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THE GROWTH OF ORCHID (*Dendrobium sp*) IN *IN VITRO* GIVING WITH COCONUT WATER ON DIFFERENT MEDIUM

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ABSTRACT

This study aimed to determine the effect of coconut water on the growth of *in vitro* orchid shoots (*Dendrobium Sp*) on Murashige and Skoog medium, medium containing foliar fertilizer (Grow More (GR) = N: P: K = 20: 20: 20). Research has been carried out in the Laboratory of "YAHDI" Plant Tissue Culture and Biology Departement of Unimed. This research design using non factorial completely randomized design with treatments namely: The first setting: MS Medium with 6 levels coconut water, namely 0%, 5%, 10%, 15%, 20%, 25%, the second : Medium containing Grow More (GR) 2 g/l with 6 levels coconut water, namely 0%, 5%, 10%, 15%, 20%, 25%. Each combination treatment was repeated 4 times. Parameter observations in this study was : the number of shoots, number of leaves, number of roots, shoots performance. The results showed that there are significant effect of medium, coconut water to all parameters: the number of shoots, number of leaves and number of roots of the *Dendrobium* orchid. Shoots performance was pale green shoots for giving of low doses of coconut water, will be green with coconut water with medium doses, the higher the concentration of coconut water will make the shoots appear stunted and eventually died.

Keywords: MS medium, coconut water, *Dendrobium Sp*, Grow More

INTRODUCTION

Orchids belonged flowering plants, widespread in parts of the world, including Indonesia. Indonesia is a country that has the number and types of orchids are very diverse. Donations and participation of Indonesian Orchid in the Orchids world is a big. It is estimated, orchid species spread throughout in the world amounted to 20,000 species and 6.000 species of which are in the Indonesian. Besides orchid species, we known also some orchids in the cross or hybrid. It is estimated that annually, produced 1.000 new hybrid. Orchids have a high economic value when compared to other ornamental plants (BPPP, 2004)

Dendrobium is one of the family Orchidaceae plants are much favored by consumers. Popularity of this orchids is due to the variety of colors and the beautiful flowers, fresh flowers also caused a period longer than other ornamental plants (Amalia, 2013). *Dendrobium* orchids are plants from tropical regions that require sunlight and temperatures hot enough, not like a particular orchid appropriate only in cold regions like *Paphiopedillum*. *Dendrobium* need

temperature 28-30°C (a minimum temperature of 15°C), with light is 50-60%. Dendrobium need environment is not too wet, but require high humidity at 65% - 70% (Kartiman, 2004).

The genus Dendrobium has a high diversity on habitat, size, pseudobulb, leaf and flower color. Spread spectrum is wide, from coastal areas to the mountains. Spread in India, Sri Lanka, China, Japan, Southeast Asia, to the Pacific region, Australia, New Zealand, and Papua New Guinea. It grows well at altitude 0-500 m above sea level with 60-80% humidity (Linga, P and Marsono. 2001).



*Simpodial type
Dendrobium
orchid*



*Dendrobium with the
long pseudo bulb dan
flower*

Figure 1. Performance of *Dendrobium*

This orchid has a long pseudo bulb. Leaf intersect along the pseudo bulb. According to the nature of the growth of this orchid including simpodial types, forming clumps and roots in every pseudo bulb. The flowers often appear at the apical bud. However, in mature plants, the flowers some time appear in the axilar.

Tissue culture method was developed to help reproduce plants, especially for plants that are difficult to breed in generative. Plantlet produced from tissue culture has several advantages, namely, identical to the parent, can be reproduced in large quantities, not to need a large place, producing a large plantlet in a short time, plantlet quality is guaranteed, and the seedlings grow faster compared with conventional propagation (Anonymous, 2010).

Tissue culture is a plant propagation technique that greatly influenced by the content of the substance in medium. To maximize the growth process, used hormones or plant growth regulators. Plant growth regulator (PGR) has a role in the process of growth and development for the survival of a plant (Nugroho, 2000, Harahap, 2011).

Coconut water is the liquid endosperm or food reserves of energy sources in the coconut. It is a complex organic substance that is always used in plant propagation by tissue culture techniques. This complex substance is often used, but have not obtained the right dose and has not verified the content of the materials that exist in the coconut water.

Coconut water, indicated to contain high endogenous cytokines, can induce the plant shoots. Recent research get content of coconut water, namely: amino acids, organic acids, nucleic acids, purines, sugars, alcohols, vitamins, minerals, growth regulators. Coconut water contain plant growth regulator (Gunawan, 1992): 9-B-D ribofuranosyl zeatin, Zeatin, N-N-Diphenyl urea, 2 (3-methyl-but-2 etyl amino) 6-purin one. The content of growth regulators in coconut water is beneficial to induce callus and induce morphogenesis process (Pisesha, 2008).

Growmore is a foliar fertilizer that is always used for spraying on orchid plant. This fertilizer contains N : P : K with ratio 40: 20: 20. Generally to stimulate vegetative growth (Fahrurroh, 2008). In this study Growmore replaces of MS medium for plant tissue culture. In the commercial treatment, using growmore can be saving the operational cost. So that the potential for business development. This fertilizer is a potential can be developed through this research, because growmore contain high Nitrogen that needed for orchid growth. Nitrogen is a nutrient that is needed primarily for vegetative growth. Plants absorb N is generally in the form of ammonium (NH_4^+) and nitrate (NO_3). Excessive N application will be effect to vegetative growth, leaf color becomes dark green and more succulent (Fahrurroh, 2008).

The purpose of this study was to determine the growth of in vitro orchid shoots after giving the Murashige Skoog (MS), Growmore (GR) medium and added coconut water.

METHODOLOGY

This research was conducted at the YAHDI Laboratory of Tissue Culture, Medan, and Biology laboratory UNIMED Medan, North Sumatera. Indonesia. The materials used are *in vitro* *Dendrobium* Sp plantlets, MS medium, Growmore, alcohol, sterile distilled water, detergent, coconut water.

Standard tissue culture tools were used for this research. This research design using non factorial completely randomized design with treatments namely: The first setting: MS Medium with 6 levels coconut water, namely 0%, 5%, 10%, 15%, 20%, 25%, the second: Medium containing Grow More (GR) 2 g/l with 6 levels coconut water, namely 0%, 5%, 10%, 15%, 20%, 25%. Each combination treatment was repeated 4 times.

Shoots were planted on the shoot induction medium according to the treatment. The culture was maintained at 24°C by regulating the room air conditioner. For maintaining the light, flourescent light of 3000-3200 lux were applied and set to 16 hour photoperiod. the number of shoots, number of leaves, number of roots, shoots performance were observed weekly from 1 until 12 weeks after planting. Data analyzed with ANAVA non factorial and differences test with Duncan's multiple range test (DMRT) at the level of 95%.

Table 1. Combination of treatment between MS medium with coconut water, Growmore medium and coconut water

Coconut water (v/v)	Medium Murashige Skoog (MS)	Medium Coconut water (v/v)	GrowMore (GR)
0 ml	M ₁ C ₀	0 ml	G ₁ C ₀
50 ml	M ₁ C ₁	50 ml	G ₁ C ₁
100 ml	M ₁ C ₂	100 ml	G ₁ C ₂
150 ml	M ₁ C ₃	150 ml	G ₁ C ₃
200 ml	M ₁ C ₄	200 ml	G ₁ C ₄
250 ml	M ₁ C ₅	250 ml	G ₁ C ₅

The first combination of medium is MS medium with coconut water:

MS + 0% coconut water (M1C0)

MS + 5% coconut water (M1C1)

MS + 10% coconut water (M1C2)

MS + 15% coconut water (M1C3)

MS + 20% coconut water (M1C4)

MS + 25% coconut water (M1C5)

The second combination of medium is Growmore (GR) with coconut water:

GR + 0% coconut water (G1C0)

GR + 5% coconut water (G1C1)

GR + 10% coconut water (G1C2)

GR + 15% coconut water (G1C3)

GR + 20% coconut water (G1C4)

GR + 25% coconut water (G1C5)

RESULTS AND DISCUSSION

Results of analysis of variance showed a significantly different effect (significant) between the treatment given to the value of the all parameters: the number of shoots, number of leaves and number of roots of the *Dendrobium* orchid, shoot performance.

Table 2. Number of Shoots, Leaves and Roots of *Dendrobium* Sp after Coconut Water Treatment in MS Medium and Growmore medium

Coconut water (%)	Combination treatment					
	Mean of shoot number		Mean of leave number		Mean of root number	
	MS Medium	Growmore Medium	MS Medium	Growmore Medium	MS Medium	Growmore Medium
0	4.75	3	4	2.5	0.5	0
5	5.5	5.25	4.75	2.25	1	0
10	5.75	3.75	3.75	4	0.75	0
15	6.75	4	3.5	2.75	0	0
20	5.5	5.5	3.75	3.5	0	0
25	3.5	6.5	2.75	2.75	0	0

a. Number of Shoot

Results showed that MS medium plus 15 % coconut water produces shoots grew 100%, the highest number of shoots (6.75). While on treatment with growmore, required a concentration of 25% coconut water to produce the highest number of shoots (6.5). On treatment with MS medium, it appears that the number of shoots increased with increasing doses of coconut water until a certain dose (15%), but decreases with increasing doses of coconut water (20%), with the number of shoots 5.5. On treatment with growmore, seen a trend of increasing number of shoots, up to the highest dose given (25% coconut water) by the number of shoots 6.5.

It is understandable that the nutrient content on MS medium is much more complete than in the Growmore, so that the giving of 15% coconut water has stimulate the growth of shoots. But with growmore added 25% coconut water also produces a high number of shoots. This means that coconut water is potential to stimulate growth in the number of shoots on *Dendrobium* orchids. Paramartha (2012) said that any effect of addition of NAA and BAP combination on growth and development of *Dendrobium taurulinum* JJ Smith Seeds in vitro. Rostika (2008) reported that the highest number of mangosteen axillary bud formation was obtained on the medium containing 3 mg/l BA (Benzyl Adenine) . BA is one of cytokinines hormone.

b. Number of Leaves

In the treatment of MS and with Growmore medium, it appears that the number of leaves increased by giving low doses of coconut water (5% on MS medium and 10% in Growmore medium), but decreases with increasing doses of coconut water. Surachman (2011) give the coconut water for the in vitro propagation and increasing the *Patchouli* leaves number.

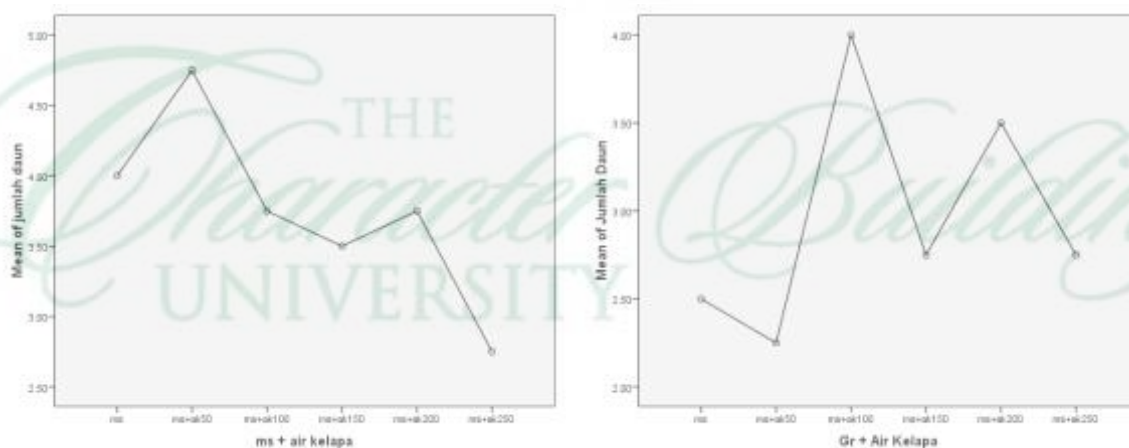


Figure 2. Number of Leaves of *Dendrobium* Sp after Coconut Water Treatment in MS Medium and Growmore medium

c. Number of Roots

In the treatment of MS medium with a low dose of coconut water (0-10%) can produce roots (average 0.75), but with increasing doses of coconut water (15%), roots are not formed. On treatment with growmore, the addition of coconut water did not produce roots.

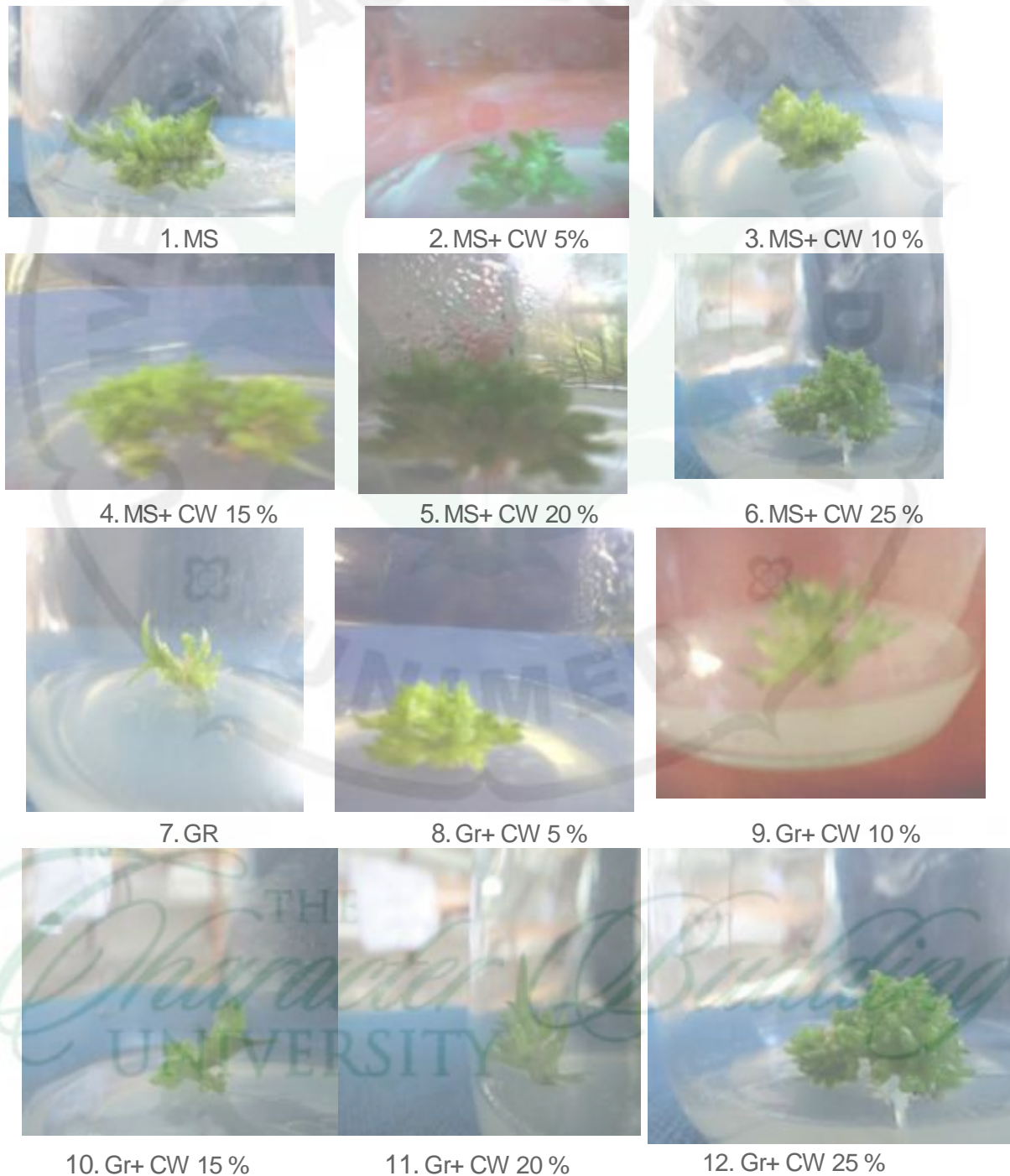


Figure 3. Performance of *Dendrobium* after 12 weeks planting. In the picture shows that the orchid plant with medium MS + 5 % coconut water, has a lot of shoots and leaves.

This study proved that coconut water can stimulate the increase in the number of shoots, number of leaves, but can not stimulate the increase in the number of roots. Can be understood as organic matter (plant growth regulator) contained in coconut water is a cytokines, the role of potential to stimulate the growth of shoots not for improve the roots (Harahap, 2011, 2012, Gunawan, 1997). Pishesha, (2008) said that any effect of concentration of IAA, IBA and coconut water against root formation *Poinsettia* (*Euphorbia pulcherrima* Wild. Et. Klotz) in vitro. IBA concentration and the period of pulse treatment have significant effects on the average number of roots produced per shoot on *Catharanthus roseus* (Rupesh, 2013).

d. Performance of Shoots

Shoots performance was pale green shoots for giving of low doses of coconut water, will be green with coconut water with medium doses, the higher the concentration of coconut water will make the shoots appear stunted and eventually died.

Coconut water contains inorganic ions (chlorine, copper, iron, magnesium, phosphorus, potassium, sodium, sulfur), nitrogen component (thanolamine and ammonia), amino acids and related substances, enzymes, organic acids. In addition, coconut water also contains sugar between 1.7 to 2.6% and protein from 0.07 to 0.55%. Besides being rich in minerals, coconut water also contains a variety of vitamins such as citric acid, nicotinic acid, pantothenic acid, folic acid, niacin, riboflavin, and thiamine.

The type and concentration of Plant Growth Regulator (PGR) was a component that determines the success of tissue culture. The explants were cultured on MS medium, Growmore medium, for further propagation, using coconut water was a class of cytokines that role in cell division, stimulate the multiplication of shoots, stimulate DNA synthesis process (Harahap, 2011)

CONCLUSION

There are significant effect of medium, coconut water to all parameters: the number of shoots, number of leaves and number of roots of the *Dendrobium* orchid. Shoots performance was pale green shoots for giving of low doses of coconut water, will be green with coconut water with medium doses. *Dendrobium* needed medium doses (10-15%) coconut water for improve the shoot number and the leave number. The higher the concentration of coconut water will make the shoots appear stunted and eventually died.



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