



## EFFECT OF VARIOUS CONCENTRATIONS OF GROWTH REGULATORS (ZPT) ON THE GROWTH OF MOON ORCHID PLANTS (*Phalaenopsis amabilis* L.)

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### Abstract :

*The Influence of Different Levels of Plant Growth Regulators (PGR) on the Development of Moon Orchids (*Phalaenopsis amabilis* L.). This research was carried out between June 2025 and August 2025. The study location was situated in Kaligandu Hamlet (RT.02/RW.02), Klepu Village, Pringsurat District, Temanggung Regency, at an altitude of roughly 550 meters above sea level. The aim of this research was to assess the efficacy of different varieties and concentrations of plant growth regulators on the growth of orchid plants. A Completely Randomized Design (CRD) utilizing a singular factor was implemented. The interventions comprised NAA (100, 150, and 200 mg/L), Gibberellin (100, 150, and 200 mg/L), and Benzyladenine (100, 150, and 200 mg/L). The metrics recorded encompassed the quantity of roots, count of new leaves, root length (cm), leaf length (cm), leaf breadth (cm), number of branched roots, and fresh plant biomass (grams). The data were examined by Analysis of Variance (ANOVA). If notable disparities were identified, the analysis proceeded with the Honestly Significant Difference (HSD) test at the 5% threshold. The findings revealed that the PGR treatments exhibited no substantial variations in the quantity of roots, leaves, root length (cm), leaf width (cm), number of branched roots, or fresh plant biomass (grams). A notable distinction was noted in the leaf length measurement.*

**Keywords :** Moon Orchid; Concentration; PGR

### INTRODUCTION

Plants that have high economic value due to the beauty of their flowers and long durability include the moon orchid (*Phalaenopsis amabilis* L.) (Aliya, et al. 2024). Market demand for moon orchids continues to increase, both for ornamental purposes and the floriculture industry (Rachmawati et al., 2024). However, the growth and development of moon orchids often face obstacles, especially in terms of plant propagation and adaptation in new environments.

ZPT can optimize the growth and development of various plants. Some types of ZPT that are often used in orchid cultivation include Naphthalene Acetic Acid (NAA), Gibberelin (GA), and Benzyladenine (BA). NAA plays a role in stimulating root formation, gibberellin functions to spur stem growth and cell elongation, while benzyladenine plays a role in cell division and the formation of new shoots. The right combination and concentration of these three ZPT can provide a synergistic effect in increasing the growth of moon orchids.

Several previous studies have shown that the application of NAA,



gibberellin, and benzyladenine can increase vegetative growth in orchid plants. However, studies that specifically discuss the effect of the combination of various concentrations of NAA and GA3 on the growth of moon orchids are still limited. Therefore, the purpose of the study is to examine the effect of the application of various concentrations of NAA, gibberellin, and benzyladenine on the growth of moon orchids. With this study, it is hoped that the optimal combination and concentration of ZPT can be found to support the production of moon orchids more efficiently and of high quality. Therefore, an initiative is needed to increase the effectiveness of moon orchid cultivation with the application of plant growth regulators (PGR). This study aims to determine the ideal mixture and concentration of plant growth regulators to improve the efficiency and quality of moon orchid cultivation.

## RESEARCH METHOD

This study used a Complete Random Design (RAL) with one factor consisting of 10 treatments, namely one control treatment and nine growth regulator (ZPT) treatments derived from three types of ZPT with three concentration levels each. These treatments included Z1 = NAA 100 mg/L, Z2 = NAA 150 mg/L, Z3 = NAA 200 mg/L, Z4 = gibberellin 100 mg/L, Z5 = gibberellin 150 mg/L, Z6 = gibberellin 200 mg/L, Z7 = benzyladenine 100 mg/L, Z8 = benzyladenine 150 mg/L, and Z9 = benzyladenine 200 mg/L. Each treatment was repeated three times so that a total of 30 trial units were obtained. The parameters observed to determine the influence of ZPT type and concentration on the growth of moon orchid plants include the number of leaves, leaf length (cm), leaf width (cm), number of roots, root length (cm), number of branched roots, and wet weight of the plant. The observation data were analyzed using Variance Analysis (ANOVA) to determine the effect of treatment, and if there was a significant difference between treatments, the analysis was continued with the Honestly Significant Difference (HSD) test at a significance level of 5%.

## FINDINGS AND DISCUSSION

### Summary of Fingerprint Analysis

Plant growth regulators are organic and inorganic compounds that modulate the physiological functions of plants. Different levels of growth regulators affect the development of moon orchids (*Phalaenopsis amabilis* L.). Findings from variance analysis regarding the parameters of root count, leaf count, root length (cm), leaf length (cm), leaf width (cm), number of branched roots, and weight of wet straw (grams) are shown as follows. The application of growth regulators affects the management of leaf count, root length, leaf length, and leaf width.

**Table: 1 Multiple Fingerprint Analysis**

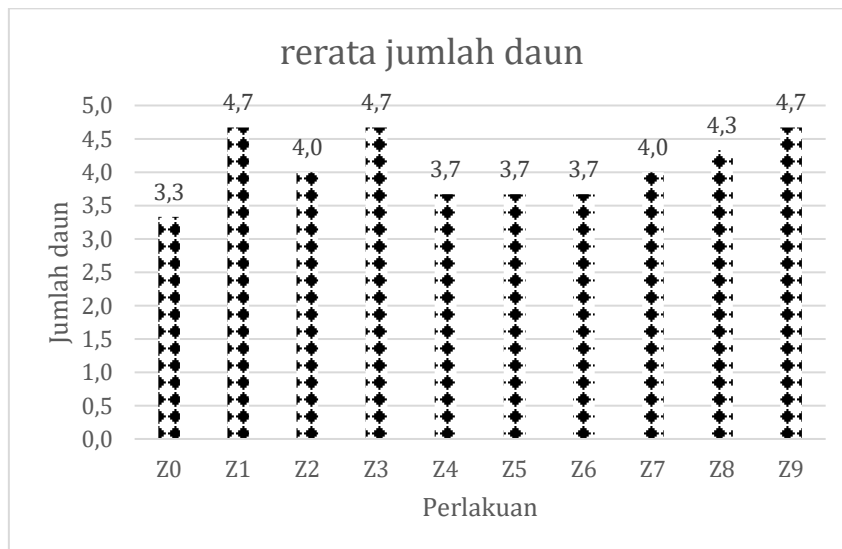
| No | Observation variables | F- count | Remarks            |
|----|-----------------------|----------|--------------------|
| 1. | Number of leaves      | 1,28 TN  | No real difference |

|    |                                    |         |                    |
|----|------------------------------------|---------|--------------------|
| 2. | Leaf length (cm)                   | 2,56 *  | Real differences   |
| 3. | Leaf width (cm)                    | 1,54 TN | No real difference |
| 4. | Number of roots                    | 1,15 TN | No real difference |
| 5. | Root length (cm)                   | 0,39 TN | No real difference |
| 6. | Number of branched roots           | 2,10 TN | No real difference |
| 7. | The Weight of Wet Trimmings (gram) | 0,99 TN | No real difference |

Remarks: tn = not real difference, \* = real difference, \*\* = very different real

Growth

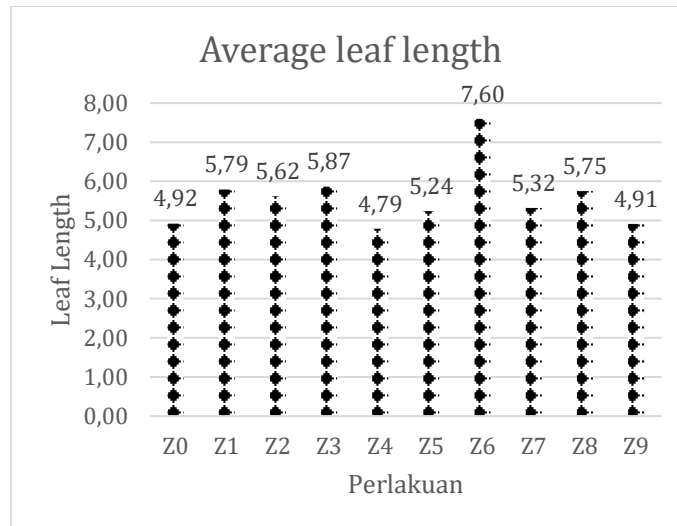
Number of leaves



**Figure 1 Number of Leaves**

In the leaf count parameters, it is known that the treatment of growth regulators has no effect on the number of leaves parameters. During the acclimatization process, the most difficult thing to do is to move seedlings. In addition, the use of the right medium as a place to grow plant seedlings, and fertilization is often an obstacle (Yuanasari et al., 2022). This is a transition period for plants that are undergoing a period of adjustment to the growing environment. Good and fast plant growth can be supported by appropriate environmental conditions. In the histogram presented above, it is clear that the highest number of leaves, namely 4.67, was recorded in PGR NAA treatment at concentrations of 100 mg/L and 200 mg/L, and PGR Benzyladenine at a concentration of 200 mg/L. The smallest number of leaves was recorded at 3.33 when PGR (control) therapy was not given. The ratio of auxin hormones introduced from the outside to auxin hormones produced internally by plants promotes leaf growth. (Aliya et al., 2025).

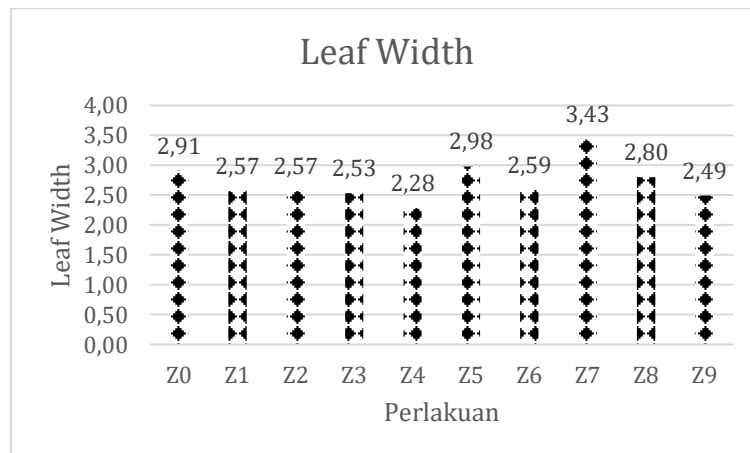
Leaf length (cm)



**Figure 2 Leaf Length**

Based on the histogram image above, it shows that the highest results were found in the recognition of Giberelin ZPT with a concentration of 200 mg/L, of 7.6 cm. while the lowest results were found in the treatment of Giberelin ZPT with a concentration of 100 mg/L, of 4.79 cm. Increasing the cell size in treatment orchid seedlings can be stimulated by administering high concentrations of gibberellin hormone (Swandari & Faisal, 2023). The gibberellin hormone initiates the hydrolysis of starch into sugars through the enzyme  $\alpha$ -amylase, increasing osmotic pressure and promoting cell elongation. (Nindia et al., 2025). The hormone gibberellin is able to activate auxins in plant cells and synergize for cell lengthening so as to spur plant growth speed.

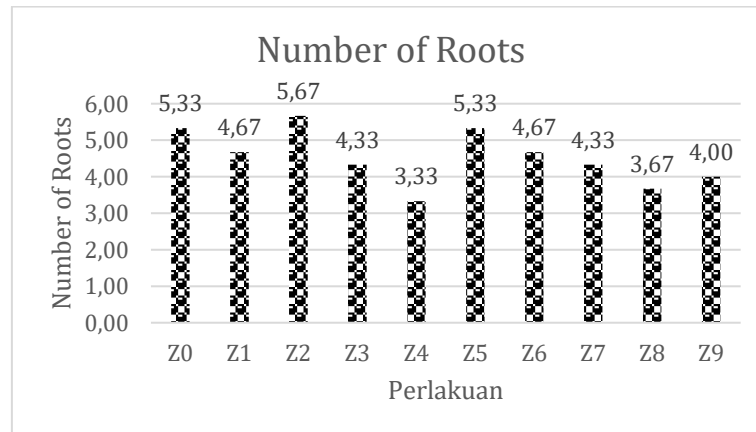
Leaf width (cm)



**Figure 2 Leaf Width**

The histogram image shows that the best treatment is found in ZPT Benziladenin with a concentration of 100 mg/L, with an average yield of 3.43 cm. Meanwhile, the lowest results are found in the treatment of ZPT Gibberelin with a concentration of 100 mg/L, with a yield of 2.28 cm. Benziladenine can help the cell division process so that meristematic activity will increase, which is very important for starting the growth of new shoots (Adi et al., 2025). Naphthalene Acetic Acid (NAA) and Benzyl Amino Purine (BAP) are used to influence plant

growth and development (Janah et al., 2025).  
Number of roots

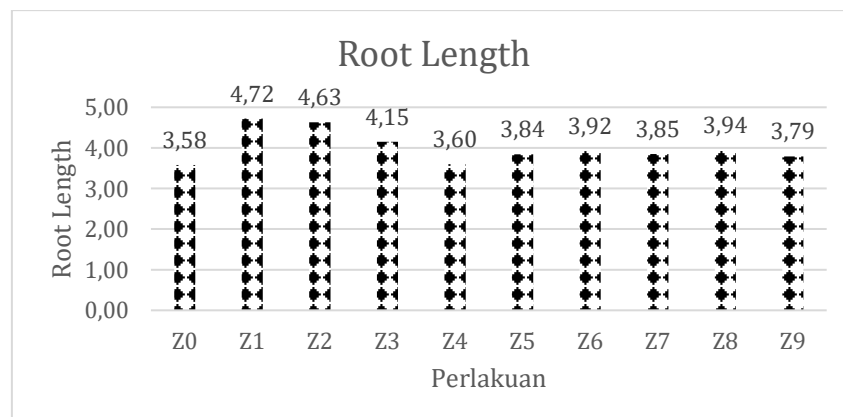


**Figure 3 Number of Roots**

The histogram shows that maximum yield is obtained with the plant growth regulator (PGR) NAA at a concentration of 150 mg/L, while the minimum yield is recorded with the plant growth regulator (PGR) Gibberellin at a concentration of 100 mg/L. Auxin serves to promote root and shoot development at the ends of the plant structure. Naphthalene Acetic Acid (NAA) is an auxin variant characterized by lower toxicity compared to other auxins and is often used in tissue culture (Arli & Noli, 2023).

Various elements, such as environmental conditions, nutrient availability, genetic makeup, and hormone levels, can affect plant development. Plant growth regulators are substances synthesized internally by plants that, in minimal concentrations, can promote or suppress development (Lisnawati et al., 2022). As a result, external administration of plant growth regulators at inappropriate doses can inhibit growth.

Root length

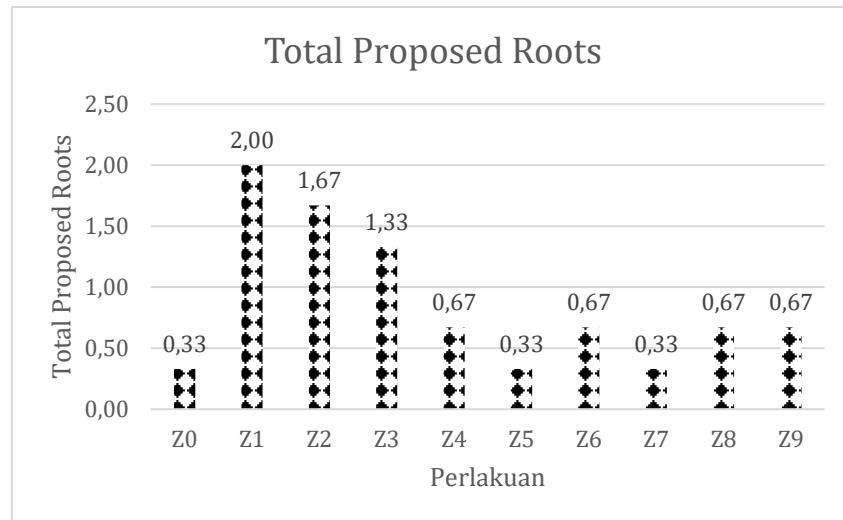


**Figure 4 Root Length**

The histogram image above shows that the average length of the longest akak was found in the ZPT NAA treatment with a concentration of 100 mg/L with a result of 4.72 cm. While the shortest root was found in the treatment Without ZPT (control) treatment, the measurement was 3.58 cm. Auxin functions by activating specific proteins in the plasma membrane of plants. H<sup>+</sup> ions affect

the cross-bonding of hydrogen in the chain of cellulose molecules that form the cell wall, thereby causing its disruption. This causes water to enter the plant cell through osmosis, which results in cell elongation (Debitama et al., 2022). The exogenous hormones required are related to the levels of endogenous hormones found in the explant (Santoso et al., 2025). The effectiveness of the use of growth regulators in the development of orchids is influenced by this. In contrast, environmental factors such as water and nutrients exert a greater influence on root development than phytohormones. (Nindia et al., 2025).

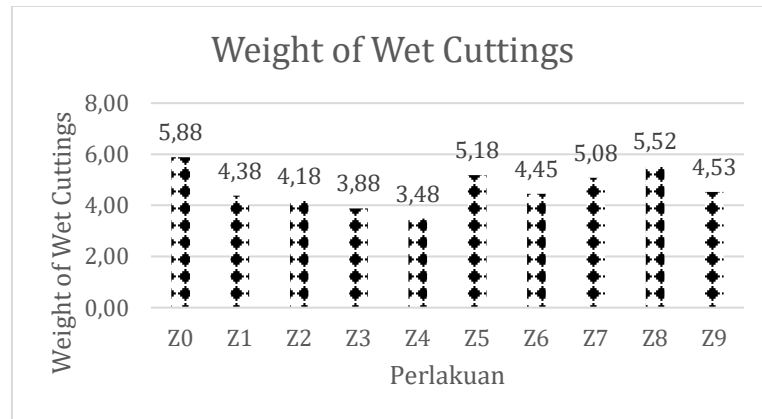
Number of branched roots



**Figure 5 Total Proposed Roots**

The histogram image above shows the highest results in the ZPT NAA treatment with a concentration of 100 mg/L with an average result of 2. The precipitated results were found in the treatment Without ZPT treatment, with a result of 0.33. Cell division for root development is believed to be influenced by intrinsic growth regulators (ZPT) and nutrient reserves present in the plant. These nutrient reserves are converted into substances that can be assimilated to facilitate plant development at a time when the roots have not yet functioned as nutrient absorbers (Rudi et al., 2022). Compared to alternative ZPT therapy, NAA (auxin) exerts the most significant influence on root development. Auxins strengthen the activity of genes associated with root initiation, accelerating the development of new root cells from explants (Triani & Ilham, 2024).

The Weight of Wet Trimmings



**Figure 6 Weight of Wet Cuttings**

The highest yield of wet cuttings was found in the treatment without ZPT (control) treatment of 5.88 grams. The lowest result was found in the treatment of Gibberelin ZPT with a concentration of 100 mg/L, amounting to 4.48 grams. The increase in wet weight as well as the dry weight of the plant is affected by the absorption of nutrients by the plant, in addition to the development of organs in plants due to increased photosynthetic activity (Dewanti et al., 2021). This is related to the growth of larger plants. Plants that have more and more leaves are getting taller and larger so that their wet weight becomes larger. Plant biomass reflects the integration results of increasing leaf area, number of leaves, and productive branching that increases light capture capacity and assimilate production (Yopa et al., 2025).

## CONCLUSION

Based on the results of the research and discussion, it can be concluded that the administration of several types of growth regulators (ZPT) has a real effect on the leaf length of the moon orchid plant, but does not have a significant effect on the number of roots, the number of leaves, the length of the roots, the width of the leaves, the number of branched roots, and the wet weight of the plant. Among the treatments tested, the administration of gibberellin with a concentration of 150 mg/L showed the best results, which resulted in a leaf length of 7.6 cm, so that the treatment can be considered the most optimal concentration in increasing the growth of the leaf length of the moon orchid.

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