Growth Of Shoots Cuttings Agarwood (Aquilaria Malacensis Lamk.) On Some Media And Application Sinthetic Plant Growth Regulator

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Abstract: This research aims to determine the effect of giving IBA and NAA and plant media combination to the growth of shoot cutting of Agarwood. This research was done by 2 treatments which are IBA and NAA (RO = 0 ppm, R1 = 50 ppm, R2 = 100 ppm, R3 = 150 ppm and R4 = 200 ppm) and plant media (M0 = soil, M1 = soil + rice husk, M2 = soil + compost) respectively. The data was analyzed with the variant analysis (ANOVA), and continued by Duncan test (P=0.05). The results showed the awarding IBA and NAA with a concentration of 50, 100, 150 and 200 ppm was able to increase the average percentage live shoot cuttings almost reach 100%, media increasing the percentage of living shoot cuttings. Interaction between media and solution IBA and NAA effect on growth of shoot cutting.

Keywords: Agarwood, Media, Sinthetic Growth Regulator and Shoots Cuttings

1 INTRODUCTION

Agarwood is one of the commodities Non-Timber Forest Products (NTFPs), this species is fast growing, hardy and can be harvested within a short rotation period of about 5-8 years through fatal harvest or sub-lethal harvest [31] . The original use value is limited only to scent the body, room and completeness of religious rituals. Agarwood containing resin or mastic that emit distinctive aroma fragrance, currently used as raw material for the perfume industry, cosmetics, incense, and preservatives types assesori, as essences, soap and shampoo. Another part of the agarwood trees believed to cure malaria [9;15; 22]. In Indonesia, Agarwood began actively trading since the fifth century and continued during the reign of the Dutch East Indies to the Indonesian government now. [12] . Agarwood on the market derived from forest products, and currently the production continues to decline, while demand continues to rise. Aquilaria malaccensis, a critically endangered tree species [23]. Therefore it is necessary for the cultivation of this plant in order to remain sustainable and can supply the needs of industry market [15]. One of cultivation effort is the preparation of seedlings for planting. Generative propagation through seeds requiring a relatively long time [17]. The seed germination and emergence from soil counted up to 30 days [30]. Vegetative propagation through shoot cuttings on the constraints faced the difficulty of forming roots [1]. In this study, we focus on vegetative propagation Agarwood shoot cuttings with application of growth regulators (IBA and NAA) for the continued growth of the roots. By shoot cuttings expected to be produced superior Agarwood seedling in large numbers to planting.

2. MATERIALS AND METODS

This study was conducted from April to June 2016 in Lempake Jaya Nurseries Samarinda and the Laboratory of Physiology, Development and Plant Tissue Culture, Faculty of Mathematic and Natural Science, Mulawarman University, East Kalimantan, Indonesia.

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The materials used in this study is the soil, compost, rice husk, stem cuttings Agarwood and growth regulators (IBA and NAA). Sources shoot cuttings were taken from Agarwood seedlings, from forest education Mulawarman University.

2.1 RESEARCH DESIGN

This study uses a completely randomized design factorial design consisting of two factors, and any combination is repeated eight times. Concentration of synthetic growth regulator (IBA and NAA) consists of five levels, R0: 0 ppm control, R1: 50 ppm, R2: 100 ppm, R3: 150 ppm, R4: 200 ppm. Growing media, which consists of 4 levels, M0: control (soil without fertilizer), M1: soil + rice husk (10: 1), M2: soil + compost (10: 1).

2.2 PROSEDUR

Sources shoot cuttings were taken from Agarwood seedlings. Long cuttings approximately 15-20 cm and a cut just below the petiole. The selected branch diameter of 0.5 cm. Branches that have been cut discarded leaves the bottom and 2-4 leaves are left on the shoots are cut in half. After all cuttings material available then soaked in a solution of IBA and NAA for 15 minutes. Shoot cuttings planted in the media with a depth range of 3-7 cm. Closure lid tightly resulting light does not enter directly, humidity and temperature in a high containment.Parameters measured were the percentage of live shoot cuttings, high stem, amount of shoots, leaves, roots, wet weight, dry weight and relative growth rate

2.3 DATA ANALYSIS

Data obtained in the analysis of variance (ANOVA) and if the results show a significant effect then conducted further tests with DMRT (p=0.05).

3 RESULTS AND DISCUSSION

The percentage of live cuttings Agarwood

Agarwood shoot cuttings survival rate is quite high, it is evident from the many cuttings are living at the end of observation. From the 120 material cuttings are planted agarwood , as many as 107 cuttings can survive for 8 weeks. combination treatment of media and concentration solution IBA and NAA are given a greater percentage are not the same. The results showed that the best treatment on the

percentage of life Agarwood shoot cuttings contained on media treatment of the soil with or without the provision of solution IBA and NAA compared to other media, where the percentage of live cuttings reached nearly 100% in all treatments soil media. This shows that the ground is still a lot of media contains nutrients and organic materials such as nitrogen, phosphorus, potassium, calcium, magnesium and others that are good for plant growth. In Vitro propagation, showed that MS medium with the addition of 3 mg/L IBA was the best medium for gaharu planlet growth after micrografting [36].On the other hand, research [25] reported that MS medium containing 15 g/L sucrose, 1.1 µM NAA + 2.2 µM BAP hormone combination, and a pH of 5.7 was highly effective for inducing friable callus from leaf explants of A. malaccensis for the purpose of establishing cell suspension culture. In addition to the media and hormone treatment is given taking cuttings material is still young (meristematic) is very good for plant growth, because meristematic tissue is active tissue divide. [6] states that are actively dividing meristematic tissue has the ability to grow and develop quite high (83.33 to 100%).

Increase the amount of shoots

Based observed that the treatment combination of media and solution IBA and NAA are given no effect to increase the number of shoots produced at the end of observation. Solution IBA and NAA with a concentration of 100 ppm is the optimum concentration to high accretion aloe plant cuttings. In accordance with the study [13] Rootone-F concentration of 100 mg / seedling generate the highest growth in plants Sentang with the high reaching 36-60 cm.

The amount of leaves

Table 2. *Effect of combination concentration solution IBA and NAA and media on amaunt of leaves.*

Solutian IBA+NAA	Media			Mean
	M0	M1	M2	
R0	0.66±0.66	0.66±0.33	1.66±0.33	1.00±0.33
R1	0.33±0.33	1.00±0.57	0.66±0.66	0.66±0.19
R2	0.66±0.33	1.00±0.57	1.66±0.33	1.11±0.29
R3	1.00±0.57	0.33±0.33	1.00±0.57	0.77±0.22
R4	0.66±0.33	0.33±0.33	0.33±0.33	0.44±0.11
Mean	0.66±0.11	0.666±0.15	1.0±0.26	

The treatment of aloes shoot cuttings with solution IBA and NAA with a combination of media did not significantly affect the number of leaves. This is likely due to prolonged submersion only 15 minutes causing the cuttings have not been able to stimulate plant growth regulator, causing shoots aloes been unable to form the leaves to the fullest. Accordance with the opinion [20] prolonged submersion Rootone-F to seeds cuttings affect the levels of substances that are absorbed in the seed cuttings. Consequently also affects the growth of plants, both root growth and leaf growth. Hence the growth of leaves on cuttings material derived from shoot cuttings become slower so that the number of leaves produced less. According to the study [8] of the coffee plant that solution IBA and NAA influence on cuttings immersion for 1 hour with most good growth concentration is at a concentration of 75 ppm. According to the study conducted by [8] The best treatment for the parameter is the number of leaf Rootone-F treatment with a concentration of 200 ppm which produces the highest number of leaves that is 6,18 strands. This means that the administration Rootone-F ZPT at a concentration of 200 ppm is adequate for the growing number of leaves, shoot cuttings Jabon. According to [18] that the response of plants or parts of plants to hormones given will vary depending on the type of crop, age, state of the environment, the level of physiological development, especially the content of endogenous hormones and nutrients.

The amount of Root

Table 3. *Effect of combination concentration solution IBA and NAA and media on amount of root.*

Solutian IBA+NAA	Media			Mean
	M0	M1	M2	
R0	7.00±2.08^{ab}	4.33±0.88^{ab}	4.66±1.20^{ab}	5.33±0.84^{a}
R1	8.66±0.88^{ab}	7.66±1.85^{ab}	3.66±1.45^{ab}	6.66±1.53^{a}
R2	5.33±1.45^{ab}	10.00±0.58^{b}	5.66±3.71^{ab}	7.00±1.50^{a}
R3	6.33±1.45^{ab}	8.00±3.51^{ab}	7.33±3.84^{ab}	7.22±0.48^{a}
R4	5.33±0.88^{ab}	5.00±1.53^{ab}	3.00±0.58^{a}	4.44±0.73^{a}
Mean	6.53±0.619^{a}	7.00±1.04^{a}	4.86±0.76^{a}	

The highest number of roots found in soil media + rice husk with solution IBA and NAA awarding at a concentration of 100 ppm as many as 10 roots (Figure 5). At concentration of 100 ppm is the optimum concentration for the growth of roots shoot cuttings aloes. It is appropriate according to [5] Award Rootone-F can stimulate the formation of root cuttings of the plant Theobroma cacao and Eucalyptus sp. at a concentration of 100 mg / ml water. The root growth response to growth cuttings aloes. Accordance with the opinion [2] which states that the optimal auxin levels will spur growth and early root development. The optimal concentration has also been confirmed by a study [28] the use of growth regulators Rootone-F on plants pulai ivory (Alstonia scholaris) at a dose of 60 mg. Plant growth regulators Rootone-F provide the best results for growth and development of shoots and roots cuttings ivory.

Wet weight

The results showed significantly affect the weight of the wet end of the crop with the highest value contained in the media's treatment of land with a concentration of 200 ppm and soil media + rice husk with solution IBA and NAA concentration of 100 ppm is 1.395 g and 1.389 g (Table 4).

Table 4. *Effect of concentration solution IBA and NAA and media on wet weight.*

Solutian IBA+NAA	Media			Mean
	M0	M1	M2	
R0	1.29±0.10^{ab}	1.09±0.23^{ab}	1.14±0.05^{ab}	1.18±0.06^{a}
R1	1.26±0.07^{ab}	1.14±0.08^{ab}	1.28±0.11^{ab}	1.22±0.44^{a}
R2	1.37±0.12^{ab}	1.39±0.20^{b}	1.28±0.09^{ab}	1.35±0.35^{a}
R3	1.24±0.60^{ab}	1.37±0.15^{ab}	1.06±0.00^{a}	1.23±0.09^{a}
R4	1.39±0.02^{b}	1.27±0.03^{ab}	1.17±0.08^{ab}	1.28±0.07^{a}
Mean	1.31±0.32^{a}	1.25±0.06^{a}	1.184±0.41^{a}	

This suggests that the combination of media and giving solution IBA and NAA has been able to increase organic and inorganic substances in a plant cell. Giving auxin when the study was a bit much though not optimum effect on plant growth. According to [19] auxin will increase the content of organic and inorganic substances in the cells. Further substances it will be converted into proteins, nucleic acids, polysaccharides and other complex molecules. Such compounds will form tissues and organs, so the wet weight of the seeds will increase. [7] stated auxin plays a role in cell elongation. Cell elongation is especially true in the vertical direction. This will be followed by elongation of cell enlargement and the increasing wet weight. The increase in wet weight is mainly caused by increased water uptake by these cells.

Dry weight

The mean of weight of the dry end of the plant can be seen in Table 5.

Table 5. *Effect of Rootone-F and Multiple Media Against Plant Dry Weight Final Observations After 8 Weeks.*

Solutian IBA+NAA	Media			Mean
	M0	M1	M2	
R0	0.24±0.04	0.25±0.06	0.39±0.08	0.29±0.05
R1	0.23±0.06	0.19±0.05	0.24±0.10	0.22±0.02
R2	0.22±0.06	0.25±0.57	0.30±0.03	0.26±0.02
R3	0.35±0.10	0.31±0.39	0.33±0.04	0.33±0.01
R4	0.33±0.05	0.26±0.02	0.22±0.05	0.27±0.033
Mean	0.27±0.03	0.25±0.02	0.30±0.03	

Based on the research results of aloes shoot cuttings showed no significant difference on the final dry weight of the plant. The dry weight of the aloe plant is the result of the heavy representation of aloes shoot cuttings moist without water content. Plant dry weight is strongly influenced by the process of photosynthesis in plants, occurs on the leaves with the help of sunlight. Results of the study showed aloes shoot cuttings solution IBA and NAA awarding and media combination not provide maximum results. It is likely influenced by the length of cuttings and leaves at the end of the study the different effect on plant dry weight. Cutting treated with 0 g/L IBA was the best PGR to produce higest rooting success, numer of root former, root lengt, shoot percentage and numer of shooth produced (29). In accordance [3] long cuttings and leaves of different have different growth factor content of carbohydrates, nitrogen and auxin are very instrumental to the growth of shoot cuttings, especially the growth of roots and shoots. There might also be influenced by the growth of roots, stems and leaves are less than the maximum research aloes shoot cuttings impacting plant dry weight. Thus, all the factors that influence the initiation and growth of roots, stems and leaves influenced the final total dry weight of the plant. The dry weight of the plant is a result of three processes, namely the accumulation of assimilates through photosynthesis, respiration and decrease assimilate due to the accumulation of food reserves. According to [2] the dry weight of the plant is a balance between taking CO_2 (photosynthesis) and release CO_2 (respiration). If respiration is greater than the process of photosynthesis, the plants will be reduced dry weight.

Relative Growth Rate (RGR)

Mean Relative Growth Rate can be seen in Table 6.

Table 6. *Effect of combination concentration solution IBA and NAA and media on Relative Growth Rate (LPR).*

Solutian IBA+NAA	Media			Mean
	M0	M1	M2	
R0	0.009±0.002	0.009±0.004	0.017±0.003	0.011±0.002
R1	0.007±0.004	0.004±0.003	0.006±0.006	0.006±0.008
R2	0.006±0.005	0.009±0.004	0.013±0.001	0.010±0.002
R3	0.014±0.005	0.013±0.002	0.014±0.002	0.014±0.003
R4	0.014±0.002	0.011±0.001	0.006±0.004	0.010±0.002
Mean	0.009±0.002	0.009±0.004	0.017±0.003	0.011±0.002

The combination of media and giving solution IBA and NAA have not been able to increase the relative growth rate of plants and possibly also caused by genetic or environmental factors. Suspected environmental factors closely related to the nutrients absorbed and the distribution of nutrients to the various organs of plants. It is likely that the time spent in a very short time of the study led to the plant can not absorb nutrients properly so that treatment solution IBA and NAA awarding and the combination of growing media is not so noticeable and causes the relative growth rate has not been observed to the fullest. [4] states that the decline in the relative growth rate for growth due to the allocation of storage distribution kolosintat the canopy and roots. [11] states that the decline in the supply of nitrogen is closely related to the ratio of leaf area resulting in a lowering relative growth rate. Provision of growth regulators on cuttings aloes research does not respond to relative growth rate, due to the concentration of 50 ppm showed the lowest value. The growth rate of the plants affected by net assimilation rate and leaf area index. Net assimilation rate is high and optimum leaf area index will increase the rate of plant growth [2]. Results of research showed that high bulge stem diameter and average agarwood plant on a combination of media treatment plant land-sand-compost dry leaves results show that most high is 2.42 cm, and most of that is 1.34 mm in the week to 18 . Growing number of agarwood plant leaves have a tendency not show significant results.This research is expected to contribute in developing the cultivation and preservation of gaharu are ready to plant in the field [27].

4 Conclution

The interaction between the media and Rootone-F effect on the growth of the cuttings. The average number of roots highest one is at the media's treatment of land + rice husk with a concentration of 100 ppm at 10 roots.

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