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Productivity of Arenga Pinnata Merr Male Flower Stalks in South Tapanuli Regency Referring to Sustainable Agricultural Systems

Produktivitas Tangkai Bunga Jantan Tanaman Aren (Arenga pinnata Merr) di Kabupaten Tapanuli Selatan Mengacu pada Sistem Pertanian Berkelanjutan

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ABSTRACT

This study aims to determine and complete the data base related to the productivity level of male palm flower stalks in producing sap in wild populations of natural habitats in South Tapanuli Regency. The research was conducted in 2 villages in 4 districts with a total sample of 40 palm plants. The stages in this research were carried out in three stages. The first stage is a survey sampling carried out by purposive sampling, namely the sampling technique to be used as a sample based on existing criteria, namely: 1. Shape of stalk, 2. Color of stalk, 3. Color of series, 4. Color of sap, 5. Length of stalk, 6 7. Stalk Diameter and 7. Nira Production Data. The second stage is the data collection on the productivity of male palm flower stalks at all levels of the stem in producing sap. The third stage is productivity data analysis. The results showed that the productivity of male flower stalks at each stalk level was in accordance with the amount of production and weight of sugar produced. Male flower stalk I has the highest amount of sap production and sugar weight followed by stalk levels II, III, IV and V. Male flower stalk I has the best productivity of all levels of male flower stalk, after that there is a decrease in the production of sap and sugar for productivity. Male flower stalks II, III, IV and V. Productivity of the best male flower stalks produced an average sap production of 968.55 liters / stalk and an average sugar weight of 526.79 kg.

Keywords: *Aren, Productivity, Male Flower Stalk*

ABSTRAK

Penelitian ini bertujuan untuk mengetahui dan melengkapi data base terkait dengan tingkat Produktivitas tangkai bunga jantan tanaman aren dalam menghasilkan nira pada populasi liar habitat alam di Kabupaten Tapanuli Selatan. Penelitian dilaksanakan di 2 desa pada 4 kecamatan dengan jumlah tanaman sampel sebanyak 40 tanaman aren. Tahapan dalam penelitian ini dilaksanakan dengan tiga tahap. Tahap pertama adalah survei pengambilan sampel dilakukan secara purposive sampling yaitu teknik pengambilan sampel untuk dijadikan sampel berdasarkan kriteria yang ada, yaitu : 1. Bentuk Tangkai, 2.Warna Tangkai, 3. Warna Rangkaian, 4. Warna Nira, 5. Panjang Tangkai, 6. Diameter Tangkai dan 7. Data Produksi Nira. Tahap kedua adalah pendataan Produktivitas tangkai bunga jantan tanaman aren pada semua tingkatan tangkai dalam memproduksi nira. Tahap ketiga adalah analisis data Produktivitas. Hasil menunjukkan bahwa Produktivitas tangkai bunga jantan pada setiap tingkatan tangkai sesuai dengan jumlah produksi dan bobot gula yang dihasilkan. Tangkai bunga jantan I memiliki jumlah produksi nira dan bobot gula paling tinggi lalu diikuti dengan tingkatan tangkai II, III, IV dan V. Tangkai bunga jantan I memiliki Produktivitas terbaik dari semua tingkatan tangkai bunga jantan, setelah itu terjadi penurunan produksi nira dan gula untuk

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Produktivitas tangkai bunga jantan II, III, IV dan V. Produktivitas tangkai bunga jantan terbaik dapat menghasilkan rata-rata produksi nira 968.55 liter/tangkai dan rata-rata bobot gula 526.79 kg.

Kata kunci: Aren, Produktivitas, Tangkai Bunga Jantan

INTRODUCTION

The distribution of the population of palm plants that grow in the South Tapanuli Regency is a potential local natural resources that become opportunities if developed. Palm plants can grow well in agro-ecosystems are diverse, especially in the mountainous region with high rainfall and soil texture sandy clay. The adequacy of water and soil moisture greatly affect the formation of flowers and fruits aren. The sugar plant is a multipurpose economically valuable as a source of livelihood of the community. From the data quoted we can see that, the sugar plant has the potential of economically promising. From the results of the average production of the sap which is processed into palm sugar in 3 (three) sub-district is the center of palm sugar production, when averaged, the farmers can produce palm sugar 1,42 kg palm sugar/tree/day and multiplied by the average price when sold to collectors per kg is Rp 15.000,- then additional income for farmers who cultivate palm sugar is Rp 21.300,-/tree/day. If in convert for 1 (one) month we take 26 (twenty six) days then an additional income for farmers who cultivate palm sugar is Rp 553.800,-/trees/month. So, when it averaged a farmer seeking 5 (five) plants or palm trees just then the income obtained from the sugar plant is ± Rp 2.769.000,-/month (Harahap, DE. 2013).

The sugar plant is known as a producer of molasses as raw material for making palm sugar. The palm tree is tapped between the ages of 6-12 years and provide optimum results at the age of 8-9 years the Quality of the sap best characterized with a high sugar content. Baharuddin, *et. al.* (2007) stated that the sugar palm sap has a sugar content of about 12.5-14%. Pontoh, J, *et. al.* (2011) revealed that the protein content in the sap of palm is quite high i.e. between 22.1 - of 56.2 µg/mL. The breadth of the spread of the population as well as the high diversity of palm plants this resulted in difficult to suspect the high or the low production of molasses. This is evident from the results of the research conducted, namely, the Exploration and Identification of Plant sugar Palm in South Tapanuli Regency in the year 2018, the obtained 4 cluster similarity and the diversity of the population of the sugar plant. Group similarities and diversity of the obtained from the results of the analysis of the 32 observed variables. Of the 32 variables were grouped into 4 characters, namely the character of the stem, leaves, flowers and fruit. The results of the field observations and the results of the analysis statistically showed that the character of the flowers, especially male flowers are tapped is a character that significantly affect the production of sugar palm sap. The level of Productivity sprigs of male flowers are tapped by farmers is different at each of the levels of the stalk, from the stalk of male flowers first to the extent sprigs of male flowers last (Parmanoan, H, 2018).

Plants aren't cultivated in particular by people in South Tapanuli Regency, but left to grow in the garden or growing wild in nature. The sugar plant by the community in the Regency of South Tapanuli is taken niranya to be used as raw material for making palm sugar. The raw material is obtained from the results of tapping the flower stalk of the male plant palm, with how to collect the sap water from one plant to another every day. This is done so that the availability of the sap can be assured every day and the process of palm sugar production can take place in a sustainable manner. According To (Straightforward, M. 2012), farmers aren every day can earn 20 - 30 liters of sap per day from 3 – 5 plants are bugged. The sap that is produced by the farmers aren't always fixed amount each day, so that the production of palm sugar that is produced varies. Farmers aren also can't make sure how the amount of sap that they will collect from each stalk of male flowers on each plant palm which is their tapping. Many factors affect the high or the low amount of sap that is tapped, one of which is the level of a stalk of male flowers to the sugar plant. In accordance with the experience and observation of farmers aren in the Village of Aek Sabaon, District Marancar namely Lintong Siregar argued that the amount of molasses produced from every

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level of the stalk of the male flower is different. On the level of a stalk of male flowers first, the amount of molasses produced will be higher compared with the amount of molasses obtained from the detection result at the level of stalks of the male flowers of the second, third, fourth and so on. It is a fact that is found directly by the farmers aren, on the basis of this is the author interested in conducting research about the Productivity of the Stalks of the Male Flowers of the Plant Aren (Arenga pinnata Merr.) in the Regency of South Tapanuli Refers to a System of Sustainable Agriculture, to know and complete the data base associated with the level of Productivity of the stalks of the male flowers to the sugar plant to produce the sap.

MATERIALS AND METHODS

The observations were made on stalk of male flowers to the sugar plant. The observed Data include the following : 1. The Shape Of The Stalk, 2.The Color Of The Stalk, 3. Color Series, 4. The Color Of Molasses, 5. The Length Of The Stalk, 6. The Diameter of the Stalk and 7. Production Data Sap.

Techniques of Data Collection and Analysis this Research was conducted by survey method by way of exploring and collecting in 2 villages in 4 kecamatan in Kabupaten Tapanuli Selatan. The stages in this research is implemented with three stages. The first stage is the survey sampling was done by purposive sampling is a sampling technique to be sampled based on the criteria there after knowing the characteristics of the population in ssentra the production of palm sugar. This survey aims to determine the target area of research which has a population of palm plants. The second stage is the data collection Productivity of the stalks of the male flowers to the sugar plant at all levels of the stalk in producing the sap. The third stage is the analysis of the data. The Data obtained from the field is described descriptively. Furthermore, the conducted analysis of the Productivity of each level of the stalk of the male flower, refers to data that have been obtained to determine the relationship between the Productivity of the stalks of the male flowers with the production of the sap of the sugar plant.

RESULTS AND DISCUSSIONS

The results of the identification and observation the Productivity of the stalk of the male flower 40 plant samples (Appendix 1), namely :

1. The Shape Of The Stalk

Obtained 2 forms a stalk of male flowers, according to the Sayaman Siregar (farmers aren village Baringin), commonly named after the stalk necklace and sprigs of green. Both arms, with differences in morphology, stalk necklace shape is more curved and usually longer. The form of the stalk of the necklace can be seen in figure 1 and sprigs of green in figure 2.

Figure 1. Stalk Necklace

Figure 2. Sprigs Of Green

Of 40 plant samples in the identification, a total of 32 plant samples have the shape of the stalk necklace and 8 sprigs of green. The most dominant plant samples with the shape of the stalk necklace is a Village Situmbaga, Sialogo and the Village of Baringin, furthermore the region most of the plant samples with the

shape of the green stalk is a Village Sinyior District Angkola Selatan (3 plant samples).

2. The Color Of The Stalk

The results of the identification to the color of the stalk of the male flower is not too varied. Obtained 2 types of color variation of the stalk which refers to the results of the identfikasi form the stalk. To stalk necklace average color of the stems are greenish-brown (brown color at the base of the stalk and green on the tip of the stalk). But on the green stalk, there are 2 types of the color of the stalk, namely : 1). Greenish-brown and 2). Brown greenish yellow, more details can be seen in figure 3.

Figure 3. Green stalk with brown color greenish-yellow

3. The Color Of The At

There are 3 kinds of color variation at an interest male, purple and dark (Figure 4), at an interest male colored and dark purple games often allowed multiplayer has size of more interest the wall rather than at an interest other male colored. According to Set of the Early (farmers in the Village of Sitaratoit), at an interest male colored purple and dark is more simple to predict that interest is eligible to be tapped. The more the age image on a male flower is purple and dark, the skin layer of a flower will look oily and this indicates that the male is ready for it (Parmanoan ,, H, 2018). Furthermore, the color of the male is purplish green (Figure 5) and the color is green of the young people (Figure 6).

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Figure 4. The color of the at an interest jantan the Purple Darkness. Figure 5. The color of the at an interest jantan Hijau Keunguan Figure 6. The color of the at an interest jantan Hijau Young people

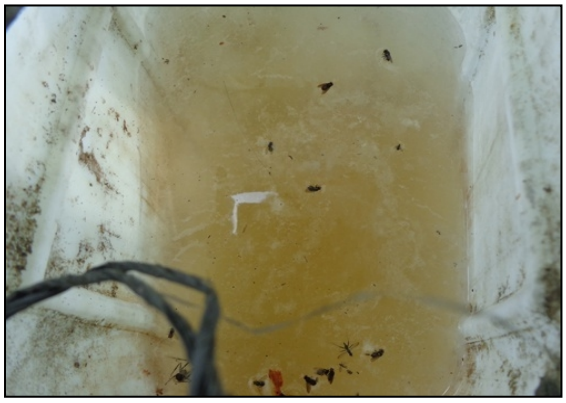

Figure 7. Roomie clear colo,

Figure 8. The sap of translucent colored brownish

In accordance with the plant sample was identified, the average colors of the series of male flowers are dark purple as many as 32 plants, the color green purplish minimum 5 plants and the color green as much as 3 plants.

4. The Color Of The Sap

The results of the identification of the color of the sap of all the plants samples obtained 2 variations of colors, namely clear and colored clear brown, can be seen in figure 7 and 8.

5. The Length Of The Stalk

The results of the observation and measurement of the length of the stalk of the male flower to 40 plant samples at each of the levels of the stalk showed the diversity is high. The length of the stalk is the most length of 141 cm, the plant 11 samples, levels of the stalk I in the village Sitaratoit District. Angkola barat. Whereas, the petiole length of the most short that is 54 cm, the plant sample 12, the level of the stalk II in the village of Sitaratoit District. Angkola barat.

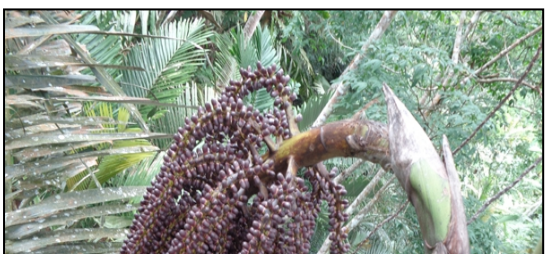

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Figure 9. Sprigs of male flowers are the most long Figure 10. Sprigs of male flowers most a short

6. The Diameter Of The Stalk

The results of the measurement of the diameter of the stalk of the male flower to 40 plant samples at each of the levels of the stalk is diverse. The Diameter of the stalk of 11.4 cm, the plant sample 32, the level of the stalk II in the village of Baringin District. Sipirok. While, the diameter of the stalk is 5.7 cm, the plants of sample 5, the level of the stalk V in the village Sinyior District. Angkola selatan.

Figure 11. The stalk of the male flower diameter of the most large Figure 12. The stalk of the male flower diameter of most small

7. The Production of Molasses

The results of the observation and measurement of Productivity sprigs of male flowers to 40 plant samples at each of the levels of the stalk in producing molasses obtained diversity is high. The productivity of the stalks of that plant samples 28, in the village of Aek Sabaon District. Marancar with the production roomie to 1755,6 liter (the tapping 11 weeks) to produce weight sugar sugar by 912,9 kg. Whereas, the Productivity of the stalk is the most low that the plants of sample 3, in the village of Sinyior District. Angkola selatan with the production of the sap 150 liters (the tapping 5 weeks) produce a weight sugar sugar of 97.5 kg. As for the Productivity of the stalks of the male flowers to the 40 plant sample at each of the levels of the stalk can be seen in Appendix 2.

The productivity of the stalks of the male flowers on each tier of the stalk in accordance with the amount of production and the weight of sugar produced.

Table 1. Comparison of the Productivity of the stalks of the male flowers on each tier of the stalk.

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Stalk Level	Production of Nira (L)		Sugar weight (kg)	
	Quantity	Average	Quantity	Average
I	7,748.4	968,555	4,214.3	526,79
II	7,073.3	884,16	3,856.3	482,04
III	6,376.9	797,11	3,451.7	431,46
IV	5,176.1	647,01	2,793.4	349,18
V	4,000.3	500,04	2,166.1	270,76

Levels sprigs of male flowers palm plants affect the production of molasses and the weight of sugar produced. This is evident from the results of the measurements have been performed on each of the levels of the stalk. Levels of the stalk I have the total production of molasses and sugar weights the most high then followed by tiers of stalk II, III, IV and V. Levels of stalk V is not a stalk of male flowers last on every palm plants that can be tapped. But according to the farmer experience (M. Lintong Siregar) in the village of Aek Sabaon District. Marancar, the average production roomie normal at each sugar plant that is intercepted which is only up to the level of stalk V, the rest can't produce well.

The productivity of the stalks of the male flowers produce molasses and sugar is influenced by several factors, among others :

1. Terms growing

Palm plants can be grown at a height of 0 – 1,500 meters above sea level, on a variety of agroekosistim and has a high adaptability to the environment of growth. But the most excellent growth at a height of 500 – 1,200 meters above sea level with rainfall more than 1,200 – to 3,500 mm/year. Soil moisture and precipitation is high influential in the formation of the crown of leaves of the plant aren. For the growth and fertilization, palm plants need a temperature of 20 - 25 °C. This plant can grow well in mountainous areas, valleys, near the river flow, the area and the many found in the forest.

2. The height of the place

The height of the place of the sugar plant in spesipik effect on the production of juice and percentage of sugar content. The lower or high then the production of sap and the amount of sugar will decrease. The production of molasses at the height of the optimal place there is in the range of 500 – 800 m above sea level. Decrease the amount of sugar produced, associated with the production of sap. Where the higher production of molasses, then the sugar content contained therein will be decreased which means that water content higher than the sugar content. So, we will find the production of sugar high is on the production of molasses is low (Harahap, DE. 2013). According To Parmanoan, H. (2019), the height of the place can affect the growth and development of female flowers and the male flowers to the sugar plant. The higher the intensity of the sun light the more easily obtained. This is evident from the morphology of the stem and plant height palm is relatively shorter compared with that grown in the lowlands and temperate. The intensity of the light of the sun that is a lot of result in the metabolism of plant growth and development aren perfect so that the process of maturation of the crop to be grown up faster and pulled out the flowers to produce.

3. The fertility of the soil

The fertility of the soil as the status of the land which shows the capacity to supply elements essential in amounts sufficient for plant growth. Fertile soil has the ability to supply nutrient elements in sufficient quantities and balanced to the plants, so the plants grow and develop healthy and produce to its potential. The nutrient Status of the soil and characteristics of plant growth contributes to the product of the juice and sugar are produced.

4. Vegetation density

Vegetation density indeed does not directly affect the Productivity of the stalks of the male flowers to the sugar plant. But on the growth and development of the sugar plant to achieve desawa strongly influenced by vegetation density. In low-lying areas and temperate, vegetation density levels are relatively higher, especially in the sugar plant wild populations in nature. The ripening process of the sugar plant to be grown in dense vegetation are relatively slower because in these conditions the metabolism of plant growth and development aren focused on the growth of the physical condition of the stem. The sugar plant

will push the header and stems towering upwards until the plant is not sheltered and there are no competitors to get the light of the sun. On the condition that palm plants become mature and produce issue of interest. The higher the stem of the sugar plant, the higher chance the plant to issue a stalk of male flowers that much. From the explanation of table 1. above, it can be seen that the percentage decrease in the productivity of male flower stalks is in accordance with the level of the stalk in table 2 below.

Table 2. The percentage decrease in the Productivity of the stalks of the male flowers

Stalk Level	Production of Nira		Sugar Weight (kg)	
	Quantity	%	Quantity	%
I	7,748.4	0	4,214.3	0
II	7,073.3	8,71	3,856.3	8,49
III	6,376.9	17.7	3,451.7	18,10
IV	5,176.1	33,2	2,793.4	33,72
V	4,000.3	48,37	2,166.1	48,60

In accordance with the data Productivity of the stalks of the male flowers in producing sap and palm sugar showed a decrease in Productivity. Sprigs of male flowers I have the best Productivity from all levels of the flower stalk of the male in producing molasses and sugar. Decline in the production of molasses and sugar to the Productivity of the stalks of the male flowers II that is equal to ± 8,49 - 8,71%. Next, followed by a decrease in the production of molasses and sugar to the Productivity of the stalks of the male flowers III that is equal to ± 17,7 – 18,1%. The productivity of the stalks of the male flowers IV decreased by ± 33,2 – 33,72%. And last, from the level of the stalk which can produce normal produce molasses and sugar, i.e. a stalk of male flowers V, with a large decrease in Productivity is ± 48,37 to 48.6%.

The decline in Productivity of the stalk of the male flower of the highest starts from the level of the stalk of IV to V. It is influenced by the older age of the palm plants to produce. Palm plants mature and start flowering starts from age 6 – 10 years (Permentan_RI, 2013). On the phase of development, the flowers of the plant aren the first one to grow is the female flower. The female flowers arise from each frond or used the midrib of the leaves, starting from the top is roughly a quarter from the top towards the bottom. The first flower until the fifth or six are female flowers, the new, followed by the male flowers that appear gradually up to the base of the stem,or 2 - 3 m above the ground. The flower stalks are tapped generally sprigs of male flowers. The number of sprigs of male flowers are productive only 4 - 6 stalks with the tapping 2-3 months. Thus, the tapping/palm tree ranges from 8 - 18 months. After that, the male flowers are still out, but less productive. The sugar plant will die within 5 years after the first flowering. All the female flowers will mature in 1 - 3 years. The young fruit can be processed into kolang kaling. In other words, the decline in Productivity of the stalk of the male flower is influenced by the physical capabilities of the sugar plant in absorbing nutrients from the soil and release it into products roomie as the manufacture of palm sugar.

CONCLUSIONS

The productivity of the stalks of the male flowers on each tier of the stalk in accordance with the amount of production and the weight of sugar produced. Sprigs of male flowers I have total production of molasses and sugar weights the most high then followed by tiers of stalk II, III, IV and V. Sprigs of male flowers I have the best Productivity from all levels of the stalk of the male flower, after that decline the production of molasses and sugar to the Productivity of the stalks of the male flowers II, III, IV and V.

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