Characterization of Sugar Plant Seeds *(Arenga pinnata* Merr.) from Several Locations in Banten Province and Their Growth Response to the Provision of Liquid Organic Fertilizers

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Characterization of Sugar Plant Seeds (*Arenga pinnata* Merr.) from Several Locations in Banten Province and Their Growth Response to the Provision of Liquid Organic Fertilizers

Kartina AM[1*], Susiyanti[1], and W A Rusadi[2]

[1]Lecturer of Agroecotechnology Department, Faculty of Agriculture, University of Sultan Ageng Tirtayasa, Indonesia
[2]Alumni of Magister of Agricultural Science, Postgraduate Program, University of Sultan Ageng Tirtayasa, Indonesia

*Corresponding author: kartina _plg@yahoo.com

Abstract. This study was aimed to observe the characterization of palm seeds (*Arenga pinnata* Merr.) from several locations in Banten as well as their growth response to the provision of liquid organic fertilizer. A research was conducted in two stages, namely the first stage was characterization of Sugar plant seeds from different locations by using a quantitative description method and the second stage was the study used an experimental design namely Randomized Completely Block Design (RCBD), with two Factors. The first Factor was Research Location (L), that was consisted of: Serang Regency Research Location (L1), Pandeglang Regency Research Location (L2), and Lebak Regency (L3). The second factor was the Type of Liquid Organic Fertilizer , that was consisted of: Liquid Organic Fertilizer of NAP type (P1), Molasses Liquid Organic Fertilizer (P2), and Liquid Organic Fertilizer of Bioconversion type (P3). The results showed that from 54 accessions of palm seedlings had a genetic coefficient value ranging from 0.33 to 1.00, which had two clusters, A with a genetic coefficient value of 0.80 or about 80% and cluster B with a coefficient value of 0.60 or about 60% which means they had a very close resemblance. A3 (Serang District) and C15 (Lebak Regency) were samples from different locations with different liquid organic fertilizer treatments but they had close similarities. The result also indicated of the combination of treatment from the location of the research with the type of liquid organic fertilizer showed that the origin of the location had a significant effect to all observed parameters of the origin of the location and there was no significant effect to the type of liquid organic fertilizer and the interaction of the origin of the location and the type of liquid organic fertilizer to all observed parameters.

1. Introduction

Banten Province is a province whose agricultural area is quite extensive and is dominated by food crops such as lowland rice, maize and soybean. Besides that, Banten Province also has annual crops such as rubber, oil palm, cocoa, and sugar plant. In Banten Province, the plantation area reaches 169,888.70 hectares and the production reaches 101,352.82 tons per year. Sugar plants occupy the eighth position of the types of plantation crops such as rubber, coffee coconut, oil palm, cacao pepper and cloves because the production of sugar plant has experienced ups and downs starting from 2014

reaching 1,632 tons, then in 2015 it reached 2,239 tons then in 2016 it decreased to 1,694 tons and in 2017 the production increased again to 3,287 tons [1].

Sugar plants are scattered in several districts such as Serang Regency, Pandeglang Regency and Lebak Regency because these areas are mostly plantation and forest areas. Aren plants are allowed to grow wild and have not been cultivated properly, so that the spread is still carried out naturally through ferret-like animals. According to [2] in [3] sugar plants grow wild, both in the lowlands, hillsides, valleys, and mountains up to an altitude of 1,400 asl.

In Serang Regency, according to local extension workers, sugar plants are scattered in several districts such as Mancak, Gunung Sari, Ciomas, and Petir because the area is still dominated by forests in the highlands so that the sugar plant grows naturally. Then, in Pandeglang Regency, Sugar plants are spread in several districts such as Sobang, Cibaliung, Angsana, Munjul, Mandalawangi, and a small part on the feet of Mount Karang to be precise in Karang Tanjung District. And in Lebak Regency, the Sugar plant has superior varieties in Cihara district, namely Parasi Aren, but there are still many aren that grow wild from along Gunung Kencana, Malingping, and Bayah districts.

The main problem in the development of sugar plant that it has not been mass-cultivated. Farmers still rely on plants that grow naturally, where the sugar plant grows in clusters with irregular spacing, resulting in waste of land. This causes the level of land and sugar plant productivity to be low, which causes the income of farmers to decrease [4]. In addition, the constraints found in sugar plant plants are that there have not been any varieties that can be characterized as a superior variety which is expected increasing of production.

From the exploration and identification activities carried out, it is expected that various genotypes of palm sugar can be developed to assemble superior varieties, because without diversity, breeding cannot select the desired traits. Diversity can be observed through the phenotypic characters of plants. However, until now the data on the characteristics of the sugar plants are not yet available and the utilization of the sugar plant has not been differentiated based on suitability for taking sap, palm fiber and fruit. Thus, it is not yet known the criteria for sugar plant to produce a good product in terms of its utilization of quality and quantity [5].

Because in Banten Province there is no superior accession to sugar plant seeds with the proper application of liquid organic fertilizer, it is necessary to conduct research on the characterization of palm seeds (*Arenga pinnata* Merr.) from several locations in Banten as well as their growth response to the provision of liquid organic fertilizer.

2. Materials and Method

The research was conducted in three districts of Banten Province, i.e. Serang Regency, Pandeglang Regency, and Lebak Regency. Furthermore, planting was carried out in the Integrated Agricultural System Area of Banten Province. This research was conducted from September 2019 to January 2020.

The tools used were 1) ruler, 2) machete / knife, 3) bucket, 4) scoop, 5) microscope, and 6) gloves. Meanwhile, the materials to be used are 1) Sugar plant seeds that grow in community plantations from several districts in Banten Province, 2) compost, 3) liquid organic fertilizer type molasses, 4) liquid organic fertilizer NAP type, 5) fertilizer organic liquid type BIO ORGANIC, 6) polybags, and 7) soil.

The samples were 18 samples of sugar plant seeds observed from each regency with a total of 54 sample plants then analyzed by cluster analysis with the help of Enthesys application with the results in the form of dendogram showing the closeness or diversity of all the samples of Sugar plant seeds.

The experimental design used was a Randomized Completely Block Design (RCBD), with two two factors, namely the type of location and type of liquid organic fertilizer.

The first factor was the location of origin (L) as follows:

L1 = Research Location in Serang Regency
L2 = Research Location in Lebak Regency
L3 = Research Location in Pandeglang Regency

The second factor was the Type of Liquid Organic Fertilizer (P) as follows:

P1 = NAP type liquid organic fertilizer
P2 = molasses type of liquid organic fertilizer
P3 = bioconversion type liquid organic fertilizer

There were 9 treatment combinations and each treatment consists of 3 replications, so that there were 27 experimental units in total. Each experimental unit consisted of 4 plants planted on an area of 3 x 3 m size.

The observed parameters were the phenotypic characters of the plant which included plant height, leaf length (cm), leaf width (cm), number of leaves (strands), and root weight (gr). Meanwhile, the observation parameters of the experimental design with the combination of the treatment from location and type of liquid organic fertilizer were plant height of 2 Week After Planting (WAP), 4 WAP, 6 WAP, 8 WAP, plant wet weight plant dry weight, and leaf area.

3. Results and Discussion

3.1. Sugar plant Morphological Characteristics

Table 1. Sugar Plant Morphological Character

Variable	Regency					
	Serang		Pandeglang		Lebak	
	Range	Average	Range	Average	Range	Average
Stem Height (cm)	11 - 57	29.17	13.5 - 52	28.494	33,5 – 70	49,667
Leaf Width (cm)	4 – 8.5	6.63	6-14.5	8	7.5-16	11.416
Leaf Length (cm)	12,5-19,5	15.023	11-19	14.861	15-21,5	19.194
Leaf Numbers	1-3	1.83	2 - 10	4.94	5 - 11	7.11
Root Weight (gr)	0.91- 4.49	2.49	1.31-11.01	4.68	7 - 25.7	13.29

Based on the study of sugar plant morphological character conducted in three districts in Banten Province, the result is presented in Table 1. In Serang Regency, the samples were A1-A20 in which all the highest samples of stem height, leaf width, leaf length were found in the sample A11 from Ciomas District. The average of stem height was 29.17 cm with the highest sample was 57 cm. The average of leaf width was 6.63 cm with the highest sample was 8.5 cm. Then, the average of leaf length was 15.02 cm with the highest sample was 19.5. Moreover, the average of leaf numbers was 1.83 with the highest number was 3 found in the samples A1, A11, and A13. Then the root weight average was 2.49 gr with the highest weight was 4.49 gr in the sample A2.

In Pandeglang regency the samples were named B1-B18. The average of stem height was 28.49 cm with the highest sample was 52 cm. The average of leaf width was 8 cm with the highest sample was 14.5 cm. Then the average of leaf length was 14.86 and the highest sample was 19 cm. The average of leaf numbers was 4.94 cm with the highest sample was 10. In Pandeglang regency, all the highest samples of stem height, leaf width, leaf length, leaf number were found in the sample B5. Furthermore, the average of root weight was 4.68 gr with the highest sample was 11.01 gr found in the sample B17 from Munjul District.

In Lebak regency the samples were named C1 –C18. The average of stem height was 49.67 cm with the highest sample was 70 cm, found in the sample C17. The average of leaf width was 11.41 with the highest sample was 16 cm, found in the sample C15. Then the average of leaf length was 19.19 cm with the highest sample was 21.5 cm, found in the sample C11. The average of leaf numbers was 7.11 with the highest sample was 11, found in the sample C13. And the average of root weight was 13.29 gr with the highest sample was 25.7 gr, found in the sample C17.

According to [6] qualitative characters are controlled by one major factor, namely genes that have a big influence so that there is very little environmental influence on this character. Diversity or variability is the diversity of individual traits of each plant population. This diversity has a very important meaning for plant breeding. The measure of diversity is the variation of accessions, the causes of diversity are influenced by environmental and genetic factors.

Research on germplasm is basically a study of the genetic diversity of accessions as the basis for breeding program activities [7]. Germplasm is a genetic source that needs attention. According to [8], a wide variability value is very important in plant breeding activities, without wide variability, breeding activities will not be effective in assembling the desired superior cultivar. The wide value of

phenotypic variability means that the phenotypic appearance of these characters is more influenced by environmental factors.

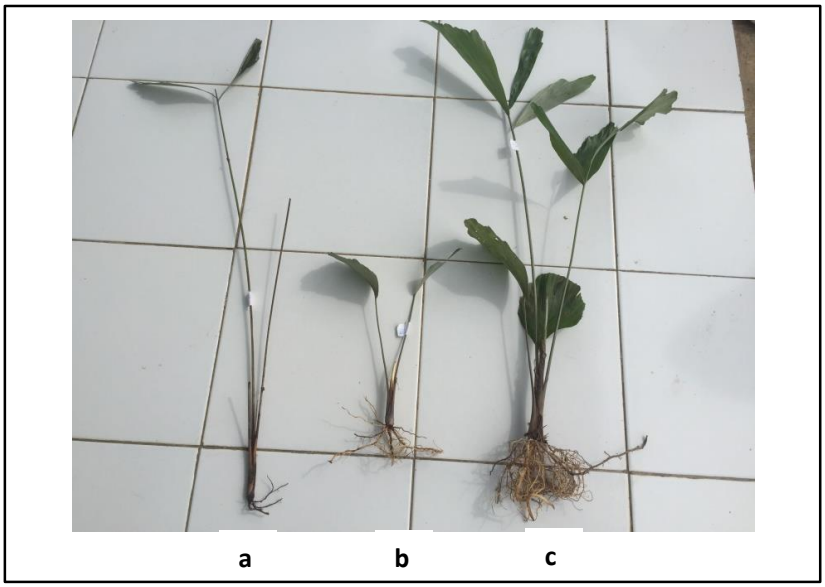

Figure 1. Sample from Serang District (a), Pandeglang Regency (b), Lebak Regency (c)

Table 2. Analysis of Varians of combination of Origin of Location and Type of Liquid Organic Fertilizer on Aren Plant (*Arenga pinnata* Merr.)

Observed Parameters	Treatment			CoD (%)
	L	P	L*P	
Plant Height				
2 WAP	**	Ns	ns	21.52
4 WAP	**	Ns	ns	21.30
6 WAP	**	Ns	ns	20.24
8 WAP	**	Ns	ns	18.41
Plant Wet Weight (g)	**	ns	ns	27.94
Plant Dry Weight (g)	**	*	*	98.47
Leaf Area (cm^2)	**	Ns	ns	25.35

Note : L = Origin Location
P = Liquid organic fertilizer
* = Significant in 5% level
** = Very Significant in level1%
ns = Non Significant
CoD = Coefficient of Diversity

Based on the Table 2, the results showed that the factor of origin location was very different from all the parameters of the observations made. Whereas the treatment factor for the type of liquid

organic fertilizer showed no significant effect on all parameters of plant height, leaf width, leaf wet weight, shoot wet weight, and leaf area, but the plant dry weight had a significant effect on the diversity value of 98.47 %. There was no interaction between the origin of the location and the type of liquid organic fertilizer for the parameters of plant height, leaf width, leaf wet weight, shoot wet weight, and leaf area, but there was an interaction on plant dry weight which had a significant effect on the diversity value.

There was a real difference in the treatment from location origin because the Sugar plant itself has the ability to adapt to various land conditions, agro-climates, and high tolerance in mixed cropping patterns including woody plants and fast growing because it has many roots and dense canopy, making it easy for it to grow in all conditions.

Unlike the case with the treatment of liquid organic fertilizers which had no significant effect, except for the parameters of plant dry weight with a diversity of 98.76%, according to [9], the application of liquid fertilizers by direct leakage is less effective because various nutrients have dissolved first, and undergoes fixation by soil colloids so that it cannot be absorbed by plants.

3.2. Cluster Analysis Result

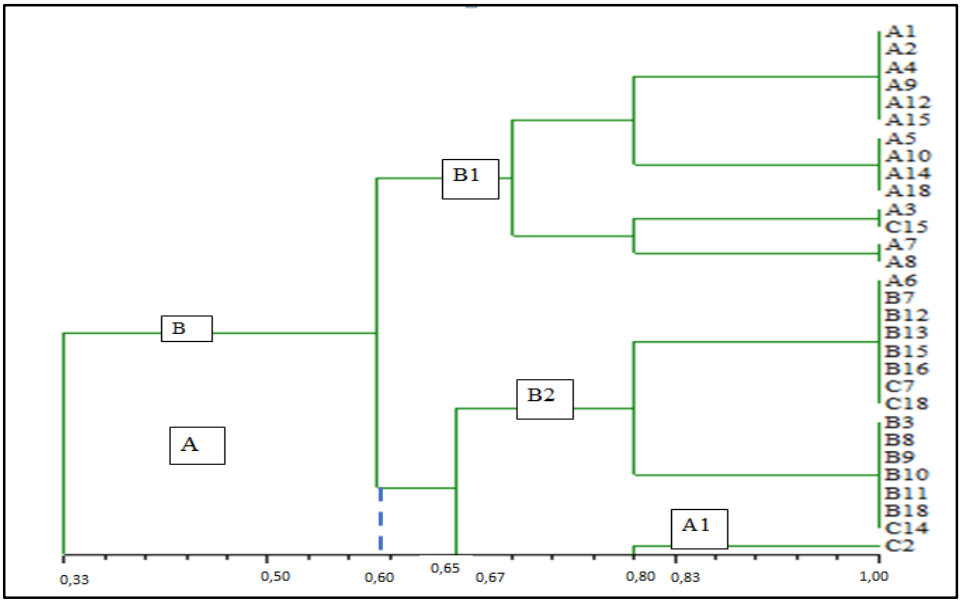

Figure 2. Result of Dendogram Analysis

Based on the results of the dendogram (Figure 2) shows that there were 54 accessions of palm seedlings, there were 2 main groups and 3 intermediate groups. The first group, namely group A, had a sub-group, namely group A1 with a similar genetic coefficient of 0.80, which was the closest to 1.00. In group A1 there was a single accession, namely C2 (Lebak Regency) with a coefficient of variation of 0.80 with the treatment of liquid organic fertilizer Molasses.

While in group B there were two sub groups, namely groups B1 and B2 with a coefficient value of 0.60. Group B1 consists of A1 (Serang Regency), A4 (Serang Regency), A9 (Serang Regency), A12 (Serang Regency), A15 (Serang Regency) which was a group that had a fairly close and stable similarity. Then the second part was shown in the chart, namely A5 (Serang district), A10 (Serang Regency), A14 (Serang Regency), A18 (Serang Regency) was a sub-section of group B2 which had quite close kinship. However, in the sub-group B1, namely A3 (Serang Regency) and C15 (Lebak Regency), they were unique because they had close kinship or similarities but came from different areas. Finally, A7, and A8 (Serang District), which were closely related or similar to the distance factor when sampling A7 (Serang Regency) and A8 (Serang Regency), could be the possibility that the accessions were closely related to the liquid organic fertilizer treatment. same. whereas in group B2 it was divided into two sub-groups of accessions which had close kinship A6 (Serang Regency), B7 (Pandeglang Regency), B12 (Pandeglang Regency), B13 (Pandeglang Regency), B15 (Pandeglang

Regency), B16 (Pandeglang Regency) , C7 (Lebak Regency), C18 (Lebak Regency) had a close proximity to the difference factor of the three regions from which the plant seed samples were taken with different treatments given.

While the last sub-part of group B2 consisted of B3 (Pandeglang Regency), B8 (Pandeglang Regency), B9 (Pandeglang Regency), B10 (Pandeglang Regency), B11 (Pandeglang Regency), B18 (Pandeglang Regency), C14 (Lebak Regency). C14 was accession originating from a different region than accession B originating from Pandeglang Regency.

This is related to the statement of [10] stated that samples from the same group describe the kinship relationship between samples, samples from the same group have a close kinship, and [11] stated that the farther the kinship among the samples, the less successful the crosses were, but the possibility of obtaining a superior genotype was greater if the crosses were successful.

4. Conclusion

Based on the results of the study, it can be concluded that the 54 accessions of oil palm seedlings had a genetic coefficient value ranging from 0.33 to 1.00 consisting of two cluster A with a genetic coefficient value of 0.80 or about 80% and cluster B with a coefficient value of 0 , 60 or about 60% which mean they had a very close resemblance. Samples A3 (Serang District) and C15 (Lebak Regency) were taken from different locations with different liquid organic fertilizer treatments but had close similarities. And the results showed that the combination of treatment from the research location with the type of liquid organic fertilizer showed that the origin of the location had a significant effect on all parameters. The influence of the type of liquid organic fertilizer as well as the interaction of the location and type of liquid organic fertilizer on all observed parameters was not significant.

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