


Research Article

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The Effect of Giving *Aloe Vera* Growth Regulators to Entres on the Success of Grafting Honey Mango Seedlings (*Mangifera Indica*)

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Abstract

This study aims to examine the influence of Aloe vera Plant Growth Regulator (PGR) application on scions regarding the success of grafting Honey Mango seedlings with concentrations of 2, 4, and 6 grams. The parameters observed include: Plant height, measured using a ruler from the ground surface to the tip of the highest stem. Stem diameter, measured 1 cm above the ground surface using a digital caliper. The number of leaves counted are those that are fully open. The leaf count was performed two weeks after planting. Stem diameter measurements were also taken two weeks after planting and then measured once a week for seven weeks. To analyze the factors affecting the treatments (M0, M1, M2, and M3) on Plant Height, Stem Diameter, and Number of Leaves, multiple linear regression was used. In addition to the PGR factor, factors such as weather, nutrients, and soil type greatly affect plant growth. It can be seen that the M3 treatment (six grams of PGR) had a greater effect (50.7%) compared to the M0, M1, and M2 treatments. This indicates that the more PGR given to the plant, the greater the R square value.

Keywords: aloe vera, growth regulator, linear regression, mango, planting



1. Introduction

Mango (*Mangifera sp*) is an annual fruit plant in the form of a tree originating from India, spreading to Southeast Asia including Malaysia and Indonesia. Mango has the potential to be developed because it has a high level of genetic diversity so that mango germplasm needs to be preserved. Variations in the shape, size and color of mango fruit show high genetic diversity (Nilasari *et al.*, 2013). Mango is a national superior fruit commodity that can act as a source of vitamins and minerals, increase farmers' income, and support industrial development and exports. According to the Central Statistics Agency and the Directorate General of Horticulture, it was recorded that Indonesia's mango production in 2016-2018 increased. In 2016 Indonesia produced 1,814,539 tons of mango, in 2017 mango production was 2,273,843 tons, and in 2018 mango production was 2,585,585 tons (Aprilia, 2021). This indicates that Indonesia has great potential in producing mangoes. Mangoes are included in the group of fleshy stone fruits with fruit lengths between 2.5-30 cm. Mangoes have round, oval, round-elongated, and flat shapes. The color of mangoes also varies, some are green, yellow, red, or a mixture depending on the mango variety. Variations in mangoes in terms of shape, size and color of fruit, which shows the fairly wide genetic diversity of mangoes (Tasliyah *et al.*, 2013). Plant Growth Regulators (PGR) are organic compounds that function as stimulants, inhibitors, or can qualitatively change and encourage growth in plants. PGR works by forming the same hormone, influencing the synthesis in hormones and influencing changes in the formation of locations in hormones (Ajar, 2017). PGR in plants consists of five types, namely auxin, gibberellin, cytokinin, ethylene, and abscisic acid, where each hormone has a different effect on plant physiology (Aisyah, 2020). PGR is given to plants to stimulate the formation of phytohormones that already exist in the plant body or replace the function and role of hormones if the plant produces hormones in insufficient amounts (Pujiasmanto, 2020). *Aloe vera* has various nutritional contents, including enzymes, minerals, sugars, fatty acids, and hormones, such as auxins and gibberellins (Fauzi, 2021). *Aloe vera* leaves contain a gel consisting of 96% water and 4% solids consisting of 75 compound components that are beneficial for plant growth.

The *Aloe vera* plant is a plant that grows widely in tropical or subtropical climates and has been used for a long time because of its medicinal function. The leaves are slightly pointed in the form of spurs, thick, brittle, serrated edges, and a speckled surface. *Aloe vera* can grow in cold climates and also in dry areas, such as Africa, Asia and America. *Aloe vera* can grow at optimum temperatures for growth ranging from 16-33°C with rainfall of 1000-3000 mm with a fairly long dry season, so *aloe vera* is a plant that is efficient in water use. *Aloe vera* cultivation is relatively easy and does not require large costs and maintenance. This will

encourage and consider making *Aloe vera* a food raw material (Pradnyani, 2018).

Aloe vera plants are now one of the agricultural commodities that have very great opportunities to be developed in Indonesia as an agribusiness, but the development of *aloe vera* agribusiness in Indonesia is relatively narrow and its locations are scattered. The development of Indonesian *aloe vera* agribusiness is centered in Pontianak, West Kalimantan Province (Arifin, 2014; Sapitri *et al.*, 2022). The results of the study by Nasution *et al.*, (2023) which aimed to determine the effect of the concentration and duration of soaking of natural PGR mixtures of *Aloe vera* and coconut water on the growth of lemon (*Citrus limon*) plant cuttings showed that the concentration of natural growth regulators of 300 ml/l can increase shoot length, fresh shoot weight, and dry shoot weight with results of 17.87 cm, 0.82 g and 0.18 g respectively. This study is a continuation of Fauzi's research (2021) which uses *Aloe vera* as an alternative natural Plant Growth Regulator (PGR) for the growth of green bean plants (*Vigna radiata*) with concentrations of 10 and 50 percent, while this study uses *Aloe Vera* as the Effect of Giving *Aloe Vera* PGR on scions on the success of grafting Honey Mango seedlings with concentrations of 2, 4, and 6 grams.

2. Materials and Methods

The research will be conducted in the experimental garden of the Plantation Management Study Program of the Politeknik Indonesia Venezuela located in Cot Suruy Village, Ingin Jaya Sub-district, Aceh Besar Regency, from May 2024 to July 2024. The tools used in this study are: knives, scissors, cameras, rulers, notebooks, pens, and digital scales. The materials used in this study are: honey mango seedlings, *Aloe vera*, small plastic and water.

The scions are obtained from mango trees that have been harvested four to five times. This preparation is done by first cleaning the scions by cutting the leaves until none are left. Weighing and administering *Aloe vera* Plant Growth Regulators (PGR) are substances used to study plant growth and productivity using extracts or essences from *Aloe vera* plants. *Aloe vera* PGR is given with different doses, starting from two grams, four grams and six grams in each honey mango scion. The grafting treatment was carried out on honey mango seedlings totaling 24 polybags, the age of the honey mango seedlings used was \pm four months. Grafting treatment is done by splitting the rootstock. Grafting mango plants is a technique commonly used to propagate mangoes by joining two different parts of mango plants.

The parameters observed were: Plant height was measured using a ruler by measuring from the ground surface to the tip of the highest stem. Stem diameter was measured at a height of one cm above the ground surface using a digital caliper. The number of leaves counted were leaves that were fully open. The calculation of the number of leaves was carried

out since two weeks after planting. Stem diameter measurements were carried out since 2 weeks after planting and then measured once a week for seven weeks.

The data was processed using the Statistical Package for the Social Sciences 25 (SPSS 25) application. To see the factors that affect the Treatment (M0, M1, M2, and M3) on Plant Height, Stem Diameter and Number of Leaves, multiple linear

regression was used (Khriswanti *et al.*, 2022; Triadiwarman *et al.*, 2022), with the following model:

$$Y = a_0 + a_1X_1 + a_2X_2 + a_3X_3$$

Dimana : Y = Treatment PGR *Aloe vera*
 X₁ = Plant Height
 X₂ = Stem Diameter
 X₃ = Number of Leaves

3. Results and Discussion

Table 1. Results of Linear Regression Analysis on Control Treatment (M0), Two gram PGR Treatment (M1), Four gram PGR Treatment (M2) and Six gram PGR Treatment (M3).

Model Summary ^b				
Num. Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1. Control Treatment (M0)	0.712 ^a	0.507	0.013	0.02146
2. Two gram PGR Treatment (M1)	0.567 ^a	0.321	-0.357	0.02517
3. Four gram PGR Treatment (M2)	0.554 ^a	0.307	-0.386	0.02543
4. Six gram PGR Treatment (M3)	0.778 ^a	0.605	0,210	0.01920

a. Predictors: (Constant), Number of Leaves, Stem Diameter, Plant Height
 b. Dependent Variable: (M0, M1, M2, and M3)

In Table 1 number 1, it can be seen that the summary R Square (R²) model shows a value of 0.507. This means that the effect of Treatment M0 (Control) on Stem Height, Stem Diameter and Number of Leaves is 50.7%, while 49.3% is influenced by other factors such as: weather, nutrient content, soil type and so on. At number 2, it can be seen that the summary R Square (R²) model shows a value of 0.321. This means that the effect of Treatment M1 (2 grams of PGR) on Stem Height, Stem Diameter and Number of Leaves is 32.1%, while 67.9% is influenced by other factors. At number 3, it can be seen that the summary R Square (R²) model shows 0.307. This means that the effect of Treatment M2 (4 grams of PGR) on Stem Height, Stem Diameter and Number of Leaves is 30.7%, while 69.3% is influenced by other factors. In At number 4, it can be seen that the summary R Square (R²) model shows 0.605. This means that the effect of M0 Treatment (6 grams of PGR) on Stem Height, Stem Diameter and Number of Leaves is 60.5%, while 39.5% is influenced by other factors (Wahyono, 2014; Dharta *et al.*, 2024). (Primasari, 2019) explained that *Aloe vera* contains the hormones auxin and gibberellin which can increase plant growth. Pujiasmanto (2020) also explained that auxin functions to stimulate cell elongation in plants.

The results of the study on treatments M0, M1, and M2 did not significantly affect the use of *Aloe vera* PGR. This is in accordance with the study of Mirhagalla and Fernando (2020), who conducted three experiments comparing *Aloe vera* gel with commercially

available PGR for root induction of semi-hardwood cuttings (*Citrus aurantifolia*), softwood cuttings (*Coleus spp.*) and air layering plants (*Syzygium jambos*). The average root length, number of roots and root strength were recorded as root properties. The effects of PGR and *Aloe vera* gel on root properties did not differ significantly for *C. aurantifolia* and *S. Jambos*. The results of Fauzi's study (2021), showed that the administration of *Aloe vera* gel with a gel concentration of 10% from the results of measuring the variables of number of leaves, leaf area, and stem diameter did not show significant differences between all treatments. This is due to the low levels of PGR and the research that was carried out in a short time for woody plants (Asra *et al.*, 2020) explained that auxin functions to stimulate stem growth. Auxin is translocated from the tip of the shoot to the cell elongation area, so that auxin can stimulate growth in a cell by binding to receptors that have been formed on the cell plasma membrane and gibberellin functions as a stimulant for bud development, plays a role in the flowering process and fruit development, encourages flowering, and stimulates leaf growth.

Primasari, (2019) explained that *A. vera* contains auxin and gibberellin hormones, where gibberellin functions as a stimulant for the growth and development of roots, leaves, flowers, and fruits. In addition to the PGR factor, factors such as weather, nutrients and soil type greatly affect plant growth (Saputro *et al.*, 2017; Sipayung *et al.*, 2024). It can be

seen that the M3 treatment (6 grams of PGR) had a greater effect (60.5%) compared to the M0, M1, and M2 treatments. This indicates that the more PGR given to the plants, the greater the R square value. This is in accordance with the research of Prabawa *et*

4. Conclusions

In addition to the PGR factor, factors such as weather, nutrients and soil type greatly affect plant growth. It can be seen that the M3 treatment (six grams of PGR)

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al., (2020) which stated that soaking natural PGR had a significant effect on the viability and vigor of expired pagoda mustard seeds, and the treatment of coconut water with a concentration of 50% (Z2) gave the best effect.

had a greater effect (50.7%) compared to the M0, M1, and M2 treatments. This indicates that the more PGR given to the plant, the greater the R square value.

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