

## EFFECT OF VARIOUS TYPES OF GROWING MEDIA AND APPLICATION OF LIQUID ORGANIC FERTILIZER ON THE GROWTH OF *DENDROBIUM* ORCHIDS

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### ABSTRACT

This research was a potted experiment carried out in a special orchid house (arnet) at the Padang Galleria Padangsambian Kelod from September to November 2019, the aim was to determine the effect of plant media and the provision of liquid organic fertilizers on the growth of *dendrobium* orchids. The factorial CRD pattern was the design used in this study, which consists of two factors, first, the use of growing media of wood charcoal (K), fern stems (P), and a mixture of fern stems with wood charcoal (M) and, second, the provision of liquid organic fertilizer, namely, Dewa (D), DI Grow (I), and GDM (G). The results showed that the interaction between the use of planting media and the application of liquid organic fertilizer had no significant effect on all plant growth parameters such as plant height, number of leaves, and number of tillers. However, the plant medium as a single treatment had a significant effect on the number of orchid tillers, fern stems (P) as the plant medium gave the highest number of tillers, namely: 2.22 stems or 32.93% more than the growing media for wood charcoal (K) and a mixture of charcoal, wood and fern stems (M) with 1.67 tillers each.

*Keywords:* orchids, planting media, liquid fertilizer

### INTRODUCTION

Cultivating orchids is quite easy, as long as they are properly cared for, they can grow in various climates. Orchids can grow from the lowlands to the highlands, because of variety of orchid species (Zhang et al., 2015). There are quite a lot of orchid plants that have been developed in Bali in particular and in Indonesia in general. Indonesia has about 3500 species of orchids resulting from interbreeding (Yulia et al., 2011). The most common type is *Dendrobium*, because this type has many colors

and is relatively easy to maintain (Biswas et al., 2019, Naik et al., 2014)

The orchid plant is an epiphyte plant, which lives by only taking parts of other plants that have decayed (Mondragon et al., 2015, Yong et al., 2014). Only a small proportion of orchids grow on the ground and are in dire need of high humus. Seeing this characteristic, it does not require a large area to work on it, so it is possible to cultivate it in the yard in urban areas which is often referred to as urban farming (Guitart et al., 2012, Malhotra, 2013). The growth of *Dendrobium* orchids, determines by plant placement, humidity conditions and

providing nutrients through fertilization (Teixeira da Silva *et al.*, 2017, Trimanto & Rahadianoro, 2017, Hariyanto *et al.*, 2019). Adequacy of nutrients accelerates the growth of orchids and the continuity of flowering (Naik *et al.*, 2017, Herastuti & Hardiastuti, 2020). Fertilization of orchids can be done by giving planting medium or spraying all over the plant (Samseemoung *et al.*, 2017). Fertilizer given to the planting medium is usually in the form of liquid spray so that the nutrient supply is filled slowly. Orchids need to be fertilized once a month with fertilizers which contains N, P, K, Ca nutrients and other micro elements (Trepanier *et al.*, 2008, Hapsoro *et al.*, 2018, Zulfita *et al.*, 2019). Fertilizers that are completed with micro nutrients, both artificial and organic fertilizers are quite widely available in the market. Liquid organic fertilizer can be applied by spray or sprinkled on the planting medium (Madusari, 2019, Fahrurrozi *et al.*, 2019).

The growth of *Dendrobium* orchids is largely determined by the appropriate planting medium and condition (Naik *et al.*, 2014). Criteria of good planting media are not easy to rot, plant roots are easy to stick, had enough cavity for air circulation, can store nutrients, and not easily become a source of disease.

Planting media can be in form of wood charcoal, fern roots, broken tile or brick.

The development of orchids has a lot of benefits. It can be used as a commodity for ecotourism, urban tourism and to increasing the income of farmers and communities.

## **MATERIALS AND METHODS**

This research was conducted at the Padang Galleria Housing, Jl. Mt. Tangkuban Perahu Denpasar. The research was conducted from August to November 2017. The materials used in this study were orchid growing media in the form of wood charcoal with code K, fern stems with code P, mixture of wood charcoal and fern stems with M code, *Dendrobium* orchid seeds, liquid organic fertilizer, namely, Dewa fertilizer, which is a pure organic liquid fertilizer produced by environmentally friendly high technology contains minerals, amino acids, natural growth hormones, DIGROW organic fertilizer which made from fresh brown *Ascophylum Nodosum* seaweed through nano fermentation technology and GDM biofertilizer which is a biological organic fertilizers that contain organic waste, seaweed, animal oil, algae, and bacteria. The tools used in this study were a pot for a plant, a house with an orchid arnet, a table for pots, a hand sprayer, a ruler and writing tools.

The design of this study is a factorial experiment with a completely randomized

basic design (CRD). This research as a whole can be seen in the flow chart of Figure 1.

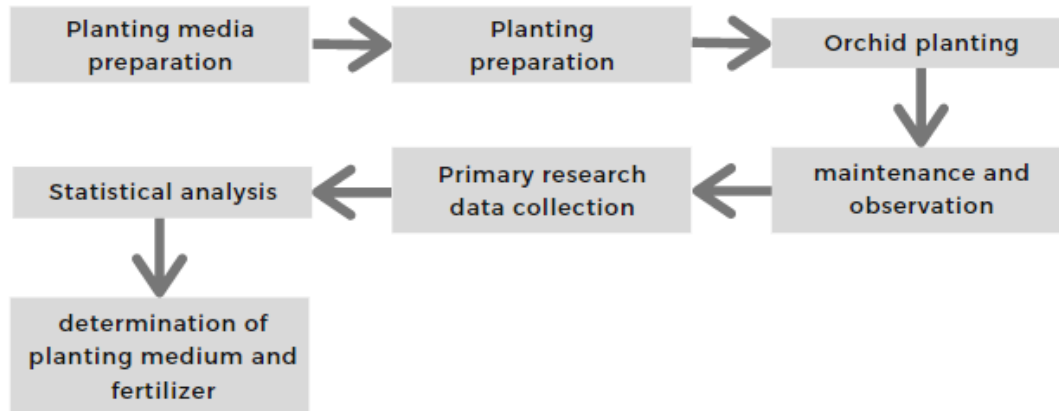


Figure 1. Research Flowchart

The research begun with the construction of a house with an arnet roof for the irradiation required by orchids. Para-potted orchid plants and further treatment arrangements were conducted by placing the planting medium according to the treatment. Three months old *Dendrobium* orchid seedlings were chosen in order to obtain a uniform plant material.

Experiments on the level of nutrient use as limitation factor were arranged in a completely randomized design (CRD) factorial pattern. There were 2 treatments given, namely the type of planting media and liquid organic fertilizer. There were 3 types of control for the type of organic fertilizer and repeated 3 times, so there were 30 experimental pots.

## RESULTS AND DISCUSSION

### Results

Table 1. The significance of the effect of the planting medium and the combination of liquid organic fertilizer and its interaction on the observed variables.

No	Parameter	Treatment		
		PM	LOF	PM X LOF
1	Plant height (cm)	NS	NS	NS
2	Number of leaves (strands)	NS	NS	NS
3	Number of tillers (stems)	S	NS	NS

Annotation: PM = planting medium; LOF = liquid organic fertilizer  
 NS = Not Significant; S = Significant ( $P < 0.05$ )

Table 2. Effect of Combination Treatment of Planting Media and Liquid Organic Fertilizer on Growth Parameters of Orchid Plants

Treatment Combination Code	Plant height (cm)	Number of leaves (strands)	Number of tillers (stems)
KI	13,00	8,33	1,67
KG	15,00	5,00	1,67
KD	13,00	6,00	1,67
PI	13,67	7,67	2,67
PG	13,33	7,00	2,00
PD	12,00	6,67	2,00
MI	11,67	6,00	1,67
MG	13,33	6,67	2,00
MD	14,33	6,33	1,67

Annotation: Treatment Combination Code of planting media of charcoal (K), fern steam (P), mix fern steam with wood charcoal (M) with application of organic liquid fertilizer of Dewa fertilizer (D), DIGROW (I), and GDM fertilizer (G).

Table 3. The Influence of Planting Media as a Single Treatment on Parameters of the Number of Tillers of Orchid Plants.

<b>Planting Media</b>	<b>Number of tillers (stems)</b>
K	1,67
M	1,67
P	2,22
LSD 5 % = 0,36	

Annotation: K: wood charcoal; P: fern stems; M: mixture of wood charcoal and fern stems.

LSD: Little Significant Difference

### Discussions

The results of the statistical analysis of the effect of the treatment of planting media and liquid organic fertilizer and their interactions with the observed variables, are in the form of significance as presented in Table 1. Treatment of the combination of planting media with liquid organic fertilizer and their interactions has no significant effect on all observation variables such as plant height, number of leaves, and number of tillers. But the planting medium as a single treatment had a significant effect on the number of tillers.

The treatment of planting media and application of liquid organic fertilizer in combination had no significant effect on plant height. However, in Table 2, it shows visually the treatment with the KG code give the highest plant height of 15 cm. Followed by MD with 14.33 cm, PI with 13.67 cm, PG with 13.33 cm, then KD has the same value as KI and PD with

13.00 cm, and the lowest is in MI with 11.67 cm.

The effect of the treatment of the planting medium and the application of liquid organic fertilizer in combination had no significant effect on the number of leaves. However, in Table 2, it can be visually explained that the KI combination treatment shows the highest number of leaves, namely 8.33 strands, followed by PI with 7.67 strands, PG with 7.00 strands, PD is the same as MG with 6.67 strands, MD with 6.33 strands, MI was the same as KD with 6.00 each and the lowest was in KG as many as 5 strands.

In combination, as shown in Table 3, the planting medium and the application of liquid organic fertilizer did not significantly affect the number of orchid tillers (LSD 5 % = 0,36), but the planting medium as a single treatment had a significant effect on the number of orchid tillers.

The number of orchid tillers in fern media were: 2.22 stems, or 32.93% more than wood charcoal (K) and a mixture of wood charcoal and fern stems (M), each of which had 1.67 stems. The advantages of fern media compared to other growing media fern growing media have good criteria for orchid growth including ferns that are able to bind and store water well, have good aeration and drainage because they are porous, rot slowly and contain nutrients needed by plants during the emergence of these orchid saplings.

The ability of ferns to bind and store water makes it easy for ferns to absorb fertilizer liquid that is sprayed so that it adds to the nutrient content planting medium so as to spur growth and emergence of tillers. Ferns contain sugar, amino acids, aliphatic acid and ester constituents needed by orchids. Fern growing media also has the advantage of not being easy weathered so that the plants can absorb the nutrients contained in a longer period of time.

The number of orchid tillers as a growth response to the growing media for wood charcoal (K) and mixed media (M) was lower than that of fern growing media (P) presumably because the wood charcoal is less porous so that the aeration and media drainage is not good, also the water holding capacity and the nutrient content are lower.

Related research from Hariyanto et al (2019), was to evaluate the effect of plant media variation, time of fertilization, and combination of both on the growth of orchid plant *Dendrobium sylvanum Rchb. f.* in acclimatization phase. The first factor was the variation of plant media: charcoals, coconut husk, bagasse, mixing of charcoal and coconut husk, combination of charcoal and bagasse, combination of coconut husk and bagasse. Based on the results, there were differences between media variation and fertilization time on the increase of leaf length and width, stem diameter, and root length of *Dendrobium* orchid in acclimatization phase. Combination of bagasse and coconut husk media showed the best result on media treatment. Research from Hapsoro et al (2018) investigate the effects of basal media and organic additives on *in vitro* growth of *Dendrobium* seedlings. This research showed that a commercial foliar fertilizer (FT medium) could be used as medium for growing *Dendrobium* hybrid seedlings *in vitro*. This shows that variation of plant media gives result on orchid growth.

## CONCLUSION

Based on the results of this study, it can be concluded that the treatment of planting media and the application of liquid organic

fertilizers in combination and their interactions have no significant effect on orchid growth. The single treatment of planting media had a significant effect on the number of orchid tillers. Fern stem (P) as a plant medium gave the highest number of tillers, namely: 2.22 stems, or 32.93% more than wood charcoal (K) and a mixture of wood charcoal and fern stems (M), each of which had 1.67 tillers stem. It can be suggested to test the dosage of liquid organic fertilizer and the use of fern stems as a medium for growing orchids.

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