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THE EFFECTIVENESS OF ALOE VERA GEL AS A NATURAL GROWTH REGULATOR ON THE SUCCESS OF GRAFTING HONEY MANGO SEEDLINGS *(Mangifera Indica)*

EFEKTIVITAS GEL LIDAH BUAYA SEBAGAI ZPT ALAMI TERHADAP KEBERHASILAN GRAFTING BIBIT MANGGA MADU *(Mangifera Indica)*

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Abstract

The development and improvement of mango plant quality can be achieved by providing high-quality mango seedlings in large quantities, in a short time, and at an affordable price. Vegetative propagation is an alternative method for obtaining high-quality seedlings, one of which is through grafting. This study aims to assess the effectiveness of applying aloe vera gel as a natural growth regulator (NGR) on scions for the success of grafting honey mango seedlings. The study was conducted at the experimental farm of the Indonesian Polytechnic of Venezuela in Cot Suruy Village, Ingin Jaya Sub-district, Aceh Besar District, from May to July 2024. The study utilized simple linear regression analysis. The observed parameters were stem height, stem diameter, and the number of leaves. The results of the ANOVA F-test analysis showed that treatments M0, M1, and M3 had an F-table value greater than the F-calculated value, indicating that the regression model was not statistically significant. However, treatment M2 had an F-table value smaller than the F-calculated value.

Keywords: Aloe Vera, Grafting, Honey Mango Plants, Plant Growth Regulators

Abstrak

Pengembangan dan perbaikan kualitas tanaman mangga dapat dilakukan dengan menyediakan bibit mangga yang bermutu dalam jumlah banyak, waktu yang singkat, dan harga terjangkau. Perbanyakan tanaman secara vegetatif merupakan alternatif untuk mendapatkan bibit yang berkualitas, salah satunya dengan menggunakan metode sambung pucuk (grafting). Penelitian ini bertujuan untuk melihat efektivitas pemberian gel lidah buaya sebagai ZPT alami pada entres terhadap keberhasilan grafting bibit mangga madu. Penelitian ini dilaksanakan di kebun percobaan Politeknik Indonesia Venezuela Desa Cot Suruy Kecamatan Ingin Jaya Kabupaten Aceh Besar pada bulan Mei sampai Juli 2024. Penelitian ini menggunakan regresi linier sederhana. Parameter yang diamati adalah tinggi batang, diameter batang, dan jumlah daun. Hasil analisis ANOVA uji F menunjukkan bahwa perlakuan M0, M1, Dan M3 dengan F tabel > F hitung maka model regresi tidak signifikan secara statistik. Sedangkan M2 dengan F tabel lebih kecil dari pada F hitung.

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Kata Kunci: Lidah Buaya, Grafting, Tanaman Mangga Madu, Zat pengatur tumbuh

INTRODUCTION

The mango tree *(Mangifera indica* L.*)* originates from Southeast Asia and India. This mango tree is a tall and large tree with dense foliage. Generally, mangoes thrive well and optimally in lowland areas, but they can still grow in regions with moderate climates, although their growth is not as vigorous as in lowland areas (Husna, 2019). Mangoes are a popular horticultural commodity, with approximately 400 varieties found throughout Indonesia. This fruit can be processed into various derivative products or consumed as fresh or frozen fruit. Additionally, it can be processed into juice, puree, or pickles (Rinawati, 2020).

According to the Central Statistics Agency and the Directorate General of Horticulture, Indonesian mango production increased from 2016 to 2018. In 2016, Indonesia produced 1,814,539 tons of Mangoes; in 2017, production increased to 2,273,843 tons; and in 2018, production reached 2,585,585 tons. This suggests that Indonesia has considerable potential for mango production. The productivity of mango crops in Banda Aceh in 2010 reached 185 tons. The total number of mango trees in Banda Aceh is 10,337, which includes mango crop yields from 9 districts in Banda Aceh (BPS Kota Banda Aceh, 2015).

The development of fruit crops requires the support of high-quality seeds, as healthy and viable seeds can significantly enhance crop production (Mulyani & Ismail, 2015). Vegetative propagation is more commonly used because plants can produce superior seeds in large quantities in a short time and have the same characteristics as their parents. One of the most common methods of vegetative propagation is the use of cuttings (Tarigan *et al.,* 2015).

The primary issue with cuttings is the difficulty in forming roots. Therefore, efforts can be made to encourage, accelerate, and stimulate root formation as well as improve the quality and quantity of roots by applying growth regulators to the cuttings. The use of growth regulators (NGR) is a crucial factor in the propagation process using cuttings, as NGR can induce the desired growth effects in plants. Plant growth regulators (PGRs) are non-nutritive organic compounds in plants that actively stimulate, inhibit, or alter the growth and development of a plant at low concentrations (Asra *et al.,* 2020).

Plant growth regulators comprise five types: auxin, gibberellin, cytokinin, ethylene, and abscisic acid, each of which has a distinct effect on plant physiology (Aisyah, 2020). The application of plant growth regulators can produce varying responses depending on the stage of development that has been reached. Safitri *et al. (*2021) state that growth regulators play a role in cell division and differentiation, and can increase shoot and root growth by combining auxin and gibberellin. Many plants produce growth hormones, which are substances that regulate plant growth and development. Aloe vera is a plant that contains growth hormones. Aloe vera contains

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a variety of nutrients, including enzymes, minerals, sugars, fatty acids, and hormones such as auxin and gibberellin. Aloe vera leaves contain a gel that consists of 96% water and 4% solids, comprising 75 beneficial compounds. The nutritional content of aloe vera gel can be used to influence plant growth and development (Wilda *et al*., 2023).

Two types of NGR can be used in plant grafting, namely natural and synthetic NGR. However, in plant grafting practice, the most commonly used natural NGR is Aloe vera (Tanjung, 2021). Aloe vera contains various nutrients, including enzymes, minerals, sugars, fatty acids, and hormones such as auxin and gibberellin (Primasari, 2019). Aloe vera leaves contain a gel composed of 96% water and 4% solids, which consist of 75 beneficial compounds.

The results of Gordianus *et al.* (2018) indicate that the application of aloe vera waste NGR at a treatment rate of 10 mL L^{-1} water has a significant effect on the growth and production of Kailan plants. Based on the issues outlined above, a study was conducted on the effectiveness of Aloe vera gel as a natural NGR for the success of grafting honey Mango *(Mangifera indica)* seedlings.

RESEARCH METHODS

This study was conducted in the garden test at Politeknik Indonesia Venezuela, Cot Suruy Village, Ingin Jaya Subdistrict, Aceh Besar District, from May to July 2024. The materials used in this study were knives, scissors, cameras, rulers, notebooks, pens, digital scales, honey mango seeds, aloe vera, small plastic bags, and water. To examine the factors influencing plant height, stem diameter, and number of leaves, simple linear regression was used, with the following model:

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

Where:
Y = Aloe vera NGR treatment,
X_1 = Plant height,
X_2 = Stem diameter,
X_3 = Number of leaves
Next, to test the second hypothesis, a simultaneous test and a coefficient of determination will be used.

Procedure Implementation Study

The land used previously had been cleared of weeds in accordance with the area required for arranging the polybags. Honey mango seedlings were obtained from cuttings from mango trees that had been harvested four times and planted in the Greenhouse Laboratory of the Plantation Management Study Program, which were 4 months old. The shade structure is made of netting with iron poles and a parasol as the roof. The material used for grafting the honey mango plants is the rootstock from crystal guava plants that have been planted in the experimental garden of

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Politeknik Indonesia Venezuela. The upper stem was cut to a size of 15 cm, followed by the use of extract or juice from the aloe vera plant for the lower stem. The application of aloe vera NGR with different doses, starting from 2 grams, 4 grams, and 6 grams per honey mango graft. Variation analysis with simple linear regression was performed on observational data from variable growth. The variables observed were plant height, plant diameter, and number of leaves.

RESULTS AND DISCUSSION

Regression M0

Based on the research results and observations during the study period, a relationship was found between treatment and stem height, stem diameter, and the number of leaves.

Table 1. R Square for treatment M0

Treatment	Observation	Average 1	Average 2	Average 3	Average 4	Average 5	Average 6	Mean
M0 Control	stem diameter	0,22	0, 13	0, 60	0, 27	0, 37	0, 32	**1,9**
M0 Control	plant height	0, 50	0, 92	0, 28	2, 28	1,59	0, 52	**6,0**
M0 Control	number of leaves	0, 5	0,3	0,0	0,0	4,0	0,2	**5,0**

From the results of the M0 (control) study, the R-squared (R^2) summary model yields a value of 0.281. This means that the effect of Treatment M0 (Control) on stem height, stem diameter, and number of leaves is 28.1%, while 71.9% is influenced by other factors, such as weather, nutrient content, and soil type, among others. The ANOVA analysis results indicate that the F-value is 0.261. F-table value, looking at the F distribution table for alpha = 0.05, with the numerator degrees of freedom (df for Regression) resulting in 3 and the denominator degrees of freedom being 2, yields a critical F value of 19.16. This means that if F table > F calculated, then the regression model is not statistically significant (Wahyono, 2014; Dharta *et al*., 2024).

Regression M1

Based on the research results and observations during the study period, a relationship was found between treatment and stem height, stem diameter, and the number of leaves.

Table 2. R Square for treatment M1

Treatment	Observation	Average 1	Average 2	Average 3	Average 4	Average 5	Average 6	Mean
M1 2 gram	stem diameter	0,33	0, 30	0,25	0,37	0, 32	0,22	**1,8**
M1 2 gram	plant height	0,67	1,63	0,70	1,33	1,97	0,10	**6,4**
M1 2 gram	number of leaves	0,00	2,83	2,00	0,67	1,50	0,50	**7,5**

In the summary model, R-squared (R^2) is 0.091. This means that the effect of Treatment M1 (NGR 2 grams) on stem height, stem diameter, and number of leaves is 9.1%, while 81.9% is influenced

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by other factors, such as weather, nutrient content, and soil type, among others. The results of the ANOVA analysis indicate that the F-value is 0.067. The F-table value, using the F-distribution table for alpha = 0.05, with numerator degrees of freedom 3 (df for Regression) and denominator degrees of freedom 2 (df for Residual), yields a critical F-value of 19.16. This means that if F table > F calculated, then the regression model is not statistically significant.

Regression M2

Based on the research results and observations during the study period, a relationship was found between treatment and stem height, stem diameter, and the number of leaves.

Table 3. R Square for Treatment M2.

Treatment	Observation	Average 1	Average 2	Average 3	Average 4	Average 5	Average 6	Mean
M2 4 gram	stem diameter	0,33	0, 62	0,18	0,23	0, 33	0,27	**2,0**
M2 4 gram	plant height	3,35	2,08	0,20	0,33	0,43	0.00	**6,4**
M2 4 gram	number of leaves	2,00	0,00	2,17	1,50	0,00	0,17	**5,8**

In the summary model, R-squared (R^2) is 0.992. This means that the effect of Treatment M2 (NGR 4 grams) on stem height, stem diameter, and number of leaves is 99.2%, while other factors, such as weather, nutrient content, and soil type, influence 0.8%. Other factors or internal factors are caused by the looser soil structure in M2, resulting in faster water infiltration and absorption by the M2 plants. The internal results of the ANOVA analysis indicate that the F-value is 79.164. Using the F distribution table at alpha = 0.05, with numerator degrees of freedom 3 (df for Regression) and denominator degrees of freedom 2 (df for Residual), the critical F value is 19.16. This means that if F table < F calculated, the regression model is statistically significant. This is because the M2 treatment was placed in the middle position under shade. Thus, direct sunlight hit the mango seedlings in the M2 treatment. This aligns with the research by Akmalia & Suharyanto (2017), which found that higher light intensity and watering volume affect all plant growth parameters.

Regression M3

Based on the research results and observations during the study period, a relationship was found between treatment and stem height, stem diameter, and the number of leaves.

Table 3. R Square for treatment M3

Treatment	Observation	Average 1	Average 2	Average 3	Average 4	Average 5	Average 6	Mean
M3 6 gram	stem diameter	0,10	0,35	0,25	0,52	0, 37	0,23	**1,8**
M3 6 gram	plant height	1,02	0,43	0,40	0,13	1,72	0.00	**3,7**
M3 6 gram	number of leaves	0,83	0,00	0,33	2,50	2,00	1,50	**7,2**

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In the summary model, R-squared (R^2) is 0.436. This means that the effect of Treatment M3 (NGR 6 grams) on stem height, stem diameter, and number of leaves is 43.60%, while 56.4% is influenced by other factors, such as weather, nutrient content, and soil type, among others. The results of the ANOVA analysis indicate that the F-value is 0.516. The F-table value, using the F-distribution table for alpha = 0.05, with numerator degrees of freedom 3 (df for Regression) and denominator degrees of freedom 2 (df for Residual), yields a critical F-value of 19.16. This means that if F table > F calculated, then the regression model is not statistically significant

CONCLUSION

The results of the ANOVA F-test analysis show that treatments M0, M1, and M3, with F table values greater than the F count, indicate that the regression model is not statistically significant. Meanwhile, M2 has an F-table value smaller than the F-calculated value. From an external factor perspective, higher light intensity and irrigation volume lead to higher growth parameters in plants. From an internal factor perspective, this is due to the looser soil structure in M2, resulting in faster water infiltration and absorption by the plants in M2. The results of the analysis of variance (ANOVA) test indicate that treatments M0, M1, and M3 are not statistically significant.

REFERENCES

Aisyah, 1.(2020). *Kultur jaringan pisang kepok tanjung (tidak berjantung) yang tahan terhadap penyakit darah (Ralstonia syzygii Subsp.* Celebenesensis*)*. Deepublish, Sleman.

Asra, R., Samarlina, R.A., & Silalahi, M. (2020). *Hormon Tumbuhan*. Cetakan ke-1. UKI Press, Jakarta.

Badan Pusat Statistik Provinsi Aceh. (2015). Banda Aceh: Kantor BPS Provinsi Aceh

Gordianus, A., Luluk S. B., & Siti, M.S. (2018). Aplikasi Dosis Pupuk Cair Limbah Lidah Buaya Terhadap Pertumbuhan dan Produksi Kailan. *Jurnal Ilmiah Respati*. 13 (2): 10.

Husna, S. R. (2019). *Penerapan learning vector quantization (LVO) untuk klasifikasi daun mangga menggunakan modified direction feature (MDF).* (Skripsi, Universitas Islam Negeri Sultan Syarif Kasim Riau)

Rinawati, M. (2020). *Analisis Faktor-faktor yang Mempengaruhi Daya Saing Mangga (Mangifera indica* L.*) Indonesia Di Pasar Internasional*. (Thesis. Universitas Muhammadiyah Malang)

Mulyani, C. dan J. Ismail. (2015). Pengaruh konsentrasi dan lama perendaman rootone F terhadap pertumbuhan setek pucuk jambu air (*Syzygium samragense)* pada media Oasis. *Jurnal Agrosamudra*. 2 (2): 1-9.

Primasari, M. (2019). Efek terapi gel lidah vuaya (*Aloe vera*) dalam penyembuhan luka. *Journal Medicinus* 32 (3): 46-49.

Safitri, R., Rahayu T dan Widiastuti, L. (2021) Pengaruh Macam Media Tanam dan konsentrasi zat pengatur tumbuh terhadap pertumbuhan setek dua nodus melati. *Jurnal Kultivasi*. 2(1): 22- 26.

Tanjung, T.Y., Darmansyah. (2021). Pengaruh penggunaan ZPT alami dan buatan terhadap pertumbuhan stek tanaman delima (*Punica granatum* L.). *Journal Hortuscoler*. 2 (1): 6-13.

Tarigan, V., Hanum, C & Danamik, R. (2015). Perrtumbuhan vegetatif dan generatif jambu air (Syzygium samarangense (Blume) Merr dan Perry) vegetatif deli hijau dengan perlakuan ZPT dan media tanam. Jurnal Dinamika Pertanian. 3(2):740-747.

Wilda, R. N., Putri, R.H.B., Devi, M.S., & Lukman, H. H. (2023). Utilization of Aloe Vera (*Aloe Vera*) As a Natural ZPT Alternative For The Growth of Rose Plant Roots. *Bioedunis Journal* 2(1). 34-38