

## CHARACTERIZATION OF MANGO (*Mangifera indica* L.) IN RIMBA JAYA VILLAGE, MERAUKE REGENCY, INDONESIA

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### ABSTRACT

This research aimed to characterize mango cultivars information mango cultivars. The research was held in Rimba Jaya Village, Merauke District, Merauke Regency for five months. The methodology was descriptive by purposive sampling. The samples were observed based on plant origin, stem colour, girth, leaf shape, leaf size, petiole length, fruit size, fruit flesh thickness, fruit flesh colour, fruit flavor, fruit scent, fruit weight and ripe fruit colour, etc. The primary data were retrieved with measuring and observing the mango plant samples. The result indicated that there are 16 accessions of mangoes. Accession 01 have high morphology similarity with Gadoh varieties-343, accession 02 with Arumanis-1 (VIII 42), accession 03 with Li'ar, accession 04 with Roti-415 (III/97), accession 05 with Royal Palm California-223 (VIII/7), accession 06 with Trapang-419 (III/101), accession 07 with Kartikia-449, accession 08 with Salak-417 (III/99), accession 09 with Kopyor-173, accession with Golek-31(I/28), accession 11 with Bapang-13, accession 12 with Golek-33 (I/30), accession 13 with F1-47, accession 14 with Delima-209, accession 15 with Mangga Ayu-287 and accession 16 with Peach (IV/111) varieties.

**Keywords :** *characterization, accession, mango, varieties, preserve.*

### INTRODUCTION

Papua is not known as its mango production. Most people familiar with Gedong Gincu from Cirebon, Podang from Kediri, and Arumanis from Pasuruan. An official food crops and horticulture Merauke instructor Sherly Colylujur said, in Manokwari and Merauke there are one or two mango trees planted per house. In Manokwari, there are fifteen mango clones. Those mangoes probably brought from Java by the time of Dutch colony (Setyawan, 2013).

According to the Central Bureau of Statistics of Merauke (2011), Merauke district is one of the biggest mango producer after Jagebob, Sota and Tanah Miring district. The data also shows the increasing of harvested mango area, starting from 2006 to year 2010 which are 297,4 ha; 292,5 ha; 313 ha; 340,9 ha; and 357 ha. In reality, this escalation is not accompanied with the maximum commerciality of mango. Mangoes only directly consumed or treated into juice and sweetmeat???. There are also mangoes that generally used as forages because of their low sweet taste. The local people's lack of desire to optimized commerciality of mangoes, showed the importance of characterization of mango clones in Merauke. The mango clones required to be characterized and evaluated for information and the kinship between clones.

Food Crops and Horticulture Merauke Agency has done several activities to introduce the Merauke local clones. In 2007, Food Crops and Horticulture Garut Agency supported the Semangga district Papua with Arumanis seedlings to enrich the mangoes planting areas (Bahar, 2008). Food Crops and Horticulture Merauke Agency held a mango contest in 2012 for Merauke district community to identify potential local mangoes (Frans, 2012). Research conducted by Oktavianto et. al. (2011) have characterized the Cantek, Ireng, Empok, and Jempol mangoes in Banyakan district Kediri regency. Ribeiro et.al. (2013) have characterized 103 mango accessions of the field of Embrapa semi-arid region in Brazil and resulted eight accessions didn't show fruits with fibers, nine other presented flesh firmness, which is an important characteristic to improve breeding.

This research aimed to gained characteristic information of mango clones in district Merauke and to know the level of morphology characteristics similarities between mango accessions with mango germplasm.

### MATERIAL AND METHOD

The research was held in Rimba Jaya village Merauke regency from September to February 2016. Meters, calipers, scale, red fabric, lup, stationary, plastics for sample containers, plastik sampel, clamp, marker, name label, and a camera.

The method was descriptive and purposive sampling. The mango plants was observed based on the parameters in Horticultural Germplasm Information System (Horticulture

Research and Development Center, 2011), which are : the origin, stem colour, girth, leaf shapes, leaf edge shapes, leaf tip shapes, leaf size, petiole length, colour of the upper leaves, fruit size, stalk length, fruit flesh thickness, fruit flesh colour, fruit flavor, fruit aroma, one fruit weight, and the colour of ripe fruit.

Data retrievals were measurements and direct observations to mango plants as primary data, while interviewing the farmers as secondary data. Data presentation is in tables and figures and the data was analyzed descriptively.

### RESULTS

From survey and interview of the farmers, there are sixteen accessions of mango, which are Air, Telur Kasuari, Pipi Merah, Daging, Telur, Madu, Labu, Arumanis, Udang, Pepaya, Nenas, Golek, Tahi Kuda, NN-1, NN-2 and NN-3 mangoes (Figure 1). The interview result is presented in Table 1. Based on the research of Oktavianto *et al.* (2011), there are three kinds of mango bark colours which are grayish brown, old gray and black.

RJA-1, RJA-2, RJA-3, RJA-5, RJA-8, RJA-10, RJA-11, RJA-12, RJA-13, and RJA-16 classified into elliptic, narrow and wide leaves (Table 2). Then from the leaves edge observation, there are group of unfolded, folded and a little folded type. The leaves tip and the leaves base observation resulted in two type, there are blunt and pointy type. While the leaf layouts resulted in horizontal or vertical and the leaf surface observation resulted in wavy leaf surface and straight leaf surface. The research of Nilasari et. al. (2013) identified mango leaves morphology diversity of interbreeding Arumanis varieties with Podang Urang resulted 32 clones which have relation with the parent and 12 clones which are from interbred clones.

Upper leaves colour observation (Table 2) is determined using the Munsell *Leaf Color Chart*. RJA-1, RJA-8, and RJA-9 are included to light green (7,5 GY 5/8). RJA-2, RJA-3, RJA-4, RJA-5, RJA-6, RJA-7, RJA-10, RJA-11, RJA-12, RJA-13, RJA-14, RJA-15, and RJA-16 are included to green (5 GY 3/4).

Observation and measurements fruit morphology are presented on Table 3, which the observation of fruit flesh colour from the sixteen accessions showed result of yellow orange, yellow, and orange. This is in accordance with Horticultural Germplasm Information System (HGIS) that there are eight categories of flesh fruit colours, which are yellow orange, brownish yellow, yellow, orange, yellowish white, yellowish green, yellowish orange, light yellow and dark yellow.

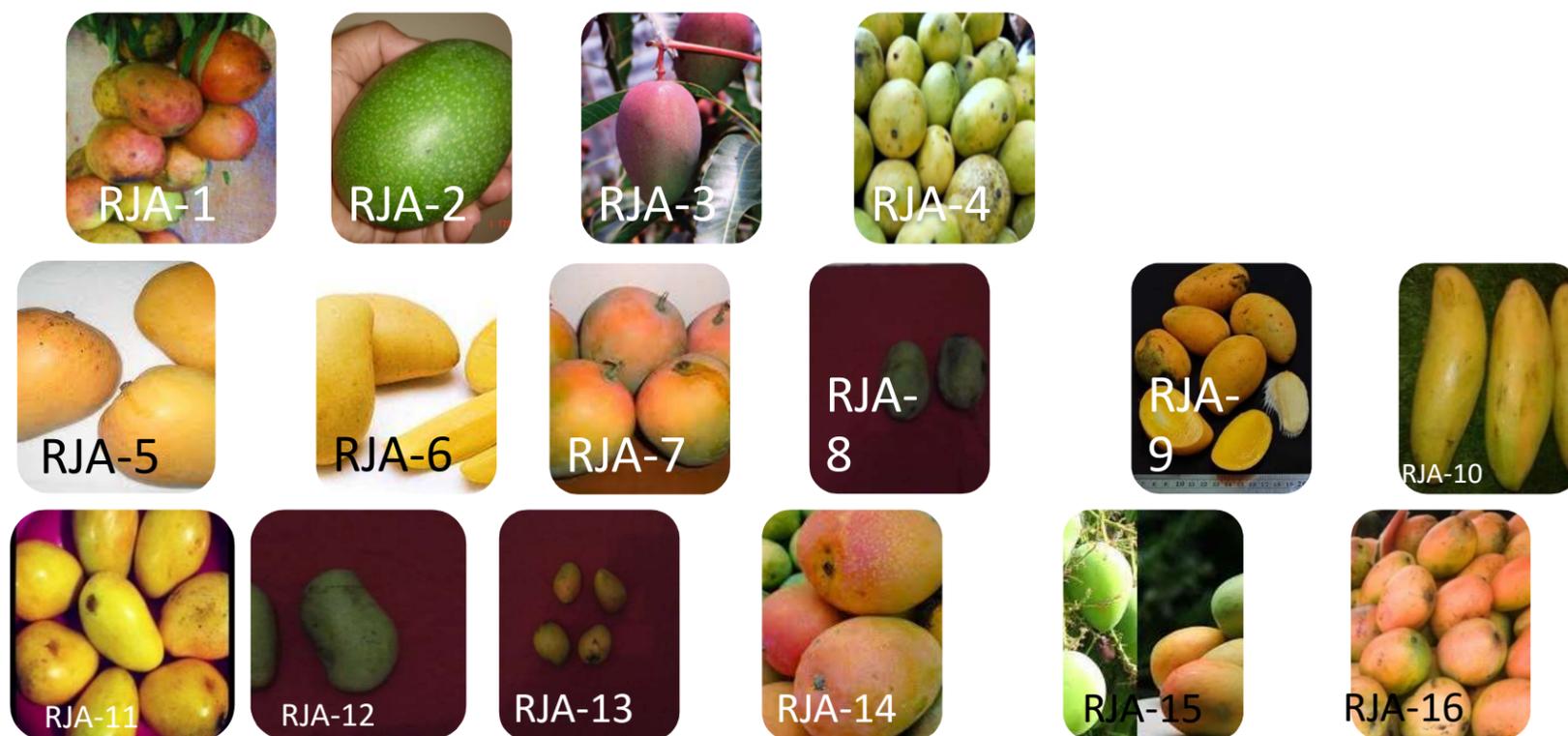


Figure 1. Sixteen mango accessions in Rimba Jaya village Merauke regency.

Table 1. Criteria of Sixteen Mango Accessions in Rimba Jaya village.

No	Aksesi (in English)	Kriteria in english		
		Origin	Year Planted	Stem colour
1.	RJA – 1 (Air)	Local	1999	White gray
2.	RJA – 2 (Telur Kasuari)	Local	1999	Old gray
3.	RJA – 3 (Pipi Merah)	Dutch	1970	White gray
4.	RJA – 4 (Daging)	Local	1984	Greyish brown
5.	RJA – 5 (Telur)	Local	1980	Old gray
6.	RJA – 6 (Madu)	Dutch	2005	Greyish brown
7.	RJA – 7 (Labu)	Dutch	1988	Old gray
8.	RJA – 8 (Arumanis)	Food Crop and Horticulture Agency	1997	Greyish brown
9.	RJA – 9 (Udang)	Local	2000	White gray
10.	RJA – 10 (Pepaya)	Food Crop and Horticulture Agency	2009	White gray
11.	RJA – 11 (Nenas)	Local	1990	Kelabu tua
12.	RJA – 12 (Golek)	Local	1990	White gray
13.	RJA – 13 (Tahi Kuda)	Java	2009	White gray
14.	RJA – 14 (NN-1)	Food Crop and Horticulture Agency	2000	White gray
15.	RJA – 15 (NN-2)	Food Crop and Horticulture Agency	2000	White gray
16.	RJA – 16 (NN-3)	Food Crop and Horticulture Agency	2000	White gray

Note. RJA = Rimba Jaya Accession

Table 2. Mango Leaves Morphology

No.	Accession	Criteria in english									
		L (cm)	W (cm)	LS H	LE	LT	LP	LS U	LB	PL (cm)	ULC
1.	RJA-1	26	7,3	1	2	1	2	3	2	7	7,5 GY 5/8
2.	RJA-2	37	9	1	1	1	2	1	1	9	5 GY 3/4
3.	RJA-3	29	6	1	2	1	2	3	2	5	5 GY 3/4
4.	RJA-4	24	4	2	1	1	2	1	1	5	5 GY 3/4
5.	RJA-5	33	7	1	2	3	1	1	2	5	5 GY 3/4
6.	RJA-6	37	8	2	2	1	1	1	2	6	5 GY 3/4
7.	RJA-7	28	7	2	3	1	1	1	2	6	5 GY 3/4
8.	RJA-8	26	7	1	1	1	2	1	2	7	7,5 GY 5/6
9.	RJA-9	36	8,7	2	2	1	2	1	1	8	7,5 GY 5/6
10.	RJA-10	34	7	1	3	1	1	3	2	8	5 GY 3/4
11.	RJA-11	37	8	1	3	1	1	1	2	7	5 GY 3/4
12.	RJA-12	32	6	1	3	1	1	1	2	8	5 GY 3/4
13.	RJA-13	22	5	1	2	1	2	1	1	3	5 GY 3/4
14.	RJA-14	28	5	2	2	1	2	1	1	4	5 GY 3/4
15.	RJA-15	32	7	3	3	1	1	3	2	5	5 GY 3/4
16.	RJA-16	37	8	1	2	1	2	3	2	5	5 GY 3/4

Note. RJA (Rimba Jaya Accession), L (length), W (width), LSH (leaf shape) 1 (ellipse), 2 (narrow), 3 (wide), LE (leaf edge) 1 (folded), 2 (unfolded), 3 (a little folded), LT (leaf tip) 1 (pointed), 2 (taper), 3 (blunt), LP (leaf position) 1 (erect), 2 (horizontal), LSU (leaf surface) 1 (wavy), 2 (wrinkled), 3 (not wavy), LB (leaf base) 1 (pointed), 2 (blunt), PL (petiole length), ULC (upper leaf colour).

Table 3. Fruit Morphology.

No	Accession	Kriteria in english												
		FSL (cm)	FL (cm)	FW (cm)	FFT (cm)	FFC	FS	FL	FW	FBC	RFSC	TFC	NP C	WPF (gr)
1.	RJA-1	17	10,6	6,4	2	3	3	5	1	3	3	1	6+	262
2.	RJA-2	19	11,4	7,7	2,5	1	2	4	1	6	1	1	2+	379
3.	RJA-3	16	10,1	6	2	3	2	4	4	2	4	2	4+	288
4.	RJA-4	11	8,8	6	2,3	1	2	3	1	3	8	1	7+	250
5.	RJA-5	15	7,8	6,6	2,2	1	2	4	2	3	12	4	3+	148
6.	RJA-6	15	11,2	5,8	2	3	3	2	1	3	12	1	4+	168
7.	RJA-7	23	7,8	5,2	2,3	1	1	5	2	4	5	9	7+	507
8.	RJA-8	18	13,2	8,3	3	1	3	2	4	7	1	1	2+	535
9.	RJA-9	11	10,2	7	1,3	3	3	4	3	3	12	4	12+	160
10.	RJA-10	25	15,6	7,8	2,4	4	1	4	4	7	8	1	2+	562
11.	RJA-11	15	9,2	6,4	2	3	5	5	2	3	12	9	16+	204
12.	RJA-12	22	13,5	9	2,7	1	3	2	4	1	7	1	3+	563
13.	RJA-13	15	6,2	7,8	2	3	3	1	2	6	5	9	8+	219
14.	RJA-14	14	10,8	7,8	2,9	3	1	4	2	13	2	4	8+	248
15.	RJA-15	16	9,2	7,6	2,7	3	1	5	2	4	5	4	9+	524
16.	RJA-16	14	7,6	4,2	2,4	3	1	4	2	2	2	9	11+	200

Note. RJA (Rimba Jaya Accession), FSL (fruit stalk length), FFT (fruit flesh thickness), FFC (fruit flesh colour), FF (fruit aroma), FS (fruit shape), FL (fruit length), FW (fruit width), FBC (fruit base colour), RFSC (ripe fruit skin colour), TFC (tip fruit colour), NPC (number per cluster), WPF (weight per fruit).

Results from Table 3 showed that from fruit scent categories are fragrant, medium, poor, or slight fragrant based on HGIS categories, which are poor, medium, fragrant, slight citrus aroma and citrus aroma. While the observation on fruit taste can be categorized into nine categories, which are sweet sour, very sweet, sour sweet, sweet, tasteless sweet, tasteless, fresh sweet, rough sweet, sour.

Ripe fruit skin colour observation on the sixteen accessions has thirteen varieties based on HGIS, which are green, yellowish red, greenish yellow, red, redish yellow, greenish red, orange yellow, yellowish green, light yellow, orange, yellowish orange, yellow, and greenish orange. The colour of the ripe fruit base categories are green, red, yellow, redish yellow, green orange, light green, yellowish green, yellow orange, greenish orange, greenish yellow, orange, yellowish orange, yellowish red, yellow and dark green. The colour of ripe fruit tip from the sixteen accessions based on HGIS are green, yellowish red, redish yellow, yellow, yellowish green, green orange, yellow orange, yellowish orange and yellowish red.

## DISCUSSIONS

Determining or determination? the morphology characteristics between plant taxon is required to know how close the kinship between mango accessions and ?. Morphology characteristic also used for identifying the variation of certain character, such as fruit taste (bitter or sweet). (Vihotogbe *et al.*, 2013).

RJA-1 has high level of morphology similarity with Gadoh-343 varieties. Based on HGIS, the similar morphology characteristics are narrow leaf shape, a little folded leaf edge, pointed leaf tip, pointed leaf base, horizontal leaf position, fruit length, fruit width, ellipse fruit shape, fruit flesh thickness, yellow fruit flesh, fragrant fruit aroma, tasteless sweet fruit, greenish yellow ripe fruit flesh, yellow fruit base, green fruit tip and weight per fruit.

RJA-2 has high level of morphology similarity with Arumanis 1 (VIII 42) varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, ellipse leaf shape, folded leaf edge, pointed leaf tip, horizontal leaf position, wavy leaf surface, fruit length, fruit flesh thickness, yellow orange fruit flesh, medium fruit aroma, sweet fruit taste, green ripe fruit skin, green fruit base and weight per fruit.

RJA-3 has high level of morphology similarity with Li'ar varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, ellipse leaf shape, pointed leaf tip, horizontal leaf position, fruit length, fruit width, fruit flesh thickness, medium fruit aroma, sweet fruit taste, red fruit skin, red fruit base and yellowish red fruit tip.

RJA-4 has high level of morphology similarity with Roti-415 (III/97) varieties. Based on HGIS, the similar

morphology characteristics are leaf length, leaf width, narrow leaf shape, folded leaf edge, pointed leaf base, horizontal leaf position, wavy leaf surface, fruit length, fruit width, ellipse fruit shape, fruit flesh thickness, yellow orange fruit flesh, medium fruit aroma, sweet sour taste, yellowish green fruit skin, yellow fruit base, green fruit tip and weight per fruit.

RJA-5 has high level of morphology similarity with Royal Palm California-233 (VIII/7) varieties. Based on HGIS, the similar morphology characteristics are leaf width, ellipse leaf shape, unfolded leaf edge, erect leaf position, wavy leaf surface, fruit length, fruit width, round fruit shape, fruit flesh thickness, yellow orange fruit flesh, medium fruit aroma, sweet fruit taste, yellow ripe fruit skin, yellow fruit base, yellow fruit tip and weight per fruit.

RJA-6 has high level of morphology similarity with Trapang-419 (III/101) varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, narrow leaf shape, blunt leaf base, erect leaf position, wavy leaf surface, fruit length, width fruit, ellips fruit shape, fruit flesh thickness, yellow fruit flesh, fragrant fruit aroma, very sweet fruit taste, yellow ripe fruit skin, yellow fruit base, green fruit tip and weight per fruit.

RJA-7 has high level of morphology similarity with Kartikia-449 varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, narrow leaf shape, a little folded leaf edge, pointed leaf tip, blunt leaf base, wavy leaf surface, fruit length, fruit width, round fruit shape, fruit flesh thickness, poor fruit aroma, tasteless sweet fruit taste, redish yellow ripe fruit skin, redish yellow fruit base and greenish yellow fruit tip.

RJA-8 has high level of morphology similarity with Salak-417 (III/99) varieties. Based on HGIS, the similar morphology characteristics are leaf width, folded leaf edge, pointed leaf tip, blunt leaf base, wavy leaf surface, fruit length, yellow orange fruit flesh, fragrant fruit aroma, very sweet fruit taste, green ripe fruit skin, yellowish green fruit base and green fruit tip.

RJA-9 has high level of morphology similarity with Kopyor-173 varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, narrow leaf shape, unfolded leaf edge, pointed leaf tip, pointed leaf base, horizontal leaf position, wavy leaf surface, fruit length, fruit width, fruit flesh thickness, yellow fruit flesh, sweet fruit taste, yellow ripe fruit skin, yellow fruit base and yellow fruit tip.

RJA-10 has high level of morphology similarity with Golek-31 (I/28) varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, ellipse leaf shape, a little folded leaf edge, blunt leaf base, wavy leaf surface, fruit length, fruit width, long fruit shape, fruit thickness, orange fruit flesh, poor fruit aroma, sweet fruit taste, yellowish green ripe fruit skin, yellowish green fruit base, green fruit tip and weight per fruit.

RJA-11 has high level of morphology similarity with Bapang-13 varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, ellipse leaf shape, a little folded leaf edge, pointed leaf tip, blunt leaf base, erect leaf position, wavy leaf surface, fruit length, fruit width, fruit thickness, yellow fruit flesh, slight fragrant fruit aroma, sweet tasteless fruit, yellow ripe fruit skin, yellow fruit base, greenish yellow fruit tip and weight per fruit.

RJA-12 has high level of morphology similarity with Golek-33 (I/30) varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, ellipse leaf shape, a little folded leaf edge, blunt leaf base, wavy leaf surface, fruit length, fruit width, long fruit shape, fruit thickness, very sweet fruit taste, green ripe fruit skin, yellowish green fruit base, green fruit tip and weight per fruit.

RJA-13 has high level of morphology similarity with F1-47 (I/30) varieties. Based on HGIS, the similar morphology characteristics are leaf length, leaf width, ellipse leaf shape, unfolded leaf edge, pointed leaf base, horizontal leaf position, wavy leaf surface, fruit length, fruit width, round fruit shape, fruit thickness, yellow fruit flesh, fragrant fruit aroma, sweet sour taste, redish yellow ripe fruit skin, green fruit base, redish yellow fruit tip and weight per fruit.

RJA-14 has high level of morphology similarity with Delima-209 varieties. Based on HGIS, the similar morphology characteristics are leaf length, narrow leaf shape, unfolded leaf edge, pointed leaf tip, pointed leaf base, horizontal leaf position, wavy leaf surface, fruit length, fruit width, fruit thickness, yellow fruit flesh, poor fruit aroma, sweet fruit taste, yellowish red ripe fruit skin, yellowish red fruit base, yellow fruit tip and weight per fruit.

RJA-15 has high level of morphology similarity with Mangga Ayu-287 varieties. Based on HGIS, the similar morphology characteristics are leaf length, a little folded leaf edge, pointed leaf tip, blunt leaf base, erect leaf position, fruit length, fruit width, fruit thickness, yellow fruit flesh, poor fruit aroma, tasteless sweet, redish yellow ripe fruit skin, redish yellow fruit base, yellow fruit tip and weight per fruit.

RJA-16 has high level of morphology similarity with Peach (IV/111) varieties. Based on HGIS, the similar morphology characteristics are leaf width, ellipse leaf shape, unfolded leaf edge, pointed leaf tip, blunt leaf base, horizontal leaf position, fruit length, fruit width, round fruit shape, fruit thickness, yellow fruit flesh, poor fruit aroma, sweet fruit taste, yellowish red ripe fruit skin, red fruit base, greenish yellow fruit tip and weight per fruit.

From the sixteen accessions, RJA-1, RJA-5, RJA-7, RJA-9, RJA-11, RJA-15, and RJA-16 are used as forage because of the high water content, the tasteless or only a little bit sweet flavor and contain a lot of fiber. While RJA-2, RJA-3, RJA-4, RJA-6, RJA-8, RJA-10, RJA-12, RJA-13 and RJA-14 are consumed by humans especially because of their sweet flavor and less fiber.

## CONCLUSIONS

Mango accessions that observed in Rimba Jaya village Merauke regency variety had 16 accessions. RJA-1 has high level of morphology similarity with Gadoh – 343 varieties, RJA-2 has high level of morphology similarity with Arumanis 1 (VIII 42) varieties, RJA-3 has high level of morphology similarity with Li'ar varieties, RJA-4 has high level of morphology similarity with Roti – 415 (111/97) varieties, RJA-5 has high level of morphology similarity with Royal Palm California – 223 (VIII/7) varieties, a RJA-6 has high level of morphology similarity with Trapang – 419 (111/101) varieties, RJA-7 has high level of morphology similarity with Kartikia – 449 varieties, RJA-8 has high level of morphology similarity with Salak – 417 (111/99) varieties, RJA-9 has high level of morphology similarity with Kopyor – 173 varieties, RJA-10 has high level of morphology similarity with Golek – 31 (I/28) varieties, RJA-11 has high level of morphology similarity with Bapang – 13 varieties, RJA-12 has high level of morphology similarity with Golek – 33 (I/30) varieties, RJA-13 has high level of morphology similarity with F1 – 47 varieties, RJA-14 has high level of morphology similarity with Delima – 209

varieties, RJA-15 has high level of morphology similarity with Mangga Ayu – 287 varieties and RJA-16 has high level of morphology similarity with Peach (IV/111) varieties.

From the sixteen accessions, RJA-1, RJA-5, RJA-7, RJA-9, RJA-11, RJA-15, and RJA-16 are used as forage because of the high water content, the tasteless or only a little bit sweet flavor and high fiber content. While RJA-2, RJA-3, RJA-4, RJA-6, RJA-8, RJA-10, RJA-12, RJA-13 and RJA-14 are consumed by humans especially because of their sweet flavor and less fiber.

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## REFERENCES

- Central Bureau of Statistics. 2011. Merauke in Numbers. Central Bureau of Statistics Merauke Regency.
- Bahar, Y.H. 2008. Menapak Merauke, Tanah Harapan dan Masa Depan Pertanian. On line. <http://dinaspertaniangarut.blogspot.com/2009/08/menapakmerauke-tanah-harapan-dan-masa.html>. Accessed on Maret 5<sup>th</sup> 2015.
- Frans, 2012. Surat Kabar Harian Papua Pos : Kontes Mangga Libatkan Masyarakat. On line. <http://www.papuapos.com/index.php/wartadaerah/modulesmenu/item/429-kontes-mangga-libatkan-masyarakat>. Accessed on March 5<sup>th</sup> 2015
- Horticulture Research and Development Center. 2011. Horticulture Germplasm Information System. On line. <http://pn.puslithorti.net/mainPage.php?jdlHalaman=passport/pasportList&&IDcrops=0340>. Accessed on January 25<sup>th</sup> 2016.
- Nilasari, A.N., J.B.S. Heddy and T. Wardiyati. 2013. Identifikasi Keragaman Morfologi Daun Mangga (*Mangifera indica* L.) pada Tanaman Hasil Persilangan Antara Varietas Arumanis 143 dengan Podang Urang Umur 2 Tahun. *Jurnal Produksi Tanaman* Vol. 1(1): 61 – 69).
- Oktavianto, Y., Sunaryo dan A. Suryanto. 2015. Karakterisasi Tanaman Mangga (*Mangifera indica* L.) Cantek, Ireng, Empok, Jempol di Desa Tiron, Kecamatan Banyakan Kabupaten Kediri. *Jurnal Produksi Tanaman*, Vol 3(2): 91 – 97.
- Ribeiro, I.C.N dos Santos, C.A.F. Santos and F.P.L. Neto. 2013. Morphological Characterization of Mango (*Mangifera indica*) Accessions Based on Brazillian Adapted Descriptors. *Journal of Agricultural Science and Technology B* 3: 798-806.
- Setyawan, B. 2013. Mangga Enak dari Papua. On line. [http://trubugosgroup.co.id/index.php?option=com\\_k2&view=item&id=146:mangga-enak-dari-papua&Itemid=61](http://trubugosgroup.co.id/index.php?option=com_k2&view=item&id=146:mangga-enak-dari-papua&Itemid=61). Accessed on Maret 5<sup>th</sup> 2015.
- Vihotogbe, R., R.G. van den Berg, and M.S.M. Sosef. 2013. Morphological Characterization of African Bush Mango trees (*Irvingia* species) in the Dahomey Gap (West Africa). *Source Genetic Resources and Crop Evolution* 60(4): 1597-1614. On line. <https://www.wageningenur.nl/en/Publication-details.htm?publicationId=publication-way-343430343135>. Accessed on July 12<sup>th</sup> 2016.