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The Effect of Growing Media and Orchid Types on the Growth of Orchid Seedlings from Tissue Culture

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A R T I C L E I N F O

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A B S T R A C T

Orchids attract attention because of their high economic value compared to other horticultural products. The urgency of orchid commodities is a fashion that can command high prices when able to meet market demand. The objective of this research was to examine the effect of growing media and orchid species on the growth of tissue cultured orchid seedlings. The research method used a factorial completely randomized design (CRD) with two treatments. The first treatment was the growing media consisting of four levels: M1: Black Moss and Charcoal Media, M2: White Moss and Charcoal Media, M3: Coconut Fiber, and M4: Shredded Fern and Charcoal. The second factor was the orchid species: X1: Dendrobium Orchid, X2: Moon Orchid. From these two factors, eight treatment combinations were obtained using a completely randomized design (CRD) with four replications. Each plot contained five orchid seedlings. The total number of seedlings used was 160 orchid seedlings. The observation variables were plant height, number of leaves, root length, and number of roots. The results of the study showed an interaction between the growing medium and orchid species. The best root length parameter was the combination of M3X2, namely coconut fiber and activated charcoal, for the moon orchid, with a root length of 11.48 cm. However, for vegetative observations, plant height and leaf number showed a single influence, with the highest results for the dendrobium orchid

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INTRODUCTION

Orchids with high potential have a wide variety of species that can be developed in Indonesia. The current problems with orchids are the limited availability of seedlings, low seedling quality, and relatively poor cultivation techniques (Andri and Tumbuan, 2015). In terms of economic value, orchids are very valuable because they attract attention and can meet market preferences. Choosing the right growing media for orchids is important to ensure it can absorb the water supply given. The types of media usually used for orchid cultivation include coconut fiber media, which contains organic nutrients, and moss media, which contains nitrogen nutrients that are best for the growth of orchid seedlings (Erfa et al., 2020).

The results of researcher Milda et al. (2017) explain that moss media contains 0.60% nitrogen. According to Qiu (2015), Dendrobium species, which are spread across various regions, grow slowly, and the average sexual reproduction cycle is three years from seed to first bloom. Research results show that moon orchids have the potential to grow and spread from Malaysia, the Philippines, Indonesia, Papua, to Australia (Panal et al., 2015). Based on leaf morphology, Dendrobium orchids have a width of 2-8 cm and a length of 12-25 cm (Jannah et al., 2020). Utami (2014) explains that these leaves emerge through the nodes of the stem, with each node having one or two leaves. Generally, the leaves are green, the stem is monopodial, and the aerial roots that attach are hairless and function to obtain nutrients from their host (Arobaya, 2022).

Based on the potential and problems of orchid plants, the purpose of this research is to study the effects of planting media and orchid types on the growth of seedlings from tissue culture. The benefits of this experiment include providing skill training for researchers as well as for people who enjoy orchid cultivation so they can grow and develop well because they have quite high economic value. It also aims to prepare superior available raw materials to meet market demand, provide interesting and useful information to improve horticultural yields that are popular with people, and add to the body of knowledge useful for the conservation of beautiful natural resources.

LITERATURE RIVIEW

In types of growing media, wood charcoal is not easily decomposed, does not easily grow fungi and bacteria, but it is hard to retain water, so watering needs to be increased, and it has low nutrient content (Adolph, 2016). Fern growing media is often used because it can hold water well, has good aeration and drainage, decomposes slowly, and contains good nutrients (Andalasari et al., 2017). Kadaka roots are good for orchid root growth because they contain oxygen, have good aeration, do not decompose easily, and contain organic nutrients (Herlina et al., 2017).

METHODOLOGY

Media, M2: White Moss and Charcoal Media, M3: Coconut Fiber and Charcoal, M4: Chopped Fern and Charcoal. The second factor was the type of Orchid (Dendrobium), which included: X1: Dendrobium Orchid, X2: Phalaenopsis (Moon Orchid). From these two factors, eight treatment combinations were obtained, namely M1X1, M1X2, M2X1, M2X2, M3X1, M3X2, M4X1, M4X2, with 5 orchid seedlings in each plot. The total number of seedlings used was 160 orchids. Implementation of the research: Choosing high-quality orchid seedlings, the care here includes soaking the medium before use with a fungicide (antracol 2g/1L) for 10 minutes, watering twice a day, and applying fungicide and insecticide aimed at making the plants look fresher and resistant to pests and diseases.

Observation Variable

1. Plant Height (cm)

Plant height observation is done from the surface of the media to the plant's growing tip using a measuring tape. Measurements started when the transplanted plants were 60 and 90 days old.

2. Number of Leaves

The leaves that have formed are counted in total (leaves on the main plant shoots) from when the plant is 60 and 90 days old.

3. Root Length (cm)

The root length is measured with a ruler from the base of the root to the tip. The root measured is the longest root on the plant. Measurement starts at the beginning of plant transfer at 60 and 90 DAT.

4. Number of Roots (fruits)

The number of roots was counted manually by tallying all the roots, starting from planting at 60 DAS and 90 DAS.

5. Data Analysis

The data obtained were analyzed using variance with the F Test, and if a significant effect occurred, it was followed up with a 5% BNT test or a 5% DMRT test.

RESULT AND DISCUSSION

1. Plant Height Observation

The variance analysis results show that there is no interaction between the growing medium and the type of orchid on plant height. The orchid type significantly affects plant height, while the growing medium does not have a significant effect. Table 1 shows that the Dendrobium orchid has an initial vegetative growth from 60 DAT to 90 DAT with an average height increase of 1.39 cm, while the Phalaenopsis or chid only increases by 0.36 cm. Dendrobium sp. orchids are the easiest to care for, tolerant of water shortages, and adaptable to low air humidity, whereas the Phalaenopsis orchid has its own appeal, such as large, elegant, colorful flowers, less sturdy petals, and flower freshness lasting up to 2 months, making it attractive to consumers. (Yuswanti, et al., 2015). This is supported by other researchers who state that orchid flowers have a relatively long flowering period (Al Farikhi et al., 2022).

Table 1. Plant Height (Cm) Before Transplanting and After 90 Days After Planting

Treatment	Average Plant Height (cm) age (days after planting)	
	60	90
X1	7,30b	8,69b
X2	5,55a	5,91a
BNT 5%	**0,517**	**0,696**

Note: Numbers in the columns accompanied by the same letter indicate no significant difference in the 5% BNT test.

Observing the Number of Leaves

The analysis of variance results showed that there was no interaction between the growing medium and the type of orchid in measuring the number of leaves. The type of orchid has a significant impact on the increase in the number of leaves, while the growing medium does not have a significant effect. Table 2 shows that the Dendrobium orchid produces more leaves compared to the moth orchid. On average, the Dendrobium orchid added 1.83 leaves, while the moth orchid added 0.42 leaves during the early growth period from 60 to 90 days after planting. The problems in orchid cultivation in Indonesia include the limited number of seedlings, the relatively low quality of seedlings, and the cultivation methods not being well implemented (Andri and Tumbuan, 2015). Orchid leaves are where photosynthesis occurs and where water and food reserves are stored (Natasaputra and Setyaningsih, 2016).

Table 2. Number of Leaves (Sheets) Before Transplanting and After 90 Days of Transplanting

Treatment	Average number of leaves 60 hst	Average number of leav 90 hst
X1	4,23b	6,06b
X2	3,23a	3,65a
BNT 5%	**0,267**	**0,480**

Note: Numbers in columns with the same letter indicate no significant difference in the 5% BNT test.

Observation of Root Length

Variance analysis results show that there was an interaction between the growing medium and the type of orchid on root length at 90 days after planting. The interaction between the type of orchid treatment and the growing medium is presented in Table 3.

Table 3. Data on Orchid Root Length Observations From 60 Days After Planting to 90 Days After Planting

Treatment	Root length (cm)
MIX1	8,85bc
M1X2	10,57de
M2X1	7,92b
M2X2	5,19a
M3X1	9,65cd
M3X2	11,48e
M4X1	9,19c
M4X2	10,59de
DMRT 5 %	0,4058

Note: Numbers in the columns accompanied by the same letter indicate no significant difference in the BNT 5 test.

Based on the DMRT test in Table 3, it shows that the best treatment combination is coconut fiber and charcoal media with the type of moon orchid (M3+X2). This is suspected to be due to the physical properties of coconut fiber, which can easily hold water and contains nutrients needed by plants for their growth. As stated by Ningsih (2007), growth media is one of the important factors to consider in orchid cultivation because the media serves as a place for the plant to anchor, maintains moisture, and stores the nutrients and water needed. The planting media treatment showed a very significant effect on root length growth. The best growing medium is coconut coir and charcoal, with an average of 10.56 cm, but it is significantly different from other growing media treatments. This is because coconut coir and charcoal mixed with chopped ferns and charcoal have very good aeration. Orchid roots function to absorb nutrients from the air and keep the plant upright. Coconut coir and charcoal are suitable for moon orchids, resulting in the longest root growth. This aligns with researchers' views that the medium should be adjusted according to the type of plant being grown (Lamasrin et al., 2023).

Observing the Number of Roots

The variance analysis results show that there is no interaction between the growing medium and orchid type on the number of roots. The dendrobium orchid type has a significant effect on the number of roots, while the growing medium does not significantly affect root numbers. Data on orchid types and their number of roots are presented in Table 4. On average, the number of roots increased by 3.16 for Dendrobium orchids, whereas the Moon orchids only increased by 1.94. The orchid type treatment showed a very significant difference in orchid growth, including plant height, number of leaves, and number of roots. The growth response shown in plant height, leaf count, and number of roots indicates that Dendrobium orchids have an advantage in easily adapting to the environment. Environmental factors like humidity, rainfall, and the altitude where orchids grow are also main factors for Dendrobium orchids to thrive. The research was conducted at an altitude of 67 meters above sea level and with

rainfall of 200–500mm. This is supported by Yusnita's study (2010) which states that Dendrobium orchids grow well at not too high elevations, for example 50-400 meters above sea level. Adolph (2016) also mentioned that a good orchid growing environment has rainfall of more than 200mm and land altitude of 0-700 meters above sea level.

Table 4. Number of Roots (Strands) Before Transplanting and After 90 Days

Treatment	**Average Number of Roots (strands) age (DAS)**	
	60	**90**
X1	9,275b	12,43b
X2	5,075a	7,01a
BNT 5%	**0,750**	**1,106**

Note: Numbers in columns with the same letter indicate no significant difference in the 5% BNT test.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the research that has been conducted, it can be concluded that there is an interaction between the type of growing media and the type of orchid on root length, with the best combination being coconut husk and charcoal media with the Phalaenopsis orchid (M3X2), reaching the best root length of 11.48 cm. The single treatment on the best orchid type is Dendrobium, which affects plant height and the number of leaves.

FURTHER STUDY

We suggest continuing research on other types of orchids using the best media from this study, which is coconut husk and charcoal, with treatments involving added nutrients and watering frequency.

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