Fruit characters of *Cucumis melo* L.: 'Tacapa Green Black', 'Melona' and 'Meloni'

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Abstract

Melon has high demand, but most of the Indonesian farmers planted import seeds of melon which has expensive price. Hence, Indonesia should produce high-quality melon seeds. This research used three melon cultivars (*Cucumis melo* L.): 'Tacapa Green Black (GB)', 'Melona', and 'Meloni' which are the result of breeding in Genetic and Breeding Laboratory, Faculty of Biology, Gadjah Mada University. The purpose of this study is to describe fruit morphological characters of these melon cultivars. 'Tacapa GB' is breeding result of Testcross ♀ 'Act3 434' X F1 'PI 371795', 'Melona' is segregation from 'Luna' and 'Meloni' is breeding result of ♀ 'SL-3' X ♂ 'PI 371795'. Seeds of 'Tacapa GB', 'Melona' and 'Meloni' was planted. While harvest, these melons were measured, observed, and documented to obtain the quantity and quality of fruit characters. Data were analyzed and compared each other. The results showed 'Tacapa GB' has weight average of 3.2 kg, brix of 7–9, fruit shape's is oval, fruit color is yellow-green, and rind color is dark green. 'Melona' has weight average of 0.8 kg, brix of 7–15, fruit color is orange, having lobes, and sweet. 'Meloni' has an oval shape, fruit color is pale yellow, the weight of 1.1 kg, brix of 8–16 and fragrant.

Keywords

cultivate, melon, melona, meloni, tacapa green black

1 Introduction

Melon (*Cucumis melo* L.) is a horticultural crop that belongs to the *Cucurbitaceae* family. This fruit became one of the popular fruits because it tastes sweet and delicious. It has a fragrant aroma and the content of nutrients. It is the sources of vitamins and minerals are good for health. Melon contains calories, low in fat and sodium (Na), potassium (K), vitamin A and vitamin C. The content of cucurbitacin-β, lithium, and zinc in melon has the potential to prevent cancer and stimulate the immune system [1].

Indonesia is at latitude 7° 02' N–11° 15' S and longitude 94° 15' E–141° 15' E making it hot and humid throughout the year [2]. The

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condition of Indonesia located in the tropics is suitable for melon plant life. For that, the melon has a great opportunity to be developed in Indonesia.

In addition, the need for melon fruits increases along with the increased awareness of the community's nutritional causes the production of melon Indonesia increased from year to year so that the melon has the potential to be developed to become a superior product. In 2014, the total production of melon in Indonesia amounted to 150 347 000 kg with harvested area of 8 185 000 m^2 and average production of 18.37 kg · m^{-2} the average production output increased 3.69 % from the previous year. In 2015, the total volume of watermelon and melon exports reached 931 051 kg [3].

However, some farmers still use imported seeds in melon cultivation because of their better quality. In 2008, according to the Republic of Indonesia Ministry of Agriculture, the total melon seeds that entered Indonesia in 2007 amounted to 3 500 kg and 100 kg were domestic seeds while the rest were imported seeds. This causes domestic seed production efforts to need to be done. Superior domestic seed production can be done by plant breeding.

In order to support the production of superior melon seeds, the Laboratory of Genetics and Breeding, Faculty of Biology Universitas Gadjah Mada has conducted melon plant breeding in recent years. There are Melon 'Tacapa Green Black (GB)', Melon 'Melona' and Melon 'Meloni'. Melon 'Tacapa Green Black (GB)' is the result of Testcross ♀ Act3 434 X F1 PI 371795. Melon 'Melona' is obtained from the segregation of melon 'Luna'. Melon 'Meloni' is a melon resulting from a cross between the parent ♀ 'SL-3' and the parent ♂ 'PI 371795'.

The method of crossing is one of the efforts in plant breeding to obtain superior plant varieties. From the crosses result obtained hybrid varieties are expected to have a superior character of both parents. The cross between male and female of Melon 'Tacapa Green Black (GB)', 'Melona', and 'Meloni' cultivars are expected to produce superior cultivar characters.

Melon characters can be determined by phenotype and genotype characters. Melon phenotype character can be determined from the genotype expression and environmental conditions. The melons cultivars of these research need to be evaluated in the field to obtain high quality. The melons characteristic desired such as thick fruit, fruit color, fruit skin color, fruit size, fruit shape, sweetness, fruit flavor, and nets [4]. Therefore, research is needed to determine the stability of phenotypes of melon hybrid characters Tacapa Green Black (GB), Melona, and Meloni.

2 Methods

This research was conducted by 1) melon seeds germination, 2) land preparation, 3) handling and plants cultivation, and 4) qualitative and quantitative observation. Data analyzed in Modangan village, Nglegok, Blitar and Laboratory of Genetics, Faculty of Biology, Gadjah Mada University.

2.1 Melon Seeds Germination. Five hundred seeds of Tacapa Green Black (GB), Melona, and Meloni was soaked in warm water overnight and 0.002 kg · m^{-3} fungicide for 2–4 h. Each sprout was planted on the small polybag (0.08 × 0.09 m) that contains soil and fertilizer for 10–12 d until the plant was ready to move to land.

2.2 Land Preparation. Before planting, land in the greenhouse should be plowed and fertilized. The land was watered once during the period of planting. The land was shed with long 32 m, height 0.3 m and wide 1 m, after that it was covered with plastic mulch and made a hole on the top to planted the melon plant with interval 0.5 m.

2.3 Planting. Plants melon in polybag was moved and planted in the land that was prepared. Amount of every cultivar were 500 plants. Every cultivar was planted in the different greenhouse.

2.4 Handling and Plants Cultivation. A plant was treated by fungicides and herbicides sprayed twice a week. After two weeks of plant life, a bamboo stick was plugged in the ground as attach place of the vine. Some of the lateral branches should be removed. Harvesting could be done when the fruit indicated the character of each cultivar.

2.5 Observation. Plants of melon were chosen randomly with every cultivar 13 plants and they were observed in qualitative and quantitative characters. Qualitative observation included the color of fruit and skin of fruit that was measured using RHS mini color chart, the shape of fruit, net, and the sweetness

measurement using hand refractometer. The quantitative observations were conducted by weight, base fruit diameter, apex fruit diameter, vertical round, horizontal round, vertical diameter, horizontal diameter, skin thickness, fruit thickness, the weight of skin, and weight of seed cavity. Every character for quantitative observation in each cultivar was measured from 13 melons and counted the average. Furthermore, the quantitative data analyzed by using PKBT-STAT 2.02.

3 Results and Discussions

Cucumis melo L. is a herbaceous plant, vines with stem and tendril, has a tap root, many branches, lobe leaves, and variant of shape fruit [5]. Cultivars Tacapa Green Black, Meloni and Melona are breeding result from different melon so it produces different and unique characters. Table 1 shows the recapitulation of different fruit Tacapa Green Black, Meloni, and Melona.

Table 1 Recapitulation of different fruit Tacapa Green Black, Meloni and Melona

Character	Cultivar	Kk (%)
Weight	*	17.58
Base fruit diameter	*	9.72
Apex fruit diameter	tn	12.08
Vertical round	*	5.57
Horizontal round	*	7.04
Vertical diameter	tn	7.00
Horizontal diameter	*	7.51
Skin thickness	*	6.32
Fruit thickness	*	7.45
Weight of skin	**	8.31
Weight of seed cavity	tn	14.66
Brix	tn	15.87

Explanation: * = different at $P < 0.05$, ** = different at $P < 0.01$, tn = not different

Table 1 was shown that weight fruit, base fruit diameter, vertical and horizontal round, horizontal diameter, skin thickness, and fruit thickness was different at level significance 5 %. The weight of skin was different at level significance 1 %. It means that measurement of these characters is different between cultivars. Whereas weight of seed cavity and brix do not have a significant difference between each cultivar. The average of Tacapa Green Black weight (3.31 kg) is different from Melona (0.9 kg) but greater than Meloni (1.1 kg). The Weight of Tacapa Green Black greater than the others because of its heritage from cultivar action as the parental [6]. Top diameter of Tacapa Green Black (0.026 m) is largest among the others. Meloni (0.012 m) is larger than Melona (0.01 m). Top diameter function is prop the fruit and bring the food. So, the smaller melon has smaller top diameter. The weight fruit is follow by another character. Melona has small weight than Meloni and Tacapa Green Black, so this cultivar has smaller measure for vertical round and diameter, fruit thickness, thick and weight of skin. Horizontal round and diameter of

Melona is greater than Meloni because of the shape of fruit, Melona is ovate with position of maximum diameter at the toward stem end, while Meloni's horizontal round and diameter is almost the same along the fruit.

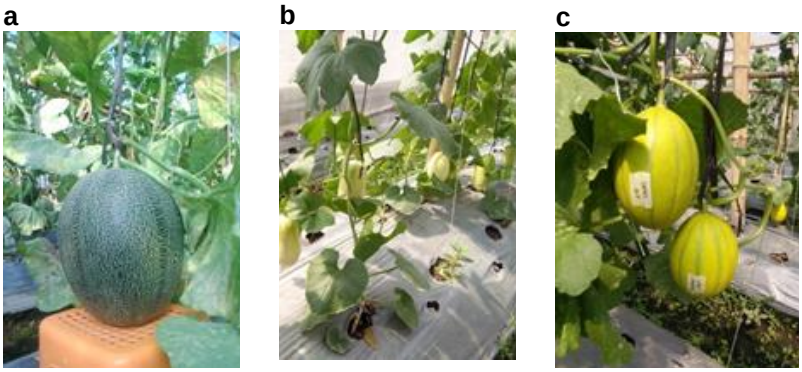

Fig. 1 Fruit of three melon cultivars in the plant; a Tacapa Green Black, b Meloni, c Melona

From (Fig. 1), we know that Tacapa Green Black has the biggest size, netted, oval, and dark green skin without lobe. Meloni has the medium size, oval and pale skin without net and lobe. Melona has the smallest size, lobes, oval and orange skin without a net.

These three cultivars have a different time to harvest. Tacapa Green Black and Melona are non-climacteric fruit that has a longer time to harvest than Meloni. Time for harvest after plant in the ground for Tacapa Green Black is 75–85 d, Melona is 70 d and Meloni is 60 d. This character is appropriate with non-climacteric melon that production ethylene does not give effect to fruit ripening. In the other hand, Meloni includes climacteric fruit that has some characteristic namely ethylene production will affect fruit ripening that makes time to fruit ripe shorter, flesh softening and lost the green color of the fruit rind at maturity [7]. Ripe Tacapa Green Black characters are full netted skin, top diameter become swollen, trichome on the fruit skin become shorter and fragrant. While Melona's ripe character is the color of lobes change from green become pale, orange skin and become fragrant. Meloni's character while ripening is the skin change from green become pale, and become fragrant. Meloni and Melona were break off while ripe but Tacapa Green Black wasn't, so it needs cut to harvest.

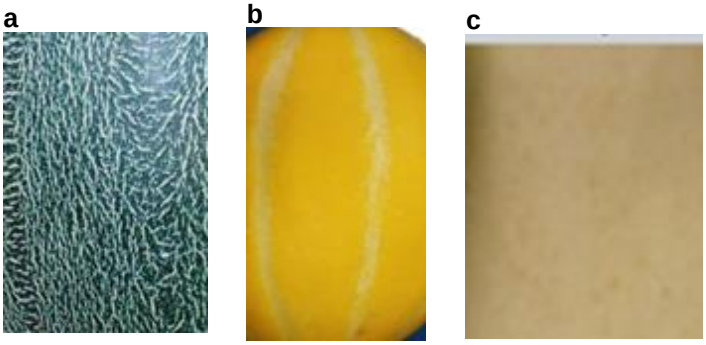

Fig. 2 Outer skin of three melon cultivars; a Tacapa Green Black, b Melona, c Meloni

The skin of Tacapa Green Black is hard, rough, and muscular (Fig. 2). That characteristic is appropriate netted melon [5]. Melona and Meloni have smooth skin which is appropriate with winter melon characteristic but both of this melon have strong fragrant than Tacapa Green Black (Fig. 2). While ripe, the skin of Melona will become bright.

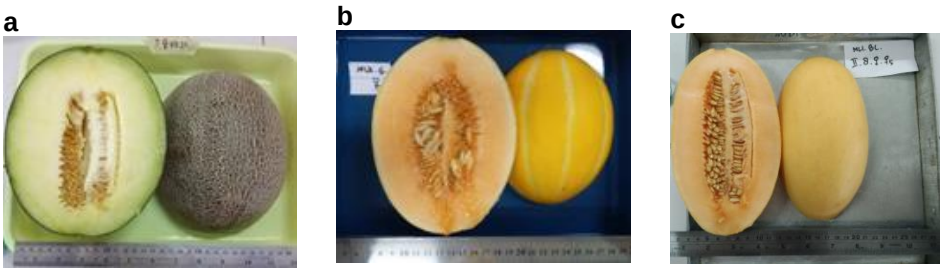

Fig. 3 The Longitudinal cross-section of three melon cultivars; a Tacapa Green Black, b Melona, c Meloni

From (Fig. 3), The color of Tacapa Green Black fruit is green, although Melona and Meloni have orange color fruit. Melon with orange fruit are sweater then green melon and orange flesh melon has compound carotenoids, especially beta-carotene (85 %) although green-flesh melon has chlorophyll and low content of carotenoids [8]. The Grade of sweet these melons is measure with refractometer appropriate with sucrose compound [9]. Brix of Tacapa Green Black is 7–9, Melona is 7–15, and Meloni is 8–16. The average brix of Tacapa Green Black is 8.5, Melona is 11.9, and Meloni is 11.5. The fruit of Tacapa Green Black is juicy, much water and the fragrant is not too strong [10]. Melona's fruit is crunchy, much water and has strong fragrant. Meloni's fruit is juicy, smooth, much water and has strong fragrant.

4 Conclusions

Tacapa Green Black, Melona, and Meloni have unique character combination from the parental character. Tacapa Green Black has weight average of 3.2 kg, brix 7–9, oval, clearly net, fruit color is yellow-green, skin fruit color is dark green. Melona has weight average 0.8 kg, brix 7–15, fruit color is orange, lobes, and sweet. Meloni has an oval shape, fruit color cream, weight 1.1 kg, brix 8–16 and fragrant.

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