Engineering and Technology Journal e-ISSN: 2456-3358

Volume 10 Issue 06 June-2025, Page No.- 5377-5381

DOI: 10.47191/etj/v10i06.09, I.F. – 8.482

Effect of Dekamon Plant Growth Regulator Concentration and NPK Phonska Plus Fertilizer Dosage on the Growth and Yield of Purple Eggplant (Solanum Melongena L.)

Salsalia Corry Nurintan S.[1], Hadi Suhardjono[2], Didik Utomo Pribadi[3]

[1,2,3]Universitas Pembangunan Nasional "Veteran" Jawa Timur, 60294, Surabaya East Jawa, Indonesia

ABSTRACT: Purple eggplant is a commodity with strong market prospects due to its relatively high economic value and rich nutritional content. Demand for eggplant continues to increase; however, this has not been matched by an increase in production. One of the strategies to enhance production is through the improvement of cultivation techniques. This study aims to evaluate the optimal combination of Dekamon plant growth regulator (PGR) concentrations and NPK Phonska Plus fertilizer doses on the growth and yield of purple eggplant (Solanum melongena L.). The research was conducted using a factorial experimental method in a Completely Randomized Design (CRD) consisting of two factors: PGR concentration (0, 2, and 4 ml/l) and NPK fertilizer dosage (20, 25, and 35 grams/plant). The results showed a significant interaction between PGR and fertilizer treatments on plant height, number of leaves, fruit weight, and number of fruits per plant at various observation times. The most effective combination was the application of Dekamon at 2 ml/l with NPK fertilizer at 25 grams/plant, which resulted in optimal plant growth and yield.

KEYWORDS: Dekamon PGR; NPK Phonska Plus; purple eggplant; growth; yield

I. INTRODUCTION

Purple eggplant (Solanum melongena L.) is a significant horticultural commodity that is widely cultivated in various tropical regions, including Indonesia. This crop is highly adaptable to a range of environmental conditions, allowing it to be grown in both lowland and highland areas. Despite increasing consumer demand for eggplant, production levels have not reached their optimal potential. Eggplant is well known across diverse social groups as an accessible food source. Its popularity stems not only from its widespread availability in both traditional markets and modern outlets such as supermarkets, but also from its palatable taste and versatility in culinary preparation (Sriyanto, Astuti, & Sujalu, 2015).

According to data from the Central Bureau of Statistics (2023), although national eggplant production rose from 691,738 tons in 2022 to 699,896 tons in 2023, some regions, such as East Java, experienced a production decline. This decline is suspected to be due to limited agricultural land and suboptimal cultivation techniques. Therefore, effective cultivation strategies are needed to optimize the growth and yield of eggplant. One potential approach is the application of appropriate fertilization practices combined with the use of plant growth regulators (PGRs) such as Dekamon.

Dekamon has been proven effective in stimulating plant growth processes during both the vegetative and generative stages. Its active components include sodium para-nitrophenolate (10.35 g/L), sodium ortho-nitrophenolate (6.90 g/L), sodium 2,4-dinitrophenolate (1.73 g/L), and sodium 5-nitroguaiacolate (3.4 g/L). In plant metabolic processes, Na^+ ions act as carriers of metabolites and can partially substitute for K^+ ion functions (Khadijah, 2021).

Fertilization using NPK Phonska Plus, which contains essential macronutrients, plays a vital role in supporting plant development by improving photosynthesis, tissue formation, and fruit enlargement. NPK Phonska Plus (15:15:15) consists of 15% nitrogen, 15% phosphorus, and 15% potassium, along with additional elements such as sulfur and zinc (Petrokimia Gresik, 2017). Fertilizers must be applied at the correct dosage and in an appropriate manner, as excessive use can lead to plant toxicity. Improper fertilization will result in suboptimal yields (Khafie, Sulistyono, & Pikir, 2021).

The objective of this study is to examine the influence of Dekamon PGR and NPK Phonska Plus fertilizer—both individually and in combination—on the growth and yield of eggplant. The findings are expected to provide technical recommendations for improving eggplant productivity through an integrated agronomic approach.

II. RESEARCH METHODS

A. Research Site and Period

This research was conducted at the experimental field of the Faculty of Agriculture, Universitas Pembangunan Nasional "Veteran" East Java from December 2024 to April

2025. The site is located at an altitude of 5 meters above sea level with a temperature range of 32-34℃.

B. Tools and Materials

The tools used in this research included seedling trays, measuring tape, analytical scale, measuring glass, caliper, watering can, hand sprayer, trowel, hoe, plant stakes, scissors, knife, writing tools, and camera.

The materials used were eggplant seeds of Prince F1 variety, planting media (soil, manure, husks), NPK Phonska Plus fertilizer, Dekamon Plant Growth Regulator (PGR) from PT. Kalatham, 40 x 40 cm polybags, fungicide, insecticide, labels, and rope.

C. Research Procedure

The research began with seedling preparation using Prince F1 eggplant seeds, sterilized in warm water for 30 minutes to promote germination. Viable seeds were sown individually in polybags and watered regularly for 21 days.

Planting media consisted of a 2:1:1 mixture of soil, manure, and husk, filled into 40 × 40 cm polybags. Transplanting was done at 21 days after sowing, with 5 cm planting depth and 40 × 40 cm spacing, totaling 81 plants.

Plant maintenance included watering twice daily, replanting until 20 DAT, staking, weeding, staged fertilization, and application of Dekamon PGR. Pest control was done both mechanically and chemically. Pruning was carried out to optimize plant growth.

Harvesting began at 53–57 Days After Transplanting (DAT) when fruits were shiny purple with moderate firmness. Harvests were done weekly until 88 DAT, using scissors to maintain fruit quality.buah.

The observed research parameters included plant height (cm), number of leaves, number of flowers, number of fruits per plant, fruit weight per harvest (grams) and fruitset percentage.

D. Experimental Design

The research was conducted using a factorial Completely Randomized Design (CRD) consisting of two factors. The first factor was the concentration of Dekamon PGR (D), which included 0 ml/l (D_0), 2 ml/l (D_1), and 4 ml/l (D_2). The second factor was the dosage of NPK Phonska Plus fertilizer: 20 g/plant (N_1), 25 g/plant (N_2), and 35 g/plant (N_3). Each treatment combination was replicated three times, resulting in 27 experimental units. Each unit consisted of 3 plants, totaling 81 plants.

E. Data Analysis

The data were analyzed using analysis of variance (ANOVA), and if the results showed a significant effect (F count > F table 5%), The analysis was followed by a Tukey test conducted at the 5% level.

III. RESULT AND DISCUSSION

A. Vegetative Phasees

The application of Dekamon PGR concentration and NPK Phonska Plus fertilizer had a positive effect on both the growth and yield of purple eggplant during the vegetative and generative phases. In the vegetative phase, the best combination was obtained from the D_1N_2 treatment (Dekamon PGR 2 ml/L and NPK Phonska Plus 25 g/plant), where this treatment significantly increased plant height and number of leaves.

The increase in plant height was influenced by the gibberellin and auxin content in Dekamon PGR, which physiologically stimulates cell division and elongation, particularly in the meristematic tissue of the stem. Gibberellins accelerate cell division, while auxins enhance cell wall thickness and stimulate cell elongation (Asra & Samarlina, 2020). These physiological processes trigger apical stem growth, resulting in increased plant height. An appropriate concentration of PGR supports plant growth, but an excessive dose may inhibit growth or even be lethal to the plant. In the early growth stage (0–2 months), the application of PGR is highly recommended (Amanda et al., 2024).

The number of leaves also showed a significant increase under the D_1N_2 treatment. Dekamon PGR contains cytokinins that influence cell division and elongation, leading to the formation and increase in the number of leaves. In addition to hormonal factors, the contribution of macronutrients in NPK Phonska Plus at a dose of 25 g/plant also plays an important role, as it helps meet the nutrient requirements of purple eggplant. The increase in leaf number is largely attributed to nitrogen. Nitrogen (N) enhances protein and chlorophyll synthesis, which are crucial for photosynthesis and thus promote leaf development. Meanwhile, phosphorus (P) plays a role in stimulating early root development. Based on these factors, the proper application of Dekamon PGR and NPK Phonska Plus supports optimal vegetative growth, both morphologically and physiologically. In general, the application of Dekamon PGR, particularly its cytokinin content, induces the formation of new organs such as leaves. As the number of leaves increases—supported by adequate nutrient supply from fertilization—photosynthesis becomes more efficient, enabling the plant to produce more food.

B. Generative Phases

Table 2. Average Number of Fruits per Plant and Fruit Weight per Harvest under the Combined Treatments of PGR Dekamon Concentration and NPK Phonska Plus Fertilizer Dosage

Parameter	Treatment	PGR Concentration (ml/l)		
	NPK Phonska Plus Dosage (g/plant)	0	2	4
Number	20	2.11 a	2.44 ab	2.56 b

of fruits	25	2.22 ab	3.33 c	2.67 b
per plants	35	2.56 b	2.22 ab	2.56 b
	LSD 5%	0.40		
Fruit	20	213.1 a	314.5 b	382.2 c
weight per	25	244.1 a	621.8 d	421.5 c
harvest	35	303.5 b	311.4 b	437.7 c
	LSD 5%	55.79		

Source: Personal Data

Note: Numbers followed by the same letter are not significantly different based on the 5% LSD test.

The combination treatment of Dekamon PGR at a concentration of 2 ml/L and NPK Phonska Plus fertilizer at a dose of 25 grams/plant (D_1N_2) resulted in a significantly higher number of fruits per plant and fruit weight per harvest. The highest number of fruits per plant was 3.33, which was significantly different from all other treatment combinations. In contrast, the lowest number of fruits per plant was recorded in the combination of 0 ml/L Dekamon PGR and 20 grams/plant NPK Phonska Plus (D_0N_1), with an average of 2.11 fruits. Similarly, the highest fruit weight per harvest was 621.77 grams, which was significantly different from the other combinations. The lowest fruit weight per harvest, 213.11 grams, was also observed in the D_0N_1 treatment.

During the generative phase, as shown in Table 1, the combination of Dekamon PGR and NPK Phonska Plus showed a significant interaction effect on these parameters. This can be attributed to the availability of phosphorus (P) and potassium (K) nutrients in NPK Phonska Plus, which were present in optimal amounts for eggplant development. The number of fruits per plant is greatly influenced by the success rate of flower-to-fruit conversion, which is directly related to the flowering process. A high number of flowers does not necessarily result in a high fruit count if many flowers drop prematurely, leading to a low fruit set percentage.

In this research, flower drop was caused by various factors, including nutrient availability and environmental conditions (such as wind and rain). Potassium (K) is an essential nutrient that plays a role in reducing flower drop, as it strengthens the structural integrity of plant parts such as leaves, flowers, and fruits, making them less prone to abscission. This is supported by Kurniawati, Karyanto, and Rugayah (2015), who stated that potassium reinforces these parts of the plant, reducing the risk of shedding. Meanwhile, phosphorus (P) plays a crucial role in accelerating flowering, fruit and seed maturation, and assisting in the formation of specific proteins required by the plant.

Cytokinin in Dekamon PGR promotes widespread cell division, including in the fruit walls, which directly affects fruit diameter and weight (Fitriani, L., Prayogi, R. S., & Wulandari, T., 2018). At the same time, high potassium content in the fertilizer supports fruit filling and regulates cellular osmotic balance, leading to larger fruit size and optimal water content.

Table 2. Average Number of Flowers under Dekamon PGR Concentration and NPK Phonska Plus Fertilizer Dosage Treatments

Treatment	Number of Flower
PGR Concentration (ml/l)	
0	14.52 a
2	16.30 b
4	16.26 b
LSD 5%	1.30
NPK Phonska Plus Dosage (g/plant)	
20	15.33
25	15.74
35	16.00
LSD 5%	ns

Source: Personal Data

Note: Numbers followed by the same letter within the same column and treatment indicate no significant difference based on the 5% LSD test; ns = not significant.

The research also found that not all parameters showed significant interaction effects. There was no interaction between Dekamon PGR and NPK Phonska Plus on the number of flowers and fruit set percentage. However, the application of PGR alone showed a significant influence. Plant Growth Regulators (PGRs) are applied externally to regulate the physiological processes of plants without functioning as nutrients (Wiraatmaja, 2017). PGRs differ from hormones in that hormones are naturally produced by plants or animals, while PGRs are generally synthetically manufactured (Debitama, Mawarni, & Hasanah, 2022).

A concentration of 2 ml/L had a significant effect on increasing the total number of flowers. As shown in Table 2, the number of flowers reached 16.30, which was significantly different from the control treatment (no PGR application), which produced 14.52 flowers. However, it was not significantly different from the 4 ml/L PGR treatment, which produced an average of 16.26 flowers. The application of NPK Phonska Plus fertilizer did not result in a significant difference in the number of eggplant flowers. This may be attributed to the gibberellin and cytokinin hormones in Dekamon PGR, which accelerate the transition phase from vegetative to generative stages by regulating and stimulating flowering and fruiting (Setiawati & Wahyuni, 2015). Auxin supports the initial development of fruit primordia. However, this effect can only be maximized when supported by a balanced nutrient supply, particularly potassium and phosphorus.

Table 3. Average Fruit Set Percentage under Dekamon PGR Concentration and NPK Phonska Plus Fertilizer Dosage Treatment

Treatment	Fruitset Percentage
PGR Concentration (ml/l)	
0	68.20
2	68.85
4	69.88
LSD 5%	ns
NPK Phonska Plus Dosage (g/plant)	
20	66.96 a
25	72.17 b
35	67.78 a
LSD 5%	4.35

Source: Personal Data

Note: Numbers followed by the same letter within the same column and treatment indicate no significant difference based on the 5% LSD test; ns = not significant.

The average fruit set percentage of purple eggplant shown in Table 3 indicates that the application of Dekamon PGR concentrations did not result in significant differences among treatments. However, the application of NPK Phonska Plus fertilizer showed the highest result at the dosage of 25 grams/plant, which was significantly different from the 20 grams/plant treatment (66.96%) and the 35 grams/plant treatment (67.78%). The application of NPK Phonska Plus fertilizer had a significant effect on the fruit set percentage, with the 25 grams/plant dosage (N_2) yielding the best results. Potassium is an essential element in the fruiting process, playing a role in enhancing pollination and successful fruit formation (Yuliana, R., Suryani, A., & Munawar, A., 2019). Phosphorus availability aids in the development of healthy flowers and supports the growth of fruit primordia. This indicates that macro- and micronutrients play a vital role in fruit development. According to Irvandi and Nurbaiti (2017), plant growth may be inhibited if the hormones and nutrients provided are not appropriate in terms of dosage and concentration. Conversely, if both hormones and nutrients are available in sufficient and appropriate amounts for plant absorption, optimal plant growth and development can be achieved. To sustainably increase the productivity of eggplant (Solanum melongena L.), the precise application of plant growth regulators (PGRs) and balanced fertilization can serve as an effective strategy. This is in line with the statement by Ahmed, F., Hossain, A. M., & Islam, M. S. (2015), which indicates that the combination of PGRs and macronutrients produces better results compared to single applications, both in terms of vegetative and generative growth parameters.

IV. CONCLUSIONS

The combination of Dekamon PGR and NPK Phonska Plus fertilizer had a significant effect on the growth and yield of purple eggplant. The best combination was found at Dekamon PGR 2 ml/L and NPK Phonska Plus 25 grams/plant (D_1N_2), which enhanced plant height, number of leaves, number of fruits per plant, and fruit weight per harvest. Individually, Dekamon PGR had a significant effect on almost all parameters, with 2 ml/L being the most effective concentration for increasing the number of flowers. NPK Phonska Plus fertilizer at a dosage of 25 grams/plant also yielded the best result for fruit set percentage.

ACKNOWLEDGMENT

All praise and gratitude are due to Allah S.W.T. for His blessings and guidance. Sincere thanks are extended to my parents for their prayers and support, to my peers for their assistance and companionship, and to my academic advisor and all lecturers for the knowledge and guidance provided throughout this work.

REFERENCES

1. Ahmed, F., Hossain, A. M., & Islam, M. S. (2015). Combined effect of plant growth regulators and nutrient management on yield and quality of brinjal. International Journal of Scientific Research in Agricultural Sciences, 2(3), 64–72.
2. Amanda, S., Syukri, & Bahri, S. (2024). The effect of concentration and soaking duration in natural growth regulators from bamboo shoots on the growth and yield of shallots (Allium ascalonicum L.). Agrotek Lestari Journal, 10(2), 167–177. https://jurnal.utu.ac.id/jagrotek/article/view/10162
3. Asra, N., & Samarlina, S. (2020). The effect of auxin and gibberellin hormones on plant growth. Indonesian Agrotek Journal, 5(2), 45–52.
4. Central Bureau of Statistics. (2023). Vegetable Crop Production 2021–2023. https://www.bps.go.id
5. Debitama, A. M. N., Mawarni, I. A., & Hasanah, U. (2022). The effect of auxin hormone as a growth regulator on several types of Monocotyledoneae and Dicotyledoneae plants. Biodidaktika: Journal of Biology and Its Learning, 17(1), 120–130.
6. Fitriani, L., Prayogi, R. S., & Wulandari, T. (2018). Interaction of plant growth regulators and macro fertilizers on the growth and yield of eggplant (Solanum melongena L.). Agrovigor Journal, 11(2), 112–120.
7. Irvandi, D., & Nurbaiti, I. (2017). The effect of NPK fertilizer and coconut water as a natural growth regulator on the growth of cocoa seedlings (Theobroma cacao L.) in sub soil medium. JOM Faperta, 4(2), 1–12.

8. Khadijah, S. (2021). The effect of Dekamon PGR and NPK 16:16:16 fertilizer on the growth of citrus scion plants (Citrofortunella microcarpa) [Undergraduate thesis, Islamic University of Riau]. UIR Repository. https://repository.uir.ac.id/16137/
9. Khafie, B., Sulistyono, A., & Pikir, J. S. (2021). Yield response of cayenne pepper due to combination of paclobutrazol concentration and NPK fertilizer dosage. Agrohita Journal, 6(2), 191–200.
10. Kurniawati, H. Y., Karyanto, A., & Rugayah. (2015). The effect of liquid organic fertilizer and NPK (15:15:15) dosage on the growth and production of cucumber (Cucumis sativus L.). Tropical Agrotek Journal, 3(1), 30–35.
11. Petrokimia Gresik. (2017). Launch of a new compound fertilizer, NPK Phonska Plus. Denpasar, Bali.
12. Setiawati, E., & Wahyuni, S. (2015). The effect of growth hormone combinations on plant photosynthesis efficiency. Indonesian Journal of Agricultural Sciences, 20(2), 89–96.
13. Sriyanto, D., Astuti, P., & Sujalu, A. P. (2015). The effect of cow manure dosage on the growth and yield of purple and green eggplant (Solanum melongena L.). Agrifor: Journal of Agricultural and Forestry Sciences, 14(1), 39–44.
14. Wiraatmaja, I. W. (2017). Plant growth regulators. Agroecotechnology Study Program, Faculty of Agriculture, Udayana University.
15. Yuliana, R., Suryani, A., & Munawar, A. (2019). Eggplant response to NPK fertilizer application. Tropical Agrotek Journal, 7(3), 233–240.