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Morphological Diversity of *Lansiumdomesticum* Corr in South Sumatra

Rupiah[1], Laila Hanum[2], Zaidan P Negara[3], Zulkifli Dahlan[2], Indra yustian[2]

[1] *Department of Environmental Biology Graduate of Sriwijaya University*
[2] *Department of Biology, FMIPA Sriwijaya University*
[3] *Department of Agriculture Faculty of Agriculture Sriwijaya University*
Email: rupiah.adel@student.pps.unsri.ac.id

ABSTRACT

Researchon the Morphological Diversity of *Lansium domesticum* Corr in South Sumatra. The research was conducted in April 2017 to June 2017. This research was conducted by means of exploration carried out in seven districts covering, East Ogan Komering Ulu District, South Ogan Komering Ulu District, Ogan Komering Ulu District, Musi rawas District, Ogan Komering Ilir District, Muara Enim District and Musi Banyuasin District. Sampling is done by using purposive sampling method. Observation of morphological diversity was done by characterization of morphology and analyzed by descriptive method. The result of this research shows that in South Sumatera, there were two variants of *L. domesticum* namely *L. domesticum* variant duku and *L. domesticum* variant langsat.

Keywords: Lansium domesticum, Morphology Diversity, South Sumatera

1. INTRODUCTION

Lansium domesticum Corr is a wet tropical plant in the form of trees. *L. domesticum* isalso one of the plants of the Meliaceae family originating from western Southeast Asia from the Thai Peninsula in the west to Kalimantan in the east. This species is still found growing wild in that region and still as one of the main cultivated fruits. From its country of origin, *L. domesticum* spread to Vietnam, Myanmar, and India (Mayanti, 2009).

Lansium domesticum Corr spread evenly in South Sumatra province. Statistical data from the Department of Agriculture and Holticulture of South Sumatera (2015) shows that the distribution of *Lansium domesticum* spread in fifteen districts such asOgan Komering Ulu (OKU), Ogan KomeringIlir (OKI), Muara Enim, Lahat, Musi Rawas, Musi Banyuasin, Banyuasin, South Ogan KomeringUlu, East Ogan Komering Ulu, OganIlir (OI), Empat Lawang, Palembang, Prabumulih, Pagaralam and Lubuk Linggau, so that the *Lansium domesticum* became one of the leading commodities and mascot flora in South Sumatra.

In term of the taxonomic status,duku, kokosan, and langsat still do not have a qualified classification. According to some taxonomists, the unqualified classification caused by the heightof the morphological resemblance, especially in duku and langsat (Te-chato et al., 1995); the presence of partenocarps and apomixis occurring in duku, kokosan, and langsat, and morphological comparisons are difficult to distinguish since these plants often grow in the same location, besides that, the giving of regional names were inconsistent so that the same name were given for different varieties or otherwise,the different names used for the same varieties (Verheij and Coronel, 1997)

Morphological characters such as variations of leaf shape, fruit color, and fruit shape can be used as a basis in determining the categories of varieties. Lim (2012) based on macromorphology placed duku, kokosan, and langsat into two varieties in one type of *L. domesticum*, L. domesticum var. typica known as duku- and *L. domesticum* var. pubescent Koorders et Valeton known as langsat and kokosan. In South Sumatra *Lansiumdomesticum*Corr has a different naming because of the character variation in the morphology of trees, leaves, and fruits.Based on this, this study aimed to examine the morphological diversity of *L. domesticum*Corr in South Sumatra.

2. EXPERIMENTAL SECTION

2.1. Place and Time

This research was conducted in the duku production center area in South Sumatera Province. The sample identification was done at the Graduate Laboratory of Sriwijaya University of Palembang. The study was conducted from April 2017 to June 2017.

2.2. Materials and Instrumentation

Some tools and instrument used in this study were stationery, camera, scissors, calipers, meter and magnifier. The materials used in this work were bamboo samples and alcohol 70%, Newsprints,

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Table 1.Morphological Characterizationsof *Lansium domesticum* in South Sumatra

Organ	Characterizations	Duku	Langsak	LangsakBulu	LangsakNipis	Langsat
Trunk	Trunk height (m)	6 – 15	6 – 15	6 – 7	7 – 8	8 – 10
	Branch type	Monopodial	Monopodial	Monopodial	Monopodial	Monopodial
	Trunk color	Brown	Brown	Grayish brown	Grayish brown	Grayish brown
	Trunk winding (cm)	34 – 300	46 – 300	35 – 87	86	98
	Canopy condition	Covered with dense leaves	Covered with dense leaves	Opened with rarely leaves	Opened with rarely leaves	Opened with rarely leaves
	The presence of hair on the top and bottom surfaces of the leaves	Hairless	Hairless	Smoothed hair on the top and bottom surfaces of the leaves	Smoothed hair on the top and bottom surfaces of the leaves	Smoothed on the top and bottom surfaces of the leaves
	Leaf tip	Tapered	Tapered	Tapered	Tapered	Tapered
Leaf	Leaf length (cm)	9,3 – 30	13,2 – 28,4	9,5 – 24	10 – 17	10 – 17
	Leaf width (cm)	5,8 – 18,5	7,4 – 16	7,5 – 11,3	5,5 – 9,3	5,5 – 7,1
	Leaf color	Yellowish green	Green	Dark green	Dark green	Dark green
	Leaf bone	Pinnate	Pinnate	Pinnate	Pinnate	Pinnate
	Leaf edge	Flat	Flat	Flat	Flat	Flat
	Leaf shape	Ellipse	Ellipse	Ellipse	Ellipse	Ellipse
Fruit	Rind Thickness (mm)	0,08 - 0,2	0, 08 – 0,1			0,03 – 0,06
	The number of seeds per fruit	3-Feb	2 – 3			3 – 4
	Number of fruits	10 – 30	12-Aug			20 – 30
	Fruit shape	Spherical	Spherical			Oval
	Fruit color	Yellow	Yellow			Yellow
	Fruit diameter (cm)	8 – 12	9-Aug			8 – 9

transparent plastic bag, tissue, adhesive plaster, paperboard, label paper, and research object (*L. domesticum*).

2.3. Procedure

Sampling was done by means of exploration using purposive sampling method,and then performed the inventory of plants. Specimens were obtained in the field were taken especially from the main organs of the plants such as branches, twigs, leaves and fruit for further identification.

2.3.1. Morphological Observation

Macromorphological observation was done by descriptive method. Observations and measurements of the macromorphological data were performed on plant's organs ie stem, leaves, flowers, and fruit in the form of qualitative and quantitative data.

2.3.2. Identification

Further identification was done using Taxonomy books e.g.Prosea, Plant resources of South East Asia 2 (Verheij and Coronel, 1997); Edible-Medicine and Non-Medicinal Plants, Third Edition: Fruit (Lim, 2012); Flora of Java, Volume II (Backer and Bakhuizen van den Brink, 1965); Morphology Tumbuhan(RosantiDewi, 2013) and journals on *Lansiumdomesticum*. Each sample was documented in the form of photographs.

2.3.3. Making Herbarium

Making herbarium was following Onrizal method (2005) that includes i. Sample collection, ii. Processing and preservation and iii. Mounting.The herbarium is taped to a rigid image paper and then attaches a completed identification label.

3. RESULTS AND DISCUSSION

Research on *L. domesticum* morphological diversity in South Sumatra was conducted in seven districts including Kabupaen OKI, East OKU, OKU, Southern OKU, MuaraEnim, MUBA, and MusiRawas. Observation of morphological diversity was done by morphological characterizations by descriptive method. The results of morphological characterizations of *L. domesticum* were presented in Table 1.

The results in Table 1 shows that of the five samples observed have different morphological characters both on fruit, stem and leaf characters. Duku fruit is yellow, spherical, The skin of duku is thicker than the peel of langsat, the skin thickness is between 0.08 and 0.2, the presence of sap on ripe fruit slightly gummy, the flesh of fruit is white and somewhat transparent, duku fruit has a sweet taste, but there are some duku fruit that has a sweet acidity. Langsat fruit is yellow, oval or rounded elongated, thin fruit skin thickness ranges from 0.03-0.06, smaller fruit with fruit diameter ranging from 3 to 4 cm, the presence of sap on ripe fruit many, fruit flesh is white and cloudy, and the taste of fruit is acid.

In addition to having differences in fruit morphological characteristics there are differences in leaf morphological characters. Leaves of duku and langsak are elliptical, the top and bottom surfaces of the leaves are hairless, the tip of the leaf is tapered, green color, some are yellowish green.While the leaves langsak bulu, langsak nipis and langsat, the surface of the bag and the bottom of the leaves are smooth-haired, dark green with pinnate leaf bone, flat edges, elliptical leaf shape.

Duku and langsak have trunkheight varying between 6 - 15 m, trunk winding from 34 - 300 cm trunk height and winding in

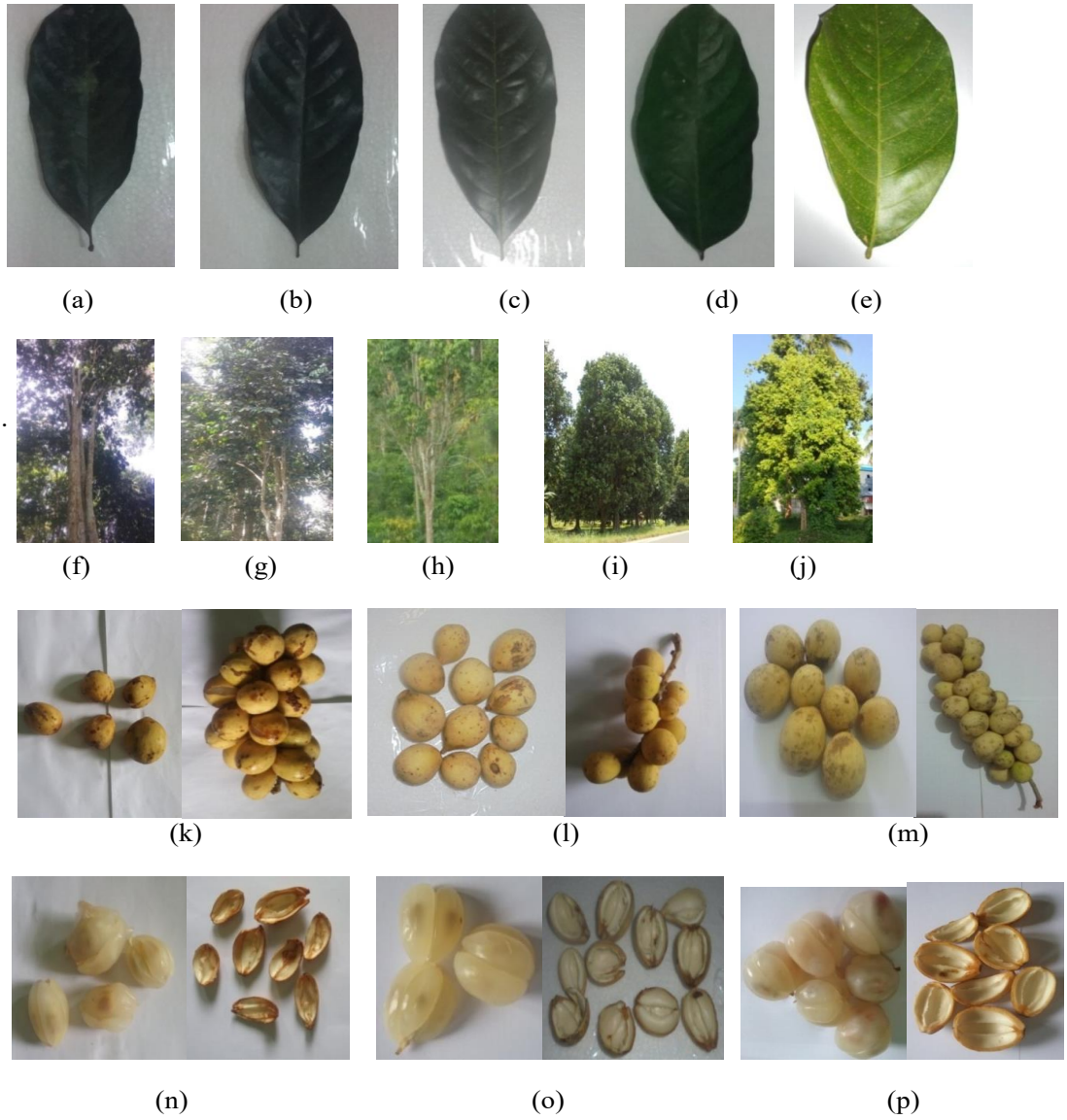

Figure 1.Differences in morphological characters, (a) leaf morphology of langsaknipis(b) leaf morphology of langsakbulu(c) leaf morphology of langsat, (d) leaf morphology of langsak, (e) leaf morphology of duku, (f) canopy condition of langsaknipis, (g) canopy condition of langsakbulu, (h) canopy condition of langsat, (i) canopy condition of langsak, (j) canopy condition of duku, (k) fruit morphology of langsat, (l) fruit morphology of langsak, (m) fruit morphology of duku, (n) the flesh of fruit morphology and skin thickness of langsat, (o) the flesh of fruit morphology and skin thickness of langsak, (p) the flesh of fruit morphology and skin thickness of duku.

accordance with the age of the plant. The type of branch ismonopodial,and closed canopy condition with dense leaves. Langsat, langsakbulu, danlangsaknipishave a height of 6 - 10 m, girth 45 - 98 cm, grayish brown of trunk color, monopodial branching type, and opened canopy condition with rare leaves. Verheij and Coronel (1992) stated that *Lansiumdomesticum*Corr is a fruit tree with a height of 15 to 20 m and a trunk diameter of 35-40 cm. In the trunkthere are deep grooved and stretched high, bark duku colored brown greenish or grayish, cracked and has a white gummy. *Lansiumdomesticum* has a monopodialtrunk branching type, the main stem is clearly visible, easy to distinguish with its branches either the direction or the size, trunk color is brown or grayish brown.

Morphological characterizations of duku, langsak, langsat, langsakbulu and langsaknipis refer to Ridley (1931); Morton (1987); and Lim (2012) in Hanum (2013). Morphological characters such as variations in leaf shape, fruit color, and fruit shape can be used as a basis in determining categories of varieties (Lawrence, 1951). Determination of taxonomic status of duku, kokosan, and langsat on Ridley variety category (1931); Morton (1987); and Lim (2012) in Hanum (2013) using the character of hair presence on the top and bottom surfaces of the leaves. Ridley (1931) in Lim (2012) places duku, kokosan, and langsat as two varieties, *L. domesticum* var. typica (duku) and *L. domesticum* var. pubescent (kokosan and langsat) based on the presence of hair on the top and bottom surfaces of the leaves, the presence of hair on the petals, the shape of fruit, the thickness of the fruit skin, the presence of sap on the ripe fruit, the nature of seeds, fruit taste, and seed size.

Based on macromorphological characterization results,duku and langsak have similar morphological characters to *L. domesticum*

var. *domesticum* (duku) and macromorphological characterization langsat, langsakbulu and langsaknipis has similar morphological characters to *L.domesticum* var. pubescent. According to Davis and Heywood (1973); Stace (1979) Varieties (local races), a population consisting of one or several biotypes, have distinctly different morphological characters, scattered in a limited (local) region within a species distribution, so the variety is called a local race. According to Brandenburg (1986), group categories can be synonymous with varieties in a formal taxonomy whereas Radford (1986) states that group formation is based on the closeness of the relationship between a taxa to another taxa which is determined by so many similar properties between the taxon. Morphological characters that support the placement in the varieties category,especially from the presence of hairs on top and bottom surfaces of leaves, fruit shape, presence of sap on ripe fruit, fruit taste, fruit skin thickness, crown condition (Figure 1).

Duku (*L. domesticumvarduku*) generally has a large tree, a bright green leaf with an upper and lower leafless surface with a relatively short bunch and contains a small amount of fruit, a pruning grain of 3-10 grains per cluster. The fruit is large, spherical and thick skin, non-gummy rind of fruit when ripe, thick fleshy, has small seeds, sweet or sticky, and smells nice.While Langsat (*L. domesticumvar, domesticum*) , dark green leaf with top and bottom surfaces are soft and less dense, with upright branching. The fruit bunches are long, solid containing 15-25 grains per cluster that are oval. The fruit has a thin skin, the flesh tastes sour refreshing. In general, langsat cannot last long and more easily blackened after picking from the tree (Verheij and Coronel, 1997; Lim, 2012 in Hanum and Kasiamdari, 2013).

According to Singh (1999),the variations of morphology shown by organism were the result of interaction between the genetic factors and the environment in which the organism was alive. Davis and Heywood (1973) suggest that morphological variations, genetically arising from mutation, recombination, and gene flow events, while ecologically emerging through a series of physiological processes due to the differences in illumination, temperature, water, wind, soil, and organisms.Verheij and Coronel (1997) states,*L. domesticum* is a complex and varied species with wild varieties and cultivation. This is partly due to the occurrence of partenocarpy events, apomixis, and natural crosses so that taxonomic status duku, kokosan, and langsat become increasingly complex. Backer and van de Brink (1965) and Morton (1987) reported *L. domesticum* var. pubescent (langsat) as wild type. Kosterman (1960) states langsat is a hybrid between duku and kokosan.

4. CONCLUSION

Based on the morphological assessment of *L. domesticum* in South Sumatra, there are two variants of *L. domesticum* were *L. domesticum* variant duku and *L. domesticum* variant langsat. Morphological characters that distinguish between duku and langsat variants are found under canopy conditions, presence of hair on top and bottom surfaces of leaves, fruit shape, fruit skin thickness, fruit taste, and the presence of sap on ripe fruit.

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