)						
12	290,57	504,81	309,18	297,08	221,88	1623,51
14	315,72	499,82	307,69	298,51	234,04	1655,78
16	303,01	514,60	306,63	298,48	234,95	1657,66
18	327,38	517,10	320,30	300,70	243,43	1708,90
BNT 5%	tn	tn	tn	tn	tn	tn

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The single factor of paclobutrazol concentration treatment showed significant differences in the weight of pods per plant of long bean plants for five weeks of harvest. The highest average weight of pods per long bean plant was obtained in week 1, P3 (175 ppm paclobutrazol) at 338,08 g, week 2, P2 (150 ppm paclobutrazol) at 557,57 g, week 3, P2 (150 ppm paclobutrazol) at 340,00 g, week 4, P1 (125 ppm paclobutrazol) at 312,26 g and week 5, P3 (175 ppm paclobutrazol) at 252,42 g. While the lowest average weight of pods per long bean plant was in the treatment of P0 (0 ppm paclobutrazol) at 340,00 g, week 4, P1 (125 ppm paclobutrazol) at 312,26 g and week 5, P3 (175 ppm paclobutrazol) at 252,42g. At the same time, the lowest average weight of pods per plant of long bean plants is in the treatment of P0 (0 ppm paclobutrazol) consecutively for five weeks, namely 272,92 g (week 1), 394,78 g (week 2), 268,26 g (week 3), 261,57 g (week 4) and 194,63 g (week 5). The single factor of NPK fertilizer dosage treatment did not significantly affect the total pod weight per plant of long bean plants.

The single factor of paclobutrazol concentration treatment showed significant differences in the total pod weight per plant of long bean plants for five weeks of harvest. The highest average weight of total pods per plant of long bean plants was obtained in the P2 treatment (150 ppm paclobutrazol), which was 1766,39 g. At the same time, the lowest average yield of total pod weight of broad bean plants was in the P0 treatment (0 ppm paclobutrazol), which reached 1392,14 g. The single factor of

NPK fertilizer dose treatment does not significantly affect the total pod weight per plant of long bean plants.

Pod Weight Per Plot

The results of the variance analysis showed that the combined treatment of paclobutrazol concentration with NPK fertilizer dose showed no significant interaction on the weight of pods per plot of long bean plants in weeks one through five. The single factor of paclobutrazol concentration treatment significantly influenced the weight of pods per plot from harvest week 2 to week five and the total pod weight per plot. The single NPK dose treatment also significantly affected the weight of pods per plot of long bean plants at harvest week 1 (Table 3).

Table 3

Weight of Pods per Plot of Long Bean Plants in the Treatment of Paclobutrazol Concentration and Doses of NPK Fertilizer

Treatment	Pod Weight Per Plot (kg)					
Paclobutrazol Concentration (ppm)	Harvest Week					Total
	1	2	3	4	5	
0	1,31	3,78 a	1,87 a	1,21 a	1,57 a	9,64 a
125	1,34	4,22 b	2,41 b	1,52 b	2,02 b	11,51 b
150	1,41	4,29 c	2,37 b	1,43 b	2,03 b	11,53 b
175	1,38	3,63 a	2,13 a	1,51 b	1,97 b	10,63 a
BNT 5%	tn	0,50	0,30	0,16	0,32	0,69
Dose of NPK Fertilizer (g/plant)						
12	1,27 a	3,97	2,47	1,48	1,87	10,95
14	1,41 a	3,90	1,98	1,39	1,95	10,63
16	1,32 a	4,12	2,14	1,37	1,78	10,73
18	1,45 b	3,94	2,19	1,44	1,99	11,01
BNT 5%	0,15	tn	tn	tn	tn	tn

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The single factor of paclobutrazol concentration treatment showed significant differences in the weight of pods per plot of long bean plants in weeks 2-5. The highest average weight of pods per plot of broad bean plants was obtained in week 2, namely P2 (150 ppm paclobutrazol) of 4,29 kg; week 3, namely P1 (125 ppm paclobutrazol) of 2,41 kg, week 4, namely P1 (125 ppm paclobutrazol) of 1,52 kg and week 5, namely P2 (175 ppm paclobutrazol) of 2,03 kg. At the same time, the lowest average

weight of pods per plot of long bean plants is in the treatment of P3 (150 ppm paclobutrazol) at harvest week 2 of 3,63 kg and P0 (0 ppm paclobutrazol) for three weeks, respectively 1,87 kg (week 3), 1,21 kg (week 4), and 1,57 kg (week 5). The single factor of NPK fertilizer dosage treatment significantly affected the total pod weight per plot of long bean plants in week 1. The highest average weight of pods per plot of broad bean plants was obtained in week 1, namely N4 (18 g/plant) 1,45 kg. At the same time, the lowest average weight of pods per plot of broad bean plants is in the N1 treatment (12 g/plant) of 1,27 kg.

The single factor of paclobutrazol concentration treatment showed significant differences in the total pod weight per plot of long bean plants for five weeks of harvest. The highest average weight of total pods per plot of broad bean plants was obtained in the P2 treatment (150 ppm paclobutrazol), which was 11,53 kg. At the same time, the lowest average yield of total pod weight per plot of broad bean plants is in the P0 treatment (0 ppm paclobutrazol), reaching 9,96 kg. The single factor of NPK fertilizer dose treatment did not significantly affect the total pod weight per plot of long bean plants.

Pod Weight Per Hectare

The results of the variance analysis showed that the combined treatment of paclobutrazol concentration with the dose of NPK fertilizer showed no significant interaction on the weight of pods per hectare of long bean plants for five weeks of harvest. The single factor of paclobutrazol concentration treatment significantly affects the weight of pods per hectare. In contrast, the single NPK dose treatment does not significantly affect the weight of pods per hectare of broad bean plants (Table 4).

Table 4

Pod Weight Per Hectare in the Treatment of Paclobutrazol Concentration and Dose of NPK Fertilizer

Treatment	Pod Weight Per Hectare (tons)
Paclobutrazol Concentration (ppm)	
0	34,80 a
125	43,39 ab
150	44,16 ab
175	43,79 b
BNT 5%	0,69
Dose of NPK Fertilizer (g/plant)	
12	40,59
14	41,39
16	41,44
18	42,72
BNT 5%	tn

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The single factor of paclobutrazol concentration treatment showed significant differences in the weight of pods per hectare of broad bean plants for five weeks of harvest. The highest average pod weight per hectare of broad bean plants was obtained in the P2 treatment (150 ppm paclobutrazol), which was 44,16 tons. At the same time, the lowest average pod weight per hectare of broad bean plants is in the P0 treatment (0 ppm paclobutrazol), reaching 34,80 tons. The single factor of NPK fertilizer dose treatment does not significantly affect the weight of pods per hectare of long bean plants.

Pod Length

The results of the variance analysis showed that the combination treatment between the concentration of paclobutrazol and the dose of NPK fertilizer had a significant effect on the length per pod of long bean plants. The single factor of paclobutrazol concentration treatment had a significant effect on the length per pod of long bean plants, but the single NPK dose treatment did not have a significant effect (Table 5).

Table 5

Pod Length of Long Bean Plants in the Treatment of Paclobutrazol Concentration and Doses of NPK Fertilizer

Dose of NPK Fertilizer (g/plant)	Pod Length (cm)			
	Paclobutrazol Concentration (ppm)			
	0	125	150	175
12	70,00 bc	54,67 a	65,00 b	66,33 bc
14	57,83 ab	62,00 ab	67,83 bc	70,50 bc
16	57,00 ab	63,50 ab	60,17 ab	64,33 ab
18	64,83 b	61,67 ab	67,50 bc	76,00 c
BNT 5%		10,09		

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The combination treatment of paclobutrazol concentration and NPK fertilizer dosage significantly affects the length per pod of long bean plants. The most extended average length per pod of long bean plants was obtained in the combination treatment of 175 ppm paclobutrazol + 18 g/plant of NPK fertilizer at 76,00 cm. The shortest average length per pod of long bean plants was obtained in the combination treatment of 125 ppm paclobutrazol + 12 g/plant NPK fertilizer at 54,67.

Pod Weight

The results of the variance analysis showed that the combination treatment between the concentration of paclobutrazol and the dose of NPK fertilizer had a significant effect on the weight per pod of long bean plants. The single-factor treatment of paclobutrazol concentration and NPK fertilizer significantly affected the weight per pod of long bean plants (Table 6).

Table 6

Weight Per Pod of Long Bean Plant in the Treatment of Paclobutrazol Concentration and Dose of NPK Fertilizer

Dose of NPK Fertilizer (g/plant)	Pod Weight (gram)			
	Paclobutrazol Concentration (ppm)			
	0	125	150	175
12	33,93 b	25,93 ab	28,60 b	33,07 b
14	20,63 a	28,67 b	34,53 b	32,70 b
16	24,87 ab	27,30 ab	26,87 ab	26,47 ab
18	32,23 b	26,73 ab	28,60 b	41,93 b
BNT 5%		7,64		

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The combination treatment of paclobutrazol concentration and NPK fertilizer dose significantly affected the weight per pod of long bean plants. The highest average weight per pod of long bean plants was obtained in the combination treatment of 175 ppm paclobutrazol + 18 g/plant of NPK fertilizer at 41,93 g. The lowest average weight per pod of long bean plants was obtained in the combination treatment of 0 ppm paclobutrazol + 14 g/plant. The lowest average weight per pod of long bean plants was found in the combination treatment of 0 ppm paclobutrazol + 14 g/plant of NPK fertilizer at 20,63g.

Number of Seeds

The results of the analysis of variance showed that the combined treatment of paclobutrazol concentration with the dose of NPK fertilizer significantly influenced the number of seeds per pod of long bean plants. The single factor of paclobutazol concentration treatment significantly affected the number of seeds per pod, while the single NPK dose treatment did not significantly affect the number of seeds per pod (Table 7).

Table 7

Number of Seeds Per Pod of Long Bean Plants in the Treatment of Paclobutrazol Concentration and Doses of NPK Fertilizer

Dose of NPK Fertilizer (g/plant)	Number of Seeds			
	Paclobutrazol Concentration (ppm)			
	0	125	150	175
12	15,67 ab	11,67 ab	16,67 b	17,00 b
14	13,33 ab	16,00 b	13,67 ab	16,67 b
16	12,00 ab	18,00 b	11,67 ab	12,33 ab
18	11,33 a	13,67 ab	17,67 b	18,00 b
BNT 5%		4,39		

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The combination treatment of paclobutrazol concentration and NPK fertilizer dose significantly affected the number of seeds per pod of long bean plants. The highest average number of seeds per pod of long bean plants was obtained in the combination treatment of 125 ppm paclobutrazol + 16 g/plant of NPK fertilizer and 175 ppm paclobutrazol + 18 g/plant of NPK fertilizer at 18,00 seeds. The lowest average number of seeds per pod of long bean plants was found in the combination treatment of 0 ppm paclobutrazol + 18 g/plant of NPK fertilizer at 11,33 seeds.

Fruit Set (%)

The analysis of variance showed that the combined treatment of paclobutrazol concentration with the dose of NPK fertilizer did not interact with the fruit set of long bean plants. The single factor of paclobutrazol concentration treatment has a significant effect on the fruit set. However, the single NPK dose treatment does not significantly affect the fruit set of long bean plants (Table 8).

Table 8

Fruit Set of Long Bean Plants in the Treatment of Paclobutrazol Concentration and Dose of NPK Fertilizer

Perlakuan	***Fruit Set* (%)**
Konsentrasi Paclobutrazol (ppm)	
0	75,66 a
125	79,91 b
150	80,01 b
175	79,59 b
BNT 5%	0,02

Dosis Pupuk NPK (g/tanaman)	
12	77,81
14	79,54
16	79,54
18	78,85
BNT 5%	tn

Notes: Numbers followed by the same letter in the same column and treatment show no significant difference in the 5% BNT test; tn: not significant.

The treatment of paclobutrazol concentration of 150 ppm (P2) singly produces the highest average percentage of fruit set of long bean plants, 80.01%, while the lowest average percentage of fruit set of long bean plants is in the P0 treatment (0 ppm paclobutrazol), 75.66%. The single factor of NPK fertilizer dose treatment does not significantly affect the number of flowers of long bean plants.

CONCLUSION

The combined treatment of paclobutazol concentration of 175 ppm and NPK fertilizer dose of 18 g/plant gave the best results in the parameters of pod length (76,00 cm), pod weight (41,93 g) and number of seeds (18,00 seeds). The treatment of paclobutrazol concentration of 150 ppm gave the best results in the parameters of the number of pods per plant from week 2 to week 4 (557,57 g, 340,00 g and 312,26 g), total number of pods per plant (68,83), the weight of pods per plant week 2 and 3 (557,57 g and 340,00 g), total pod weight per plant (1766,39 g), pod weight per plot week two and week 5 (4,29 kg and 2,03 kg), total pod weight per plot (11,53 kg), pod weight per hectare (44,16) and fruit set (80,01%). The treatment of NPK fertilizer dose of 18 g/plant gave the best results in weight per pod (41,93 g) and pod weight per plot in week 1 (1,45 kg).

REFERENCES

Afifi, L. N., T. Wardiyanti dan Koesriharti. 2017. Respon Tanaman Tomat (*Lycopersicum escelentum* Mill) Terhadap Aplikasi Pupuk yang Berbeda. Jurnal Produksi Tanaman. 5(5): 774-781.

Badan Pusat Statistik (BPS). 2022. Statistik Tanaman Hortikultura Indonesia. https://www.bps.go.id. (Diakses pada 30 Agustus 2023 pukul 13.31 WIB).

Efendi, E., D. W. Purba, dan N.U.H. Nasution. 2017. Respon pemberian pupuk NPK mutiara dan bokhasi jerami padi terhadap pertumbuhan dan produksi tanaman bawang merah (*Allium ascalonicum* L). *Jurnal Penelitian Pertanian BERNAS*, 13(3): 20-29.

Gusmawan, M. W. A dan T. Wardiyati. 2019. Pengaruh Penaplikasian Paclobutrazol pada Tanaman Coleus (*Coleus scutellarioides* L.) dengan Perbedaan Konsentrasi. *Jurnal Produksi Tanaman* 7(4): 666-673.

Handayanto E., M. Nurul dan F. Amrullah. 2017. *Pengelolaan Kesuburan Tanah*. Malang: Universitas Brawijaya Press. 198 Hal.

Khafie, B., A. Sulistiyono dan J. S Pikir. 2021. Respon Hasil Tanaman Cabai Rawit Akibat Kombinasi Konsentrasi Paclobutrazol dan Dosis Pupuk NPK. *Jurnal AGROHITA: Jurnal Agroteknologi Fakultas Pertanian Universitas Muhammadiyah Tapanuli Selatan*, 6(2): 191-200.

Lingga. P dan Marsono. 2013. *Petunjuk Penggunaan Pupuk.* Jakarta: Penebar Swadaya. 149 Hal.

Rahmawan, I. S., A. Z. Arifin dan Sulistyawati. 2019. Pengaruh Kalium (K) Terhadap Pertumbuhan dan Hasil Kubis (*Brassica oleraceae* var. capitata, L.). *Jurnal Agroteknologi Merdeka Pasuruan*, 3(1): 17-23.

Saputra, I., Nurbaiti dan G. Tabrani. 2017. Pengujian Beberapa Konsentrasi Paclobutrazol dengan Waktu Aplikasi Berbeda pada Tanaman Tomat (*Lycopersicum esculentum Mill*.). *Jurnal Online Mahasiswa*, 4(1):1-14.

Saputra, E., Nurbaiti dan S. Yoseva. 2016. Pengaruh Pemberian Paclobutrazol Terhadap Pertumbuhan dan Produksi Tanaman Tomat *(Lycopersicumesculentum* Mill.) dengan Pemangkasan Satu Cabang Utama. *JOM Faperta UR,* 4(1): 1-11.

Utomo, M., Sudarsono, R. Bujang, T. Sabrina, J. Lumbanraja dan Wawan. 2016. *Ilmu Tanah Dasar-dasar dan Pengelolaan*. Jakarta: Prenadamedia Group. 433 Hal.

Widaryanto, E., Baskoro, M dan Suryanto. 2011. Pengaruh Waktu dan Konsentrasi Paclobutrazol Terhadap Pertumbuhan Bunga Matahari (*Hellianthus annuus* L.). *Jurnal Online Agroekoteaknologi*. 3(3): 929-937