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# Effectiveness of Shade and Cocopeat as a Growing Media for Acclimatization of Barangan Banana *(Musa acuminate lin)* Plants

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**Abstract:** The Effect of Shade and Cocopeat as a Growing Media on the Growth of Barangan Banana (Musa Acuminte Lin) at the acclimatization stage. Bananas are a superior commodity and the provision of quality seeds is important, so it is important to achieve the problem of planting media and providing shade at the acclimatization stage of young plants. The purpose of this study was to evaluate the provision of shade and the effectiveness of cocopeat as a planting medium for Barangan bananas at the acclimatization stage. This research was conducted in an open field, Medan Marelan, North Sumatra in September-November 2021. The study used a split plot design with the main plot providing shade at two levels, namely without shade and 50% paranet shade and cocopeat as a subplot with 5 levels, namely 100%. cocopeat, 100% topsoil, 75% cocopeat; 25% topsoil, 50% cocopeat: 50% topsoil, and 25% cocopeat: 75% topsoil. Data processing using ibm spss statistics software. The effect of shading was significantly different on the observation of plant height, number of leaves, stem diameter, leaf thickness and shoot dry weight. The use of 25% cocopeat: 75% topsoil increases the vegetative growth of plants in the number of leaves, stem diameter and plant chlorophyll. The interaction without shade and the effectiveness of cocopeat as a planting medium was significantly different where plants using 25% cocopeat: 75% topsoil and without shelter showed better vegetative growth compared to plants with shade and other cocopeat ratios. From the results, the best results show that the average use of 25% cocopeat compared to 75% soil shows that plants can grow optimally when the planting medium has good porosity.

**Keywords:** Acclimatization; Barangan Banana; Cocopeat; Growing Media; Musa acuminate lin; Shade

## Introduction

Banana *(Musa spp.)* is one of the leading fruit commodities in Indonesia. Based on harvested area and banana production, Indonesia is in the first position as a banana exporter in the world. This potential provides opportunities for commercial use of bananas according to consumer needs (Ministry of Agriculture, 2014). Banana production in the world continues to increase. In 2005 it was recorded that world banana production had reached 72.5 tonnes. This is because many residents of certain countries consume bananas as a staple food. As one of the world's banana producing countries, Indonesia has produced as much as 6.20% of the world's total production and 50% of Asian banana production comes from Indonesia (Prabowo et al., 2018; Sibarani et al., 2019; Suyanti, 2010).

Barangan banana is a type of banana that is very popular with consumers, even though the price is more expensive than other types. Demand for Barangan bananas continues to increase but is not accompanied by an increase in quality and area of the plant (Samanhudi et al., 2021).

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Provision of quality banana seeds is important to support banana planting (Almekinders et al., 2019; Suswati et al., 2020). Tissue culture technique is one way to provide banana seeds in bulk in the current era (Álvarez et al., 2019). Tissue culture is a series of activities carried out to make plant parts (roots, shoots, plant growth tissue) grow into intact (perfect) plants under in vitro conditions (Rahimi et al., 2023). There are stages in tissue culture, namely acclimatization to adapt the plants before transplanting to the field (Heriansyah, 2020). The acclimatization process is an important stage because it affects the percentage of living plants (Gunarta et al., 2023)

According to Heriansyah (2020), acclimatization is a process of adapting the results of tissue culture to a more extreme external environment. The main differences in environmental factors from tissue culture and greenhouse conditions include light, temperature, relative humidity, in addition to nutrients and growing media (Mohammed et al., 2022).

Success in acclimatizing plantlets resulting from tissue culture is determined, among other things, by the planting medium because the media acts as a place for plant growth and development, as well as a storage area or source of nutrients for plants. Danial et al. (2020) and Syaiful et al. (2019) states that media that has low humidity can cause plantlets to be damaged and even die in a relatively short time. According to Ababil et al. (2021), the planting medium needed for plantlet acclimatization should be porous in nature, not easily decomposed, have the ability to hold good water, contain high enough nutrients, not be a source of pathogenic fungal inoculums, and be easy to obtain in large quantities. needed. Planting media that have these properties include husk charcoal, compost, poor sand and cocopeat. Among the growing media, cocopeat and husk charcoal are relatively easy to obtain.

One of the organic materials that can be used as a growing medium is coconut husk waste (cocopeat). Cocopeat is one of the growing media produced from the crushing process of coconut coir, the coir crushing process produces fiber or fiber, as well as fine powder (Arbiwati et al., 2020).

Cocopeat contains essential nutrients, such as high potassium (K) and phosphorus (P), but it also contains nitrogen (N), calcium (Ca), magnesium (Mg), boron (B), chlorine (Cl), copper (Cu), iron (Fe), manganese (Mn), molybdenum (Mo) and zinc (Zn). In addition, the advantage of cocopeat is that it has characteristics that are able to bind and store water strongly (Sulistiya, 2021).

Light intensity is controlled by paranet (Black shades), Paranet aims to combine physical protection for plants and light filtering which results in vegetative growth, productivity, quality and ripening speed gains (Al-Dairi et al., 2023). The excess light intensity or lack of shade had a negative impact on the performance of banana plant plantlets (Augustien & Triani, 2021; Cavallaro et al., 2022). Therefore, this intensity requirement was carried out by research to evaluate cocopeat as a planting medium at the acclimatization and growth stages of banana plants.

## Method

The study used a Split Plot Design (RPT) with the main plot providing shade and cocopeat subplots as a planting medium. Process statistical data using the IBM SPSS Statistics 24 application (Manju & Pushpalatha, 2022). The area used for research is cleaned of rubbish and weeds that can interfere with plant growth. After the area is clean, a shade is made of bamboo poles and a roof made of paranet with a size of 8 m x 5 m. The media used are cocopeat and top soil around the research area (Sundaresan et al., 2019). The planting media is filled in polybags with a diameter of 8 cm and a height of 10 cm. The seeds used are in accordance with the treatment. Seedlings were obtained from tissue culture results from "Green Solar" which was 5 weeks old.

The planting medium used is the planting medium according to the treatment. The planting medium must first be weighed according to its respective composition before it can be used. The polybag used was a black polybag measuring 8 cm x 10 cm. The polybag is filled with planting media and when filling the polybag is shaken to compact the soil. Polybags are filled with planting media to a height of 2 cm from the lip of the polybag and poured with water until saturated before planting. Planting seeds in polybags is done by inserting the planting medium according to the treatment and then placing the seeds in polybags. Watering the banana plants is done every day in the morning and evening. Watering is done until the surface of the polybag looks wet.

*Observation parameters*

The research parameters measured were based on agronomic and physiological characteristics as follows (Olivares Campos, 2023).

*Plant height (cm)*

Observation of plant height was carried out at 3 - 12 weeks of observation. The height of this plant is measured from the base of the stem to the tips of the fully opened leaves. To facilitate measurement, stakes are made with a height of 2 cm from the ground surface. Performed on all plants that are sample plants.

*Number of leaves (strands)*

Counted from the bottom of the leaf to the young leaves that have opened perfectly. The calculation of the number of leaves parameter was carried out at 3 - 12 weeks of observation.

*Stem diameter (mm)*

Observation of stem diameter was carried out by measuring the girth of the plant stem. This observation was carried out at 3-12 weeks of observation.

*Frond length (cm)*

Observation of frond length was carried out at the end of the observation, by measuring the plant midrib from the base to the tip of the base of the leaf.

*Leaf area (cm²)*

Leaf area measurements were carried out at the end of the study at 3-12 weeks of observation. Measurements are made using the help of the ImageJ application by drawing the leaves of the plant on paper with a ruler beside it with the aim of becoming a scale when using the ImageJ application.

*Leaf Thickness (mm)*

Leaf thickness was measured at the end of the study at 3 - 12 weeks of observation. Measurements were made using a thickness gauge.

*Leaf relative moisture content (%)*

To measure the relative moisture content of the leaves, the leaves were weighed 0.5 gram and taken as fresh weight (BS), after that the leaves were soaked in water for 4 hours, weighed and taken as wet weight (BB). Leaves were dried in an oven at 80oC for 24 hours, weighed and the weight was taken as dry weight (Farooq et al., 2010). The calculation of the relative moisture content of the leaves Formula 1:

$$K.A.R = \frac{Fresh\ Weight - Dry\ Weight}{Wet\ Weight - Dry\ Weight} x100\% \quad (1)$$

## Result and Discussion

*Result*

*Seed height*

The results of observing the height of banana seedlings in shade and without shade with the treatment of cocopeat as a planting medium and the results of the variance can be seen in Table 1.

**Table 1.** Height of banana seedlings treated with various levels of shade intensity and modification of the planting medium at the age of 3 -12 WAP.

| WAP | Treatment | Plant height (cm) | | | | | Average |
|---|---|---|---|---|---|---|---|
| | | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| 3 | $N_0$ | 30.27 | 30.92 | 31.61 | 32.08 | 32.45 | 31.47 |
| | $N_1$ | 33.02 | 31.00 | 34.08 | 32.25 | 34.08 | 32.89 |
| | Average | 31.65 | 30.96 | 32.85 | 32.17 | 33.27 | |
| 6 | $N_0$ | 31.01a | 31.47ab | 32.15abc | 32.70abc | 32.93abc | 32.05a |
| | $N_1$ | 34.30c | 37.88d | 33.67abc | 34.17bcd | 36.75d | 35.35b |
| | Average | 32.66a | 34.68b | 32.91a | 33.44ab | 34.80b | |
| 9 | $N_0$ | 31.96a | 40.07d | 33.66a | 33,75a | 33.94ab | 34.68a |
| | $N_1$ | 36.28bc | 46.31e | 36.37bc | 36.81c | 40.70d | 39.29b |
| | Average | 34.12a | 43.19c | 35.02a | 35.28a | 37.32b | |
| 12 | $N_0$ | 45.84 | 55.65 | 53.13 | 53.63 | 50.34 | 51.72 |
| | $N_1$ | 52.93 | 62.39 | 52.01 | 54.7054.17ab | 53.93 | 55.19 |
| | Average | 49.39a | 59.02b | 52.57ab | | 52.14ab | |

Note: The numbers followed by different letters in the rows and columns show significantly different Duncan's multiple range test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat: 100%; topsoil (C0), 100% cocopeat: 0% topsoil (C1), 75% cocopeat: 25%; topsoil (C2), 50% cocopeat : 50% topsoil (C3), 25% cocopeat : 75% topsoil (C4).

Based on table 1 it can be seen that at 3 WAP the treatment of cocopeat as a planting medium and the intensity of the shade had no effect on the height of the seedlings. The interaction between 100% cocopeat media without shade gave the best results at plant height of 40.07 (9 WAP) while the lowest yield was 100% soil without shade at 31.96 (9 WAP).

*Number of leaves*

Based on Table 2 it can be seen that the interaction between 25% cocopeat planting medium: 100% soil without shade gave the best results on the number of leaves of 7.75 (12 WAPs) while the lowest results were 50% cocopeat planting medium: 50% soil and 75% cocopeat planting medium: 25% soil without shade each of 5.17 (12 WAPs).

**Table 2.** The number of leaves treated with various levels of shading intensity and modification of the planting medium at the age of 3 -12 WAP.

| WAP | Treatment | Number of Leaves (strands) | | | | | Average |
|---|---|---|---|---|---|---|---|
| | | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| 3 | $N_0$ | 4.17 | 4.00 | 4.08 | 4.50 | 4.67 | 4.17a |
| | $N_1$ | 4.92 | 4.50 | 4.75 | 4.67 | 5.08 | 4.92b |
| | Average | 4.54ab | 4.25a | 4.42a | 4.58ab | 5.25b | |
| 6 | $N_0$ | 4.50 | 4.33 | 4.25 | 4.75 | 5.00 | 4.57a |
| | $N_1$ | 5.08 | 4.83 | 4.75 | 4.92 | 5.50 | 5.02b |
| | Average | 4.79a | 4.58a | 4.50a | 4.83a | 5.25b | |
| 9 | $N_0$ | 6.08c | 6.25c | 4.83a | 5.00a | 6.08c | 5.65 |
| | $N_1$ | 5.75bc | 6.17c | 5.42ab | 6.00bc | 6.15c | 5.90 |
| | Average | 5.92cd | 6.21d | 5.13a | 5.50b | 6.13c | |
| 12 | $N_0$ | 6.92c | 6.83c | 5.17a | 5.17a | 7.75d | 6.37 |
| | $N_1$ | 6.17b | 6.25b | 5.83b | 6.17b | 6.42bc | 6.17 |
| | Average | 6.54b | 6.54b | 5.50a | 5.67a | 7.08c | |

Note: The numbers followed by different letters in the rows and columns show significantly different Duncan's multiple range test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat : 100% topsoil (C0), 100% cocopeat : 0% topsoil (C1), 75% cocopeat : 25% topsoil (C2), 50% cocopeat : 50% topsoil (C3), 25% cocopeat : 75% topsoil (C4).

*Stem diameter*

The results of observations of stem diameter in shaded and without shade with the treatment of cocopeat as a planting medium and the results of the variance can be seen in Appendix 13 - 16. Based on the variance, it can be seen that the application of cocopeat as a planting medium was significantly different from stem diameters 6 - 12 WAP and in shading, there was a significant difference in the number of leaves at 6 and 9 WAP and the interaction between shade and cocopeat as a planting medium was significantly different for plant height at 6, 9, and 12 WAP.

**Table 3.** Stem diameter treated with various levels of shade intensity and modification of the planting medium at 3 -12 WAP.

| WAP | Treatment | Stem diameter (mm) | | | | | Average |
|---|---|---|---|---|---|---|---|
| | | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| 3 | $N_0$ | 5.51 | 5.34 | 5.41 | 5.55 | 5.44 | 5.45 |
| | $N_1$ | 5.70 | 5.54 | 5.82 | 5.81 | 5.91 | 5.75 |
| | Average | 5.61 | 5.44 | 5.65 | 5.68 | 5.68 | |
| 6 | $N_0$ | 5.79ab | 5.65a | 5.83ab | 5.78ab | 5.83b | 5.78a |
| | $N_1$ | 5.91ab | 6.05abc | 6.56e | 6.24cd | 6.40de | 6.35b |
| | Average | 5.85a | 5.85a | 6.20c | 6.01ab | 6.12bc | |
| 9 | $N_0$ | 7.74b | 7.01a | 6.65a | 6.75a | 8.42c | 7.04b |
| | $N_1$ | 7.11a | 6.85a | 6.96a | 6.95a | 7.19a | 6.97a |
| | Average | 7.42b | 6.93a | 6.80a | 6.85a | 7.18b | |
| 12 | $N_0$ | 10.16a | 8.12ab | 9.14abc | 9.75bcd | 14.35e | 10.30b |
| | $N_1$ | 10.06cd | 7.82a | 8.95abc | 9.08abc | 11.14d | 9.43a |
| | Average | 10.11b | 8.02a | 9.04ab | 9.41b | 12.75c | |

Note: The numbers followed by different letters in the rows and columns show significantly different Duncan's multiple range test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat : 100% topsoil (C0), 100% cocopeat : 0% topsoil (C1), 75% cocopeat : 25% topsoil (C2), 50% cocopeat : 50% topsoil (C3), 25% cocopeat : 75% topsoil (C4).

Based on Table 3 it can be seen that the interaction between 25% cocopeat planting media: 100% soil without shade gave the best results on a stem diameter of 14.52 (12 WAPs) while the lowest yield was on 100% soil planting medium without shade of 10.16 (12 WAPs).

*Midrib length*

Based on table 4 it can be seen that cocopeat as a 100% planting medium gave the highest yield on the midrib length parameter of 39.35c while 100% soil growing media gave the lowest yield of 31.51 and the interaction between 100% cocopeat planting medium and shade gave the best results on frond length was 41.54 (12 WAP) while the lowest yield was in 100% soil planting medium without shade of 29.75 (12 WAP).

The results of observing the length of the fronds in the shade and without the shade with the treatment of giving cocopeat as a planting medium and the results of the variance can be seen in Appendix 17. Based on the variance it can be seen that the provision of cocopeat and the interaction of shade and cocopeat gave real results on the parameter of frond length at the end study.

**Table 4.** Length of fronds treated with various levels of shading intensity and modification of the planting medium at the age of 3 -12 WAP.

| Treatment | Leaf area (cm) | | | | | Average |
|---|---|---|---|---|---|---|
| | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| $N_0$ | 29.75a | 37.16bcd | 36.56bcd | 38.92cd | 39.05cd | 36.29 |
| $N_1$ | 33.27abc | 41.54d | 33.62abc | 31.12ab | 35.88bcd | 35.08 |
| Average | 31.51a | 39.35c | 35.09ab | 35.02ab | 37.46bc | |

Note: The numbers followed by different letters in the rows and columns show a significant difference in the Duncan's multiple distance test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat : 100% topsoil (C0), 100% cocopeat : 0% topsoil (C1), 75% cocopeat : 25% topsoil (C2), 50% cocopeat : 50 % topsoil (C3), 25% cocopeat : 75% topsoil (C4).

*Leaf Area*

Based on table 5 it can be seen that the application of 25% cocopeat: 75% soil gave the best results in the leaf area parameter followed by 100% soil planting media of 181.92 then 173.89 while the lowest results were obtained by 50% cocopeat: 50% soil planting media 1 10.26 and followed by other treatments. The interaction between 25% cocopeat: 75% soil without shade gave the highest yield of 200.07 while the lowest yield was 75% cocopeat: 25% soil without shade 104.48 cm².

**Table 5.** Leaf area treated with various levels of shade intensity and modification of the planting medium at the age of 3 -12 WAP.

| Treatment | Leaf area (cm²) | | | | | Average |
|---|---|---|---|---|---|---|
| | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| $N_0$ | 185.19d | 116.46ab | 104.48a | 110.66ab | 200.07d | 143.37 |
| $N_1$ | 162.60c | 127.56b | 116.03ab | 118.83ab | 163.78c | 137.76 |
| Average | 173.89b | 122.01a | 110.26a | 114.75a | 181.92b | |

Note: The numbers followed by different letters in the rows and columns show significantly different Duncan's multiple range test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat : 100% topsoil (C0), 100% cocopeat : 0% topsoil (C1), 75% cocopeat : 25% topsoil (C2), 50% cocopeat : 50 % topsoil (C3), 25% cocopeat : 75% topsoil (C4).

*Leaf Thickness*

Based on table 6 it can be seen that the 25% cocopeat planting medium: 75% soil in the shade gives the best results at a leaf area of 0.20 while the lowest yield is at 100% cocopeat planting medium of 0.17. Treatment without shade also gave the best results on leaf area of 0.20 while shading had a value of 0.19 mm.

**Table 6.** Leaf thickness treated with various levels of shade intensity and modification of the planting medium at the age of 3 -12 WAP.

| Treatment | Leaf thickness (mm) | | | | | Average |
|---|---|---|---|---|---|---|
| | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| $N_0$ | 0.21 | 0.18 | 0.20 | 0.19 | 0.22 | 0.20b |
| $N_1$ | 0.19 | 0.16 | 0.18 | 0.19 | 0.21 | 0.19a |
| Average | 0.20b | 0.17a | 0.19a | 0.19a | 0.22b | |

Note: The numbers followed by different letters in the rows and columns show significantly different Duncan's multiple range test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat : 100% topsoil (C0), 100% cocopeat : 0% topsoil (C1), 75% cocopeat : 25% topsoil (C2), 50% cocopeat : 50% topsoil (C3), 25% cocopeat : 75% topsoil (C4).

*Leaf Relative Water Content*

The results of observing the relative water content of the leaves in the shade and without the shade with the treatment of cocopeat composition as a planting medium and the results of variance. Based on Table 7, it can be seen that there is no significant effect on the treatment of naundan and cocopeat as a planting medium and their interaction on the parameter of leaf relative moisture content.

**Table 7.** Relative water content of the leaves treated with various levels of shading intensity and modification of the planting medium at the age of 3 -12 WAP

| Treatment | Relative moisture content of leaves (%) | | | | | Average |
|---|---|---|---|---|---|---|
| | $C_0$ | $C_1$ | $C_2$ | $C_3$ | $C_4$ | |
| $N_0$ | 70.52 | 73.00 | 72.75 | 70.35 | 72.98 | 71.92 |
| $N_1$ | 70.99 | 76.35 | 69.14 | 70.76 | 74.03 | 72.26 |
| Average | 70.75 | 74.68 | 70.95 | 70.56 | 73.51 | |

Note: The numbers followed by different letters in the rows and columns show significantly different Duncan's multiple range test at α = 5%. without shade (N0), with shade (N1) and 0% cocopeat : 100% topsoil (C0), 100% cocopeat : 0% topsoil (C1), 75% cocopeat : 25% topsoil (C2), 50% cocopeat : 50% topsoil (C3), 25% cocopeat : 75% topsoil (C4).

*Discussion*

Shading shows a significant effect on the vegetative growth of banana plants in the form of plant height (Table 1), number of leaves (Table 2) and stem diameter (Table 3) more optimal at the acclimatization stage, the plants have not been able to be exposed to extreme temperatures so that growth can be more optimal compared to plants without being given shade treatment. Shading also showed a significant effect on shoot dry weight. This is because the water content under the shade will cause less evaporation in the planting media due to lower temperatures, while the growing media without shade will have a slightly greater evaporation so that the plants do not get enough water from the planting medium. Light intensity that is too low will limit photosynthesis and cause food reserves to tend to be used rather than stored (Julianto, 2019; Scaranari et al., 2009; Toyosumi et al., 2021). At high light intensity, air humidity is reduced, so that the transpiration process takes place more quickly.

Shading shows a significant effect on leaf thickness. In plants that are not given thick shade, the leaves are thicker, while plants that are given shade are thinner. This is because plants without shade treatment get more sunlight than plants that are in the shade so that plants can photosynthesize more optimally. (Julianto, 2019). The process of photosynthesis produces primary metabolites which are used for plant metabolism resulting in growth and development. In addition, primary metabolites are used to prepare secondary metabolites that support the process of plant adaptation and protection. A very important aspect in the process of plant growth is the provision of substrate. The substrate used to form new plant materials, most of which are carbohydrates, is obtained from the process of photosynthesis in organs, namely leaves.

The effect of cocopeat as a planting medium on the growth of banana plants Cocopeat as a growing medium shows a significant effect on the vegetative growth of plants in the form of plant height, number of leaves, stem diameter to frond length. From the results, the best results show the average use of 25% cocopeat compared to 75% soil, this shows that plants can grow optimally when the planting medium has good porosity and high-water content, assisted by soil conditions that have sufficient nutrient content so that plants can grow more optimal. Cocopeat is also able to improve the physical properties of the soil, namely making the growing media have better aeration and drainage in supporting the development of plant roots. A good planting medium is a medium that is able to provide sufficient amounts of water and nutrients for plant growth (Gardner et al., 1991). This can be determined in soils with good air and water management, have stable aggregates, good water holding capacity and space for sufficient roots.

Application of cocopeat as a planting medium showed a significant effect on leaf area and leaf thickness. The highest value for both parameters was the ratio of cocopeat 25%: 75% soil. This is due to the ratio of soil which is more than cocopeat so that the nutrients contained in the soil can supply nutrients for the growth of leaf area and leaf thickness of plants while cocopeat acts as a planting medium that is able to bind water and change the physical properties of the soil to become more porous so that roots can grow, work optimally, the formation of leaves by plants is strongly influenced by the availability of nitrogen and phosphorus nutrients in the soil and those available to plants.

Interaction of shade and provision of cocopeat as a planting medium on plant growth At plant height (Table 1) and frond length (Table 4) the lower the incoming light, the lower the light reception received by banana plants. Low light intensity in plant development will cause etiolation symptoms so that parts of the canopy are hampered due to the hormone auxin while the parts exposed to light will be active and very fast growth because plants looking for light to carry out photosynthesis can run more optimally and plants that are still small or developing usually require sufficient water and porous media for root development so that they are more flexible to take up nutrients so that at plant height the highest results can be seen in providing shade by providing 100% cocopeat as a planting medium. Cocopeat is a medium that has a fairly high-water holding capacity. Cocopeat media has micro pores that are able to absorb greater water movement, resulting in higher water availability (Istomo & Valentino, 2012).

In the treatment without shade and the provision of 25% cocopeat: 75% soil showed a significant and highest effect on the number of leaves (Table 2) and stem diameter (Table 3). This is because banana plants aged 9 and 12 mspt are beginning to adapt to the outside environment so that they can grow more optimally compared to younger plants. The ratio of soil and cocopeat media supplies nutrient content, availability of water in the planting medium and porous nature that roots can penetrate easily so that vegetative growth in banana plants can occur optimally. The more it meets the nutrient requirements and the availability of water in a plant, the more optimal the growth of the plant will be. This can be seen from the highest leaf area of banana plants in the treatment without shade and the growing medium cocopeat 25%: soil% because when the plants grow optimally, they eat the better the leaf growth. The nutrient deficiencies lead to stunted growth and physiological diseases such as chlorosis and stunting which cause plants to not develop due to inhibition of photosynthesis (Saleem et al., 2023). Stem diameter growth is influenced by the accumulation of assimilates. The growth of vegetative organs will affect plant yields. The greater the growth of the vegetative organs which function as assimilate producers (source) will increase the growth of the user's organs (sinks) which in turn will give greater results as well.

## Conclusion

Shading increased growth in height, diameter, and number of banana leaves at a young age compared to the treatment without shade. The use of cocopeat as a planting medium with a composition of 25% cocopeat: 75% topsoil can increase the growth of banana plants at the acclimatization stage. The effectiveness of cocopeat as a planting medium with a composition of 25% cocopeat: 75% soil gave the best results on growth in height, number of leaves, and diameter of banana seedlings at the acclimatization stage and observation of leaf chlorophyll. Interaction of treatment without shade and the effectiveness of cocopeat with a composition of 25% cocopeat: 75% soil gave the best results in the growth of banana seedlings at the acclimatization stage.

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The authors declare no conflict of interest.

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