

Original Research Paper

The effect of Gandasil and LB fertilizer concentrations on the growth of *Dendrobium* sp

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Abstract

Dendrobium sp. orchids, especially hybrid varieties, are one of the species that can tolerate direct sunlight well. Fertilizing these orchids involves using foliar fertilizers, made from organic or chemical materials, applied through the leaves' stomata. This method involves spraying the fertilizer to provide additional nutrients beyond what the roots absorb. This research aimed to determine the effects of fertilizers on leaf count and plant height. The experiment included two treatments and two replications, with methods such as media sterilization, sample preparation, watering, transplanting, fertilizing, and plant observation. Data were analyzed using one-way ANOVA with a p-value <0.05. Foliar fertilizer was applied to the underside of the leaves between 8-9 AM or 3-4 PM when stomata were open. Spraying was avoided during the rainy season to prevent fertilizer runoff while stomata were closed. Observations revealed that using Grow Quick Leaf Booster (LB) fertilizer at a concentration of 2 ml (diluted with ½ water) promoted longer growth than Gandasil fertilizer at 1 ml (diluted with ½ L of water and 1 tablespoon), which also produced good results and accelerated orchid growth. Gandasil increased plant height, leaf count, leaf diameter, and the number of seedlings, while LB fertilizer primarily enhanced plant height. These findings suggest that while both fertilizers improve growth, Gandasil has a broader range of benefits, including vegetative growth and leaf development, whereas LB is more focused on increasing plant height.

Keywords: gandasil fertilizer; hybrid *Dendrobium*; LB fertilizer

1. Introduction

Orchids in Indonesia are one of the most diverse species. This species diversity represents a very valuable potential for the development of orchids in Indonesia, especially with regard to orchid genetic resources which are very necessary to produce superior orchids. Currently, orchid development in Indonesia is facing various problems, including a limited supply of seeds, low-quality seeds and cultivation techniques that have not been implemented properly (Andri & Tumbuan, 2015). The *Dendrobium* orchid is a genus of orchids where most of the orchids in the *Dendrobium* genus have good tolerance for receiving direct sunlight, especially hybrid *Dendrobium*. *Dendrobium* variety *Dian Agrihorti* or better known as *Denrobium endhoven* x *Dendrobium antennatum* Rchb.f is an orchid resulting from a cross between the Ornamental Plant Research Institute. This orchid variety has yellowish-green flowers and purple sides, the advantages of the *Dendrobium* var orchid. *Dian Agrihorti* has large flowers and a large number of flower stalks (Ayuningtyas et al., 2021).

Dendrobium sp. is an epiphytic plant that requires shade and is often found on tree trunks, branches or twigs. Orchid *Dendrobium* sp. It has beautiful flowers with a variety of colors and is classified as an ornamental plant that is much sought after by orchid lovers. Orchids have good potential for development, however the development of orchid production is still relatively low. Orchid plants require a long time to produce flowers from crosses, so it is necessary to provide fertilizer to provide

nutrients for growth, development and stimulate flowering and increase productivity. For most orchids and especially epiphytic orchids, fertilization is given in the form of a solution. The elements needed are macro elements and micro elements, all of these elements must always be available through the leaves. Orchid plants in the juvenile phase, generally hybrid orchids require additional nutrients needed for growth. Overcoming this problem, it is necessary to provide foliar fertilizer with a balanced NPK content (Badan Pusat Statistik Pontianak, 2016).

The growth and development of orchid seeds can be stimulated by a fertilization process that contains micro and macro nutrients. Fertilization can be done through roots and leaves. Foliar fertilizer is a compound fertilizer to stimulate growth in orchid plants which is applied by spraying or watering all parts of the plant. Nutrient absorption through foliar fertilizer is more effective than fertilizing through roots because the fertilizer is applied in solution form which can be absorbed by plant organs that are exposed when fertilizing is applied (roots, stems, leaves). The foliar fertilizer needed for the initial vegetative growth period is compound foliar fertilizer such as LB and gandasil fertilizer with a nitrogen (N) composition higher than other elements (Hastuti et al., 2016). Based on previous research, the adaptation process and vegetative growth period are still quite long, therefore, to accelerate the growth of *Dendrobium* sp. This can be done by adding Gandasil leaf fertilizer which has its potential.

Tissue culture is a method for isolating parts of a plant and growing them under aseptic conditions so that these parts can reproduce. Plants or plantlets that grow in vitro require an acclimatization stage. In acclimatization, the planting media is one of the factors determining the success of each orchid growth because the growing media is a place for orchid roots to stand (Irsyadi, 2021). This research aims to find the best type of foliar fertilizer mainly the usage of Gandasil fertilizer for the growth of *Dendrobium* sp. seedlings from tissue culture.

2. Research Methods

The research was carried out at the Yogyakarta City Agriculture and Food Service, Malangan, Giwangan, Umbulharjo District, Yogyakarta City. The orchid samples used were the results of tissue culture of the *Dendrobium* sp. variety—Department of Agriculture.

2.1. Materials

The tools used in this research were pots, rulers, measuring cups. The materials used are *Dendrobium* sp. orchid seeds, a tissue culture variety of leaf fertilizer using local fertilizer from a brand of Grow Quick Leaf Booster (LB) with a macronutrient content of 45% N, 15% P, and 15% K. Micronutrients consist of Cu, Mn, Zn, B, Fe, and Mo, as well as vitamin B1 at 0.15%, water, using Gandasil D fertilizer which contains 14% nitrogen, 1% magnesium and compound elements such as manganese (Mn), boron (B), Copper (Cu), cobalt (Co), Zinc (Zn). The research procedures carried out include sterilizing the media and seeds, preparing the planting media, planting and observing for 4 weeks.

2.2. Sterilization Process

Sterilization of media and tissue culture tools was carried out simultaneously using an autoclave. Inserted bottles containing media and culture tools that have been prepared into the autoclave for sterilization process at a temperature of 121°C, pressure 1-2 atm for 20 minutes. Culture tools were stored in the storage area. Storing media on media storage shelves aims to anticipate contamination of media equipment.

2.3. Sample Preparation

Orchid samples selected were minimum at 3 months old and already had leaves and roots to see the comparison of the samples obtained from tissue culture results that had been acclimatized so that it was easy to see the results of the growth of the orchid plants. Orchids were watered or sprayed each day on the orchid samples once a day, this will give the plant ample time to dry out before the slight decrease in temperature in the evening. Once the orchid was fertilized, they are not required for watering. Furthermore, the orchid greenhouse must be kept in a clean environment and should remove moses from the specific growing area (Hariyanto et al., 2019).

2.4. Transplanting

Orchid plants that are ready to plant (more sprouts of roots) were then moved to larger pots. The planting medium consisting of wood charcoal and moss was first soaked in a 0.1% fungicide solution for 5 minutes to prevent the growth of fungi on the root, stem and leaf rot (Suharman & Nurhapisah, 2021). After that, the orchid seeds can be planted by placing them in the middle of wood charcoal and moss.

2.5. Orchid Fertilization

Orchid samples are taken every 3 days and fertilization is done every morning and after fertilization, measurements are taken and look at the number of leaves in the sample and use LB fertilizer concentration (Grow Quick Leaf Booster) 2 ml with a ratio of 1ml solution and ½ L of water. Whereas in Gandasil fertilizer contain elements for growth and formation of leaves so that they remain green, do not fall off, and are strong against drying, due to its 2 nutritional contents, namely macro elements and microelements; macro elements consist of 20% total N, 15% P₂O₅ and 15% K₂O, while the Gandasil D micro elements consist of Cu, Mg, B, Mn, and so on using it needs a ratio concentration of 1 ml with a ratio of 1 spoonful of shoots and ½ L of water (Dewanti et al., 2022).

2.6. Plant Observation

Observations on orchids are carried out once a week. This observation obtained data of the growth of orchid plants such as plant height and number of leaves. Data required was then analyzed by observation and data described using ANNOVA and the standard deviation was calculated.

3. Results and Discussion

In this activity, the results of observations on orchid samples showed that every week there was an increase in the height and number of leaves, but there was also a decrease in leaves using a concentration of 2 ml LB fertilizer with a ratio of 1 ml and ½ L of water and while Gandasil fertilizer used a concentration of 1 ml with a ratio of spoon shoots and water ½ liter. In Table 1, the results obtained show that the average number of leaves shows that LB and Gandasil fertilizers provide different average numbers and are measured by the standard deviation.

Table 1. Average Number of Dendrobium Orchid Leaves

Observation	Lb	Gandasil
1st week	3.7	4.3
2nd week	4.0	4.3
3rd week	4.7	4.7
4th week	5.0	5.0
Total Average	4.4 ± 0.30*	4.6 ± 0.52*

Standard deviation*

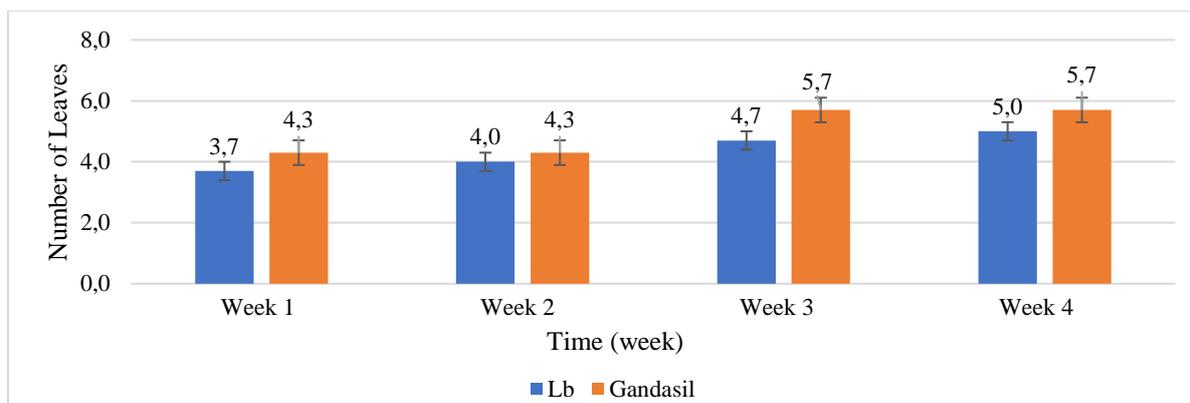


Figure 1. Comparison of The Average Number of Leaves

Based on Figure 1, the average value of the number of leaves with the treatment of giving LB fertilizer from week 1 to week 4 ranges from 3.7-5.0, so per week it gives an increase in the number of leaves by 1 leaf, while the treatment with giving Gandasil fertilizer is around 4.3-5.7, in week 1 to week two it gives the same increase, in week 3 to week 4 the number of leaves is still the same. So it can be seen from the results of the observations that there was an increase in the number of leaves with LB fertilizer with a concentration of 2 ml per week, but Gandasil fertilizer gave a faster increase compared to using LB fertilizer. There is a significant difference when observed, it can be seen that the results of Gandasil fertilizer are close to exceeding approximately 1-2 number of leaves. If you look at the results of the ANOVA analysis, both results show values that are not significant with a P-value > 0.05 as recorded in Table 2 below.

Table 2. ANOVA Results Number of Leaves

ANOVA						
Sources of Variation	SS	df	M.S	F	P-value	F crit
Between Groups	0.10125	1	0.10125	0.422609	0.539716	5.987378
In Group	1.4375	6	0.239583			

Table 3. Average Height of Dendrobium Orchid Plants

Observation	Lb (cm)	Gandasil (cm)
Week 1	1,2	1,3
Week 2	2,0	2,6
Week 3	3,0	3,3
Week 4	3,5	3,8
Total Average	2.425 ± 0.88*	2.75 ± 0.93*

Standard deviation*

In Table 3 above, observation tests on Gandasil and LB fertilizers provide different improvements and different standard deviation results. Based on Figure 2, the average value of plant height with the treatment of giving LB fertilizer from week 1 to week 4 ranged from 1.2 cm - 3.5 cm, giving a weekly increase of 1 cm in height per week, while the treatment using Gandasil fertilizer was around 1.3 cm - 3.8 cm gives an increase of 1 cm, the same as LB fertilizer but with Gandasil fertilizer it is higher than using LB fertilizer.

According to Hartati (2019), states that Gandasil D is a complete foliar fertilizer because it contains elements that really support the growth and formation of leaves so that they remain green, do not fall off, and are strong against drying, because Gandasil D fertilizer has 2 nutritional contents, namely macro

elements, and microelements, macro elements consist of 20% total N, 15% P₂O₅ and 15% K₂O, while the micro elements of Gandasil D consist of Cu, Mg, B, Mn, and so on. Apart from the nutritional content, this is in line with Pramitasari (2016), who states that Gandasil D is also equipped with vitamins aneurine, lactoflavine and nicotonic acid amide which can increase growth and flower formation. On LB fertilizer with macronutrient content, namely N of 45%, P of 15%, and K of 15%. Micronutrients consist of Cu, Mn, Zn, B, Fe, and Mo, as well as vitamin B1 at 0.15%, water, the amount of LB fertilizer uses a concentration of 2 ml while in Gandasil it gives 1 ml, why give a different concentration because at a concentration of 1 ml of gandasil is comparable to 2 ml of LB fertilizer concentration, due to the difference in macro and micro content (Sumiati, 2019).

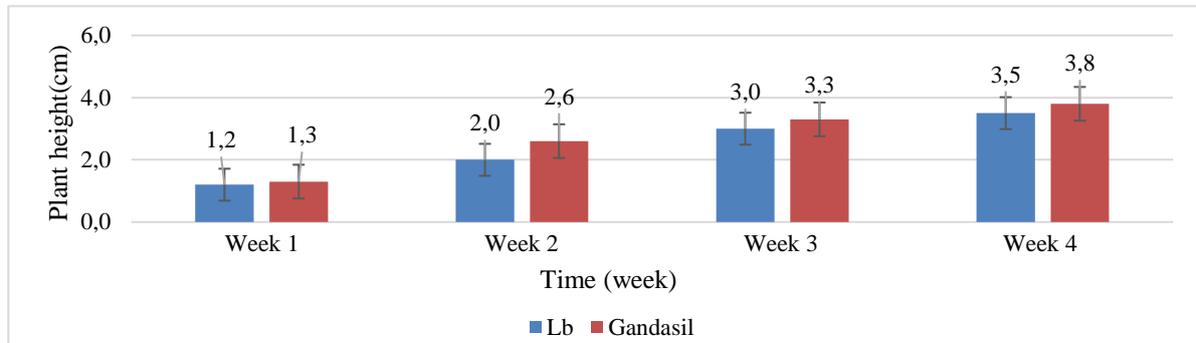


Figure 2. Comparison of Average Plant Heights

Based on Figure 2 above, it shows that the average value of leaf height with the treatment of giving LB fertilizer from week 1 to week 4 ranges from 1.2cm -3.5 cm giving a weekly increase of 1cm in height per week while the treatment with giving Gandasil fertilizer is around 1.3cm-3.8cm gives an increase of 1cm, the same as LB fertilizer but with Gandasil fertilizer it is higher compared to using lb fertilizer. Gandasil foliar fertilizer has a better effect on the growth of *Dendrobium* orchids compared to other brands (Andalasari et al., 2017). However, the ANOVA test results in Table 4 show that the value is not significant at p-value > 0.05.

Table 4. ANOVA Results of Plant Height

ANOVA						
Sources of Variation	SS	df	M.S	F	P-value	F crit
Between Groups	0.21125	1	0.21125	0.18924972	0.678753571	0.514889765
In Group	6.6975	6	1.11625			

Febrizawati et al. (2014), stated that to achieve optimal fertilization efficiency, fertilizer must be given in an amount that is sufficient for the plant's needs, not too much and not too little, if too much fertilizer is given then the soil solution will be too concentrated which can result in poisoning of the plant. plants, on the other hand, if there is too little fertilization the effect on the plants may not be visible. *Dendrobium* sp. likes humid places, namely around 70-80%, but an environment that is too damp or wet and always watery will make it easier to attack bud rot and leaf rot. Minimum humidity is up to 50% (Da Silva., 2017).

After it was proven that Gandasil D Fertilizer had an influence on orchid growth. According to Badri Burhan (2016), the application of different fertilizers provides different growth responses, especially in the variables of plant height and number of leaves. Application of Gandasil D fertilizer produces a better growth response than LB fertilizer, this is thought to be due to the different nutrient content in the two types of fertilizer. Gandasil contains 20% N, 15% P, 15% K and 1% Mg and

additional microelements Mn, B, Cu, Co, Zn as well as vitamins, while Grow Quick Leaf Booster (LB) contains macronutrients, namely N, of 45 %, P is 15%, and K is 15%. Micronutrients consist of Cu, Mn, Zn, B, Fe, and Mo, as well as vitamin B1 at 0.15% (Andalasari et al., 2017). Gandasil D fertilizer is able to support plant growth so that it can grow faster and also induces the vegetative growth phase in plants, especially leaf growth. According to Tini et al (2019). Orchids are plants that have high economic value, where they have beautiful flower shapes, varied colors, and flower patterns that continue to develop and can last for a long time (Herliana et al., 2019). This makes orchid plants a quite promising business. The orchid-growing business can not only be done by the large plant industry sector but can also be done from the household sector.

4. Conclusion

Based on the results of the observations and analysis that have been carried out, it can be concluded that using LB fertilizer with a concentration of 2 ml with a ratio of 1 ml and ½ water provides very long growth compared to using Gandasil fertilizer with a concentration of 1 ml with a ratio of 1 tablespoon and water ½ L can give good results and can accelerate the growth of the orchid. Research shows that Gandasil fertilizer has a very effective growth effect and is easily affordable/easy to find.

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