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Increment Information of Height and Diameter Ulin (Eusidroxylon Zwageri T et B) Plant Aged 9 Years in the Ex-Situ Conservation Area of State Agricultural Polytechnic of Samarinda

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Abstract:- This research is motivated by a lack of information about the riap of the Ulin (Eusideroxylon zwageri T et B) plant, both in the in-situ and ex-situ conservation areas. Ulin is one of the types of plants that are currently increasingly rare. Efforts to overcome the extinction of the ulin type and its breeding to maintain sustainability for it need to be known for its growth both in diameter and height.

The purpose of this study was to find out the diameter and height of the ulin (*Eusideroxylon zwageri* T et B.) plant which is 9 years old in the ex-situ conservation area of State Agricultural Polytechnic of Samarinda.

This research was conducted in the ex-situ conservation area of State Agricultural Polytechnic of Samarinda campus for 1 (one) year from December 2019 to December 2020 which includes, measurement of the diameter and height of Ulin (Eusideroxylon zwageri T et B) plants twice, data processing and writing.

Based on the results of current annual increment calculations the height of the Ulin (*Eusidroxylon zwageri* T et B) plant is 1.08 m and the diameter is 0.30 cm, while the mean annual increment is 0.78 m and the diameter is 0.84 cm.

Keywords:- *Ulin, Increment, Height, Diameter, ex-situ conservation.*

I. INTRODUCTION

East Kalimantan, which is mostly covered by natural forest areas in the form of tropical rain forests, this area can easily be distinguished from other types of forests, because of its many variations and diversity of types. Where in one area per hectare can be found up to hundreds of types of plants[1]

One such diversity of plants is Ulin (*Eusideroxylon zwageri* T et B). Ulin is one of the protected types of plants. Ulin wood is rare. This is due to slow growth, small germination success rates, and illegal forest logging. It is feared that if not preserved immediately, Ulin wood will become extinct[2].

Ulin (*Eusidroxylon zwageri* T et B) is one of the constituent types of tropical rainforests that grow naturally in the region of South Sumatra, Jambi and almost all over Kalimantan[3].

According to Reference [4], the type of ulin plant at this time is increasingly rare in line with the needs of this type of wood that continues to increase without being followed by balanced cultivation efforts. Efforts to overcome the extinction of the ulin type and its breeding to maintain sustainability and meet the needs of ulin wood, need to be replanted in its natural distribution or instu or exitu as an introduction plant.

But until now, this in-situ conservation effort has failed a lot, illegal logging in in-situ conservation areas over time is increasing, so that other rescue efforts are carried out including through ex-situ conservation.

The need for conservation of genetic material in forest trees is inevitable. Forest tree conservation efforts follow two common approaches: in-situ and ex- situ conservation. In-situ conservation is applied by protecting stands from extinction or managing protected stands so that the desired genetic component is preserved[5]. Meanwhile, according to Reference [6], ex-situ preservation is the development of biological resources outside their habitat.

Currently data or information about the increment (growth) of each forestry plant is needed. Height and diameter are the most easily measured growth characteristics and are often used as standards in quality determination are diameter and height. This information is needed to find out the growth of ulin plants in the exitu conservation area.

Based on the description above, the author is interested in providing information about the diameter and height of ulin (*Eusideroxylon zwageri* T et B) plants grown in the Area of State Agricultural Polytechnic of Samarinda as one of the ex-situ activities.

II. METHODOLOGY

➢ *Research Place and Data*

This research was conducted in the ex-situ conservation area of State Agricultural Polytechnic of Samarinda, for 1 (one) year from December 2019 to December 2020.

➢ *Tools and Material*

The tools used in this study are measuring signs that are 5 meters high, to measure the height of Ulin plants and microcalipers to measure the diameter of ulin plants. The material used is the Ulin (*Eusidroxylon zwageri* T et B) plant as many as 78 plants that are 9 years old.

➢ *Research Procedure*

1) Carrying out data retrieval (in the field)

Data retrieval is to take measurements of the height and diameter of the ulin plant. Measurements are taken 2 (two) times during the year.

2) Data retrieval methods

a. High data retrieval is total height, a tool for measuring height using measuring signs. For ulin plants that are more than the length of measuring signs, the plant is climbed.

b. The collection of diameter data is carried out 20 cm above ground level using a microcaliper tool.

➢ *Data Collection*

3) Classify height measurement results with intervals of 1 m and diameter measurements with intervals of 2 cm.
4) Calculating the statistical values that is:

a. Calculate the average value

$$\bar{x} = \frac{\sum fx}{n}$$

where:
$\bar{x}$ = average (height, diameter)
$\sum fx$ = number of variabels (height, diameter)
n = Number of individual observations

b. Calculate the value of the standard deviation (Sd)

$$Sd = \sqrt{\frac{\sum fx^2 - \frac{(\sum fx)^2}{\sum f}}{\sum f - 1}}$$

where:
Sd = Standard Deviation
∑fx = number of value x (height ; diameter)
∑fx2 = Sum of squares of value x (height ; diameter)
n = Number of individual observations

c. Coefficient of Variation

$$CV = \frac{Sd}{X} x\ 100\%$$

where:
CV = Coefficient Of Variation
Sd = Deviation Standard
X = mean

5) Calculate Increment

Increment who was informed in this study is Diameter Increment and High Increment.

a. Mean Annual Increment (MAI)

According to Reference [7], Mean Annual Increment is calculated in the form of formulas such as the following:

Xi = X2 - X1

Where:
X_i = Increment.
X_1 = Early measurement (height/ diameter measured in December 2019)
X_2 = Final measurement (height/diameter measured in Desember 2020)

b. Current Annual Increment (CAI)

Current Annual Increment is calculated in the form of formulas such as the following:

$$i_x = \frac{X_t}{t}$$

where:
i_x = Mean Annual Increment (height/diameter)
X_t = Height/ Diameter at the time of measurement
t = Age of the plant at the time of measurement (year)[7]

III. RESULT AND DISCUSSIONS

A. Height Measurement

In Table 1 below is presented the statistical value of the measurement of the height of the Ulin plant at the age of 9 years.

Variable	N	Data		Average	Sd	CV
		Max	*Min*			
Early Measurement	78	8.79	1.42	5.26	1.69	32.07
Final Measurement	78	10.20	2.10	6.38	1.69	26.50

Table 1:- Average And Standard Deviation (Sd) results for measurement of Ulin (*Eusidroxylon zwageri* T et B) plant height

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The range of maximum data values (max) with minimum data (min) gives an indication of the variation in the height of the ulin plant. Based on the results of measurements and calculations of measurement data on the height of the Ulin (*Eusidroxylon zwageri* T et B) plant showed an average height increase from the initial measurement. By paying attention to the coefficient of variation of the high measurement as stated in Table 1. It is known that the coefficient of variation of each measurement shows a decreased value, this means that the ulin planted the more it ages the more uniformly the growth is high. This is in accordance with Opinion of Reference [8], which states that the lower the coefficient value of variation the more uniform the data. The increase in height is seen in Figure 1. below:

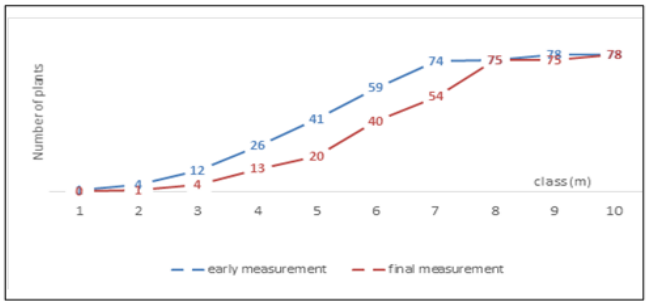

Figure 1:- Graph of Ulin (Eusidroxylon zwageri T et B) Plant Height Measurement Result

Cumulative data from measurements such as those presented in Figure 1 there is a shift from the initial measurements that show high growth in the Ulin (Eusidroxylon zwageri T et B) plant.

B. Diameter

Measurement of the diameter of the Ulin (Eusidroxylon zwageri T et B) plant as shown in Table 2.

Variable	N	Data		Average	Sd	CV
		Max	*Min*			
Early Measurement	78	13.10	2.00	7.28	2.50	34.28
Final Measurement	78	13.42	2.31	7/62	2.48	32/53

Table 2:- Average and Standard Deviation (Sd) results for measurement of Ulin (Eusidroxylon zwageri T et B) plant diameter

From the measurement and calculation of Ulin diameter (Eusidroxylon zwageri T et B) as presented in Table 2, it is known that the average diameter increases. The growth of the diameter towards more uniform but the level of uniformity still remains large this indicates a change in the value of the coefficient of variation between the early diameter measurement and the final diameter measurement.

Diameter measurement data with groupings in classes with intervals of 2 cm can show the distribution of diameter as presented in the figure below:

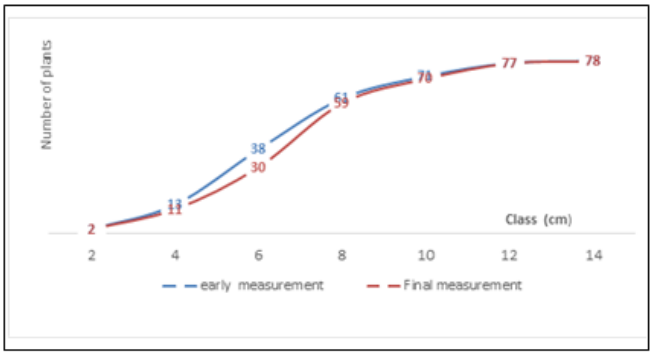

Figure 2:- Graph of Diameter Distribution Results of initial and final measurements of the Ulin (Eusidroxylon zwageri T et B) plant.

There is a shift in diameter distribution, between the initial and final measurements, as presented in Figure 2. This narrower range shift shows growth in each class of relatively small diameters.

C. Increment

According to Reference [7], increment is the increase in diameter or height of an individual plant calculated in a certain period of time, the small increment indicates the growth speed of a type of Incerement plant calculated in this study is increment (CAI and MAI) diameter and height.

Current Annual Increment (CAI) is the increase of a parameter in one year. The calculation of increments of the height and diameter of the Ulin (*Eusidroxylon zwageri* T et B) plant is obtained from the reduction of the final measurement with the initial measurement, for more details the description annual Increment values can be seen in the following table:

Variable	N	Data		Average	Sd	CV
		Max	*Min*			
Early Measurement	78	0.49	0.18	0.30	0.08	26.45
Final Measurement	78	1.50	0.45	1.08	0.25	23.22

Table 3:- Average Calculation Results, Standard Deviation (Sd) and Coefficient of Variation (CV) for The Current Annual Increment.

The mean annual increment (MAI) is the value of the parameter measured at the end divided by the number of years to get the final value.

Variable	N	Data		Average	Sd	CV
		Max	*Min*			
Early Measurement	78	0149	0.26	0.84	0.27	32.75
Final Measurement	78	1.13	0.23	0.70	0.19	26.56

Table 4:- Average Calculation Results, Raw Deviation (Sd) and Coefficient of Variation (CV) for Mean Annual Increment

Taking into account the graph of Ulin's height and diameter spread as seen in Figures 1 and 2, a graph shift between the initial measurement and the final measurement shows that there is growing accretion for all the ulin plants studied. For more details, the growth and diameter of each ulin plant studied can be seen in Table 3 and Table 4. Increment diameter and height of Ulin (Eusidroxylon zwageri T et B) plant in the conservation area of the ex-situ State Agricultural Polytechnic of Samarinda is larger when compared to increment ulin (*Eusidroxylon zwageri* T et B) plants in natural forests which amounted to 0,18 cm/year[9].

Reference [10] stated that the diameter of the ulin (*Eusidroxylon zwageri* T et B) plant is 10 years old in KHDTK Samboja at 2.9 cm / year while the increment is 0.3457 m / year high. While Reference [11], ulin plant aged 8,5 years has a diameter of 0.55 cm/year while the height is 0,81 m / year. There is a tendency to get older the age of the ulin plant the smaller increment, both diameter and increment height.

Based on the results of measurements and observations of this ulin tree even with the same type and age, growth is not uniform. This uniformity is thought to be due to edafis and light factors. It is seen in the research area that there are still shade plants that cause ulin plants to get different light and some grow in rocky soil.

This is in accordance with the opinion of Reference [12], plant growth is heavily influenced by climatic factors, physiological factors, edafic factors and biotic factors. According to Reference [7], the better the condition of the growing place for a type of tree, the better the growth

IV. CONCLUSION

Based on the results of the discussion above, conclusions can be drawn as follows:

1. The average height of the ulin plant (*Eusidroxylon zwageri* T et B) on the initial measurement was 5.26 m with a variation of 32.07%, while in the final measurement the average was 6.38 m with a variation of 26.50%
2. The average diameter of the ulin plant *(Eusidroxylon zwageri* T et B) on the initial measurement was 7.28 cm with a variation of 34.28%, while in the final measurement the average was 7.62 cm with a variation of 32.53%
3. Current annual increment the height of the Ulin plant (*Eusidroxylon zwageri* T et B)) at 1.08 m while the current annual Increment its diameter by 0.30 cm
4. The mean annual increment of Ulin plant height (Eusidroxylon zwageri T et B) is 0.78 m while the mean annual riap is 0.84 cm in diameter.
5. The ex-situ conservation of the Ulin plant (*Eusidroxylon zwageri* T et B) was the beginning of efforts to save the plant's increasingly rare genetic material. Nevertheless the number of places of origin, the area of conservation plants that are too small and narrow, nashi far from ex-situ conservation that should be.

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