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THE EFFECT OF BAP AND THE LEVEL OF AGING STEM ON THE GROWTH OF PINEAPPLE (*Ananas comosus* (L) Merr) STEM CUTTING

Fitriana Nasution and Sri Hadiati
Indonesian Tropical Fruit Research Institute, Jl. Raya Solok Aripan, West Sumatera, Indonesia
E-Mail: emon_delpiero@yahoo.com

ABSTRACT

A research was conducted to find out the effect of BAP and the level of aging stem on the growth of pineapple (*Ananas comosus* (L) Merr.) stem cutting from March to June 2009, at Indonesian Tropical Fruit Research Institute (ITFRI), Solok, West Sumatera. The experiment was arranged in factorial randomized block design with 5 replications. Two treatments applied were BAP (0; 100; 300; 500 ppm) and the level of aging stem (young stem; old stem). The Pieces of the stems was soaked into BAP solution in accordance with the treatment for 3 minutes and then dried. Based on the results of observation, it was found that all treatments have not significantly effect to all parameters. From the observation, it is also known that every stem cutting has the ability to produce shoots. Probably cutting requires longer time soaking BAP (> 3 minutes).

Keywords: pineapple, cutting, BAP, stem.

INTRODUCTION

Pineapple (*Ananas comosus* (L.) Merr.) is one of the essential commodities of tropical fruit. Pineapple belongs to the Bromiliaceae family, from which one of its most important health-promoting compounds, the enzyme bromelain, was named. Pineapple has contributed 8% of the world fresh fruit production, and Indonesia is the third largest country which produces processed pineapple and fresh pineapple after Thailand and the Philippines (FAOSTAT, 2002).

Pineapple can be propagated vegetatively and generatively. Plant materials for vegetative propagation can be in the form of shoot, slip, crown, stem, and leaves cutting. For species that can be propagated easily by cuttings, this method has numerous advantages. Many new plants can be started in a limited space from a few stock plants. It is inexpensive, rapid, and simple, and does not require the special techniques necessary in grafting, budding, or micropropagation. There is no problem of incompatibility with rootstocks or of poor graft unions. Greater uniformity is obtained by absence of the variation which sometimes appears as a result of the variable seedling rootstocks of grafted plants. The parent plant is usually reproduced exactly, with no genetic change (Hartman *et al*., 1990). It is easier to perform than *invitro* tissue culture, and after out-planting into the nursery, tissue culture plantlets need higher levels of subsequent care (i.e., photoperiod and temperature maintenance, subculturing) than plants derived from stem cuttings (Soni, 2010). Many mutans can be obtained from such tissue cultures (Wakasa *et al*., 1798).

Growth regulators are man-made phytohormones. Some have the same chemical structure as natural phytohormones, whereas others are closely related chemically to those natural substances. As with the phytohormones, they are placed in one of two groups: (1) compounds which promote plant development and (2) compounds which retard or inhibit growth and development (Edmont *et al*., 1987). Various classes of growth regulators, such as auxins, cytokinins, gibberellins, and ethylene, as well as inhibitors, such as abscisic acid and phenolics, influence root initiation (Hartman *et al*., 1990).

Therefore, the research was coducted to find out the effect of BAP and the level of aging stem on the growth of pineapple stem cuttings.

MATERIALS AND METHODS

The research was conducted from March to June 2009, at Indonesian Tropical Fruit Research Institute (ITFRI), Solok, west Sumatera. The experiment was arranged in factorial randomized block design with 5 replications. Two treatments applied were BAP (0; 100; 300; 500 ppm) and the level of aging stem (young stem; old stem).

The stem was harvested. It was cleaned from leaves and roots which covered them. Furthermore, the stem was cut on crosswise and each piece was cut into two parts. The Pieces of the stems was soaked into BAP solution in accordance with the treatment for 3 minutes and then dried. For the level of aging stem which included categories of young stem was the color of stem still creamy and the stem was not covered by roots. The categories of old stem were dark brown color stem and the stem was covered by roots. Stem cuttings were planted with the position of the back facing up in the seedbed containing medium sand, then covered with 1 cm thick sand media. Spacing of each cuttings was about 5 cm. The sand used was river sand that has been cleared of stones. Observation was conducted at 3 months after treatment on time of shoots emergence, shoots percentage, number of shoots, number of leaves, and shoots height. Collected data were analyzed using Analysis of Variance (Anova) followed by 5% HSD test.

RESULTS AND DISCUSSIONS

Mean value of time of shoots emergence, shoots percentage in different treatments are presented in Table-1.

Table-1. The effect of BAP and the level of aging stem on number of shoots, number of leaves, and shoots height.

Treatment	**Time of shoots emergence** (day)	**Shoots percentage** (%)
BAP		
B_0 = without BAP	34.50 a	51.92 a
B_1 = 100 ppm	35.00 a	38.44 a
B_2 = 300 ppm	35.90 a	54.86 a
B_3 = 500 ppm	28.70 a	45.00 a
T (The level of aging stem)		
T_0 = young stem	34.70 a	54.51 a
T_1 = old stem	32.35 a	40.60 a

*Means in the same column followed by the same letter are not significantly different at 5% HSD test.

The statistical analysis showed that there is not interaction between BAP and the level of aging stem. BAP and the level of aging stem are not significantly effect on time of shoots emergence and shoots percentage. Giving BAP until 500 pm was not significantly effect on time of shoots emergence and shoots percentage because the timing of soaking stem in BAP solution was too short about 3 minutes. Probably cuttings require longer time soaking BAP (> 3 minutes).

On *Rhizophora mucronata*, hypocotyl cuttings were soaked in the 500 ppm solution for 24 hours (Mulyani, *et al*., 1999). To improve the growing bud capability of branch cutting material of Bamboo hitam (*Gigantochloa atroviolacea* Widjaja) was done by soaking the materials in the 5000 ppm hormone IBA solution for 2 hours prior to be immersed in the cultivating medium (Saefudin and Rostiwati, 2010). To determine the growth regulators on shoot regeneration at kiwifruit, the root cuttings were soaked in benzylaminopurine (BAP; 75 mg/litre) for 24 hours (Lawes and Sim, 1980). On *Curcuma alismatifolia*, for breaking bud dormancy of rhizome, the rhizomes were soaked into the sterilized BAP for 30 minutes (Thohirah *et al*., 2010).

Another possibility why the BAP did not significantly affect all the observations, was BAP need to be combined with other plant growth regulators. Combination of BAP and activated charcoal had a significant effect on the number of shoots at *Piper ningrum* (Abbasi *et al*., 2010).

Every stem could produce shoots at 28.70 - 35.90 days and value of shoots percentage about 40.60 - 54.86. Every stem cutting has the ability to produce shoots. The level of aging stem was not significantly effect on all parameters because the stem of pineapple has axillary meristems. The stem bears apical and axillary meristems. In the vegetative stage the terminal meristem is shaped like a rather broad dome. The tunica only comprises one layer of cells, whereas the corpus is made up of 1 to 3. A group of cells in the axis of each leaf retains its meristem character and subsequently give rise to axillary buds. These buds later take different forms depending on the portion of the stem from which they arise. They are covered by a sheath in the shape of a hood and several leaf scales. Their meristems are identical in shape to the terminal meristem during its vegetative stage (Py *et al*., 1987).

Values of number of shoots, number of leaves, and shoots height based on statistical analyses for the treatments are presented in Table-2.

Table-2. The effect of BAP and the level of aging stem on number of shoots, number of leaves, and shoots height.

Treatment	**Number of shoots**	**Number of leaves**	**Shoots height** (cm)
BAP			
B_0 = without BAP	1.150 a	10.34 a	7.272 a
B_1 = 100 ppm	0.082 a	8.051 a	6.596 a
B_2 = 300 ppm	1.092 a	10.50 a	7.550 a
B_3 = 500 ppm	0.991 a	8.220 a	5.320 a
T (the level of aging stem)			
T_0 = young stem	1.118 a	10.19 a	7.788 a
T_1 = old stem	0.085 a	8.372 a	5.582 a

*Means in the same column followed by the same letter are not significantly different at 5% HSD test.

The data showed that treatments were not significantly effect on number of shoot, number of leaves, and shoots height. According to Weerasinghe and Siriwardana (2006), each stem resulted in 20-25 slices in 2cm length. Out of 200 tested stem slices 158 slices or 76% were survived and produced suckers.

Value of Bud height had variation between 5-7 cm. Weerasinghe and Siriwardana (2006) said that at three months after the sucker emergence they developed up to 7-10 cm in length. In the secondary nursery they developed faster and achieved 15-20 cm height at the end of the fourth month.

Actually, the success of cutting propagation depends on many variables incorporated into the process; these include nutritional status of the stock plant, hormone level, juvenility of the stock plant, and environmental factors (Acquaah, 2005; Sutanto, 2010).

CONCLUSIONS

- All treatments were found to have not significantly effect to all parameters;
- Every stem cuttings has the ability to produce shoots; and
- Probably cuttings require longer time soaking BAP (> 3 minutes).

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