

1 **ACCEPTED RESEARCH NOTE**

2
3 **Exploration And Characterization of Superior Locals Durian In Two**
4 **Subdistricts of Malang East Java Indonesia**

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17 **ABSTRACT**

18 Durian production centers in East Java areas are quite numerous, two of which are Kasembon
19 and Ngantang Subdistricts, Malang District. In these areas, most durian trees are propagated
20 from seeds. This research aimed to determine the genetic diversity by exploration and
21 characterization of superior types, it was conducted by descriptive method. Determination of
22 samples in the study using a non probability sampling design with a purposive sampling
23 method. The research was conducted by characterizing the qualitative and quantitative
24 morphological characters from fruit, leaves, and trees. The characters identified are 81
25 characters. Characterization of the durian types was made based on the guidebook description
26 from Bioversity International. Quantitative data was used for descriptive statistical analysis.
27 Qualitative data analysis was carried out using the Unweighted Pair Group Method with
28 Arithmetic Averaging (UPGMA) method using NTSYS version 2.02 software. The results of
29 the research showed that local superior durians from Kasembon and Ngantang Subdistrict had
30 diverse characteristics. Diversity are in the character of fruits, leaves, and trees. The genetic
31 distance among superior durians is 0.109–0.343. Some of durian accessions observed such as
32 Vodca, and Kunir Amad have the potential to be registered as regional assets or as local
33 superior cultivars.

34 **KEYWORDS:** Characteristic, durian, local, morphology.

35
36 **INTRODUCTION**

37 Durian (*Durio zibethinus*) is a climacteric, seasonal tropical fruit of Southeast Asia. The
38 ripe durian fruit owing to its unique taste and aroma is considered locally the king of fruits
39 (Srianta et al., 2012), contain high in essential micro and macro nutrients, minerals and

40 vitamins (Ho & Bhat, 2015), provide phytoestrogens, anti inflammatory, and antioxidants
41 (Zannah et al., 2022). Durian is a type of annual plant, and evergreen leaves, but it has a
42 period of flushing, which is a period of growing new leaves and generally occurs after the
43 fruiting period is over (Ashari, 2017).

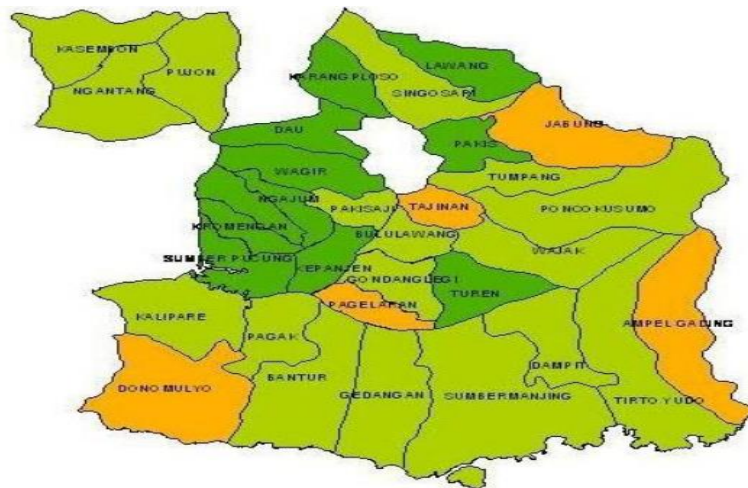
44 Durian production in Indonesia reaches 1.169 million tons annually, East Java being the
45 largest durian producer with 289,000 tons (Agriculture Ministry, 2019), provides additional
46 income for the community (Matius et al., 2018; Prasetyo et al., 2018). In Indonesia at least
47 there are 84 varieties have been released by the Ministry of Agriculture, based on their
48 morphological characteristics, and originate. The wide variety of cultivars is an important
49 source of germplasm as selection material for breeding durian and becoming superior local
50 fruit cultivars from each region (Yulita & Nurnianjari, 2010). Efforts to identify superior
51 types of durian from this region to various areas carried out through inventory activities,
52 includes exploration and identification, is an out of the field activity collect data on types of
53 durian in the area, genotype morphology characteristic expected to reveal potential seed of
54 plant to be developed in another region, also is used as a reference to introduce all types
55 durian in this area to a wider scope (Yuniastuti, Anggita, et al., 2018; Yuniastuti, Nandariyah,
56 et al., 2018).

57 Characterization and relationship among them are very important for plant breeding
58 program (Hariyati et al., 2013). First select a good character edible fruit, flesh color, water
59 content, attractive flesh aroma, soft aril texture, fair flesh creaminess, sweet and sweet with
60 bitter after-taste flesh. These two subdistricts are known as centers of local durians in Malang
61 Regency which have wide diversity of local cultivars with delicious taste and more expensive
62 than other types but have not been reported yet. This research was conducted to determine the
63 genetic diversity and characterization of local superior durians in Kasembon and Ngantang
64 Subdistricts.

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66 MATERIALS AND METHODS

67 The research was conducted in peak season from January to August 2018 in Subdistricts
68 of Kasembon 7°47'02", 112°18'32" and altitude of 500-721 m asl and Ngantang -7°51'23",
69 112°22'09" and altitude of 199-539 m asl.



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Figure 1. Research map location (Source: <http://www.malangkab.go.id>).

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Durian is known as an obligate cross pollinated plant (Santoso et al., 2014). The way to map the differences in durian plant types is by conducting exploration with farmers who own trees in their yards. Observed plant samples were determined based on the results of interviews through field surveys involving farmers, farmer groups, traders and local agricultural services as well as a durian fruit festival organized by the Government in East Java. Criteria for evaluating the superiority of each identified durian variety using the Durian Assessment Standard Guidelines (Direktorat Budidaya Tanaman Buah, 2010).

The characterization of the durian types was made based on the guidebook description from Bioversity International (Bioversity International, 2007). The characters identified are 81 characters, namely 48 fruit characters, 20 leaf characters, and 13 tree characters. The characteristics identified in the organoleptic test were aril texture, aril juiciness, presence of fiber, creaminess, flesh taste flesh aroma, and flesh stickiness.

Qualitative data analysis using the Unweighted Pair Group Method with Arithmetic Averaging (UPGMA) method using NTSYS (Numerical Taxonomy and Multivariate Analysis System) software. Qualitative data of characters are transformed into binary data and arranged in table form in Ntedit software version 1.07. After that, the data from the Ntedit result is processed with NTSYS version 2.02 software (Handayani & Rahayu, 2017). The results of processing data in this software produce a dendrogram and matrix.

RESULTS AND DISCUSSION

Genetic variation of local durians

In the exploration, there were 18 durian types (Table 1) were selected based on national durian idiotypes and consumer preference (Santoso et al., 2016). Most durian trees in these areas were originated from seeds.

Table 1. Names and subdistricts of superior durian found.

No.	Durian name	Initials	Origin subdistrict
1.	Kendi	KD	Ngantang
2.	Kunir Amad	KA	Ngantang
3.	Vodka	VK	Ngantang
4.	Manalagi Kuning	MK	Ngantang
5.	Duri Tajam	DT	Ngantang
6.	Getuk	GT	Ngantang
7.	Ranti	RT	Ngantang
8.	Selaput Udang	SU	Ngantang
9.	Toni	TN	Ngantang
10.	Aroma Kweni	AK	Ngantang
11.	Joko	JK	Ngantang
12.	Tarum	TR	Ngantang
13.	Ketan	KT	Ngantang
14.	Gipat	GP	Ngantang
15.	Klenting Kuning	KK	Kasembon
16.	Lima Ratus	LR	Kasembon
17.	Duri In	DI	Kasembon
18.	Brojo	BJ	Kasembon

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97 Diversity exists in three levels, namely genetic, species, and ecosystem diversity.

98 Morphological characteristics are based on the appearance of phenotypes, namely fruit shape,

99 fruit spines, fruit flesh taste, flowers, leaf colour, and other characteristics (Rivero-Guerra,

100 2011; Sunaryo et al., 2015; Sundari et al., 2015; Daryono & Maryanto, 2017).

101 Durian fruit shape is globose (7 of 18 individuals) in general (Figure 2). Characters of

102 shape of the fruit apex are: mammiform, convex, truncate, depressed, and pointed. Shape of

103 the fruit base are: depressed, convex, truncate, and necked. Fruit spine shape are: convex,

104 concave, pointed concave, and conical. Fruit spine density are: intermediate and sparse. Fruit

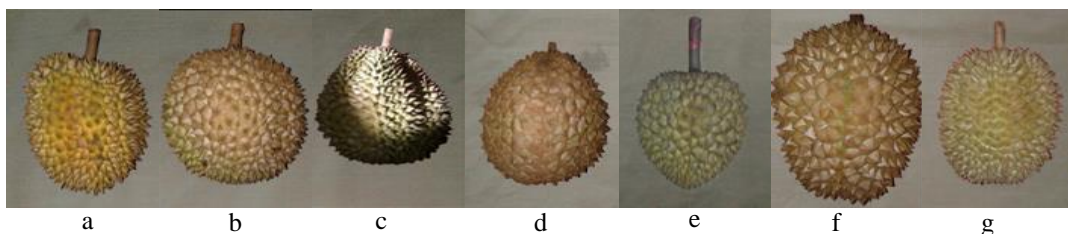
105 rind color, are: yellow, yellowish green, greenish yellow, and brown. Flesh color are: yellow,

106 orange, and white (Figure 3). Local superior durians mostly have intermediate easiness of

107 splitting, thin-rinded durian fruit has a longer shelf life, and has a more edible portion of fruit

108 (Fitmawati et al. 2015).

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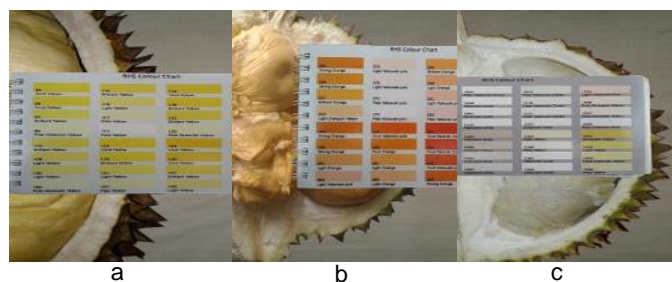
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111 **Figure 2.** Fruit shape (a) globose; (b) oblate; (c) star; (d) obovoid; (e) oval; (f) oblong; (g)

112 ovoid.

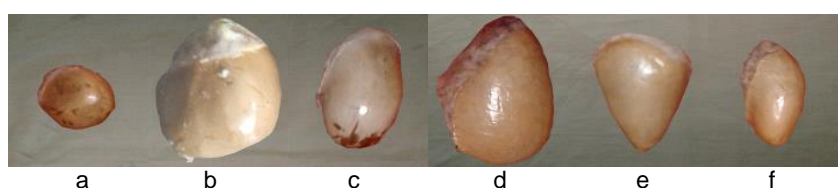
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116 **Figure 3.** Flesh color, a. Yellow, b. Orange, and c. White.
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118 Durian individuals with aborted and immature seeds have the potential to develop as
119 superior durians without seeds and enlarge the edible portion. Durian had seed shape
120 variations (Figure 4), with seed coat color intensity light and dark.
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123 **Figure 4.** Seed Shape, a. Spheroid, b. Ellipsoid, c. Oblong, d. Ovoid, e. Obovoid, and f.
124 Irregular.
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126 The 18 durian types were varied in leaf form, generally leaf blade shape is elliptic (16 of
127 18 individuals). Most of the leaf attitude is drooping at 45° (17 of 18 individuals), the crown
128 shape of the tree was 2, its growth habit variants of the durian tree were 3, most of the tree
129 growth habit is intermediate (15 of 18 individuals). Durian tree age range from 11 until there
130 are more than 100 years. Tree height range between 10.1-30.1 meters.

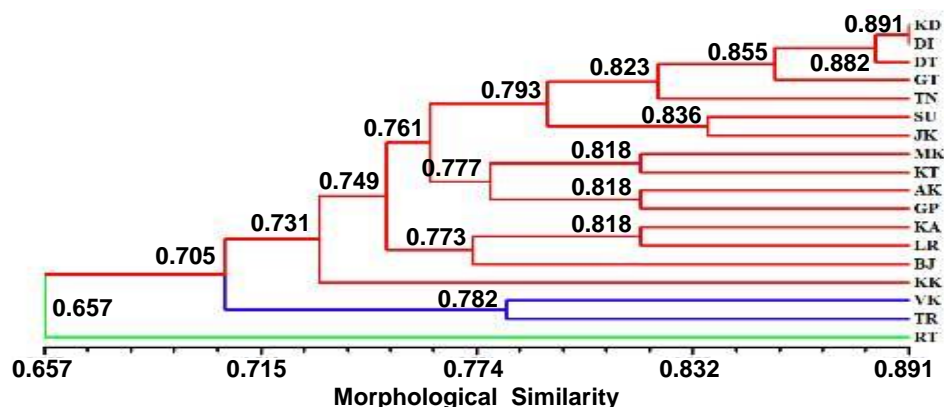
131 The organoleptic test showed that most of the local durians had moderate flesh aroma,
132 soft aril texture, non-juicy aril, medium presence of fibre, fair flesh creaminess, slightly sticky
133 flesh, sweet and sweet with bitter after-taste flesh with total sugar range between 34.96 ± 0.33
134 – $48.38 \pm 0.46\%$. It caused by genetic differences, environmental factors and the possibility of
135 fruit ages at different harvest times (Hadiati et al., 2016), the sweetness level is influenced by
136 level of fruit maturity and water content (Belgis et al. 2016)

137 Propagation by seeds will produce offspring that vary with the properties of the parent
138 plant, because durian is a cross pollinating plant (Bumrungsri et al., 2009). According to
139 (Indriyani et al. 2012), maternal parent influence the character of fruit (length, skin thickness,
140 number of seeds, seed weight per fruit) and percentage of aborted seeds. There are many
141 hybrids which are suitable for selection because durian is an open pollination plant (Prihatini
142 et al. 2016), this is consistent with the results of this study. Exploration results for local
143 durians in the two sub-districts show a high level of diversity as most durians grow from

144 seeds that are the result of crossing different combinations of parent trees. This increases the
 145 genetic diversity of durian plants, giving us the opportunity to obtain superior accession with
 146 high heterosis to use as mother trees and develop through vegetative propagation. However,
 147 the consequences of seed propagation will make the durian population heterogeneous,
 148 resulting individual inferior phenotypes that are less profitable for farmers.

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 150 **Clustering of local durians**

151 Cluster analysis was carried out based on qualitative data, showed that morphological
 152 similarity value of 18 durian species was 0.657–0.891 (Figure 5). Local superior durians in
 153 Kasembon and Ngantang Subdistricts based on the qualitative characters of fruit, leaves and
 154 trees, are divided into 2 Main Clusters, Ranti's accession was identified as the only individual
 155 with the lowest similarity coefficient (0.657) with the other 17 accessions, so it split from the
 156 two main cluster that formed, as it bears little morphological resemblance to other accessions.
 157 Grouping between accessions is not always related with origin, first group consists of various
 158 accessions originating from both subdistrict, Kendi and Duri In are the two accessions that
 159 show the highest morphological similarity (0.891). Grouping occurs because these accessions
 160 have similarities in morphological characters which can be caused by natural cross pollination
 161 of durian plants with the help of bats, birds and several species of beetles (Sritongchuay et al.,
 162 2016; Stewart & Dudash, 2017; Wayo et al., 2018). The highest similarity value was found
 163 between Kendi and Duri In durian (0.891), while the lowest similarity value was found
 164 between durian Ranti and 17 other durians (0.657) so it has not been identified. This is in
 165 accordance with the results of the study (Santoso et al., 2017) and (Sundari et al., 2021) that
 166 the fewer similarities, smaller similarity value or greater the genetic distance. Based on
 167 morphological observations (leaf and tree characters), genetic distance between durians is
 168 0.109–0.343.



169
 170 **Figure 5.** The dendrograms of Local superior durian Kasembon and Ngantang Subdistricts

	KD	KA	VK	MK	DT	GT	RT	SU	TN	AK	JK	TR	KT	GP	KK	LR	DI	BJ
KD	1.000																	
KA	0.745	1.000																
VK	0.673	0.655	1.000															
MK	0.727	0.782	0.673	1.000														
DT	0.873	0.800	0.745	0.800	1.000													
GT	0.873	0.745	0.691	0.691	0.836	1.000												
RT	0.636	0.673	0.600	0.655	0.691	0.655	1.000											
SU	0.818	0.691	0.636	0.782	0.782	0.782	0.618	1.000										
TN	0.800	0.800	0.636	0.764	0.818	0.800	0.709	0.782	1.000									
AK	0.800	0.709	0.636	0.745	0.764	0.745	0.655	0.818	0.818	1.000								
JK	0.800	0.673	0.673	0.673	0.745	0.764	0.618	0.836	0.800	0.764	1.000							
TR	0.782	0.764	0.782	0.745	0.818	0.782	0.636	0.709	0.764	0.727	0.691	1.000						
KT	0.727	0.745	0.691	0.818	0.727	0.709	0.691	0.745	0.818	0.800	0.727	0.764	1.000					
GP	0.745	0.800	0.618	0.782	0.764	0.709	0.673	0.745	0.818	0.818	0.709	0.691	0.782	1.000				
KK	0.764	0.727	0.636	0.764	0.745	0.709	0.618	0.745	0.691	0.727	0.673	0.764	0.764	0.764	1.000			
LR	0.745	0.818	0.636	0.727	0.782	0.764	0.709	0.727	0.818	0.800	0.727	0.782	0.727	0.764	0.691	1.000		
DI	0.891	0.764	0.709	0.764	0.891	0.855	0.655	0.836	0.873	0.836	0.818	0.764	0.782	0.836	0.764	0.782	1.000	
BJ	0.782	0.818	0.636	0.673	0.727	0.745	0.673	0.745	0.764	0.727	0.727	0.764	0.709	0.745	0.709	0.727	0.764	1.000

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173 **Figure 6.** The resemblance matrix of local superior durian characters in Kasembon and
 174 Ngantang Subdistricts.

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176 Differences and similarities in the emergence of outside morphology of a plant species
 177 can be used to determine the proximity of kinship. Environmental factors also influence the
 178 expression of these characteristics, even if they are only temporary (Hafizah et al., 2018).

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180 **CONCLUSIONS**

181 The results of the research showed that local superior durians from Kasembon and
 182 Ngantang had diverse characters in the character of fruits, leaves and trees. The genetic
 183 distance between 18 durian accessions is 0.109–0.343 on the fruit, leaf and tree characters.
 184 Some of durian accessions observed such as Vodca, and Kunir Amad have the potential to be
 185 registered as regional assets or as local superior cultivars. This research was carried out
 186 observing agromorphology and organoleptics, so the results are still influenced by the
 187 environment.

188

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 191 Kasembon subdistricts for their permission to characterize existing durian plants.

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