



RESPONSE OF GROWTH AND YIELD OF CURLY RED CHILI PLANTS (*Capsicum annum* L.) TO VARIOUS CONCENTRATIONS OF THE GROWTH REGULATOR PACLOBUTRAZOL

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Abstract

Curly red chili pepper (*Capsicum annum* L.) is one of the horticultural commodities with high economic value for development. One effort to increase the production yield of curly red chili plants is by using the growth regulator Paclobutrazol. Paclobutrazol is a growth regulator that can inhibit vegetative growth and stimulate generative growth in plants, such as flower formation and fruit development. The aim of this research was to determine the response and the appropriate concentration of the growth regulator Paclobutrazol on the growth and yield of curly red chili (*Capsicum annum* L.). This study was conducted in Bangka Leda Village, Langke Rembong District, Manggarai Regency, for 5 months, from April 2024 to August 2024. The study used a randomized block design consisting of one factor, namely Paclobutrazol concentration, with 6 treatment levels. The treatments used were P0 = No Paclobutrazol, P1 = Paclobutrazol concentration of 200 ppm/liter of water, P2 = Paclobutrazol concentration of 300 ppm/liter of water, P3 = Paclobutrazol concentration of 400 ppm/liter of water, P4 = Paclobutrazol concentration of 500 ppm/liter of water, and P5 = Paclobutrazol concentration of 600 ppm/liter of water. The observational data obtained in this study were analyzed using Analysis of Variance (ANOVA). If the results showed significant effects, they would be followed by an Honest Significant Difference (HSD) test at a 5% level. The results of the study indicated that the application of various concentrations of Paclobutrazol growth regulator had significant effects on parameters such as plant height (inhibiting plant height), number of branches (inhibiting the number of branches), flowering time, harvest time, number of fruits, and fresh fruit weight of curly red chili plants. The application of Paclobutrazol growth regulator at a concentration of 600 ppm/liter of water (P5) was able to inhibit plant height and the number of branches, while providing optimum results for generative growth, such as 50% flowering time (days), harvest time (days), number of fruits (pieces), and fresh fruit weight (g) of curly red chili plants.

Keywords: Commodities, Economics, Horticulture, Production, Vegetative.

1. Introduction

Curly red chili (*Capsicum annum* L.) is one of the horticultural commodities with high economic value for development. Curly red chili (*Capsicum annum* L.) is known as an annual woody plant that thrives in tropical climates. In general, curly red chili contains high levels of nutrients and vitamins such as calcium, fats, proteins, carbohydrates, vitamin A, vitamin B, and vitamin C, as well as alkaloid compounds such as capsaicin, flavonoids, and essential oils. Capsaicin is the compound responsible for the spicy and hot taste in chili

peppers, which makes chili useful as a spice in various dishes and as a high-value fruit vegetable (Prasetya, 2014). Curly red chili is a commodity with good development and marketing prospects because it is in high demand and widely used by the community. Along with human needs and current technological advancements, chili peppers are not only used as a basic ingredient for cooking spices but can also be processed into raw materials for industries such as pharmaceuticals (anesthetics and ointments), cosmetics, dyes, and other uses (Pratiwi et al., 2021). This has led to an increasing demand for chili peppers daily, prompting many farmers to cultivate curly red chili. Curly red chili is quite promising for cultivation as it is fairly tolerant and does not require specific growing conditions, and it is widely utilized by the public. Manggarai Regency is one of the regions with agricultural potential, particularly in horticultural plant development to boost the local economy. One of the horticultural commodities developed in this region is chili. However, based on the potential of chili plants in Manggarai Regency, production trends from 2020 to 2022 have been fluctuating, while per capita consumption patterns have relatively increased. Data from the Central Bureau of Statistics (BPS) of East Nusa Tenggara Province (2023) shows that in 2020, chili production in Manggarai Regency reached 2,034 quintals, with an average weekly consumption of 0.005 quintals per capita. In 2021, production decreased to 1,036 quintals, with the same average weekly consumption of 0.005 quintals per capita, and in 2022, production increased to 1,215 quintals, with an average consumption of 0.006 quintals per capita. Amid high weekly demand or consumption of chili, unstable production results will affect the availability of chili in the market, making it difficult to meet public demand for chili adequately. According to Sihombing and Chairia (2016), the future demand for chili is expected to continue to increase, driven by the growing demand from processing industries, rising per capita consumption, and the increasing population.

The fluctuation in chili production in Manggarai Regency is influenced by several factors, one of which is the suboptimal application of agricultural cultivation technology. This results in low quality and quantity of the fruits produced. Based on these issues, agricultural cultivation needs technological support, such as the use of growth regulators, to stimulate, inhibit, and modify the physiological processes of the plants so that productivity can be increased or aligned with expectations. According to Risanda (2017), growth regulators commonly used to promote the growth of flower and fruit shoots in plants include Paclobutrazol. Paclobutrazol is a growth regulator often utilized to inhibit vegetative growth and stimulate generative growth in plants (Saputra et al., 2017). This inhibition causes the plant's nutrients and energy to be redirected more quickly to the generative phase. Ristiani (2017) explains that Paclobutrazol has several functions, such as suppressing stem elongation, controlling canopy growth, enhancing root growth, increasing chlorophyll content, which improves the leaves' ability to perform photosynthesis, minimizing lodging in plants, encouraging off-season flowering and fruiting, and making flowers and fruits more uniform. The mechanism of Paclobutrazol works by inhibiting the biosynthesis of gibberellins in the plant, which then slows down the process of cell division and elongation. This inhibition results in the suppression of vegetative growth, causing the photosynthates produced to be redirected towards the required reproductive growth, such as flower and fruit formation (Wijana et al., 2015).

The application of Paclobutrazol must be carried out accurately, both in terms of concentration and timing, specifically during the vegetative phase. The activity of plant growth regulators can be determined by the concentration and sensitivity of plant tissues. Therefore, it is crucial to carefully determine the concentration to achieve optimal results. Based on this background, this research is necessary to determine the growth response and yield of curly red chili plants (*Capsicum annuum* L.) to various concentrations of the plant growth regulator Paclobutrazol. The objective of this study is to determine the appropriate response and concentration of Paclobutrazol for the growth and yield of curly red chili plants (*Capsicum annuum* L.). This research also aims to provide benefits to the author or readers by enhancing their knowledge about cultivating curly red chili plants using Paclobutrazol and offering information to farmers and the community regarding the use of Paclobutrazol for the growth and yield of curly red chili plants. This research has benefits for readers to increase their insight into the cultivation of curly red chili plants using the growth regulator Paclobutrazol and can provide information on the use of the growth regulator Paclobutrazol for farmers or the community on the growth and yield of curly red chili plants.

2. Materials and Methods

Explaining research chronological, including research design, research procedure (in the This research was conducted from April 2024 to August 2024 in Bangka Leda Village, Langke Rembong Subdistrict, Manggarai Regency. The materials used in this study were curly red chili seeds (Castillo F1 variety), soil, manure, NPK Mutiara 16:16:16 fertilizer, paclobutrazol, water, seedling trays, ultraviolet plastic, bamboo, and mulch. The tools used included measuring cups, labels, writing tools, rulers, sprayers, an analytical balance, a camera, raffia strings, measuring tapes, hoses, scissors, calipers, mulch hole makers, sacks, hoes, shovels, machetes, and watering cans. This research employed a randomized block design consisting of one factor. The factor in this study was the concentration of paclobutrazol using six treatment levels, with three repetitions for each treatment, resulting in 18 experimental units. Each experimental unit contained 6 plants, and all the plants were used as observation samples. Therefore, the total number of plants in this study was 108. The treatments used were as follows: P0 = 0 ppm/liter of water, P1 = 200 ppm/liter of water, P2 = 300 ppm/liter of water, P3 = 400 ppm/liter of water, P4 = 500 ppm/liter of water, P5 = 600 ppm/liter of water. The observation data obtained in this study were analyzed using Analysis of Variance (ANOVA). Data that showed a significant effect were further tested using the Honest Significant Difference test at a 5% level, utilizing Microsoft Excel 2010.

3. Results and Discussion

Plant Height (cm)

Table 1. Average plant height (cm) 7 weeks after planting

Treatment	Plant height (cm)
P0: 0 ppm/liter of water	37,67 ^a
P1: 200 ppm/liter of water	20,36 ^b
P2: 300 ppm/liter of water	19,31 ^b
P3: 400 ppm/liter of water	19,19 ^b
P4: 500 ppm/liter of water	18,92 ^b
P5: 600 ppm/liter of water	18,78 ^b

Explanation: Numbers followed by the same letter indicate no significant difference in the Honest Significant Difference test at the 5% level.

Based on further testing, it was found that the application of various concentrations of the growth regulator Paclobutrazol had a significant effect on plant height parameters. This indicates that Paclobutrazol is capable of contributing to the inhibition of height growth in curly red chili plants. Table 1 shows that, at the observation of the plants 7 weeks after planting, the lowest plant height of 18.78 cm was observed in the treatment with Paclobutrazol at a concentration of 600 ppm/liter of water (P5). This indicates that the treatment with Paclobutrazol at a concentration of 600 ppm/liter of water (P5) is the optimum concentration for suppressing the height growth of curly red chili plants compared to other treatments. The increase in plant height becomes more inhibited as the concentration of Paclobutrazol administered increases. According to Syahputra et al. (2013), the application of Paclobutrazol at low concentrations can slow down plant height growth, but if the concentration is increased, plant growth will be further inhibited. Hibibah and Sumadi (2013) argue that higher concentrations of Paclobutrazol will affect plant height growth, as Paclobutrazol has high effectiveness in suppressing plant height growth.

Paclobutrazol is a growth regulator commonly used to slow vegetative growth and accelerate generative growth in plants. This leads to shorter plant height when treated with various concentrations of Paclobutrazol. According to Kusumawardani and Hariyono (2020), the mechanism of action of the growth regulator Paclobutrazol is to inhibit or suppress gibberellin biosynthesis in the sub-apical meristem of the plant, resulting in slower cell division and elongation, causing the plant to become shorter. Gibberellin in plants functions in the cell elongation process, which determines plant height (Adilah et al., 2020). Pulungan et al. (2018) stated that a lack of gibberellin content in plants hinders the process of plant height growth, and the increase in plant height tends to slow down.

Inhibition results in a delay in cell division and vegetative growth of plants, leading to the redirection of assimilates towards generative growth, such as flower and fruit formation. The highest plant height of curly red chili observed 7 weeks after planting was achieved in the 0 ppm/liter water treatment (P0). It is suspected that the 0 ppm (P0) treatment did not have its growth inhibited by Paclobutrazol, resulting in the tallest plants. Moko et al. (2018) argue that the absence of Paclobutrazol application leads to normal plant growth or unhindered height growth. This is why the 0 ppm/liter water (P0) treatment in this study resulted in the tallest plant height of 37.67 cm.

Number of Branches (branches)

Table 2. Average number of branches 7 weeks after planting

Treatment	Number of branches (branches)
P0: 0 ppm/liter of water	7,56 ^a
P1: 200 ppm/liter of water	4,33 ^b
P2: 300 ppm/liter of water	4,28 ^b
P3: 400 ppm/liter of water	4,56 ^b
P4: 500 ppm/liter of water	4,22 ^b
P5: 600 ppm/liter of water	4,33 ^b

Explanation: Numbers followed by the same letter indicate no significant difference in the Honest Significant Difference test at the 5% level.

Based on the follow-up tests, it was found that the application of various concentrations of the growth regulator Paclobutrazol significantly affects the inhibition of branch growth in plants. This indicates that Paclobutrazol can contribute to reducing the number of branches in curly red chili plants. Table 2 shows that, seven weeks after planting, the treatment with Paclobutrazol at concentrations of 200 ppm/liter of water (P1), 300 ppm/liter of water (P2), 400 ppm/liter of water (P3), 500 ppm/liter of water (P4), and 600 ppm/liter of water (P5) tends to inhibit the growth and number of branches of curly red chili plants. It is suspected that the application of Paclobutrazol can suppress vegetative growth, resulting in fewer branches compared to the treatment with 0 ppm/liter of water (P0). Harpitaningrum et al. (2014) argue that the application of Paclobutrazol has side effects such as inhibiting vegetative growth and causing the plant to transition more quickly to generative growth, which involves the formation of flowers and fruits.

The application of Paclobutrazol is highly effective in suppressing plant growth. This is influenced by the chemical components in Paclobutrazol that inhibit gibberellin biosynthesis in plants. The mechanism of Paclobutrazol's action is to inhibit gibberellin biosynthesis in plants, resulting in slower cell division and elongation. The inhibition of gibberellin production causes cell division to continue, but the new cells do not elongate (Wijana et al., 2015). This results in the formation of branches with short internodes. According to Rugayah et al. (2022), the number of branches is related to the number of flowers and fruits produced. Plants with fewer branches will produce more flowers and fruits, and vice versa.

Seven weeks after planting, the average number of branches was highest in the treatment with Paclobutrazol at 0 ppm/liter of water (P0), with 7.56 branches, compared to other treatments. This is believed to be because the 0 ppm/liter of water (P0) treatment did not inhibit vegetative growth with Paclobutrazol, resulting in the highest number of branches. Moko et al. (2018) stated that the absence of Paclobutrazol application allows plants to grow normally, without hindrance to their height. Another factor is that the number of branches is influenced by plant height; the taller the plant, the more branches it produces. This is supported by Sintia (2011), who observed that taller plants tend to have more branches. This is why the Paclobutrazol 0 ppm/liter of water (P0) treatment resulted in the highest number of branches compared to other treatments.

Flowering Age 50% (days)

Table 3. Average age of flowering 50% (days)

Treatment	Flowering Age 50% (days)
P0: 0 ppm/liter of water	56,33 ^a
P1: 200 ppm/liter of water	53,00 ^{ab}
P2: 300 ppm/liter of water	52,33 ^{ab}
P3: 400 ppm/liter of water	50,00 ^{ab}
P4: 500 ppm/liter of water	48,67 ^{ab}
P5: 600 ppm/liter of water	47,67 ^b

Explanation: Numbers followed by the same letter indicate no significant difference in the Honest Significant Difference test at the 5% level.

Based on the follow-up tests, it was found that the application of various concentrations of the plant growth regulator Paclobutrazol significantly affected the flowering age in curly red chili plants. Table 3 shows that the fastest average flowering age was observed with the Paclobutrazol treatment at a concentration of 600 ppm/liter of water (P5), which was 47.67 days after planting, while the longest was at a concentration of 0 ppm/liter of water (P0), which was 56.33 days after planting. The quicker flowering age with Paclobutrazol treatment is suspected to be due to the plant growth regulator's ability to suppress vegetative growth and promote generative growth. This is supported by Wardani et al. (2020), who state that Paclobutrazol functions to inhibit vegetative growth and redirect photosynthesis towards generative growth, such as flower formation. This causes plants treated with Paclobutrazol to induce flowering more quickly compared to the 0 ppm/liter of water (P0) concentration.

The application of Paclobutrazol at high concentrations can induce flowering more quickly in plants. The higher the concentration of Paclobutrazol applied, the faster the flowering onset. Harpitaningrum et al. (2014) stated that increasing the concentration of Paclobutrazol also accelerates the flowering process in plants. This explains why the treatment with Paclobutrazol at a concentration of 600 ppm/liter of water (P5) in this study was able to induce flowering more quickly compared to other treatments.

According to Pulungan et al. (2018), Paclobutrazol plays a role in inhibiting the vegetative growth process of plants. This inhibition leads to higher carbohydrate reserves in the plant, which accelerates generative growth, such as flower formation and fruit development. Physiologically, plants treated with the growth regulator Paclobutrazol experience a deficiency in gibberellins but can still stimulate flowering. According to Risanda (2017), the application of Paclobutrazol results in the inhibition of gibberellin production in plants, thus leading to a faster transition to the generative phase, including flower and fruit formation.

The application of Paclobutrazol has a significant impact on the age at which chili peppers (*Capsicum annuum*) start flowering. However, data from Table 3 show that flowering in this study began at 47 days after planting, which is later compared to the typical description for chili peppers, which is around 40-43 days after planting. It is suspected that the flowering age of chili peppers is more influenced by environmental factors, specifically sunlight intensity. The research location had low sunlight intensity, with daily exposure ranging from 5-6 hours. Magdalena et al. (2014) argue that changes in plant growth from the vegetative phase to the generative phase can be caused by both internal and external factors, such as the duration of sunlight exposure. According to Hermawan (2023), chili plants can achieve optimal productivity if they receive adequate sunlight, which is around 10-12 hours. Mestari (2024) indicates that the timing of flowering can be influenced by factors such as sunlight duration, humidity, and daily temperature

Number of Harvested Fruits (fruits)

Table 5. Average number of harvested fruits

Treatment	Number of Harvested Fruits (fruits)		
	Harvest I	Harvest II	Harvest III
P0: 0 ppm/liter of water	3,89 ^a	7,72 ^a	7,83 ^a
P1: 200 ppm/liter of water	4,50 ^{ab}	7,50 ^a	8,67 ^{ab}
P2: 300 ppm/liter of water	5,33 ^{ab}	11,06 ^{ab}	7,61 ^a
P3: 400 ppm/liter of water	5,89 ^b	10,50 ^{ab}	8,39 ^{ab}
P4: 500 ppm/liter of water	5,72 ^b	11,28 ^{ab}	7,72 ^a
P5: 600 ppm/liter of water	6,28 ^b	12,56 ^b	10,06 ^b

Explanation: Numbers followed by the same letter indicate no significant difference in the Honest Significant Difference test at the 5% level.

Based on the results of further tests, it is known that the application of various concentrations of the plant growth regulator Paclobutrazol significantly affects the number of harvested fruits in curly red chili plants during the first, second, and third harvests. The highest average number of harvested fruits per harvest was obtained during the second harvest compared to the first and third harvests. The increase in fruit number in the second harvest is suspected to be influenced by the number of flowers that appeared. The more flowers that are formed, the more fruits are produced. Table 5 shows that the optimum concentration of Paclobutrazol in supporting the number of fruits in curly red chili plants is 600 ppm per liter of water (P5). This indicates that as the concentration of Paclobutrazol increases, the number of fruits obtained also increases. The application of Paclobutrazol at high concentrations can stimulate flowering in plants, resulting in a higher number of flowers formed. With the increased number of flowers, the number of fruits obtained also increases. Sugianto et al. (2022) stated that the higher the concentration of Paclobutrazol applied, the more flowers and fruits are formed.

Paclobutrazol is a growth regulator that can inhibit vegetative growth and stimulate generative growth, such as the formation of flowers and fruits in plants (Saputra et al., 2017). The application of paclobutrazol can put the growth point of the plant to rest, leading to inhibited cell division and increased photosynthesis output, as well as a higher C/N ratio in the canopy. This will stimulate the formation of flowers in the plant, resulting in more flowers being produced. Zamzami et al. (2015) argued that the number of fruits obtained is influenced by the number of flowers that grow; the more flowers that grow, the more fruits will form. The mechanism of action of paclobutrazol as a plant growth regulator is by inhibiting gibberellin biosynthesis in plants. This inhibition causes vegetative growth to be suppressed, thus directing the plant to reach the generative phase faster, such as the formation of flowers and fruits. Similar results were found in the study by Sakhidin and Suparto (2011), where the application of paclobutrazol as a plant growth regulator inhibited gibberellin synthesis, leading to suppressed vegetative growth in durian plants, but accelerated generative growth, increasing the number of flowers and fruits produced. The research by Ariyanto (2020) showed that the application of paclobutrazol in long bean plants can increase crop yields, improve fruit quality, and increase the number of fruits produced.

Fresh Weight of Harvested Fruit (g)

Table 6. Average fresh fruit weight of harvest (g)

Treatment	Fresh Weight of Harvested Fruit (g)		
	Harvest I	Harvest II	Harvest III
P0: 0 ppm/liter of water	14,72 ^a	26,67 ^a	27,61 ^a
P1: 200 ppm/liter of water	16,00 ^{ab}	27,39 ^a	32,72 ^{ab}
P2: 300 ppm/liter of water	20,22 ^{ab}	39,44 ^{ab}	28,50 ^a
P3: 400 ppm/liter of water	21,28 ^b	39,56 ^{ab}	31,78 ^{ab}
P4: 500 ppm/liter of water	20,94 ^b	41,94 ^{ab}	28,39 ^a
P5: 600 ppm/liter of water	23,89 ^b	43,89 ^b	39,56 ^b

Explanation: Numbers followed by the same letter indicate no significant difference in the Honest Significant Difference test at the 5% level.

Based on the results of further tests, it was found that the application of various concentrations of the plant growth regulator Paclobutrazol had a significant effect on the fresh weight of curly red chili peppers during the first, second, and third harvests. Table 6 shows that the optimum concentration of Paclobutrazol in increasing the fresh weight of chili fruits was 600 ppm per water (P5). The high fresh weight of the fruit produced is suspected to be influenced by the number of harvested fruits (Table 5). The more fruits harvested, the higher the fresh weight obtained. Zamzami et al. (2015) stated that the greater the number of fruits harvested, the higher the weight of the fruit obtained.

Paclobutrazol functions to inhibit the vegetative growth process of plants, and this inhibition leads to an increase in the carbohydrate reserves produced, causing the plant to bear fruit more quickly. The more carbohydrates the plant obtains, the heavier the fruit produced will be (Pulungan et al., 2018). According to Azima et al. (2017), the application of the growth regulator Paclobutrazol can increase the fruit weight in plants because more assimilates are used for generative growth, such as flower formation, fruit development, and fruit ripening, compared to vegetative growth.

4. Conclusion

The conclusion of this study is that the provision of various concentrations of the growth regulator Paclobutrazol has a significant effect on plant height (inhibits plant height), number of branches (inhibits the number of branches), flowering age, harvest age, number of fruits, and fresh fruit weight of curly red chili plants. The provision of the growth regulator Paclobutrazol at a concentration of 600 ppm/liter of water (P5) can inhibit plant height and number of branches, and provide optimum results for generative growth parameters, namely flowering age (days), harvest age (days), number of fruits (units), and fresh fruit weight (grams) of curly red chili plants 50%. The results of this study have contributed to horticultural farmers, especially in the cultivation of curly red chili plants related to the effect of the use of the growth regulator Paclobutrazol and the right concentration on curly red chili plants. The use of the growth regulator Paclobutrazol in agriculture can increase crop productivity and increase income for farmers. Limitations in the research that has been done, namely the existence of external factors in the form of environmental factors such as rainfall. Suggestions given from the results of this study include the need for the use of a covered house. Further research needs to be carried out using different concentrations from this study, namely by adding the concentration of the growth regulator Paclobutrazol to obtain the optimal concentration for the growth and yield

of curly red chili plants (*Capsicum annum* L.). The application of the growth regulator Paclobutrazol should be carried out in the vegetative phase.

5. References

- Adilah, R., Rochmatino, R., & Prayoga, L. 2020. Pengaruh Paklobutrazol dan Ga₃ Terhadap Pertumbuhan dan Pembungaan Pada Tanaman Cabai (*Capsicum annum* L.). *Bio Eksakta: Jurnal Ilmiah Biologi Unsoed*, 2(1), 109-115.
- Ariyanto, M. 2020. Pengaruh Konsentrasi paklobutrazol terhadap pertumbuhan & hasil tanaman kacang panjang (*Vigna sinensis* L.). *skripsi*. Universitas Pembangunan Nasional Jawa Timur, 86.
- Azima, N. S., Nuraini., Sumadi., & J. S. Hamdani. 2017. Respons pertumbuhan dan hasil benih kentang G0 di dataran medium terhadap waktu dan cara aplikasi paklobutrazol. *Jurnal Kultivasi*, 16(2): 313-319.
- (BPS NTT) Badan Pusat Statistik Nusa Tenggara Timur. 2023. Produksi Tanaman Sayuran Menurut Kabupaten/Kota (Kuintal). Diakses pada: 3 Oktober 2023. Tersedia pada: <https://ntt.bps.go.id/indicator/55/595/2/produksi-tanaman-sayuran-menurut-kabupaten-kota.html>.
- Harpitaningrum, P., Sungkawa, I., & Wahyuni, S. 2014. Pengaruh Konsentrasi Paklobutrazol terhadap Pertumbuhan & Hasil Tanaman Mentimun (*Cucumis sativus*) Kultivar Venus. *Jurnal Agrijati*, 25(1): 1-17.
- Hermawan, A. 2023. Evaluasi Kesesuaian Lahan Untuk Tanaman Cabai (*Capsicum annum* L.) dan Kapulaga (*Amomum cardamomum*) di Kecamatan Cisayong Kabupaten Tasikmalaya. *disertasi*. Universitas Siliwangi. 17.
- Hibibah, N. A. & Sumadi. 2013. Konservasi Tanaman Angrek (*Grammatophyllum*) Secara In Vitro Melalui Pertumbuhan Minimal Menggunakan Paklobutrazol. *Jurnal MIPA*, 36(1): 8-13.
- Kusumawardani, D. A., & Hariyono, D. 2020. Pengaruh konsentrasi paklobutrazol dan komposisi media terhadap pertumbuhan dan hasil tanaman krisan pot (*Chrysanthemum sp.*). *Jurnal Produksi Tanaman*, 8 (3): 315-320.
- Magdalena, L., Adiwirman., & Zuhry, E. 2014. Uji pertumbuhan dan hasil beberapa genotipe tanaman tomat (*Lycopersicon esculentum* Mill.) di dataran rendah. *Jom Faperta*, 1(2): 1-10.
- Moko, R., Sompotan, S., & Supit, P. C. H. 2018. Aplikasi Paklobutrazol terhadap Pertumbuhan pada Tanaman Tomat (*Lycopersicon esculentum* Mill.). *Jurnal Cocos*, 1(4): 1-8.
- Prasetya, M. E. 2014. Pengaruh pupuk NPK Mutiara dan pupuk kandang sapi terhadap pertumbuhan dan hasil tanaman cabai merah keriting varietas Arimbi (*Capsicum annum* L.). *Jurnal Agrifor*, 13(2): 191-198.
- Pratiwi, H., Darmawati, A., & Budiyanto, S. 2021. Pengaruh Konsentrasi dan Frekuensi Pemberian POC Limbah Tahu terhadap Pertumbuhan dan Produksi Cabai Merah (*Capsicum annum* L.). *Buana Sains*, 21(1): 87-98.
- Pulungan, A. S., Lahay, R. R., & Purba, E. 2018. Pengaruh Waktu Pemberian dan Konsentrasi Paklobutrazol terhadap Pertumbuhan dan Produksi Tanaman Ubi Jalar (*Ipomoea batatas* L.). *Jurnal Agroekoteknologi*, 6(1): 1-6.
- Risanda, I. 2017. Pengaruh Jenis Pupuk dan Raterdan Paklobutrazol Terhadap Keragaman Tanaman Cabai (*Capsicum annum* L.). *skripsi*. Universitas Lampung. 47.
- Ristian, R. 2017. Pengaruh Konsentrasi Paklobutrazol pada Penampilan Tanaman Sedap Malam (*Polianthes tuberosa* L.) dalam Pot. *skripsi*. Universitas Lampung. Lampung. 50.
- Rugayah, R., Sari, A., Karyanto, A., & Sarno, S. 2022. Aplikasi Paklobutrazol Dan Pupuk NPK Untuk Merangsang Pembungaan Pada Tanaman Sepatu Filum (*Spathiphyllum wallisii regel*). *Jurnal Agrotek Tropika*, 10(3): 447-454.
- Sakhidin, S. R. & Suparto. 2011. Kandungan Giberelin, Kinetin, dan Asam Absisat pada Tanaman Durian yang Diberi Paklobutrazol dan Etepon. Saputra, I., Nurbaiti., & Tabrani, G. 2017. Pengujian Beberapa Konsentrasi Paklobutrazol dengan Waktu Aplikasi Berbeda pada Tanaman Tomat (*Lycopersicon esculentum* Mill.). *JOM Faperta*, 4(1):1-14.
- Sihombing, S. & Chairia, L. (2016). Analisis Permintaan dan Penawaran Cabai Merah di Provinsi Sumatera Utara. *Journal of Agriculture and Agribusiness Socioeconomics*, 5(1): 2-4.
- Sintia, M. 2011. Pengaruh Beberapa Dosis Kompos Jerami Padi dan Pupuk Nitrogen terhadap Pertumbuhan dan Hasil Jagung Manis. *Wartazoa*, 8(3): 7.

- Sugianto, D., Sulistyono, A., & Triani, N. 2022. Respon Pertumbuhan & Hasil Tanaman Cabai Rawit (*Capsicum frutescens* L.) Terhadap Pemberian Konsentrasi Paclobutrazol & Dosis Pupuk Organik Cair Limbah Buah Pisang. *Jurnal Pertanian Agros*, 24(2): 939-945.
- Susanto, M. & Baskorowati, L. 2018. Pengaruh genetik dan lingkungan terhadap pertumbuhan sengon (*Falcataria moluccana*) ras lahan Jawa. Bioeksperimen: *Jurnal Penelitian Biologi*, 4(2): 35-41.
- Wardani, F. F., Damayanti, F., & Rahayu, S. 2020. Respon pertumbuhan dan pembungaan bunga lipstick (*Soedjana Kasan*) terhadap aplikasi GA3, etefon, dan paklobutrazol. *Jurnal Agron Indonesia*, 48(1):75-82.
- Wijana, I. M. A., Hariyono, K., & Winarso, S. 2015. Pengaruh Aplikasi Paklobutrazol dan Dosis Pupuk Kalium terhadap Pertumbuhan dan Hasil Umbi Bawang Merah (*Allium ascalonicum* L.). *Berkala Ilmiah Pertanian*, 1(1): 1-5.
- Zamzami, K., Nawawi, M., & Aini, N. 2015. Pengaruh jumlah tanaman per polibag dan pemangkasan terhadap pertumbuhan dan hasil tanaman mentimun Kyuri (*Cucumis sativus* L.). *Jurnal Produksi Tanaman*, 3(2): 113-119.