

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly¹, Nurhayati², Murni Sari Rahayu³

¹Master of Agrotechnology Program, Faculty of Agriculture Universitas Islam Sumatera Utara

^{2,3}Faculty of Agriculture Universitas Islam Sumatera Utara

Corresponding Author: nurhayati@uisi.ac.id

Abstract

Low potato production in Indonesia is caused by poor seed quality and low availability of potato seeds. One of the efforts to produce superior and quality potato seeds is to apply growth regulators (ZPT) because they can produce a lot of potato seeds, but plant growth becomes depressed. The purpose of this study was to determine the effect of paclobutrazol concentration and application time on the growth of potato G2 (*Solanum tuberosum L.*). This research was carried out on UPT land. BIH Kutagadung Berastagi, which lasted for four months, from November 2020 to March 2021. The design used in this study was a Factorial Randomized Block Design consisting of 2 factors and repeated 3 times. The first factor is the concentration of the hormone Paclobutrazol (P) which consists of 4 levels, namely: P0 = Control; P1 = 200 ppm; P2 = 400 ppm; P3 = 600 ppm. The second factor was the application time of Paclobutrazol (W) which consisted of 3 levels, namely: W1 = 20 days after planting; W2 = 30 days after planting; W3 = 40 days after planting. The research results show that treatment of paclobutrazol concentration had no significant effect on the number of leaves and stem diameter, but had a very significant effect on plant height. The time of application of paclobutrazol had no significant effect only on the number of leaves, but had a real effect on plant height, stem diameter. The interaction between concentration and application time of paclobutrazol had no significant effect on leaf number and plant height, but had a very significant effect on stem diameter.

Keywords: *Potato, Paclobutrazol, Time*

1. INTRODUCTION

1.1 BACKGROUND

Potato (*Solanum tuberosum L.*) is a very important horticultural commodity in Indonesia. The nutritional content of potatoes per 100 grams of tubers is 2 g protein, 0.1 g fat, 19.1 g carbohydrates, 11 mg calcium, 50 mg phosphorus, 0.7 mg iron, 0.3 g fiber, 0.09 mg vitamin B1, 16 mg vitamin C and 83 cal calories (Idawati, 2012).

The high nutritional content makes potato (*Solanum tuberosum L.*) a commodity that gets priority for its development. Indonesian people's need for potatoes continues to increase from year to year. Changes in people's consumption patterns for potatoes are able to increase the need for potatoes every year. This situation resulted in an increase in the area of potato planting and increased demand for quality and quality potato seeds.

Potato productivity in Indonesia in 2016 was 18.23 tons/Ha with a production yield of 1,213,038 tons/Ha from a harvested area of 66,450 Ha. Potato production decreased by 6.232 tons/Ha from 2015, previously the total production reached 1,219,270 tons/Ha and the total productivity was 18.20 tons/Ha (BPS, 2016). In addition, the need for domestic potato production in 2017 still has not reached the planned target of 1,437,332 tons and according to data from the Directorate General of Horticulture, the results achieved were 1,235,180 tons, which means that 85.93% has been achieved, while potato production in 2019 the target is 1,506,628 tons but the total production is only 1,314,657 tons/ha.

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly, Nurhayati, Murni Sari Rahayu

Low potato production in Indonesia is caused by poor seed quality and low availability of potato seeds. Only 7.4% of quality potato seeds are available in Indonesia, far from the need for 140,000 tonnes/year (including imports), resulting in an average national production of only 12 tonnes/ha of a potential yield of 40 tonnes/ha (Ministry of Agriculture, 2012).

Potato seed producers in general still use potluck potato seeds. Potato seeds were obtained from neighbors with unclear quality and were even derivatives that could no longer be monitored, until several cases were found that the potato seeds used were G20. Even though the good potato seed generations are G1, G2, G3, and G4. However, the price of these seeds is still high, making it difficult for the community to reach. The availability of quality potato seeds is still very low, resulting in low productivity caused by degenerative viruses (Suparso, 2019).

One of the efforts to produce superior and quality potato seeds is to apply growth regulators (ZPT). One of the ZPT that is often used is paclobutrazol. Paclobutrazol is a PGR that can inhibit growth by inhibiting gibberellin synthesis (Salisbury and Ross, 2002). One of the roles of gibberellins is in the process of cell elongation. By inhibiting the production of gibberellins, the cells continue to divide but the new cells do not elongate. Paclobutrazol has the property of stopping the process of plant growth so that the reserves of carbohydrates become more abundant, thus allowing the plants to flower and bear fruit immediately.

At the stage of changing stolons into tubers, potato plants require low levels of gibberellic acid (GA). Then it requires higher GA levels when the tubers enter the development phase (Wareing and Jennings, 1980; Salisbury and Ross, 1995). Paclobutrazol which is absorbed by the plant is then translocated through the xylem to the growing point. Active compounds that reach the sub-apical meristem will inhibit GA biosynthesis, so that cell elongation is hampered (Krishnamoorthy, 1981). This inhibition will accelerate and focus energy for the formation of seed-sized potato tubers.

ZPT activity is influenced by the concentration and sensitivity of plant tissue (Arteca, 1996). Giving ZPT will be more effective if the concentration and time of administration are correct (Ani, 2001). Based on the description above, it is necessary to do research on the use of paclobutrazol ZPT with different application times which are expected to increase production potato tubers that enter seed size but suppress plant growth.

The aims of this research are as follows:

1. Knowing influence concentration and time of application paclobutrazol on potato growth.

1.2. Research Hypothesis

There is an effect of paclobutrazol concentration and application time of paclobutrazol on the growth of potato plants.

2. RESEARCH METHODOLOGY

2.1. Place and Time

This research was conducted in UPT land. BIH Kutagadung Berastagi, which is located at Jalan Jamin Ginting KM 67, Raya Village, Berastagi District, Karo Regency. The research was conducted from November 2020 to March 2021.

2.2. Materials and Tools

The materials used in this study included: class G1 potato seeds of size M, namely with a weight of 60-80 grams which had sprouted approximately 1 cm, sourced from UPT. BIH Kutagadung Berastagi, Soil and cow manure, paclobutrazol hormone.

Meanwhile, the tools used consisted of a 50 cm poly bag, a hoe, a small shovel, a rope, a tape measure, a bucket, a 3 ml syringe, a bucket and a measuring cup.

2.3. Research Methods

This study used a factorial randomized block design (RBD), which consisted of 2 factors.

- I. The first factor is the concentration of the hormone Paclobutrazol which consists of 4 levels, namely:

P0 = Control

P1 = 200 ppm

P2 = 400 ppm

P3 = 600 ppm

II. The second factor is the application time of Paclobutrazol which consists of 3 levels, namely:

W1 = 20 days after planting

W2 = 30 days after planting

W3 = 40 days after planting.

Thus, there were 12 treatment combinations where each treatment combination was repeated 3 times, so there were 36 experimental units.

2.5. Data analysis

Treatments that show a significant effect of the observed variables will be followed by the Duncan's Distance test. This test aims to see the effect of each treatment or combination of treatments on the observed variables.

2.6. Land Preparation and Planting Media

Land clearing (sanitation) was carried out before the research began by clearing weeds around the land using a grass cutter (scythe). Then the polybags were arranged according to the treatment used, each sample contained 5 sub-samples. The planting medium used is soil mixed with manure 2: 1 then filled into half of the polybags, then the polybags are watered up to field capacity.

2.7. Making a Trial Map (plot)

The plots were made with a size of 1 mx 1 m with a distance of 50 cm between plots, then polybags were arranged in 1 plot of 5 polybags.

2.8. Planting

The potato seeds used were the Granola variety (G1) potato seeds. Potato seeds are stored for 2 months in baskets covered with newspaper before planting. Giving newspaper aims to reduce the water content and seed decay during storage, because of the nature of the newspaper which absorbs water. The potato seeds were treated with Mipcinta 50 WP and Mankozeb pesticides with a ratio of 1:1 before being wrapped in newspaper. Planting is done with a planting depth of 7-10 cm in polybags.

2.9. Maintenance

a. Sprinkling

Watering is done once a day, but the plants are not watered when it rains. If the potato plants are watered every day, the humidity in the planting medium will be high so that the tubers will rot. Water functions to dissolve nutrients and transport them to plant parts. The tool used for the watering process is gembor. Potatoes need soil that is constantly moist.

b. Weeding and Embroidery

Weeding I is generally done at the age of 20 HST. Subsequent weeding depends on the condition of the weeds, but generally the second weeding is done at 45 HST. Weeding is done to maintain good quality of soil growth and development, so that the soil becomes loose and removes weeds that can interfere with plant growth. While embroidery aims to maintain uniform plant growth by replacing plants with plants of the same age.

c. hoarding

Hoarding is done simultaneously with weeding; this aims to strengthen the establishment of plants and keep the stolons from sunlight. Pembumbunan is done 2-3 times, depending on weather conditions. During the rainy season, soil is added up to 4 times, tubers and roots of potato plants must be protected from sunlight by covering them with planting media.

d. Fertilization

Fertilizer is given according to the recommendation of the Lembang Vegetable Plant Agriculture Center, namely twice, fertilization 1, namely plants aged 15 HST. Fertilization 2, namely when the plant is 30 HST. The dose of fertilizer per plant is as much as 16 grams. Fertilization is done by making holes in the planting medium then covering the fertilizer with the planting medium, the distance between the fertilizer and the plants is about 5 cm.

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly, Nurhayati, Murni Sari Rahayu

e. Installing Ajir

The stakes are installed when the plants are 20 HST with the aim that the plants can grow upright and not fall over easily. The stake material used is bamboo which is cut to a length of 80 cm and a width of 3 cm. The distance between the marker and the plant is 5 cm and is strengthened using a rope. The use of bamboo can be minimized by using ropes to support the leaves and stems of plants.

f. Control of Plant Pests and Diseases (HPT)

HPT control is carried out to minimize damage caused by pests and diseases in potato plants so that they do not interfere with the growth rate of plants. HPT control is carried out mechanically and chemically. Mechanical control includes land clearing, weeding and removing disease attacks on potato plants. Chemical control such as giving insecticides and fungicides. HPT control was carried out 2x a week with Decis insecticide and Antracol fungicide for 1 month of age, 2 months of age sprayed with Mankozeb fungicide, 3 months of age sprayed with Daconil fungicide.

Paclobutrazol application

After the plants are 20 days old, the application of Paclobutrazol is carried out according to the application plot, as well as at 30 days and 40 days.

Observational Variables

1. Plant height (cm)
Plant height was measured from the base of the stem to the highest growing point.
2. Number of leaves (strands)
The leaves that are counted are the leaves that have more than one child.
3. Stem Diameter

3. RESULTS AND DISCUSSION

3.1. Number of Leaves

Paclobutrazol (P) concentration, application time of Paclobutrazol (W) and the interaction between the two had no significant effect on the number of leaves of potato plants.

The Paclobutrazol administration decreased the number of leaves of potato plants, however, there is a tendency that the higher the concentration of Paclobutrazol given the number of leaves on potato plants will decrease. This is in accordance with research conducted by Ani (2001) and Karmelina (2017) which stated that the application of Paclobutrazol had no significant effect on the number of leaves of potato plants.

Table 1. Average number of leaves due to concentration and time of application of paclobutrazol

Paclobutrazol concentration (ppm)	Paclobutrazol Application Time (hst)			Average
	W1(20)	W2 (30)	W3 (40)	
	-----Sheet-----			
P0 (0)	31	30	31	30,67
P1(200)	21	35	30	28.78
P2(400)	26	35	24	28,22
P3(600)	27	32	25	28,11
Average	26,25	27.50	33.08	

Although the concentration of Paclobutrazol and the time of application of Paclobutrazol had no significant effect on the number of leaves of potato plants, there was a tendency that the number of leaves at application time of 30 days after planting (W2) was higher than the application time of 20 days after planting (W1) and application time of 40 days. after planting (W3).

The number of leaves of potato plants was not affected by the interaction of Paclobutrazol concentration and time of application of Paclobutrazol. This is because the number of plant leaves is strongly influenced by genotype and environmental factors. Giving paclobutrazol suppresses the number of leaves because it suppresses the increase in plant height, so that shorter plants reduce the formation of new branches and leaves (Lengkong et al., 2015). This is in line with the results of research by Ani (2001) which stated that the concentration of Paclobutrazol did not affect the number of leaves of potato plants. Gianfagna (1987) stated that growth retardants (retardants) are chemical compounds that have little effect on leaf and root production.

3.2. Plant Height

The concentration of Paclobutrazol (P) had a very significant effect, the time of application of Paclobutrazol (W) had a significant effect, while the interaction between the two had no significant effect on the height of potato plants.

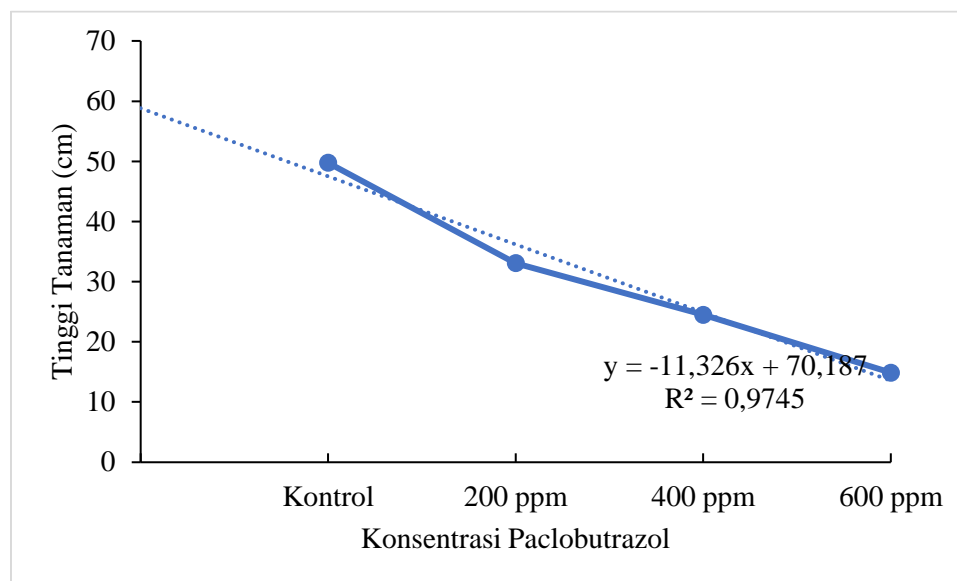


Image 1. Graph of the Effect of Several Paclobutrazol Concentrations on Potato Plant Height

Figure 1 shows that potato plants without Paclobutrazol (P0) application had higher height than plants that were applied with Paclobutrazol. In addition, it is also known that the higher / concentration of Paclobutrazol given will suppress the growth of potato plant height. In Figure 1 it can be seen that the administration of Paclobutrazol earlier will suppress the increase in plant height. In accordance with Ani's statement (2001), that the earlier the application of paclobutrazol has a greater effect on plant height because at an earlier age the plant is experiencing rapid growth so that the effect of paclobutrazol acting on the meristem by suppressing gibberellin biosynthesis is increasingly evident.

The interaction between 600 ppm (P3) Paclobutrazol concentrations and all application times of Paclobutrazol (W) showed the lowest plant height which was significantly different from the interaction between Paclobutrazol concentrations and other Paclobutrazol application times. Similar results were found in the research of Ani (2001) and Lienargo, et al. (2014) where the time of spraying and the concentration of paclobutrazol interacted with growth and production in potato and corn plants. The height of potato and corn plants sprayed with paclobutrazol was further reduced with increasing application doses.

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly, Nurhayati, Murni Sari Rahayu

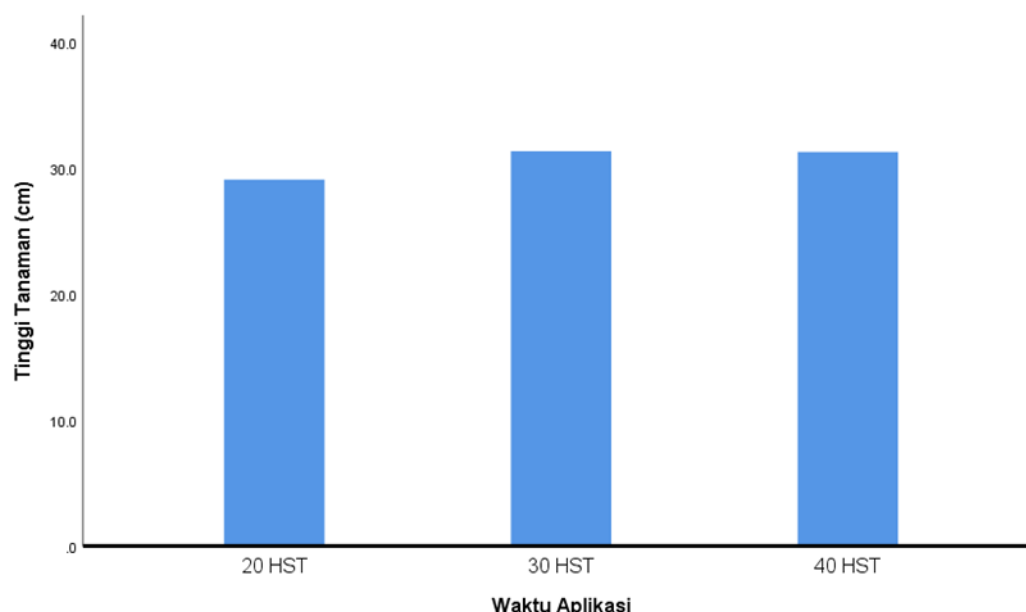


Figure 2. Graph of the Effect of Time of Paclobutrazol Application on Potato Plant Height

Table 2. Average Plant Height as a result of Treatment Concentration and Application Time of Paclobutrazol

Paclobutrazol concentration (ppm)	Paclobutrazol Application Time (hst)			Average
	W1(20)	W2 (30)	W3 (40)	
	-----cm-----			
P0 (0)	47.93b	49.30 ab	52.07a	49.77 a
P1(200)	31.43c	34.50c	33,27c	33.07b
P2(400)	23.80 d	25,43d	24,20 d	24.48c
P3(600)	13.10 e	16.03e	15.50e	14.88 d
Average	29.07b	31,32 a	31.26 a	

Note: The numbers followed by the same lowercase letter show no significant difference according to Duncan's Multiple Range Test at the 5% level

According to Wieland and Wampe (1985) paclobutrazol is translocated through the xylem tissue and reaches the shoot buds. The vascular system next to the growing point functions as a storage plant for growth regulators and inhibits the biosynthesis of gibberellic acid, causing growth and shoot elongation to stop.

3.3. Stem Diameter

The treatment of Paclobutrazol (P) concentration had no significant effect, the time of application of Paclobutrazol (W) had a very significant effect, and the interaction between the two had a very significant effect on the diameter of the potato plant stems.

Figure 3 shows that the largest stem diameter of potato plants was obtained when the paclobutrazol concentration was 200 ppm (P1) and the lowest was obtained at the paclobutrazol concentration of 400 ppm (P2). While the application time that produces the largest stem diameter is at 30 HST (W2), as shown in Figure 3.

Table 4 shows that the application of Paclobutrazol at a dose of 600 ppm (P3) with an application time of 30 HST (W2) Paclobutrazol produced the highest stem diameter, which was only very significantly different from the P2W1 and P3W3 treatments.

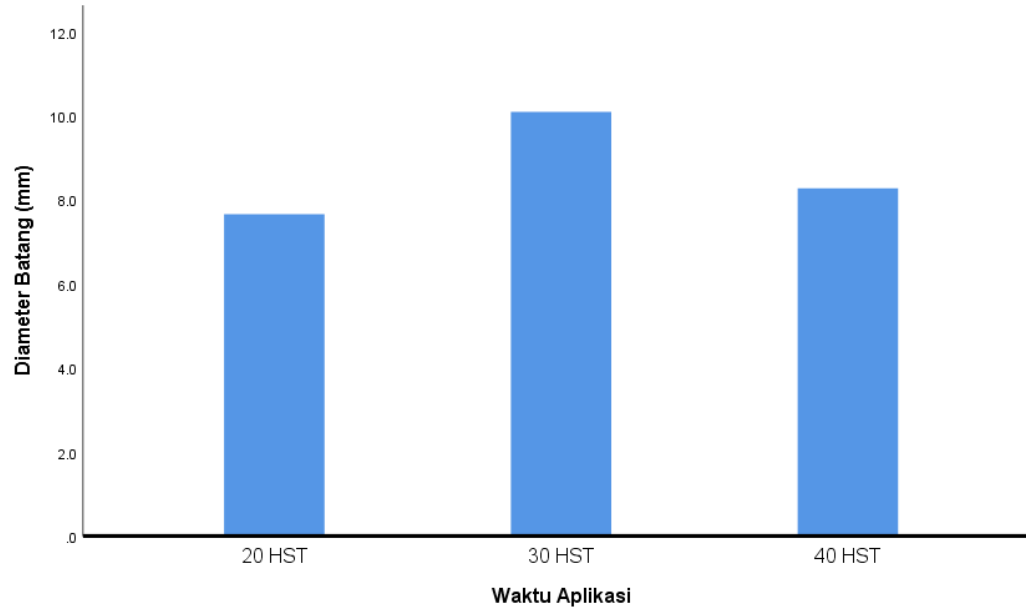


Figure 3. Graph of the Effect of Time of Paclobutrazol Application on Stem Diameter of Potato Plants

Table 4. Average stem diameter due to concentration and time of application of paclobutrazol

Paclobutrazol concentration (ppm)	Paclobutrazol Application Time (hst)		
	W1(20)	W2 (30)	W3 (40)
P0 (0)	8.70 ab	9.27 ab	8.13 ab
P1(200)	9.07 ab	9.87 ab	11.10 ab
P2(400)	3.73c	9.53 ab	9.70 ab
P3(600)	9.13 ab	11.70a	4.17c

Note: The numbers followed by the same lowercase letter show no significant difference according to Duncan's Multiple Range Test at the 5% level

3.4. Effect of Paclobutrazol Concentration

The concentration of Paclobutrazol given had a significant effect on plant height and had no significant effect on the number of leaves and stem diameter. The real effect of increasing the concentration of Paclobutrazol resulted in a decrease in plant height and tended to reduce the size of the stem diameter and reduce the number of potato leaves.

3.5. Plant Height

The results of this study are in line with the results of other studies regarding the effect of paclobutrazol on plant height. The results of Gusmawan's research (2018) stated that the administration of different concentrations of paclobutrazol had an effect on the height of Coleus plants starting at 35 HST. Research from Karmelina (2017) stated that the application of Paclobutrazol also had a significant effect on the plant height of three potato varieties. The result showed that the higher the concentration of paclobutrazol, the lower the plant height. Paclobutrazol

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly, Nurhayati, Murni Sari Rahayu

is a plant growth inhibitor that works by inhibiting gibberellin biosynthesis so that it can suppress plant growth in height. This is in accordance with the opinion of Hughes and Keith (2004) who stated that paclobutrazol reduces stem length and can cause a reduction in internode length and leaf area. The results of this study are in accordance with the opinion of Davis et al. (1988) who stated that the mode of action of triazoles was to reduce shoot elongation based on inhibition of GA biosynthesis. Inhibition of GA biosynthesis causes disruption of stem elongation because cell division in the sub-apical meristem (segments) is inhibited resulting in stunting (Gianfagma, 1987).

a. Number of Leaves

The results of this study are in line with the results of other studies regarding the effect of paclobutrazol on the number of leaves of potato plants. The results of Gusmawan's research (2018) stated that the administration of different concentrations of paclobutrazol had no effect on the number of leaves of the Coleus plant. Increasing the concentration of paclobutrazol had no effect on the number of coleus leaves. According to Chaner (2014) growth inhibition caused by the application of paclobutrazol arises because the components contained in paclobutrazol block the three stages for the production of gibberellins in the terpenoid pathway by inhibiting enzymes that catalyze metabolic reactions. One of the main functions of gibberellins is to stimulate cell elongation. When gibberellin production is inhibited, cell division will still occur, but new cells will not elongate. That is why paclobutrazol has more effect on stem shortening and has no effect on the number of plant leaves.

b. Stem Diameter

The treatment of Paclobutrazol (P) concentration had no significant effect, the time of application of Paclobutrazol (W) had a very significant effect, and the interaction between the two had a very significant effect on the diameter of the potato plant stems. The higher the concentration of Paclobutrazol, the smaller the stem diameter. The largest stem diameter of potato plants was obtained when the paclobutrazol concentration was 200 ppm (P1) and the lowest was obtained at the paclobutrazol concentration of 400 ppm (P2). The application time that produces the largest stem diameter is at 30 HST (W2). The decrease in stem diameter due to administration of Paclobutrazol is in accordance with the results of Nita's research. 2017 that . Application of Paclobutrazol on Growth and Yield of Three Varieties of Potato (*Solanum tuberosum L.*

4. CONCLUSIONS AND SUGGESTIONS

4.1. CONCLUSION

- a. The treatment of paclobutrazol concentration had no significant effect on number of leaves, and stem diameter, but very significant effect on plant height
- b. The time of application of paclobutrazol had no significant effect only on the number of leaves, but have a real effect on plant height, stem diameter
- c. The interaction between concentration and time of application of paclobutrazol had no significant effect on the number of leaves and plant height but had a very significant effect on stem diameter

4.2. Suggestions

It is suggested to conduct research to determine the effect of concentration and time of application of paclobutrazol in a more comprehensive manner. It is necessary to measure other parameters, such as leaf area (cm²), leaf area index, and leaf chlorophyll count (grains/mm²).

REFERENCES

- Aini, KH, 2012. Production of Potato Flour. Thesis. UPI-Jakarta.
- Ani, Norma. 2001. The Effect of Time of Application and Paclbutrazol Concentration and Urea Concentration on Potato Cuttings on the Production of Tuberlet Granola Varieties. Thesis. University of Northern Sumatra. Medan.
- Arteca RN 1996. Plant Growth Substances Principles and Applications. Chapman and Hall, New York.
- Azima, NS, A. Nuraini., Sumadi., JS Hamdani. 2017. Responses of G0 Potato Seed Growth and Yield in Medium Plains to Time and Method of Paklobutrazol Application. Cultivation Journal 16(2): 313-319.
- Vegetable Crops Research Institute. 2016. Potato Seed Production (*Solanum tuberosum L.*). Bandung.
- Bustani, B., Khaddafi, M. ., & Nur Ilham, R. (2022). REGIONAL FINANCIAL MANAGEMENT SYSTEM OF REGENCY/CITY REGIONAL ORIGINAL INCOME IN ACEH PROVINCE PERIOD YEAR 2016-2020. International Journal of Educational Review, Law And Social Sciences (IJERLAS), 2(3), 459–468.<https://doi.org/10.54443/ijerlas.v2i3.277>
- Davis, Td, GL Steffens and Sankia. 1998. Triazol Plant Growth Regulators. In J. Janick (Ed). Portland Oregon. Timber Press Hort. Rev. 10: 63-105
- Difly, S.. 2011. Cultivation of Potatoes in the Highlands and Desert Plains. Gramedia. Medan.
- Directorate of Horticultural Seeds. 2007. Vegetable Seed Certification. Directorate General of Horticulture, Ministry of Agriculture. p. 4
- Falahuddin, F., Fuadi, . F., Munandar, M., Juanda, R. ., & Nur Ilham, R. . (2022). INCREASING BUSINESS SUPPORTING CAPACITY IN MSMES BUSINESS GROUP TEMPE BUNGONG NANGGROE KERUPUK IN SYAMTALIRA ARON DISTRICT, UTARA ACEH REGENCY. IRPITAGE JOURNAL, 2(2), 65–68.<https://doi.org/10.54443/irpitage.v2i2.313>
- Geovani, I. ., Nurkhotijah, S. ., Kurniawan, H. ., Milanie, F., & Nur Ilham, R. . (2021). JURIDICAL ANALYSIS OF VICTIMS OF THE ECONOMIC EXPLOITATION OF CHILDREN UNDER THE AGE TO REALIZE LEGAL PROTECTION FROM HUMAN RIGHTS ASPECTS: RESEARCH STUDY AT THE OFFICE OF SOCIAL AND COMMUNITY EMPOWERMENT IN BATAM CITY. International Journal of Educational Review, Law And Social Sciences (IJERLAS), 1(1), 45–52.<https://doi.org/10.54443/ijerlas.v1i1.10>
- Gianfagna, TJ 1987. Natural and Synthetic Growth Regulations and Their Use in Horticultural Agronomic Crops In Davies, Pj. (ed). Plant Hormones and Their Role in Growth and Development. Dodrecht. Martinua Nijhoff Publisher. pp 614-632
- Gusmawan, Maretha Widhya Aulyaa. 2018. The Effect of Paclbutrazol Application on Coleus (*Coleus scutellarioides L.*) Plants with Different Concentrations. Thesis. Brawijaya University. Poor.
- Hasni, VU, Asil B., Ferry ETS, and Rina CH, 2014. *Response Adding to The Coumarin in to Micro Tuber Production of Potato Plantlets(Solanum tuberosumL.)Varieties ofGranola*. Journal of Agroecotechnology Online. ISSN No. 2337- 6597 Vol.2, No.4: 1552 – 1562.
- Hasyim, A, Sofiari, Kusmana, Kusadriani, Y, Lutfi. 2012. Dimensions of Higher Potato Varieties Resistant to Phytophthora infestans (Mont) de Bary, Incentives for Increasing the Capacity of Researchers and Engineers (PKPP 2012). Ministry of Research and Technology. p. 2. Hort Conference, February 4th. Department of Forestry and Natural Resources. Purdue University, Peoria, Illinois.
- Herman, S., 2015. Comparison of the Use of Kirinyuh Leaf POC with Bioplasma in Potato Cultivation (*Solanum tuberosumL.*) in the Garden

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly, Nurhayati, Murni Sari Rahayu

- Simalem Resort, North Sumatra. Polytechnic Final Project Report Payakumbuh State Agriculture Production Technology Study Program Horticulture, Department of Food Plant Cultivation. West Sumatra
- Hughes, BR and CN F, Keith. 2004. Effect of Paclobutrazol Treatments on Growth and Tuber Yields in Greenhouse Grown Shepody Seed Potatoes. In <http://www.actachort.org/>. p 6
- Ilham, Rico Nur. et all (2019). Investigation of the Bitcoin Effects on the Country Revenues via Virtual Tax Transactions for Purchasing Management. International Journal of Supply Management. Volume 8 No. 6 December 2019.
- Ilham, Rico Nur. et all (2019).. Comparative of the Supply Chain and Block Chains to Increase the Country Revenues via Virtual Tax Transactions and Replacing Futures of Money. International Journal of Supply Management. Volume 8 No. 5 August 2019.
- Karmelina, Nita. 2017. Application of Paclobutrazol on Growth and Yield of Three Varieties of Potato (*Solanum tuberosum L.*) in Medium Plains. Thesis. Brawijaya University.
- Kusumiyati, S., R. Yayat, and S. Wawau. 2015. Improving Potato Quality with Fertilizer Application (Macro and Micro) and Paclobutrazol in Medium Plains. College Research Excellence. Agroecotechnology Study Program. Faculty of Agriculture, Padjadjaran University.
- Lasta Irawan, A. ., Briggs, D. ., Muhammad Azami, T. ., & Nurfaliza, N. (2021). THE EFFECT OF POSITION PROMOTION ON EMPLOYEE SATISFACTION WITH COMPENSATION AS INTERVENING VARIABLES: (Case Study on Harvesting Employees of PT. Karya Hevea Indonesia). International Journal of Social Science, Educational, Economics, Agriculture Research, and Technology (IJSET), 1(1), 11–20.<https://doi.org/10.54443/ijset.v1i1.2>
- likdanawati, likdanawati, Yanita, Y., Hamdiah, H., Nur Ilham, R., & Sinta, I. (2022). EFFECT OF ORGANIZATIONAL COMMITMENT, WORK MOTIVATION AND LEADERSHIP STYLE ON EMPLOYEE PERFORMANCE OF PT. ACEH DISTRIBUS INDO RAYA. International Journal of Social Science, Educational, Economics, Agriculture Research, and Technology (IJSET), 1(8), 377–382. <https://doi.org/10.54443/ijset.v1i8.41>
- Lengkong, OB, Lengkong, EF, Tiwow, D., Najoan, J. 2015. Study of the Application of Paclobutrazol and Several Types of Foliar Fertilizers on the Growth and Production of Midland Potatoes (*Solanum tuberosum L.*).Sam Ratulangi University.
- Majied Sumatrani Saragih, M. ., Hikmah Saragih, U. ., & Nur Ilham, R. . (2021). RELATIONSHIP BETWEEN MOTIVATION AND EXTRINSIC MOTIVATION TO ICREASING ENTREPRENEURSHIP IMPLEMENTATION FROM SPP AL-FALAH GROUP AT BLOK 10 VILLAGE DOLOK MASIHUL. MORFAI JOURNAL, 1(1), 1–12.<https://doi.org/10.54443/morai.v1i1.11>
- Neni, J. 2010. Organic Potato Cultivation. Gramedia. Medan. pg 87.
- Nur Ilham, R. ., Arliansyah, A., Juanda, R., Multazam, M. ., & Saifanur, A. . (2021). RELATHIONSIP BETWEEN MONEY VELOCITY AND INFLATION TO INCREASING STOCK INVESTMENT RETURN: EFFECTIVE STRATEGIC BY JAKARTA AUTOMATED TRADING SYSTEM NEXT GENERATION (JATS-NG) PLATFORM. International Journal of Economic, Business, Accounting, Agriculture Management and Sharia Administration (IJEBAS), 1(1), 87–92.<https://doi.org/10.54443/ijebas.v1i1.27>
- Nur Ilham, R., Likdanawati, L., Hamdiah, H., Adnan, A., & Sinta, I. . (2022). COMMUNITY SERVICE ACTIVITIES “SOCIALIZATION AVOID STUDY INVESTMENT” TO THE STUDENT BOND OF SERDANG BEDAGAI. IRPITAGE JOURNAL, 2(2), 61–64.<https://doi.org/10.54443/irpitage.v2i2.312>
- Pulungan, AS, RR Lahay., E. Purba. 2018. The Effect of Timing of Administration and Concentration of Paklobutrazol on the Growth and Production of Sweet Potato (*Ipomoea batatas L.*). Journal of Agroecotechnology FP USU 6(1): 1- 6.

- Rahmaniar, R., Subhan, S., Saharuddin, S., Nur Ilham, R. ., & Anwar, K. . (2022). THE INFLUENCE OF ENTREPRENEURSHIP ASPECTS ON THE SUCCESS OF THE CHIPS INDUSTRY IN MATANG GLUMPANG DUA AND PANTON PUMP. *International Journal of Social Science, Educational, Economics, Agriculture Research, and Technology (IJSET)*, 1(7), 337–348. <https://doi.org/10.54443/ijset.v1i7.36>
- Rukmana, R. 1996. *Potato Cultivation*. Self-help Spreader. Bandung. 73 p.
- Salisbury, FB, & Ross. (2002). *Plant Physiology* (Volume 2). Translation from: FB Salisbury and CU Ross. *Plant Physiology* 4th Edition. (Vol. 7). Bandung: ITB.
- Sambeka, Frangki., Samuel D. Runtuuwu., Johannes EX Rogi. 2012. The Effectiveness of Timing and Concentration of Paclobutrazol on Growth and Yield of Potato (*Solanum tuberosum* L.) Variety Supejohn. *Eugenia* 18(2): 126-134.
- Sandi, H. ., Afni Yunita, N. ., Heikal, M. ., Nur Ilham, R. ., & Sinta, I. . (2021). RELATIONSHIP BETWEEN BUDGET PARTICIPATION, JOB CHARACTERISTICS, EMOTIONAL INTELLIGENCE AND WORK MOTIVATION AS MEDIATOR VARIABLES TO STRENGTHENING USER POWER PERFORMANCE: AN EMPERICAL EVIDENCE FROM INDONESIA GOVERNMENT. *MORFAI JOURNAL*, 1(1), 36–48. <https://doi.org/10.54443/morai.v1i1.14>
- serly. 2013. Growth Response and Production of Sweet Potato (*Ipomoea batatas* L.) Application of Paclobutrazol and Growmore 6-30-30. Program thesis Postgraduate. Hasanuddin University. Macassar
- Sinta, I. ., Nur Ilham, R., Kumala Sari, D. ., M, M., Khaidir, K., & Ekamaida, E. (2021). Training The Processing Of Tomato Sauce For A Home-Based Business The Scale Of SMES. *IRPITAGE JOURNAL*, 1(1), 26–28. <https://doi.org/10.54443/irpitage.v1i1.24>
- Sinurat, M. ., Heikal, M. ., Simanjuntak, A. ., Siahaan, R. ., & Nur Ilham, R. . (2021). PRODUCT QUALITY ON CONSUMER PURCHASE INTEREST WITH CUSTOMER SATISFACTION AS A VARIABLE INTERVENING IN BLACK ONLINE STORE HIGH CLICK MARKET: Case Study on Customers of the Tebing Tinggi Black Market Online Store. *MORFAI JOURNAL*, 1(1), 13–21. <https://doi.org/10.54443/morai.v1i1.12>
- Sitepu, R. 2007. Growth Response and Production of Potato Plants (*Solanum tuberosum*L.) against Potassium Fertilizers and Paclobutrazol. University of Northern Sumatra. Medan. USU repository.
- Struik, PC 2007. Responses of The Potato Plant to Temperature. p.s. 368-393. In D. Vreugdenhil. *Potato Biology and Biotechnology*. Elsevier.
- Tumewu, P., Paula Ch. Supit, Ridson B., Anni E. Tarore, and Selvie Tumbelaka. 2012. Fertilization of Urea and Paclobutrazol on Growth and Production of Corn (*Zea mays saccharata* Sturt.). *Eugenia*. 18(1).
- Wattimena, GA 1989. *Growth Regulatory Substances: Physiological Role and Fundamentals Use of Plant Biotechnology* Laboratory, Department of Cultivation Agriculture. Faculty of Agriculture. Bogor.
- Widaryanto, E., Medha Bagaskara, and Agus Suryanto. 2011. Application of Paclobutrazol in Sunflower Plants (*Helianthus annuus* L.cv. Teddy bear) as an Effort to Create Pot Ornamental Plants. Faculty Agriculture University of Brawijaya. Poor.
- Wieland and Wampe. 1985. *Plant Growth Substances In Agriculture*. WH. Freeman Co. San Francisco.
- Weaver, RJ, 1972. *Plant Growth Substances in Agiculture*. WH. Freeman Co. San Francisco.
- Yusuf Iis, E., Wahyuddin, W., Thoyib, A., Nur Ilham, R., & Sinta, I. (2022). THE EFFECT OF CAREER DEVELOPMENT AND WORK ENVIRONMENT ON EMPLOYEE PERFORMANCE WITH WORK MOTIVATION AS INTERVENING VARIABLE AT THE OFFICE OF AGRICULTURE AND LIVESTOCK IN ACEH. *International Journal*

EFFECT OF PACLOBUTRAZOL ON THE GROWTH OF POTATO (*Solanum tuberosum L.*)

Tuti Sudarniati Genaly, Nurhayati, Murni Sari Rahayu

of Economic, Business, Accounting, Agriculture Management and Sharia Administration (IJEBAS), 2(2), 227–236. <https://doi.org/10.54443/ijebas.v2i2.191>