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Identification Morfological Characteristic of Lai (Durio kutejensis (Hassk.) Becc.) Endemic to East Kalimantan in Batuah Village, Kutai Kartanegara Regency

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Abstract:

Lai (*Durio kutejensis* (Hassk.) Becc) is one of the durian relatives that is quite prospective to be developed into a superior commodity because it has a characteristic aroma that is not too pungent and the color of the fruit tends to be yellow to reddish. This research was conducted in Batuah, Kutai Kartanegara from March to July 2023, in 2 places, namely kilometer 26 and kilometer 30 of Batuah. This study shows that the morphological character shows Lai has a leaf width of 10.79 cm, a leaf length of 29.38 cm, and a petiole length of 2.6 cm. Morphological characters of the stemshow lai hasa diameter of the stem of 34.39 cm, a diameter of the branch of 10.52 cm, and a height of branch-free boundary of 162.79 cm. The morphological character of the flower, lai has 48 pieces of stamens in each bud, pistil length is 7.53 cm, and length is 7.94 cm. Fruit morphological characters, fruit length of 14.31 cm, fruit circumference of 46.73 cm, fruit stalk length of 2.86 cm, The Shape of the fruit is star-shaped, rounded, and square, thorn length of 0.93 cm, skin thickness of the fruit is 0.62 cm, lai fruit skin color in the Orange, Yellow, and Yellow Orange groups, lai fruit flesh color is in between Orange and Yellow Orange groups, flesh thickness is 0.72 cm, seed length 4.18 cm, seed diameter 21.59 mm, the color of the seeds is in the Greyed Orange and Greyed Red color groups.The location of the study influences the morphological character of Lai. Lai morphology at the research site km 30 has better results than at the research site km 25.

Keywords:

Identification, Morphological Character, Lai, Batuah, Kutai Kartanegara Regency

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1. INTRODUCTION

Indonesia has a diversity of germplasm found in tropical forests spread across Indonesia. This tropical forest stores a lot of biodiversity. Very favorable conditions for many varieties of plants can live in it with a variety of their life needs. One of the tropical forests in Indonesia is East Kalimantan.

East Kalimantan is one of the areas that have biodiversity, especially in the type of Durio spp. The diversity of Durio spp in East Kalimantan is one of the regions that describes the growth of durian and the distribution of rich sources of germplasm from Durio spp in Indonesia. Genus Durio spp. Become one of the strategic commodities.

The number of Durio species is many and have differences from one another in the taste, aroma, and color of the flesh. Some are found in seedless durian seeds (Kurniadinata et al, 2020). Durian plant species that have a great opportunity to be developed in East Kalimantan, among others *Durio zibethinus, Durio lowiana, Durio dulcis, Durio grandiflorus, Durio graveolen, Durio oxleyanus,* and *Durio kutejensis* (Hassk.) Becc. (Mansur, 2007). In some types of Durio, for example,*Durio kutejensis* (Hassk.) Becc. it even has different names in each region, including papakai and pekawai (Rizal et al, 2015).

Batuah village has long been known as one of the development centers of *Durio kutejensis* (Hassk.) Becc. Especially in the Kutai Kartanegara Regency. However, lately the existence of germplasm *Durio kutejensis* (Hassk.) Becc. It is increasingly threatened along with the increasingly massive coal mining in the region. The results of observations that have been conducted in the field showed that the population of *Durio kutejensis* (Hassk.) Becc. in the Batuah region continues to experience shrinkage. *Durio kutejensis* (Hassk.) Becc. This has not been identified raises concerns about the dwindling population of local lai that exist today.

Lai (*Durio kutejensis* (Hassk.) Becc.) is an endemic plant of East Kalimantan. Lai is one of the durian relatives that is quite prospective to be developed as a superior commodity in East Kalimantan. Lai has distinctive characteristics when compared to *Durio zibenthinus*, such as a less pungent aroma and fruit color that is more likely to be yellow to reddish.

Identification is done by looking at the morphological characteristics of lai, this is the easiest and fastest way to group and obtain diversity and individuals who come from these areas based on their specific morphological characteristics (Susilawati and Sabran, 2018). Identification of the diversity of morphological characters can describe lai, for example, on the color of flowers that vary, among others, have shades of white, yellowish, brown, pink, and maroon flowers. The skin of the fruit is generally green to yellow, but there is also a red color. The flesh of the fruit has a variety of flavors, ranging from bitter to sweet, soft to fibrous texture, as well as white, light yellow, dark yellow, and orange to red (Priyanti, 2012).

Based on the description above, this study aims to determine the morphological character of Lai and the influence of the research location in Batuah Village, Kutai Kartanegara Regency.

2. MATERIALS AND METHODS

The materials used in this study are leaves, flowers, fruits, and trees. The tools used include measuring meters, tape meters, paper pads, tags, RHS color charts, rulers, stationery, nails, hammers, and cameras.

The method of this study is to visit the designated Lai garden. This study focuses on the identification of morphological characters of leaves, flowers, fruits, and other trees. Lai leaves are measured in length, width, and petiole length. Lai flowers measured the length of the pistil and stamens and counted the number of stamens. Lai fruit measured fruit length, fruit circumference, fruit stalk length, fruit stalk diameter, fruit thorn length, fruit skin thickness, fruit flesh thickness, seed length, and seed diameter and determined the fruit, thorn shape, fruit skin color, fruit flesh color, and seed color.

2. RESULT AND DISCUSSION

2.1. Morphological Character of the Leaves

The results of measurements of leaf width, leaf length, and petiole length of lai growing in locations km 25 and km 30. Leaf morphology Data are shown in Table 1.

Table 1. Morphological Characters of Leaves at the Location of km 25 and km 30

No	Observation Of Morphological Characters	Measurement Result (cm)	
		km 25 Batuah	**km 30 Batuah**
1	**Average leaf width**	**9.87 ± 0.72**	11.01 ± 1.12
2	**Average leaf length**	**27.96 ± 3.65**	29.72 ± 2.06
3	**Average petiole length**	**2.54 ± 0.39**	2.61 ± 0.51

Morphological characters of leaves at both research sites showed an average leaf length of 29.38 cm, an average leaf width of 10.79 cm, and a petiole length of 2.60 cm. Lai has large leaf dimensions when compared to other Durio species, this is reinforced by Saragih et al., *Durio zibethinus*, or known as Durian or its crosses (Aprilianti, 2017). Priyanti also suggested that Lai leaves have leaves with the longest and widest size among other Durio species (Priyanti, 2012). Lai leaves are elongated because if the length of the Leaf is divided by the width of the leaf, it amounts to 2.5 to 3 to 1 (Tjitrosoepomo, 2018).

Observation of leaf morphology character indicates that there is a mixture of Lai varieties Lai Kutai and Lai Batuah. This is because according to the characteristics of Lai, batuah leaves have a length of 30-35 cm and a width of 6-8 cm, while Lai kutai has a characteristic leaf length of 26-39 cm and a width of 9-13 cm, and Lai mahakam has a leaf size of 22-28 cm long and 9-10 cm wide (Rizal et al, 2007).

2.2. Morphological Character of the Flowers

Observation of Lai flowers used several aspects, including the number of stamens, pistil length, and stamen length, among the sampled flowers. Data on the observation of plant flowers can be seen in Table 2.

Table 2. The Morphological Character of Flowers at the Location of km 25 and km 30

No	Observation Of Morphological Characters	Measurement Result (cm)	
		km 25 Batuah	km 30 Batuah
1	**Average number of stamens**	44.14 ± 2.16	48.93 ± 5.23
2	**Average pistil length**	7.29 ± 0.84	7.59 ± 0.94
3	**Average stamen length**	7.31 ± 0.85	8.09 ± 0.85

Observations of the morphological character of flowers in both locations showed an average number of stamens of 48 pieces, an average pistil length of 7.53 cm, and an average length of stamens of 7.94 cm. Flowers on lai have a red color with a large size. This is confirmed by research conducted by Sunaryo et al., Lai flowers are red (Sunaryo et al, 2015). Lai flowers have the same number of petals and sepals, that is, five pieces. The research of Saragih et al. shows that Lai flowers are large with the number of sepals and petals in Lai flowers numbered five. The color of the sepals of Lai flowers is yellow, while the petals are red (Saragih et al, 2020).

2.3. Morphological Character of the Fruits

Fruit observation from Lai used several parameters, including fruit length, fruit diameter, fruit stalk length, fruit stalk diameter, thorn shape, thorn length, fruit base shape, fruit bottom end shape, fruit skin color, fruit flesh color, fruit flesh thickness, seed length, seed diameter, seed color, and seed shape. Data from the observation of interest lai. The location of km 25 and km 30 are summarized in Table 3.

Table 3. The Morphological Character of Fruits at the Location of km 25 and km 30

No	Observation Of Morphological Characters	Measurement Result	
		km 25 Batuah	km 30 Batuah
1	Average fruit length (cm)	17,20 ±2,66	13,61 ±1,63
2	Average fruit circumference (cm)	48,73 ±1,31	39,77 ±3,74
3	Average fruit stalk length (cm)	2,86 ±0,71	2,84 ±0,57
4	Average fruit stalk diameter (mm)	17,10 ±1,84	14,10 ±1,95
5	Thorn shape		
	Tight	6	21
	Loose	1	8
6	Average thorn length (cm)	1,04 ±0,22	0,93 ±2,14
7	Top shape of the fruit		
	Star-shaped	7	26
	Rounded	-	2
	Square	-	1

8	The bottom shape of the fruit		
	Star-shaped	7	26
	Rounded	-	2
	Square	-	1
9	Average fruit peel thickness (cm)	0,73 ±0,21	0,59 ±0,16
10	Fruit peel color (Color group)		
	Green Yellow 1	-	1
	Orange 23	-	1
	Orange 24	-	1
	Orange 25	-	1
	Yellow 2	-	1
	Yellow 13	1	6
	Yellow Orange 13	-	1
	Yellow Orange 14	1	2
	Yellow Orange 15	3	2
	Yellow Orange 16	-	3
	Yellow Orange 17	-	3
	Yellow Orange 20	-	2
	Yellow Orange 21	1	5
	Yellow Orange 23	1	-
11	Flesh color of fruit (color group)		
	Orange 24	-	5
	Orange 25	-	5
	Orange N25	-	2
	Yellow Orange 14	2	1
	Yellow Orange 17	3	6
	Yellow Orange 21	2	6
	Yellow Orange 23	-	4
12	Average thickness of flesh (cm)	0,69 ±0,13	0,73 ±0,26
13	Average seed length (cm)	4,20 ±0,43	4,21 ±0,43
14	Average seed diameter (mm)	24,18 ±2,85	21,31 ±2,20
15	Fruit seed color (Color group)		
	Greyed Orange 165	-	3
	Greyed Orange 166	1	5
	Greyed Orange 167	1	-
	Greyed Orange N167	3	2
	Greyed Orange 172	-	2
	Greyed Orange 174	-	1
	Greyed Orange 175	2	13
	Greyed Orange 177	-	1
	Greyed Red 178	-	2
16	Shape of fruit seed		
	Oval	7	25
	There are wrinkled seeds.	-	4

Observation of morphological characters showed average results in both locations, among others, fruit length 14.31 cm, fruit circumference 41.51 cm, fruit stalk length 2.84 cm, fruit stalk diameter 14.68 cm, thorn length 0.95 cm, skin stalk 0.62 cm, flesh thickness 0.72 cm, seed length 4.21 cm, and seed diameter 21.87 mm. Lai has a smaller fruit length than Durio zibethinus or durian. This is illustrated by the length of the lai fruit that has been observed, which is 9.5 – 21.5 cm, while the durian in Batuah village has a length of 15 – 30 cm (Saragih et al, 2020).

Observation of the shape of the fruit is done by sensing at both locations found the shape of thorns on the fruit Lai 27 fruit, while 9 fruit Lai with tenuous thorns as in durian. The upper and lower shapes of the lai fruits observed showed the results of 33star shapes, 2 round pieces, and 1 square piece.

The character's skin color on Lai observed showed greyed yellow, yellow, yellow orange, and orange. Based on Saragih et al. lai's skin color is more yellow when compared to durian. The color of the seeds in the lai fruit shows an orange-brown to reddish-brown color, namely with the Greyed Orange and Greyed Red color groups, this is because the seeds in the lai fruit are older and longer than durian, but have the same width as durian (Saragih et al, 2020).

Lai has a yellow to orange fruit with yellow-orange and Orange color groups, this is because vitamin A levels are very high in Lai fruit. The flesh of lai fruit contains beta carotene which is a provitamin A that will be converted into vitamin A in the body. Lai fruit skin is thicker, spiny more tightly, and the flesh is smaller when compared with durian (Antarlina, 2009).

2.4. Morphological Character of the Stem

Observation of the trunk from lai takes measurements on, among others, the circumference of the trunk and the diameter of the trunk from the measurement of the circumference of the trunk, the circumference of the first branch as well as the diameter of the first branch from the measurement of the circumference of the branch and the height of the first branch from the ground surface. Data on the measurement results of rods at km 25 and km 30 locations can be seen in Table 4.

Table 4 The Morphological Characters of Stem at the Location of km 25 and km 30

No	Observation Of Morphological Characters	Measurement Result (cm)	
		km 25 Batuah	**km 30 Batuah**
1	**Average stem circumference**	102.69 ± 18.93	109.27 ± 33
2	**Average stem diameter**	32.70 ± 6.03	34.80 ± 10.51
3	**Average of the first branch circumference**	35.46 ± 17.12	32.44 ± 10.13
4	**Average of the first branch diameter**	11.29 ± 5.45	10.33 ± 3.23
5	**Average of branch-free limit**	110.9 ± 5.36	175.32 ± 65.77

Lai morphological characters on the trunk in both locations showed an average yield of 107.99 cm trunk circumference with a diameter of 34.39 cm, an average branch circumference of 33.03 cm with a diameter of 10.52 cm, and the free boundary of the branch as high as 162.79 cm. The Lai that has been observed has a sympodial branching type. The sympodial branching type is a form of branching with a main stem that is difficult to determine because its development stops or loses greatly to the growth of its branches (Tjitrosoepomo, 2018).

This study shows that at the location of km 30 Batuah there is Lai morphology which is the result of a cross between Lai and Durio zibethinus, namely on tree number 58. When

viewed again in Table 3, some fruits show skin color in green Yellow color Group 1 with color code Brilliat Greenish Yellow A. This may be a fruit plant Lai-durian known by the public as Lai mandong.

The Lai found had the same flesh color as the average of the other Lai fruits found. The plant is crossbred, because it has a morphological character the skin color of the fruit is more greenish; the size of the fruit found lai is not smaller than the fruit of Lai; and the leaves are smaller than Lai.

Lai-durian is often referred to by its common name Lai mandong. Lai-durian is a natural cross between Lai and Durio zibethinus. Lai-durian has different morphological characters from durian and lai. This plant shows consistent morphological characteristics on its leaves and flowers, this is a strong indication that Lai-durian is the result of the natural crossing of Lai with Durio zibethinus (Sunaryo et al, 2015).

The Lai-durian crossing is an example of Allogamy or cross-pollination. Plants of the species Durio spp. have the character of open pollination (Open pollination). This open pollination between species causes crosses to occur between Durio spp species (Sunaryo, 2023).

The results of Lai's research at both research sites showed different results. Data from this study showed that at 25 km location has a lower yield compared with the 30 km location, only the average fruit size is larger at the 25 km location.

Lai research results show that the location of km 25 has a non-intensive maintenance pattern, this is illustrated by the absence of fertilization and periodic pest control. The planting pattern used at the location uses a mixedcropping pattern or mixed plants. The mixed plant planting pattern is one of the polyculture planting patterns that combine several types of plants at the same time without any planting distance or row (Simatupang and Pangaribuan, 2021). Plants found on the land, among others, are cempedak, rambutan, durian, bananas, bananas, and duku.

The Lai research site at the 30 km site uses more intensive maintenance. Fertilizing the lai at the site is carried out three times per year with NPK, boron, KCl,and dolomite fertilizers twice and at the end of the season using compost. The planting pattern used is monocropping or monoculture. Monoculture planting pattern is a planting pattern by planting the same plants on the same land at the same time.

4. CONCLUSION

Based on the identification of morphological characters that have been done along with the discussion of the results of the study, it can be concluded that,

1. Lai has an average leaf width of 10.79 cm, an average leaf length of 29.38 cm, and an average petiole length of 2.6 cm. The trunk of the lai has an average circumference of 107.99 cm and an average diameter of 34.39 cm, the circumference of the first branch of the lai is an average of 33.03 cm and a diameter of 10.52 cm, and the free border of the lai is an average of 162.79 cm. Lai flowers have an average number of stamens of 48 pieces in each bud, an average pistil length of 7.53 cm, and an average stamen length of 7.94 cm. Lai fruit has morphological characteristics, including an average fruit length of 14.31 cm, an average fruit circumference of 46.73 cm, an average fruit stalk length of

2.86 cm, and an average fruit stalk diameter of 17.1 mm. The Shape of the fruit is star-shaped, rounded, and Square, The Shape of the Thorns is close or tenuous, and the length of the Thorns is an average of 0.93 cm. Lai fruit skin thickness averages 0.62 cm. The average thickness of the fruit flesh is 0.72 cm, the color of the skin of the lai fruit in the Orange, Yellow, and Yellow Orange groups, and the color of the flesh of the Lai fruit in the Orange and Yellow Orange groups. Lai fruit seeds, among others, have an average seed length of 4.21 cm, an average seed diameter of 21.87 mm, and the most common seed color in The Color group Greyed Orange and Greyed Red.

2. The location of the study influences the morphological character of lai depending on land conditions and plant maintenance patterns. Plant maintenance includes fertilization and control of plant pests and diseases.

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