

The Influence of Gibberelin and Light on the Growth of Plantlet Orchids *Denrobium Taurulium* J. J Smit in Vitro

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Abstract—Experiments aimed at studying the concentration of gibberellin and light against the growth of Orchid Plantlet *Dendrobium taurulium* J. J. Smit. This experiment was carried out at the Faculty of Agriculture Universitas Winaya Mukti, Sumedang West Java. Trial began in May and ended of August 2018. The experimental design used was the split plot design consists of 2 factors and repeated 3 times. Main Plot is light (P), $p_1 = 40$ Watt light bulbs, $p_2 = 35\%$ of the Sun's light, $p_3 = 50\%$ of the Sun's light, and the sub plot of concentration Gibberellin (G), $g_0 = 0 \text{ mg L}^{-1}$, $g_1 = 1 \text{ mg L}^{-1}$, $g_2 = 2 \text{ mg L}^{-1}$ and $g_3 = 3 \text{ mg L}^{-1}$. The results are no interaction between the light and the concentration of Gibberellin to the growth plantlets Orchid *Denrobium taurulium* J. J Smit in In vitro. Gibberellin concentration of 1 mg L^{-1} gives influence on highest plants aged 12 weeks of Culture (WOC), number of leaf 4 WOC and wet weights 12 WOC. While 50% of the Sun's light, giving the influence on the amount of leaf 4 WOC and number of roots 12 WOC on plantlet Orchid *Dendrobium taurulium* J. J. Smit in vitro.

Keywords: *plantlet Orchid Dendrobium taurulium, gibberellin, light*

I. INTRODUCTION

Indonesia has a growing range of ornamental plants. Development of the commodity of ornamental plants on the availability of market share, competitive advantage and economic value. It is shown with the development of markets that are expanding with the increasing demand in the foreign countries. One of the most prospective ornamental commodity for national development is orchids. The orchid exports Volume rose by 27.92 percent, from 40.56 tons in 2017 to 51.89 tons in 2018 [1].

Orchids are ornamental plants that have a relatively low consumer market depending on the season. Although many orchid genera exist, consumers prefer orchids from the genus *Phalaenopsis*, *Chattaya*, *Denrobium*, *Oncidium* and *Vanda* compared to the genus *Luisia*, *Eria*, and *Cryptosylis* because the treatment is relatively easy, easier to be humed, and has Many varieties of flowers. *Denrobium* is one of the orchids who have many enthusiasts because it is relatively more adaptable in the lowlands, not too need special care, easy to bloom, has a variety of flowers, some hybrids that flowers

remain fragrant. One of the obstacles to the development of orchids in Indonesia is the limited availability of superior seeds [2]. In the provision of high quality seed is necessary introduction of tissue culture in the planting of the seed of the Orchids plant by the perpetrator of orchids [3].

Tissue reproduction in order to increase the growth of plantlet, then added Giberelin to the media culture. The addition of Giberelin 2 ppm increase the speed of the emergence of plant seeds in Gandaria [4], GA3 500 ppm has been able to increase the percentage of germination by 57.33% in plants *Galopogonium Caeruleum* [5], GA3 20 ppm increases the growth of the shoots on grape Vines [6], 4 ppm Gibberellin on sub-cultural media for the paprika plant [7], 5 ppm of GA3 on mung bean plants [8]. In orchid plants addition GA3 2 ppm in the media is also able to accelerate the emergence of orchids seeds [9], Giberelin 2 ppm and 250 ml of coconut water added to the media VW (Vacin & Went) is suitable for the growth of Orchid Plantlet Month [10], The addition of organic materials in VW media is capable of affecting the organogenesis of the orchids [11], and in MS media with coconut water 100 ml/L is able to increase the growth of orchids *D. Anosmum* [12,13].

From previous research results of VW Media is more suitable for orchids when the media is held in MS. Giberelin according to Tikafebrianti, Anggraeni, & Windriati can increase germination and vigor index of seeds, but cannot improve Potential to grow maximal GA3 1.5 ppm is able to increase the growth of orchid-infancy of snake tongue in Invitro but does not show any influence on the level of live explation [14,15]. So one way to use it to pass in vitro method with the addition of the growth Regulator (ZPT) One of them with Giberelin (GA3) and giving light to improve the percentage of live explants. Application granting GA3 and light on VW media, it is expected that the resulting orchid plant has quality that meets the criteria and competently.

II. RESEARCH METHODS

This research was conducted by experimental method by conducting the diamond experiment and Greenhouse Anggrek at the agricultural faculty of Winaya Mukti Tanjungsari University, Sumedang, West Java with a height of 850 m above

sea level. This experiment was carried out in May – August 2018. The tools used are stationery, cameras, aluminum foil, 140 ml clear bottles, autoclave, enkas, plastic, curry bracelets, gas stoves, analytical scales, pH indicators, pipettes, stirrer rods, Beaker glass 500 ml, glass beaker 100 ml, hand sprayer, funnel, lamps Neon 40 watts, paracetamol 35% and 50%, ruler, Pinsent 15 cm, tweezers 30 cm, knives, scissors, calculators, petri bowls, and tissues. While materials used include: Planlet orchids (*Denrobium taurulium*), Media Vacin and Went (VW). The environmental design used in this experiment was the Split Plot Design consisting of 12 treatments and 3 repeats. Twelve treatments and each unit consisted of 4 bottles then repeated 3 times, up to a total of 144 bottles of trials. The design of the treatment in this study consisted of two factors namely, the intensity of Light (P) and Gibberelin (G). The light Factor (P) consists of 3 levels (as the tile is primary): P1 = 40 Watt TL lamp; P2 = Sunlight 35%; P3 = Sunlight 50%. The second factor is the concentration of Gibberelin (G) consisting of 4 levels (as a tile child): G0 = without gibberelin (control); G1 = Concentration Gibberelin 1mg L⁻¹; G2 = Gibberelin Concentration 2 mg L⁻¹; G3 = concentration Gibberelin 3 mg L⁻¹.

III. RESULTS AND DISCUSSION

Based on table 1 light level TL 40 Watt and sunlight 35% gives a less good influence, while the solar light level of 50% lifespan 4 WAC gives a better influence on the number of leaf variables. In the degree of Gibberelin 1 mg L⁻¹ showed better influence on the variable number of leaves, seen in the concentration of Gibberelin 2 mg L⁻¹ and the concentration of 3 mg L⁻¹ The result was decreased.

Based on table 2, there is no interaction between the Gibberelin and the light to the height of the plant, the length of the roots and the amount of roots and wet weight of plant. The height of the plant in the level of lamp TL 40 Watt gives better results than other treatment. The concentration of Gibberelin 1mg L⁻¹ showed higher plantlets height compared to the G0 and G3 but differed not real with G2. At the level of the lamp the TL 40 Watt affects well against the high variable of plants compared with other light treatments. The concentration treatment of gibberelin and light does not give a good influence on the length of the roots.

TABLE I. EFFECT OF GIBERELIN AND LIGHT ON AVERAGE NUMBER OF LEAVES AGE 4, 8 AND 12 WEEKS AFTER CULTURE (WAC)

Treatment	Average number of plant leaves		
	4 WAC	8 WAC	12 WAC
Light :			
P ₁ (Lamp TL 40 Watt)	2,56 a	3,83 a	4,52 a
P ₂ (Sunlight 35 %)	2,83 a	3,81 a	4,33 a
P ₃ (Sunlight 50 %)	2,94 b	3,88 a	4,38 a
Giberelin :			
G ₀ (Without gibberelin)	3,17 b	4,17 b	4,72 b
G ₁ (gibberelin 1mg L ⁻¹)	2,86 b	3,86 a	4,39 a
G ₂ (gibberelin 2 mg L ⁻¹)	2,44 a	3,69 a	4,31 a
G ₃ (i gibberelin 3 mg L ⁻¹)	2,64 a	3,64 a	4,22 a

Description: The number quoted in the same letter shows a different unreal according to the smallest real difference test at 5%.

TABLE II. EFFECT OF GIBERELIN CONCENTRATION AND LIGHT ON THE NUMBER OF LEAF PLANLET ORCHIDS

Treatment	Plant Height 12 WAC (mm)	Length of plant roots 12 WAC (mm)	Total Plant roots 12 WAC (Strands)	Plant Wet weights 12 WAC (g)
Light :				
P ₁ (Lamp TL 40 Watt)	24,19 b	9,94 a	1,94 a	0,187 a
P ₂ (Sunlight 35 %)	12,50 a	10,42 a	4,88 b	0,194 a
P ₃ (Sunlight 50 %)	12,92 a	11,63 a	5,21 b	0,204 a
Giberelin:				
G ₀ (Without gibberelin)	14,92 a	11,44 a	3,81 a	0,064 a
G ₁ (gibberelin 1mg L ⁻¹)	19,00 b	11,00 a	4,25 a	0,088 b
G ₂ (gibberelin 2 mg L ⁻¹)	16,28 a	10,19 a	4,36 a	0,067 a
G ₃ (gibberelin 3 mg L ⁻¹)	15,94 a	10,00 a	3,61 a	0,053 a

Description: The number quoted in the same letter shows a different unreal according to the smallest real difference test at 5%.

The Sun's treatment 35% and sunlight 50% give the best influence over the number of roots, compared with the light treatment TL 40 Watt has no good effect on the number of roots. Concentrations of Gibberelin 0 mg L⁻¹, 1 mg L⁻¹, 2 mg L⁻¹, and 3 mg L⁻¹ did not give a good influence on the number of roots. Effect of light lamp TL 40 Watt, sunlight 35% and sunlight 50% does not affect the wet weight of the planet. While the treatment of Gibberelin 1 mg L⁻¹ gives better response than other gibberelin concentrations.

At a light level 50% provides a better influence over the number of leaves and the amount of plant roots. Suspected light intensity affects the growth of leaves because of one of the plant organs for photosynthesis so that the plant can produce a meal and can experience optimum growth. The growth and production of crops fell significantly in a state of being enlisted [16]. While the concentration of Gibberelin 0 mg L⁻¹ and 1mg L⁻¹ have a good effect on the number of leaves. The addition of GA3 1 mg L⁻¹ is able to increase the plant height of 12 WAC and wet weight of 12 WAC plants, the provision of appropriate gibberelin levels will be able to give the best response to the plant [17], so that more GA3 additions do not guarantee growth and crop results [18].

IV. CONCLUSION

No interaction between gibberelin and light against the growth of orchid plantlets *denrobium taurulium* J. J Smith in vitro. The concentration of Gibberelin 1 mg L⁻¹ gave an increase to the plant's height of 12 WAC by 27.35% and the wet plantlets weight of 37% T. 50% Light provides an exposure to the increase in the number of 4 WAC age leaves by 14.8% and the number of roots 12 WAC amounted to 168.56% at the *Denrobium taurulium* J. J Smith plantlets in Vitro.

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