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Different Planting Media in *Barangan* Banana (*Musa Acuminata Colla*) Breeding in Southeast Aceh

***Nico Syahputra Sebayang*[1], *Diah Eka Puspita*[2], *and Surya Basri*[1]**

[1]*Agrotechnology, Gunung Leuser University, Kutacane*
[2]*Agrotechnology, Abulyatama University, Banda Aceh*

Abstract. Many banana plants in Indonesia have been cultivated by the community, one banana plant that has a high potential and has a chance to be developed is barangan banana (Musa acuminata Colla). The aim of this study *is* to find out the response of the growth of banana suckers using different planting media. This study was conducted in Kumbang Jaya Village of Badar District of Southeast Aceh Regency, which took place from April to June 2017. A non factorial randomized block design (RBD) consisting of 3 levels of treatment with 4 replications was used as a research design in this study. The level of treatment is PM1: soil without mixture, PM2: soil + manure + sand (1: 1: 1) and PM3: soil + husk + sand (1: 1: 1). Parameters observed were plant height aged 2, 4, 6 and 8 weeks after planting (WAP), stem diameter aged 2, 4, 6 and 8 WAP and number of leaves aged 2, 4, 6 and 8 WAP. The results showed that different planting media had a very significant effect on plant height at 8 WAP, number of leaves aged 6 WAP and significantly affected the stem diameter of 8 WAP. But the effect was not significant on plant height aged 2, 4 and 6 WAP, stem diameter aged 2, 4 and 6 WAP and the number of leaves aged 2, 4 and 8 WAP. For plant height, stem diameter and number of leaves aged 2, 4 and 6 WAP, the growth produced by each treatment tends to be the same.

Keywords: banana suckers, growing media, growth

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1. Introduction

Bananas (*Musa paradisiaca*) are fruits that contain various types of vitamins, minerals and carbohydrates. Bananas can be divided into four types includingdessert banana that are eaten fresh after the fruit is ripe, plantain bananas that are eaten after being processed, seeded bananas that are used by the leaves and bananas that are taken by fiber [1]

Bananas provide high energy that is equal to 91 kca/100g of ingredients [1] compared to other fruits. Carbohydrates of bananas can supply energy faster than rice and biscuits, thus many sports athletes consume bananas when pausing to replace their drained energy.The quality of bananas is determined by the degree of aging, the cleanliness, the shape, the presence or the

*Corresponding author at: Agrotechnology, Gunung Leuser University, Kutacane Bambel, Kabupaten Aceh Tenggara, Aceh 24651

E-mail address: sebayangns@gmail.com

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absence of sticky fruit or loose fruit, and the pest or thw disease [2] Young bananas are a source of fiber in human food.

Barangan banana is a type of banana that is very well known as dessert banana. The characteristics of *Barangan*banana are straight fruit shape and have round base. The length of the fruits are 12-18 cm and their diameter are 3-4 cm. The other characteristics can be seen from the peels and the flesh. The color of the peels is yellowish red with brown spots and the flesh color is orange.The taste of fruit flesh is also delicious and the aroma is fragrant [3].

Bananas can grow in the tropics both in the lowlands and highlands with an altitude of not more than 1,600 m above sea level (asl). The optimum temperature for growth is 27° C, and the maximum temperature is 38 ° C, andthe soil acidity (pH) is 4.5-7.5. The rainfall is 2000-2500 mm/year or at least 100 mm/month.When a region has a dry consecutive month of more than 3 months then banana plants need additional irrigation to grow and to produce well. [5].The appropriate topography of the banana plant is a flat land with a slope of 8º. The land is located in the tropics between 16ºN-12º'S. Table 1 shows the area of banana plants in Southeast Aceh Regency (1000 asl, 4° 22'14,42 "-4 ° 42'40,8" N and 96 ° 15'23,6 "-96 ° 22'10 , 76 "E).

Table 1. Banana plant area in Southeast Aceh Regency

No	District	Plant Area (Ha)	Harvest Area (Ha)	Productivity (Ton/Ha)	Production (Ha)
1	Lawe alas	1,113	90	0.07	6.30
2	Babul rahmah	6,523	150	0.07	10.50
3	Tanoh alas	1,235	95	0.06	5.70
4	Lawesigala-gala	1,096	80	0.07	5.60
5	Babul makmur	625	65	0.06	3.90
6	Semadam	2,382	110	0.06	6.60
7	Leuser	1,177	200	0.07	14.00
8	Bambel	891	92	0.06	5.52
9	Bukit Tusam	1,049	140	0.06	8.40
10	LaweSumur	950	30	0.06	1.80
11	Babusalam	960	107	0.07	7.49
12	LaweBulan	1,636	108	0.07	7.56
13	Badar	2,278	130	0.06	7.80
14	Darul Hasanah	2,300	123	0.07	8.61
15	Deleng Pokhisen	2,430	103	0.06	6.18
16	Ketambe	2,130	149	0.07	10.43
	Total	**28,775**	**1,772**	**0.07**	**116.39**

To get the land as a media for planting is getting very hard nowadays. In addition, to maintain environmental sustainability, the use of land as a growing medium must be careful [7]. According to [8], a plant growth media is one of the factors that must be considered because it affects the growth and development of plants to get optimal results. The author also added that a media which was good for plant growth must have a good physical properties, loose and have

the ability to control the water capacity. The physical condition of the soil is very important for the life of the plant to become an adult plant.

The use of organic materials which are mixed with soil and certain comparisons are expected to increase plant growth. The addition of organic matter to the growing medium has a large role in improving the physical, chemical and biological properties of the soil which will affect growth of the plant. In addition, organic materials as well as energy and micro food sources can increase microbial activity and supply of plant nutrients. [9].

The ideal planting medium for plants is fertile, loose, aerated quite well, and well drained.In 1996, the research about the use of rice husks as a medium for seeding tea cuttings has been conducted. The results showed that a good mixture as a growing medium for tea cuttings was 85% rice husk mixed with 15% topsoil or 75% rice husk mixed with 25% topsoil [10]. This study aims to determine the response of the growth of barangan banana seeds (Musa acuminataColla.) Using different soil media.

2. Materials and Methods

2.1. Materials

The tools used were hoes, machetes, watering can, a tape measure, rope, saw, nail, hand sprayer, bucket/basin, stationery. The materials used were *Barangan* Banana seeds, soil, polybag, paranet.

2.2. Time and Location of the Research

This research was conducted at the Horticultural Seed Agency of the Agricultural Department of Kumbang Jaya Village, Badar District, Southeast Aceh Regency. Flat land topography with an altitude of approximately 245 at sea level. This research was conducted from April until July 2017.

2.3. Methods

A non-factorial randomized block design (RBD), with the differences observed are Planting Media (PM) which consists of 3 levels was used in this study and the factors to be examined are:

PM1 = soil without mixture

PM2 = soil, goat droppings, sand (2: 1 : 1)

PM3 = soil, rice husk, sand (2 : 1 : 1)

The results of the study that show the real effect will be continued with Tukey's Honest Significant Difference(HSD) test at the level of $\alpha = 5\%$.

Banana suckers that would be planted are suckers of 20-40cm in size (newly planted suckers or small shoots from the base of a banana plant). They could be done by separating the suckers from healthy mother banana plants in the field. Sseparating the newly planted suckerswere done carefully by using a wide-eyed crowbar.

The area used as the place of research was first cleaned of weeds and other plant pest that could interfere when conducting research.Cleaning could be done manually or using agricultural tools and machines.

Shade was made with west-east direction where it was eastward with a height of 2.10 m and west direction 2.10 m. It was also made using paranet, arranged in such a way, 13 m long and 10 m wide. The purpose of shading was to avoid rain and direct sunlight.

Before the banana that were still in the form of suckers are planted in the nursery medium, they were first dried for 24 hours.The goal was to dry the sap at the base of banana rhizome or corm.Furthermore, the suckers that had been prepared were treated by immersing them in a Dithane M-45 fungicide solution for 2 hours. While waiting for the suckers to be soaked, a planting hole was prepared in the polybag. Then they were inserted into the planting hole in an upright position and planted to a distance of 5-10 cm above the base of the soil, then covered with a polybag. Furthermore, the polybag line was re-arranged according to the research plan.

Sample plants were representative plants of each research plot used as material for measuring the variables studied. The plants were determined randomly without neglecting other plants. The large number of sample plants per plot was 6 plants. There are three parameters would looking: Stem diameter (mm); the diameter of the stem of a young banana was measured after the plant was 2 weeks old after being planted in a polybag. Measuring the diameter of the stem was done using calipers. The measurement was then carried out every 2 weeks until the fourth observation. Number of leaves; the number of banana leaves was calculated when the young bananas are 2 weeks after the plant, with a time interval of 2 weeks. Plant height (cm); Plant height was measured when the plant was 2 weeks after planting. Then it was measured again with a measurement interval of 2 weeks. Plant height was measured from the point of growing the plant.

3. Results and Discussion

3.1. Results

The results of statistical tests on variance analysis (appendix 4 until 15) showed that the treatment of different planting media had a very significant effect on plant height aged 8 WAP and on number of leaves aged 6 WAP,it also significantly affected on the stem diameter aged 8

WAP. However, the effect was not significant on plant height aged 2, 4 and 6 WAP, stem diameter aged 2, 4 and 6 WAP and the number of leaves aged 2, 4 and 8 WAP.

3.2. Plant Height (cm)

The average height of plants aged 2, 4, 6 and 8 due to the influence of planting media can be seen in Table 2.

Table2. The average Height of Plants Aged 2, 4, 6 and 8 Due to the Influence of Planting Media

Treatment	Plant Height (cm)			
	2 WAP	4 WAP	6 WAP	8 WAP
PM1	18.24	23.91	27.91	56.33
PM2	8.41	13.99	20.41	90.24
PM3	16.41	22.49	27.83	48.83
$BNT_{0,05}$	**-**	**-**	**-**	**12.96**

Table 2 shows the height of *Barangan* banana plants aged 2, 4 and 6, the highest WAP was found in PM1 treatment, but at the age of 8 WAP the best growth was found in PM2 treatment.

3.3. Stem Diameter (cm)

The average diameter of the stems aged 2, 4, 6 and 8 WAP due to media influence of planting media can be seen in Table 3.

Table 3. Average Diameter of Stems Aged 2, 4, 6 and 8 WAP Due to the Influence of Planting Media

Treatment	Diameter of Stems (cm)			
	2 WAP	4 WAP	6 WAP	8 WAP
PM1	8.16	8.49	9.07	8.24
PM2	7.83	8.00	8.83	10.99
PM3	7.83	8.83	10.24	8.16
$BNT_{0,05}$	**-**	**-**	**-**	**2.45**

Table 3 shows that the highest diameter of stem *Barangan* banana age 2 WAP was found in PM1 treatment, at the age of 4 and 6 WAP the best results were found in PM3. However at the age of 8 WAP the best results were found in PM2 treatment, although statistically not significantly different.

3.4. Number of Leaves

The average number of leaves aged 2, 4, 6 and 8 WAPdue to the influence of planting media can be seen in Table 4. Table 4 shows the number of leaves of *Barangan* banana age 2 WAP tended to be the same, but at the age of 4, 6 and 8 WAP the highest number of leaves was found in PM2 treatment. Based on the results of statistical tests on variance analysis (appendix 4 until 15) showed that the treatment of different planting media had a very significant effect on plant height aged 8 WAP, number of leaves aged 6 WAP and significantly affected the stem diameter

aged 8 WAP. But the effect was not significant on plant height aged 2, 4 and 6 WAP, stem diameter aged 2, 4 and 6 WAP and the number of leaves aged 2, 4 and 8 WAP. In this study, PM2 showed that the development of banana suckers was better than MT 1 and PM3 treatments, this was presumably because the presence of animal dung media on PM2 contributed well to banana suckers.This is in line with the statement [11] who stated that manure can increase biological activity in the soil and improve soil surface stability.

Table 4. The Average Number of Leaves Aged 2, 4, 6 and 8 WAP Due to the Influence of Planting Media

Treatment	Number of Leaves			
	2 WAP	**4 WAP**	**6 WAP**	**8 WAP**
PM1	1.75	1.50	3.25	5.75
PM2	1.25	1.75	4.50	7.00
PM3	1.75	1.25	2.75	5.50
$BNT_{0,05}$	**-**	**-**	**0.64**	**-**

The results of analysis of goat and cow manure [12] showed that the total N content of manure from goat dung was higher than that of manure from cow dung. Manure also protects and helps regulate soil temperature and humidity in or above the ground, therefore giving compost in sufficient quantities will be able to support the growth of banana plants well because in addition to the nutrients contained in compost can guarantee root growth, compost can also improve the physical, chemical and biological properties of the soil so that the penetration of the roots will be better [13].

Giving goat manure in PM2 treatment, is thought to have an effect on the development of the roots of the newly growing banana suckers to be better than other treatments. Thus it made easier to absorb nutrients in the soil indirectly. [14] explained that giving goat manure affected the addition of soil organic matter and decreased soil weight. The low soil weights will provide a good environment for the development of plant roots and it will also facilitate the nutrient absorption indirectly. In addition, goat droppings can also increase soil porosity, this is caused by the form of goat dung which is granular, so it can increase the pore osf soil.

According [15]One of the requirements of a good planting medium is to have the physical properties of crumbs to facilitate developing roots and for good aeration and drainage, thereforethe structure of the media plants which is appropriate for banana suckers from tissue culture and from rhizome or corm is a crumb and loose soil structure. Therefore, in preparing the nursery media for banana plants, several possible combinations of mixtures from soil, husks, compost, sand, and manure can be used.

According [16], fertilizer cow pen is good organic material to increase nutrients, the addition of organic fertilizer in the form of compost is more beneficial because the nutrients needed by plants become available forms so that they can be absorbed by plants According to the results of [17] showed that combining the composition of plant media between soil, sand, manure (2: 1: 1)

in papaya seedlings (*Carica papaya* L.) gave the best seedling growth in the wet weight of underground seeds.

[18] stated that the soil and the sand media with a volume ratio of 4: 1 had a significant effect compared to the soil and the sand media alone, on shoot formation, shoot stem height, and produced the best vegetative growth of plants. [19] found that giving compost caused differences in seed height, number of leaves, leaf length, and stem circumference which were better than without composting in banana rhizome or corm

The results of the research conducted by [20], they found that in the treatment of a mixture of soil + sand + compost with a ratio of 2: 1: 1, showed the results of the development of suckers in the nursery of *Kayu* banana plants (*Musa paradisiacal* L, cv. Kayu) with no significant differences in soil mix media treatment + sand + compost + husk charcoal with a ratio of 2: 1: 0.5: 0.5.

Better PM2 growth compared to other treatments is thought to also be caused by the activity of microorganisms contained in goat manure so that it affected the process of changing organic matter and providing nutrients for plants. As all people know, that manure also contains soil microorganisms which are beneficial for plant development both in nurseries and in the field.

A research conducted [21] found that total microorganisms from the allocation of chicken and goat manure were higher than cow manure. This high amount shows the development of microorganisms which decomposited organic matters in goat manure better than cows. The existence of this decomposition microorganism activity can spur the availability of nutrients for plants.

The development of the diameter and height of banana suckers and the number of banana suckerss in this research, are also thought to be influenced by good development at the bottom of the suckers. It can be seen that the PM2 planting media treatment on the three research parameters gives higher yields than PM1 and PM3. The results of a similar study were also obtained by [22], that the husk charcoal + manure media produced a high number of shoots and a good number of roots.

There is a difference in shoot height, shoot diameter and number of leaves in MT 2 compared to other treatments. It is possible because the formation of the upper part of the plant is quite good, it requires many supporting components. [20], stated that in the formation of plant tissue rhizomes do respiration to form roots and shoots. Respiration will run smoothly if the media has balanced macro and micro pores, so that air and water can be available to the rhizomes or corms.

Media porosity in PM2 is also influenced by the presence of sand as a combination. In general, sand is considered adequate and suitable when used as a medium for seeding seedlings, growth of plant seeds, and roots of plant stem cuttings. Media porosity in PM2 is also influenced by the presence of sand as a combination. In general, sand is considered adequate and suitable when used as a medium for seeding seedlings, growth of plant seeds, and roots of plant stem cuttings. The characteristics of sand that dry quickly will ease the process of lifting young plant that are considered old enough to be transferred to other media. In addition, the advantage of sand planting media is the ease of use and can improve the aeration system and drainage of the planting medium.

Because of having macro pores, sand becomes easily and quickly dry by the evaporation process. Cohesion and consistency (resistance to separation process) of sand is so small that it is easily eroded by water or wind. Thus, the sand media requires more intensive irrigation and fertilization. This causes sand to be rarely used as a single planting medium. The addition of rice husk as in MT 3 treatment is actually quite supportive for the development of the three observational parameters.

Table 5. Comparison of Nutrients between Rice Husk and Goat Manure

Contents	Rice Husk*)	Goat Droppings **)	Note
C-organic	7.51 %	20.72 %	
N-total	0.49 %	0.95 %	
P2O5	0.07 %	0.36 %	
K20	0.08 %	1.00 %	
KTK	88.08 cmol/g	-	
pH H2O	6.73	-	
Water	7.4 %	87 %	

Note : *) [23]
**) [24]

In addition to the small amount of nutrients, rice husks did not contain microorganisms that were beneficial to the soil. Thus, the activity of soil microorganisms was less than the PM2 media which was treated with goat manure.

4. Conclusion

Different planting media had a very significant effect on plant height at 8 WAP, number of leaves aged 6 WAP and significantly affected the stem diameter at 8 WAP. But the effect was not significant on plant height aged 2, 4 and 6 WAP, stem diameter aged 2, 4 and 6 WAP and the number of leaves aged 2, 4 and 8 WAP. The best results for plant height, stem diameter and number of leaves aged 8 WAP were found in the treatment of soil planting media + goat droppings + sand (1: 1: 1) which is PM2 treatment.For plant height, stem diameter and number of leaves aged 2, 4 and 6 WAP, the growth produced by each treatment tends to be the same

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