journal homepage: https://ojs3.unpatti.ac.id/index.php/biopendix

B I O P E N D I X P-ISSN: 2407-4969
Volume 12, Number 1, March 2025 E-ISSN:2684-8341
Pages: 37-42 DOI: https://doi.org/10.30598/biopendixvol12issue1page37-42

Effect of the Type of Cover and Planting Media on the Growth of Kepok Banana (*Musa paradisiaca* L.) During the Acclimatization Period

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Submitted: January 7, 2025; Revised: February 20, 2025; Accepted: March 29, 2025; Published: March 31, 2025

Abstract. According to the Indonesian Central Statistics Agency (BPS), banana production has consistently increased from 2020 to 2023, around 12.97%. Unfortunately, Indonesia's annual banana production is still fluctuating and difficult. This is due to the difficulty of obtaining superior seeds in large quantities in a short time. The aim of this research is to determine the effect of the type of cover and planting media on the vegetative growth of kepok banana (*Musa Paradisiaca* L.) during the acclimation period. This research uses a Divided Plot Design (RPT), the cover as the main plot and the planting medium as the sub-plot. The type of hood used is 16% UV plastic and 75% paranet while the planting media used is top soil + cocopeat, top soil + burnt husk and top soil + vermicompost (vermicompost) in a ratio of 1:2. Data analysis used one way ANOVA and continued with the Duncan test. The results obtained included that the hood treatment had a significant effect on the percentage of live seeds, plant length, stem diameter, leaf area and total chlorophyll. The 16% UV plastic cover type produces the best average results compared to 75% paranet. Planting media had a significant effect on leaf area and total chlorophyll and had no significant effect on other parameters. The interaction between the combination of cover and planting media is found in the parametersof leaf area and total chlorophyll.

Keywords: Planting medium; Leaf area, Total chlorophyll, Plant length

INTRODUCTION

Bananas are a nutritious food, a source of carbohydrates, vitamins, and minerals. The largest carbohydrate component in bananas is starch in the flesh, and will be converted into sucrose, glucose and fructose when the bananas are ripe 15-20% (Musita, 2018). In addition, bananas are one of the most widely consumed fruits in the world, and also an economically important and nutritious food crop in several regions of the world. Bananas are very popular because of their delicious taste and high nutritional content. It provides energy reserves that are quickly absorbed by the body and is a good source of vitamins C and B6 (Rattanapan & Ounsaneha, 2020). Indonesia's fruit production that ranks first is bananas, making bananas a leading crop in Indonesia. This condition also makes Indonesia have made the largest contribution to national fruit production. According to the Indonesian Central Statistics Agency (BPS), banana production has increased consistently from 2020 to 2023 by around 12.97%. Unfortunately, Indonesia's banana production each year is still relatively fluctuating and difficult to estimate properly.

Tissue culture technique is one method that can be used to produce large quantities of high-quality seedlings. This technique is very effective because it can multiply plants in large quantities in a relatively short time. One of the advantages of this technique is that it can produce high multiplication, is genetically uniform, and the planting material is free from pests and diseases. Banana seedlings produced in vitro (tissue culture) grow faster and produce more offspring. However, there are still problems in the final stage of tissue culture, namely acclimatization (Manurung, 2025). Acclimatization is the stage of adapting plantlets from the in vitro environment to a new environment outside the bottle. In in vitro propagation (in bottles), environmental factors can be controlled, while in the field, environmental factors are difficult to control. One of the important environmental factors to consider at the acclimatization and enlargement stage of banana seedlings is the planting medium. The planting medium is important because it supports plants, maintains moisture, provides nutrients and root aeration in plants (Erfa et al., 2020).

MATERIALS AND METHODS

This research will be conducted at the UPTD Benih Induk Hortikultura Jl.Karya Jaya No.22, Pangkalan Masyhur - Medan. The research was conducted for approximately two months, namely in June-August 2024. Chlorophyll content analysis was carried out at the Inlegneteo Laboratory of the Islamic State University of North Sumatra Medan.

The tools used in this study were rulers, pH meters, iron scissors, plastic containers, luxmeters, cover supports, calipers, hygrometers, watering cans, analytical scales and UV-VIS spectrophotometry while the materials used in this study were banana seeds (Musa sp.) from the culture of the kepok variety (*Musa paradisiaca* L.), organic vermicompost fertilizer, cocopeat, burnt rice husks, polybags, top soil, 16% UV plastic (white with a thickness of 200 microns), 75% paranet, tap water, active fungicide (dithane 45), growtone.

The design used in this study was a Split Plot Design (RPT) with 3 replications. The factors studied were the cover notated (S) as the main plot and the planting media notated (M) as the sub-plot. Factor I was the effect of the cover notated (S) consisting of 2 treatments, namely (S1) 16% UV Plastic and (S2) 75% Paranet. While factor II was the effect of planting media notated (M) including (M1) Top soil + cocopeat, (M2) Top soil + burnt rice husks, (M3) Top soil + vermicompost with a ratio of each planting media of 1: 2. The parameters observed in the study were the percentage of seedlings, plant length, stem diameter, leaf area and total chlorophyll. Observations of the percentage of living seedlings were carried out in weeks 1-4 MST, plant length at 2-4 MST, stem diameter at 4 MST, leaf area at 4 MST and total chlorophyll at 4 MST.

RESULTS AND DISCUSSION

Based on research conducted on the influence of the type of cover and planting media on the vegetative growth of Kepok banana (*Musa paradisiaca* L.) during acclimatization, the following results were obtained:

Percentage of Live Seeddlings

The results of the analysis of variance in Appendix 4.1 show that the treatment of the type of cover and planting media or the interaction of the two did not significantly affect the percentage of live seedlings. The average percentage of live seedlings can be seen in Table 1

Table 1. Live seed percentage parameter

Cover	Growing media			Average
	M1	M2	M3	
S1	100,00	100,00	100,00	100,00
S2	88,89	77,78	77,78	81,48
Average	94,44	88,89	88,89	

Table 1 shows that the treatment of 16% UV plastic cover (S1) was able to produce an average percentage of live seedlings of 100% while the 75% paranet cover (S2) only produced a percentage of live seedlings of 81%. This is thought to be due to the ability of 16% UV plastic to maintain humidity in the cover optimally.

(Yudani et al., 2019) explained that the provision of 16% UV plastic covers can lower the temperature during the day so that the transpiration rate is lower, this is good for supporting growth during acclimatization. According to Ramdani et al., (2017) to be able to grow optimally, banana plants require quite high humidity, which is around 60% - 70% and a temperature range of 27 ° C - 38 ° C. From the statement, it can be concluded that in this study, the 16% UV plastic cover produced a temperature and humidity that were closer to optimal, namely 33°C and 44% humidity, while the 75% paranet produced a temperature of 32°C and 38% humidity. One way to maintain high humidity is to use a 16% UV plastic cover. This is closely related to the role of the auxin hormone in the formation of roots, branches and plant height growth, where this hormone is more active in lower sunlight intensity.

Plant Length

The interaction of the type of cover significantly affected the length of the kepok banana plant at 2-4 MST, while the treatment of the planting medium did not significantly affect the length of the plant at 1-4 MST. The interaction of the type of cover and planting medium significantly affected the length of the plant from 1-4 MST.

Table 2. Plant Length parameter

MST	Cover	Growing media			Average
		M1	M2	M3	
1	S1	8,27	7,44	9,95	8,55
	S2	8,06	7,34	8,76	8,05
	Average	8,17	7,39	9,36	
2	S1	10,57	8,57	13,03	10,72
	S2	9,35	8,57	9,72	9,21
	Average	9,96	8,57	11,38	
3	S1	12,03	10,87	14,79	12,56
	S2	10,77	9,76	11,10	10,54
	Average	11,40	10,31	12,95	
4	S1	12,96	12,01	15,94	13,63
	S2	12,00	10,81	12,01	11,61
	Average	12,48	11,41	13,97	

The treatment of 16% UV plastic cover (S1) showed a significant difference with the 75% paranet treatment (S2) at 2-4 MST. From the results of the study, the 16% UV plastic cover produced the highest average plant length at 4 MST, which was 13.63 cm, which was significantly different from the 75% paranet which produced a length at 4 MST of 11.61 cm. This is thought to be because the light intensity on the 16% UV plastic is more optimal for the growth of kepok banana seedlings during the acclimatization period. This is supported who reported that the highest plant length was produced at lower light intensity. Excessive light intensity causes stunting in the stems and leaves of the plant (Ariany et al., 2013).

In addition to light intensity, temperature in the cover also plays an important role in stem elongation, stated that the role of temperature on plant length growth is very important because temperature affects enzyme activity. If the temperature rises above the optimal temperature, enzyme activity will actually decrease. Likewise, if the temperature is too low, chemical reactions in the cells cannot run properly. If the chemical reactions of the cells are disrupted, the growth of the plant length will also be disrupted (Mulyono, 2013).

Based on Table 2, the interaction treatment of 16% UV plastic cover and top soil + vermicompost planting media showed a significant difference with other treatments at 1-4 MST. The highest average increase in the length of the kepok banana seedlings was in the S1M3 treatment (top soil + vermicompost, UV16% plastic cover). This is because vermicompost contains high macronutrients and also contains growth regulators such as auxin, cytokinin, and gibberellin. Gibberellin and cytokinin hormones play a role in cell division and stem elongation or seedling height increase. The increase in plant height is influenced by the presence of nutrients needed by the plant during its life. In young plants, cells in the plant organs are actively dividing and increasing in size. The apical meristem produces new cells at the tip of the root or stem, causing the plant to grow taller or longer, this is the role of the auxin hormone found in vermicompost (Sari, 2013).

In addition, the N element available in the vermicompost planting medium can increase the overall vegetative growth of plants, especially in the growth of roots, stems, and leaves. Stated that in the vegetative phase in plants there is N circulation from the roots to the leaves and vice versa to channel N to the user organs so that there is no N deficiency in plant organs, so that if the plant lacks N, the formation of the stem will be disrupted (Wibowo et al., 2020).

Leaf Area

The results of the analysis of leaf area variance of 54 banana plants with different types of covers and planting media at the age of 4 MST can be seen in Appendix 9. The results of the statistical analysis showed that the treatment of the type of cover and planting media had a significant effect on the leaf area of banana plants (Musa paradisiaca L.) during the period at the age of 4 MST. Leaves are one of the plant organs that function as photosynthetic organs because leaves contain chlorophyll, a pigment that absorbs light energy, which carries out the photosynthesis process to produce sugar.

Tabel 3. Leaf area parameter

Cover	Growing media			Average
	M1	M2	M3	
S1	11,40	9,51	10,60	10,50
S2	7,67	6,25	8,41	7,44
Average	9,53	7,88	9,50	

Leaves are one of the plant organs that function as photosynthetic organs because leaves contain chlorophyll, a pigment that absorbs light energy, which carries out the process of photosynthesis to produce sugar. The wider the leaf, the more chlorophyll content, which means the higher the rate of photosynthesis. The higher the rate of photosynthesis, the faster the growth of a plant (Santrum et al., 2021).

Table 3 shows that the treatment of 16% UV plastic and 75% paranet has the same response to the area of kepok banana leaves. The treatment of covering has an important role in the area of plant leaves, because the cover is closely related to light intensity and humidity. Covering also helps reduce the high transpiration (evaporation) process, so that the humidity in the planting medium is maintained. This is very important to prevent water loss that can interfere with seedling growth. The optimum light intensity for plants at the acclimatization stage is 1,000 - 10,000 lux with a humidity of 40-60% in the cover to ensure that the seedlings can adapt well before being planted in the field (Yunadi, 2019). From the results of observations made, the 16% UV plastic cover (S1) produced a light intensity of 1,001 Lux with a humidity of 40% while the 75% paranet cover (S2) produced a light intensity of 1,309 Lux with a humidity of 40%. Based on Table 3 on the observation of 4 MST UV 16% plastic cover with a light intensity of 1,001 Lux was able to produce the largest leaf area with an average of 10.50 cm and was not significantly different from 75% paranet. The denser the cover intensity, the greater the leaf area will be because the plant's response in adapting to shade to seek light results in the leaves becoming thin and wide. That plants will expand the surface area of their leaves to obtain sufficient light so that plant photosynthesis can take place.

From the data presented in Table 3 above, it can be seen that the combination of topsoil + cocopeat (M1) planting media is able to produce the largest kepok banana leaf area, which is 11.40 cm. Mixing topsoil with cocopeat aims to increase the ability of the planting media to store water, which states that the combination of topsoil and cocopeat planting media is effective in maintaining the humidity of the planting media. Cocopeat provides a high water storage capacity and improves the structure of the media, while topsoil provides essential nutrients. The balance between these two ingredients is very important to support optimal plant growth (Nurcharisma, 2021), Cocopeat's ability to store water and nutrients reaches 73% so that plants do not lack nutrients. This is because the total organic material content in cocopeat is quite high, namely 89.09% (Ramadon, 2025). From the research results, the burning rice husk planting medium has the lowest results in producing leaf area. This is thought to be because rice husk charcoal is porous, light, not dirty, but has a low water absorption capacity and good porosity. This property is beneficial if used as a planting medium because it supports the improvement of soil structure (Pratiwi et al., 2017).

Total Chlorophyll

Tabel 4. Total Chlorophyll Parameter

Cover	Growing media			Average
	M1	M2	M3	
Average	5,66	4,29	4,75	

Chlorophyll is a pigment that functions to collect light and transmit energy to the reaction center in the process of photosynthesis. If the amount of chlorophyll available in the leaves is sufficient, the amount of light absorbed and used in the process of photosynthesis can increase (Triharyanto et al., 2025). Photosynthate from photosynthesis is generally stored in the tubers and stems of plants, as is the case with banana plants. So that plants with many leaves can photosynthesize optimally and have relatively larger stem sizes. Based on the results of the analysis of total chlorophyll variance, it shows that the treatment of cover and planting media has a significant effect on 4 MST, as can be seen in Appendix 11. It can be seen in Table 4 that the combination of 16% UV plastic cover is able to produce the highest total chlorophyll, but is not significantly different from the 75% paranet cover. This is thought to be because 16% UV plastic is able to produce more optimal intensity 32

than paranet. Morphologically, plants that grow in areas with covers will produce more chlorophyll. This is because plants that grow in shaded areas process nutrients from the roots (Maharani et al., 2018).

In addition, chlorophyll levels are greatly influenced by the element Mg, this is the most important element in the formation of chlorophyll. In addition to sufficient light, other elements such as N, Fe and Mn also affect the part of chlorophyll. This is in accordance with the composition of vermicompost which contains various nutrients needed by plants, such as N, P, K, Ca, Mg, S, Fe, Mn, Al, Na, Cu, Zn, Bo and Mo. With these nutrients, microbes that decompose organic materials will be able to continue to develop until they can decompose organic materials more quickly so that the photosynthesis process can take place optimally (Pratiwi et al., 2017).

CONCLUSION

1. The type of cover has a significant effect on leaf area, plant length, total chlorophyll, stem diameter and percentage of live seedlings of kepok banana (Musa paradisiaca L.) during the acclimatization period. The treatment of 16% UV plastic cover (S1) produced an average better result compared to 75% paranet (S2) in each parameter.
2. The type of planting media has a significant effect on leaf area and total chlorophyll. The treatment of top soil + vermicompost (M3) planting media produced the best average result in each parameter.
3. There is an interaction between cover and planting media on the parameters of leaf area and total chlorophyll in the vegetative growth of kepok banana (Musa paradisiaca L.) during the acclimatization period.

ACKNOWLEDGEMENTS

With the completion of this journal, the author would like to express his gratitude to all parties who have provided direction, guidance and motivation in the preparation of this journal. Therefore, on this occasion, the author would like to express his appreciation and gratitude to Prof. Dr. Ir. M. Idris, M.P and Mrs. Khairunnisa, S.P., M.Agr as Supervisor I and Supervisor II, who have been willing to take the time, provide direction, guidance and support during the process of compiling this journal.

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