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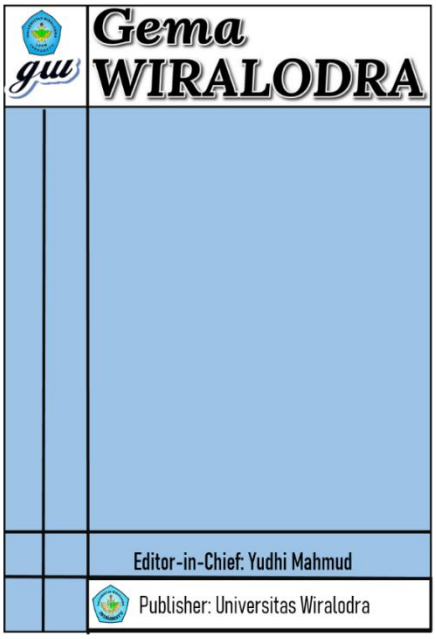

The effect of giving gibberellin at different concentrations on the elongation of palm oil palm oil (*borrassus flabelifer*)

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Original Article

The effect of giving gibberellin at different concentrations on the elongation of palm oil palm oil (*borrassus flabelifer*)

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Abstract
This research has been carried out in the greenhouse of BAPEDALDA NTT. The method used was an experimental method with a completely randomized design consisting of 4 (four) treatments, namely control (G_0), giving gibberellin 100 ppm (G_1), gibberellin 200 ppm (G_2), and gibberellin 300 ppm (G_3), each treatment consisted of 4 (four) replications so that the total experimental unit was 16 units. The parameters of this study were apokol elongation and the percentage of palmyra growth. The data obtained were analyzed using analysis of variance (ANOVA), and continued with the honest significant difference test (BNJ) if there is a difference. The results showed a significant difference between the control and the gibberellin treatment for the apokol length parameter. Meanwhile, the percentage of palm growth showed no effect. The results of the analysis of variance for the average parameter of apokol elongation obtained $F_{\text{-Count}} > F_{\text{-Table}}$, where $F_{\text{-Count}} = 6.67$ and $F_{\text{-Table}}$ 5% = 3.49. This means that there is an effect of giving gibberellins on the length of the apokol ejection. Because there are differences, it is continued with the Honest Significant Difference (BNJ) test. The results of the BNJ test showed that the G_2 treatment was not different from the G_1 and G_0 treatments and was different from the G_3 treatment. The G_1 treatment was not different from the G_0 treatment but different from the G_3 treatment. The G_0 treatment was no different from the G_3 treatment.
Keywords: Lontar, Growth hormone, Gibberellins

1. Introduction

The lontar plant (Borassus flabellifer) is a plant that is familiar to the people of East Nusa Tenggara (NTT) because this plant has long lived and grown in the NTT region, especially in several places such as on Timor Island, Sabu Island, Rote Island, and Sumba. Lontar plants have considerable potential. One example is the result of the lead from the male flower or its mayang in the form of sap. Palm sap for the people on Sabu Island and Rote Island is usually processed into granulated (solid) sugar, liquid sugar, to crystal sugar, also called sugar. Apart from being processed into sugar, sap can also be processed into other drinks such as red wine, white laru, and sopi (Naiola, 2004).

The palm plant has many uses in Indonesia and abroad, such as India, Myanmar, and Cambodia (Colchester& Chao, 2011). Lontar plants are versatile plants because all parts of the body are helpful. In Indonesia, the palm tree parts often used are the leaves, fruit, and flowers (Argus et al., 2022; Haryati et al., 2022). Palm flowers can be used for a drink called sap or legen. Palm leaves are used to make traditional handicrafts. Lontar in India is used as a drink and building material, while in Burma (Myanmar), it is used as a food ingredient (Sarma et al., 2022).

Studies on the traditional use of palm leaves in Indonesia have been carried out in Lamongan, West Nusa Tenggara, and East Nusa Tenggara Provinces. The Lamongan people use lontar fruit as processed food and drinks, including solid sugar, liquid sugar, and legen (Arifah, 2011). The Sambori people in Bima Regency, West Nusa Tenggara, use palm leaves as crafts, including mats, sadaku, bags, and so on (Zulharman & Aryanti, 2016; Bria & Binsasi,

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Original Article

2020). According to the research results by Age et al. (2020) and Tnunay & Hanas (2021), the people of Raijua Island (NTT) utilize all parts of the lontar plant, namely leaves, roots, stems, stalks, flowers, and fruit.

Lontar trees belong to the palmae group of the monocot class. They can live in dry climatic conditions or conditions for an extended period, as in East Nusa Tenggara Province, which generally has a longer dry season than the rainy season, which is 7-9 months in a year. One year. The lontar plant has a unique germination pattern compared to other palm groups because, at the beginning of the lontar growth, the first organ called apokol will emerge. Then, the apokol will grow into the ground (Jansz et al., 2002). Therefore, to breed lontar is very inefficient because it must be done in pots with a height of not less than 90 cm.

Apart from having a unique germination pattern, the population of lontar trees in NTT Province is decreasing. This is due to the increased use of lontar without cultivation. The decline in the population was caused by 1) the very high level of utilization of the palm plant, 2) the conversion of land functions due to an increase in population, and 3) no cultivation at all, so these plants live naturally and wildly. Seeing the problems above, an effort is needed to overcome the problem of Palmyra germination. One way is to use growth regulators, including gibberellins. Gibberellin supports cell elongation cambium activity and the formation of new RNA and protein synthesis (Dayan et al., 2012; Sharma & Zheng, 2019).

Every plant produces gibberellin, but it is insufficient for its physiological needs. Therefore, gibberellins are needed from outside (exogenous gibberellins) (Rai et al., 2017). Based on the description of the background above, the problem that can be formulated is whether gibberellins affect the germination process of palm leaves. This research aims to be the latest information material for the general public and related agencies, such as the Forestry and Plantation Services.

2. Method

The method used in this research is the experimental method. This research was conducted using a completely randomized design (CRD), which consisted of 4 treatments, namely:

G_0: Without Gibberellin
G_1: Giving Gibberellin 100 ppm
G_2: Giving Gibberellin 200 ppm
G_3: Giving Gibberellin 300 ppm

Each treatment was repeated 4 times here, meaning that the G0 treatment was planted in 4 pots, then for the G_1, G_2, and G_3 treatments, each was planted in 4 polybags and carried out simultaneously. The placement of polybags is done randomly using a lottery system. Obtained observational data were analyzed using analysis of variance (ANOVA). If there is an influence between the treatments, an Honest Significant Difference (BNJ) test is carried out to determine the best treatment. Data analysis models:

$Y_{ij} = \mu + T_1 + \epsilon_{ij}$
i = 1, 2, …, t
j = 1, 2, …, r
with:
Y_{ij} = Response or observation value of the I-th treatment and j-th repetition.
μ = Common mean value
T_1 = The effect of the i-th treatment
ϵ_{ij} = Effect of experimental error on the I-th treatment and j-th repetition.

p-ISSN: **1693 - 7945**
e –ISSN: **2622 - 1969**

Original Article

3. Results and Discussion

Observations were made since the seeds were sown until the last observation day. The parameters measured in this study were the ejection apokol length velocity and the percentage of ejection growth.

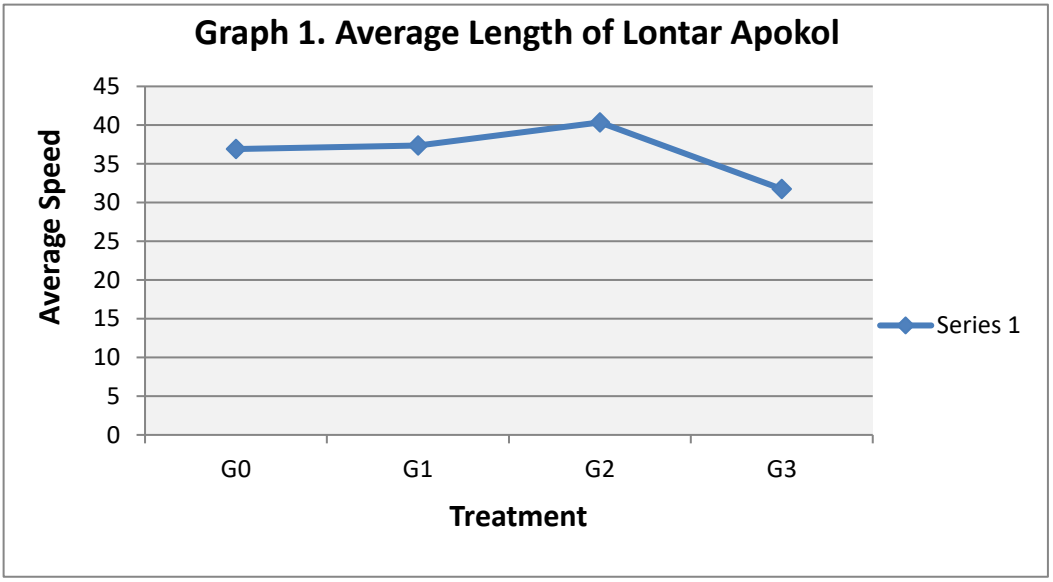
Apollo long

The average length of the palm apokol measured during the study period (6 months) is as presented in Table 1.

Table 1
The length of apokol lontar increased for each treatment (cm).

Treatment	Test				Total	Average
	1	2	3	4		
G_0	39	31	39,8	37,9	147.7	36,93
G_1	38,4	33	41.8	36,2	149,4	37.35
G_2	44,7	37,8	36,9	42	161.4	40.35
G_3	22,9	34	35,8	34,3	127.0	31.75
Amount					585.5	

From the results of the analysis of variance on the length of the palm apokol (appendix 2), an $F_{\text{-count}}$ of 6.67 is obtained while the $F_{\text{-table}}$ ($\alpha = 0.05$) = 3.49, and the $F_{\text{-table}}$ ($\alpha = 0.01$) = 5, 95. Because $F_{\text{-Count}} > F_{\text{-Table}}$, H1 is accepted while H0 is rejected. This means that there is an effect of giving gibberellins on the length of the ejection apokol. Because the BNJ test followed an effect, the results of the further tests showed that the most influential treatment of gibberellins was the administration of gibberellins with a concentration of 200 ppm. The average length of the palm apocol required for the palm seeds to germinate until the leaves grow in each treatment can be illustrated in the following graph.



From the graph above, it can be seen that the length of the ejection apokol is faster in the G2 treatment.

Growth Percentage

In this experiment, out of the 16 seeds tested, it turned out that not all of them produced leaves until the end of the allotted observation time. Therefore, it is necessary to look again at each treatment. In general, the percentage of growth can be obtained from the number of normal sprouts divided by the number of seeds tested, multiplied by 100%, meaning that the sprouts

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that have successfully grown are divided by the total treatment, which is 4 polybags, then multiplied by 100%. Like the first treatment, G_0, there was only 1 that managed to grow, so it was divided by 4 replications, and 0.25 was obtained. If multiplied by 100%, the result was 0.25. So, on for the second, third, and fourth treatments. The average percentage of palm growth can be seen in Table 2.

Table 2
Percentage of Palm Oil Growth (%)

Treatment	Test				Total	Average
	1	2	3	4		
G0	0	0	0	1	1	25 %
G1	1	1	1	1	4	100 %
G2	1	1	0	0	2	50 %
G3	0	0	1	0	1	25 %
Amount					8	

The table above shows that of the 4 seeds planted in each treatment, the G1 treatment gave good results because all the seeds could grow to produce leaves. However, the results of the analysis of variance (Appendix 3) turned out to have no effect. The research results showed that the $F_{\text{-count}}$ was 0.240 while the $F_{\text{-table }(\alpha = 0.05)} = 3.49$ and the F-table ($\alpha = 0.01$) = 5.95. Because $F_{\text{-Count}} < F_{\text{-Table,}}$ then H_O is accepted. This means that administering gibberellins does not affect the percentage of palmyra growth.

Discussion

Based on the analysis of data from 16 experimental units, it can be said that the administration of gibberellin had a significant effect on the length of the ejection apocol (Borrassus flabellifer), but did not affect the growth percentage of ejection. Because in this study, each polybag was planted with only 1 seed. In addition, some seeds have not grown leaves until the specified time, so the growth percentage has no effect.

The honest significant difference test (BNJ) results found that gibberellin administration stimulated the length of ejection apokol the fastest was G2 (200 ppm gibberellin administration). Excessive hormones will damage the tissue in the palm apokol, and if gibberellins are not given, it takes a long time to grow (10 to 12 months). The following treatment was G1, whose growth was also good but not optimal. So, the administration of growth hormones, especially gibberellins, must be by the standards.

Giving gibberellins at a concentration of 200 ppm accelerates the long process of apokol ejection. The results of this study indicate that a concentration of 200 ppm is effective for increasing the length of palm apokol. In contrast, if the concentration is increased, it will inhibit the physiological processes of plants. The results of this study are in line with the opinion of Tjitrosomo (1983) that gibberellins are effective in stimulating stem elongation but at tiny concentrations. From the results of research conducted, it turns out that the best concentration is 200 ppm. If you look at the 100-ppm treatment, it turns out that of the 4 plants, it turned out that only one managed to grow and elongate. This happened because the hormone given was still lacking. The 100-ppm treatment did not experience death but slow growth. Only one grew in the 300-ppm treatment, while the others experienced decay. So, it can be concluded that the growth hormone must be by a suitable size, namely 200-ppm.

Thus, giving giberein at different concentrations can affect the growth and elongation of apokol lontar. Because by giving gibberellins, the process of absorbing water and minerals through the imbibition process is smoother so that the cell walls can soften. Furthermore, the digestion process can take place where there is a process of overhauling complex compounds

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into simple compounds with the help of enzymes so that they are readily soluble in water. Likewise, the assimilation process will be easily transported to growth points, producing new proteins. Mahayasa (2006) said that the seeds of lontar plants have a pattern that is not the same as plants in general, not even with most plants of the same type, namely palmae.

The important thing that was obtained in this study was that giving gibberellin (200 ppm) was very effective for the length of the palm apocol when compared to without giving gibberellin and giving gibberellin (300 ppm) with a concentration of 200 ppm there would be a good interaction between the availability of water, light, and air so that spur the growth process.

In this study, it was seen that the treatment of gibberellin 100 ppm growth reached 100%. However, looking at the apokol elongation, the average G3 treatment was smaller than the G2 treatment. It is said that the apokol will extend to 60 cm, and then the leaves will start to grow (Mahayasa, 2006), but this is not the case. The results in the field showed that in the G0 treatment the average apokol length was 36.93 cm, G1 the average apokol length was 37.35 cm and G2 the average apokol length was 40.35 cm, while G3 was 31.75 cm. This means that gibberellin affects palmyra growth. However, in this study, only 1 seed was planted in each polybag, so the percentage had no effect. The growth percentage of ejection was found in treatment G0 (without gibberellin), which was 25%; G_1 (gibberellin given 100 ppm), which was 100%; G_2 (gibberellin given 200 ppm), which was 75%; and G_3 (gibberellin given 300 ppm) which was 50%.

In this study, some seeds had not grown in the G_0 treatment where the first leaves had not yet appeared during the observation (4 months). In the G_0 treatment, the seeds did not die. It just took longer to germinate. Also, a lower germination percentage is likely from unripe fruit. This is in line with the opinion of Swenson et al. (1994) that seeds from immature fruit will produce a lower germination percentage, while good seeds from ripe fruit are usually larger and heavier. Thus, having a lot of food reserves. Large, heavy seeds usually yield a higher percentage.

It is said that in nature, the growth of the first leaf to the ground takes quite a long time (around 6-9 months). However, after conducting research, it turns out that it does not always have to be 6-9 months because plants have started to appear leaves in the fourth month. This means that gibberellins significantly affect the length of the palm apocol and can accelerate the growth process. In the analysis and discussion above, the researchers only looked at the final results of apokol elongation and the percentage of palmyra growth.

4. Conclusion

These findings are reached as a result of the study that has been done: (1) In the Regional Revenue Agency working area for the Central Region of Bandung City, the variable of taxpayer compliance is partially influenced by the variable of tax service quality. (2) In the operating area of the Regional Revenue Agency for the Central Region of Bandung City, the tax socialization variable has a partially significant relationship with the taxpayer compliance variable. (3) The taxpayer compliance variable in the operational region of the Regional Revenue Agency for the Central Region of Bandung City is partially influenced by the online PBB payment system variable. In the working region of the Regional Revenue Agency for the Central Region of Bandung City, service quality, tax socialization, and online payment methods collectively (simultaneously) substantially impact taxpayer compliance.

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