



## TECHNIQUES FOR MASS DEVELOPMENT OF BAMBOO BETUNG (*DENDROCALAMUS ASPER* BACK.) USING BRANCH CUTTINGS

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### Abstract

Betung bamboo (*Dendrocalamus asper* Back.) is a bamboo species that is widely used by the community as a substitute for the function of wood. Research on the vegetative propagation of Betung bamboo until now still gives different results. This study aims to determine the treatment of the hormone Rootone-F concentration and the right growing media for planting bamboo betung. The first factor is the concentration of the hormone Rootone-F which consists of 4 levels, namely: (without hormones), 200 mg / L, 400 mg / L, and 600 mg / L. The second factor is the planting media which consists of 4 levels of comparison between Top soil and compost, that is: Top soil (mo), 1: 1 ratio, 1: 2, and 2: 1. Growth variables observed were number of shoots, shoot length, number of leaves and root volume. The results showed that the treatment of the hormone Rootone-F 400 mg / L planted in mixed of top soil and compost with a ratio of 1: 2 gave the best results for the growth of betung bamboo branch cuttings.

**Keywords :** Betung bamboo, Rootone-F, cutting, growth.

### Introduction

In general, bamboo has several advantages over wood, namely a small shrinkage ratio, has a higher elasticity, and decorative value (Novriyanti, 2005; dalam Arsad, 2014; Hartanti, 2010). All parts of bamboo can be used which includes the roots, stems, twigs and leaves, so that bamboo is categorized as a multipurpose tree species (Eskak and Paramadharma 2016; Yani, 2014; Sukawi, 2010). Young bamboo (bamboo shoots) are used as food and traditional medicine, while bamboo roots are useful for preventing erosion, filtering harmful substances in the soil (Tan, 2008). Bamboo is also a fast growing plant and has a relatively short cycle of 3-4 years which can be harvested (Tan, 2008; Pangestika, Pertumbuhan Propagul Bakau). One type of bamboo that is widely used by the community is Bamboo Betung (*Dendrocalamus asper* Back.), among others: as home building materials, bridge infrastructure, household furniture, charcoal materials, and various other uses of infrastructure as a substitute for the function of wood (Hartanti, 2010; Sukawi, 2010).

Bamboo can be propagated vegetatively and generatively (Paembonan and SHL, 2019). However, generative propagation takes a long time because bamboo is one type of plant that rarely blooms, and bears fruit or seeds. Flowering bamboo takes six to seven months for the fruits and seeds to be physiologically mature (Tan, 2008; Sutiono, 2010).

Bamboo propagation can be done vegetatively by using branch cuttings, stem cuttings and rhizoma cuttings. Propagation of betung bamboo with rhizome cuttings and stem cuttings is rarely done because the number of plant material obtained is relatively small and requires a long time. Branch cuttings are the most effective way because it does not damage the bamboo clump, the formation of clumps is faster, the process is easy, does not require a long time and cuttings material can be obtained in large quantities (Sari *et al.*, 2016).

In order to support the development of bamboo betung plants widely, the government through the Ministry of Forestry is planning mass bamboo planting in community forests and production forests. The problems faced in bamboo cultivation is the fulfillment of plant materials from the vegetative part of the bamboo. One effective way to meet the demand for bamboo cutting materials in bulk and to provide a lot of material cuttings is through vegetative propagation with bamboo branch cuttings (Ministry of Forestry 2007; Sumiasri and Indarto, 2001).

The problem that is commonly found in vegetative propagation of bamboo is the difficulty of stimulating the growth roots on cuttings. Therefore the research was carried out the effect of the concentration of the Rootone-F hormone to stimulate the growth of the roots of the betung bamboo branch cuttings in the appropriate mixed planting media.

### Materials and Methods

The research was carried out at the Permanent Nursery Center for Forest Plant Seedlings in Gowa Regency, South Sulawesi from January to March 2020. Bamboo cuttings were obtained from betung bamboo trees in Gowa Regency, one kilometer from the nursery, which are 2 years old. Cuttings are taken from the base of the branches including 2 sections of the branches. All cuttings were soaked in a solution of the hormone Rootone-F for 2 hours.

Media for planting consisting of a mixture of topsoil and compost prepared in polybags which size of 20 cm x 25 cm. All cuttings that have been soaked in a solution containing the hormone Rootone-F were putted into a poly bag containing media in a vertical position, where 1 segment is inserted into the ground and 1 other section above the ground level. All cuttings arranged in a polybag then put in a plastic lid to maintain air humidity. Bamboo cuttings were watered every day to maintain soil media moisture in field capacity conditions.

The treatment of the hormone Rootone-F, consists of 4 levels of concentration, namely: h0 (0 mg / L) as a control,

h1 (200 mg / L aquadest), h2 (400 mg / L), and h3 (600 mg / L). The prepared soil media consists of a mixture of top soil and compost with the ratio of each: m0 (only top soil as a control); m1 (1: 1); m2 (1: 2); and m3 (2: 1). There are 16 combinations of treatments between hormone concentration and growing media with 5 replications.

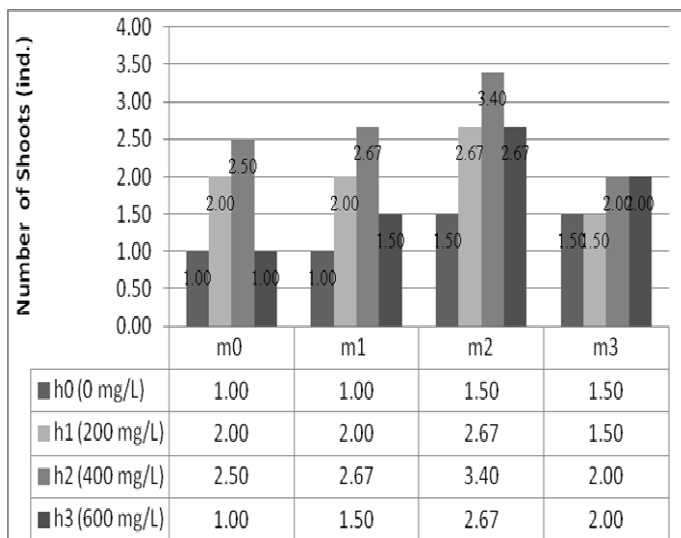
The variables observed were: percentage of branch cuttings, shoot length, number of shoots, number of leaves, and root volume (cm<sup>3</sup>).

**Data Analysis**

The data obtained were analyzed by Analysis of Variance using SPSS-16 program. If there is an influence of different treatments given, then further tests are done using the Tukey Test (Sumiasri N and Indarto N S 2001).

**Results and Discussion**

**Number of Shoots :** Data from the average number of shoots for each treatment is shown in Figure 1.



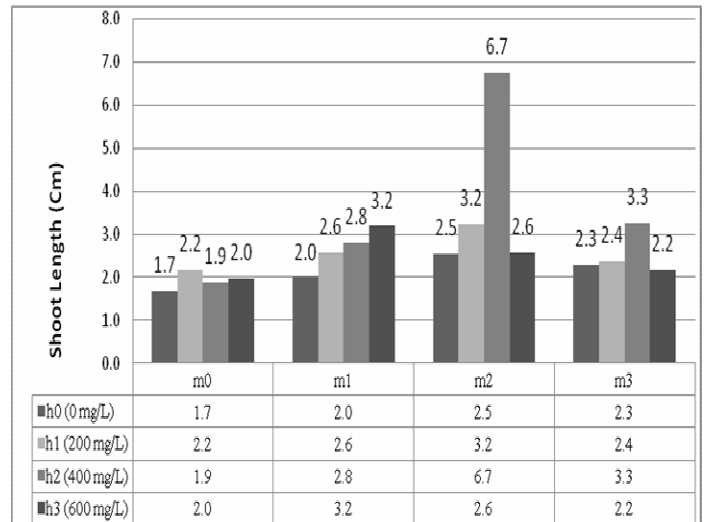
**Fig. 1 :** Average Number of Bamboo Betung Cuttings Shoots

The results of the analysis of variance showed that the hormone Rootone-F treatments with different concentrations gave a significant effect on the number of shoots. Rootone-F hormone treatment with a concentration of 400 mg / L gives the highest number of shoots with an average value of 2.64. Tukey test results showed significant differences (p> 0.05). The treatment of growing media with a ratio of top soil to compost (1:2) shows the highest average number of shoots that is 2.56 compared to other treatments. Tukey Test results showed a significant difference (p> 0.05).

**Shoots length**

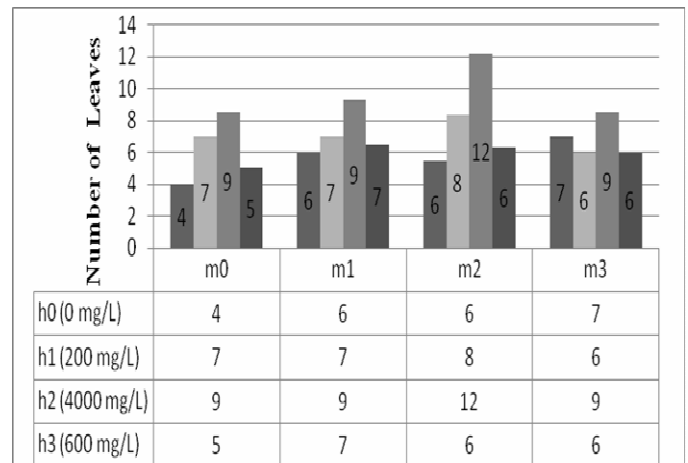
The average value of shoot length for each treatment showed that the combination treatment of h2m2 gave the highest increase with an average value of 6.7 cm. Tukey Test Results for the Interaction of hormone treatment and growing media showed a significant difference (p> 0.05).

The treatment of 400 mg / L hormone interaction with the growth media of top soil and compost of 1 to 2 was the best result that significantly affected the length of betung bamboo shoots (p> 0.05).



**Fig. 2 :** Histogram of Average Length of Betung Bamboo Cuttings Shoots

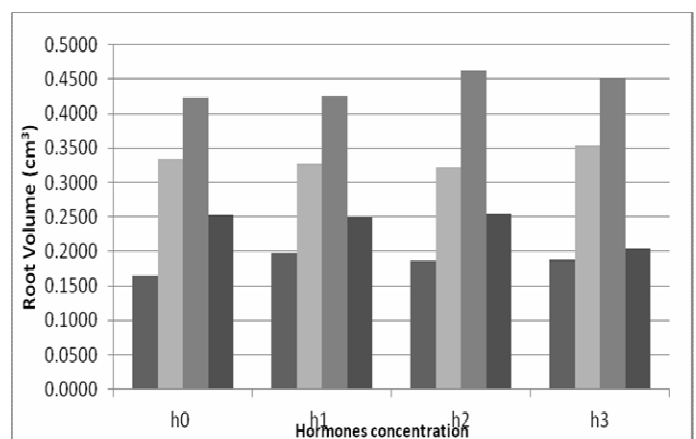
**Number of Leaves :** The average response to the number of leaves for the treatment of the hormone Rootone-F concentration is shown in Figure 3.



**Fig. 3 :** Effect of Concentration of Rootone-F Hormone on the Number of Betung Bamboo Leaves

The concentration of hormones h2 (400 mg/L) treatment gave the highest number of leaves with an average increase was 9.63 leaves. Tukey test results showed a significant effect on p> 0.05.

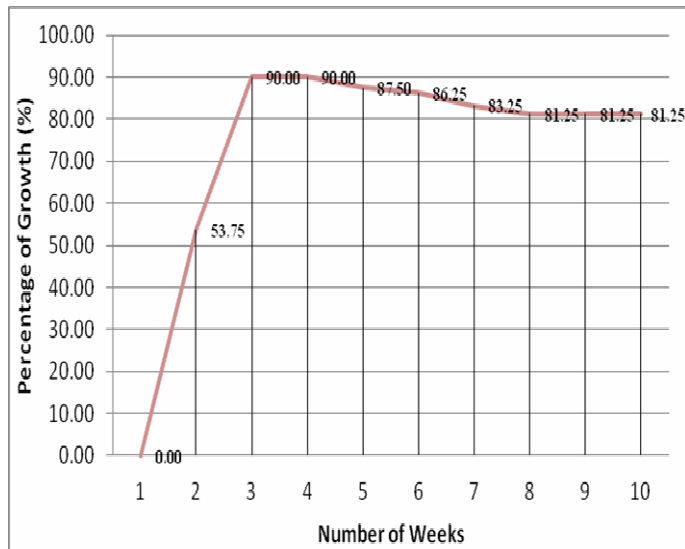
**Root Volume :** The average response of root volume to the treatment of the hormone Rootone-F concentration in Figure 4.



**Fig. 4 :** Effect of Rootone-F Hormone Concentration on Average Root Volume of Betung Bamboo Cuttings After 10 Weeks

Figure 4 shows that the treatment of Rootone-F 400 mg/L and m2 media has the highest root volume with an average of 0.4627 cm<sup>3</sup>, while h0m0 treatment gives the lowest root volume which is 0, 1658 cm<sup>3</sup>. Tukey test results of the effect of the concentration of hormones on the volume of bamboo root showed a significant effect ( $p > 0.05$ ).

**The percentage bamboo cuttings growth :** Percentage of growth of betung bamboo branches from the first week to the tenth is shown in Fig.5.



**Fig. 5 :** Graph of growth percentage of bamboo betung branch cuttings for 10 weeks

The cuttings began to shoot out in the second week and continued to increase until the 3<sup>th</sup> week. The increase in the growth number of cuttings was due to the food reserves that were still stored in the cuttings so that it encouraged growth until the 6<sup>th</sup> week of 86.25%. However, starting on the 7<sup>th</sup> week the number of live cuttings began to decrease to 81.25% and then showed a stable amount of growth until the tenth week. Lack of water supply to the leaves occurs in the 6<sup>th</sup> week because some cuttings have not produced roots to absorb water from the soil so that the transpiration rate is higher than the rate of absorption of water despite in adequate groundwater conditions (Nio S A and Torey P 2013).

## Discussion

### Growth regulator

Rootone-F contains several active ingredients to stimulate cell division and root production at the base of cuttings, while Tetramethylthiamin (thiram) is 4% which functions as a fungicide to prevent fungal attacks (Cahyadi and Iskandar, 2017).

The results showed that the application of the hormone Rootone-F with a concentration of 400 mg / L showed better growth. Giving a hormone with a concentration of 400 mg/L is the optimum amount of hormone in supporting the growth of bamboo betung cuttings, and the higher will suppress the growth of cuttings.

Giving hormones at the right concentration is very important in cell differentiation, but the higher can be toxic which can reduce plant growth (Sudomo, Aris, Rohandi A and Mindawati, 2013), conversely, if giving hormones with low concentrations makes the rooting time become longer (Cahyadi and Iskandar, 2017). Bamboo cuttings are also

known as one of the plants that is difficult to deliver roots, so the cuttings shoots always grow earlier than the roots. This results in being lacking in water supply due to the absence of roots at the seven week to absorb water from the soil and high water demand by leaves due to the higher transpiration rate (Nio and Torey, 2013).

### Growing Media

The growth of shoot cuttings is influenced by growth media factors, the type of cuttings, the position of cuttings in the parent plant, and others (Adinugraha, 2011). The right type of growth media for cutting growth is of concern, as the growing media has good water binding capacity. (Arfah *et al.*, 2016; Danu and Subiakto, 2015). The main requirement for solid growing media is to be well-drained and aerated, and sterile (Danu and Subiakto, 2015; Agroteknologi, 2017).

Compost or manure can improve soil physical properties such as soil permeability, soil porosity, soil structure, water holding capacity and soil cation. The use of compost as a planting medium can increase the composition of soil microorganisms and facilitate the growth of plant roots (Roidah, 2013). The results showed that the combination of planting media with a ratio of top soil to compost of 1:2 was the best combination of media results on all variables measured. The number of leaves on cuttings is one of the important indicator in plant growth. (Sudomo *et al.*, 2013) states that plants that have more leaves at the beginning of growth will grow faster because the ability to produce photosynthesis is higher than cuttings that have the less number of leaves.

The combination treatment of Rootone-F hormone with a concentration of 400 ppm with soil media which the comparison of top soil to compost of 1:2 is the best result in producing the bamboo roots, because the nutrient content in compost and the hormone Rootone-F is very helpful in root initiation in cuttings. This is consistent with the statement (Tan, 2008) that high carbohydrate content and sufficient nitrogen will form vigorous roots and shoots (Larekeng *et al.*, 2020).

Roots in cuttings are formed adventitiously from cambium and part of nodes that are formed due to injury and roots are formed from parenchymal tissue (Qalbi *et al.*, 2019). The number of roots will lead to optimal absorption of nutrients and water so that the physiological process will proceed well to stabilize the growth and development of cuttings in forming a perfect plant (Nio and Torey, 2013; Mulyani, 2015).

The use of compost and top soil media for cuttings growth is a good choice of media for cuttings growth because compost fertilizer has a variety of macro and micro nutrient content needed for plant vegetative growth (Arfah *et al.*, 2013). Therefore the use of this type of media is very important to support the growth of plant cuttings.

## Conclusion

In the context of mass propagation of bamboo betung (*Dendrocalamus asper* Back.) cuttings, the treatment of the hormone Rootone-F with a concentration of 400 mg/L gives the best growth results, and an appropriate planting medium is in the ratio of 1:2 of soil to compost.

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