

Improving The Fruit Quality Through The Assembly of The New Watermelon Variety with Sweet Taste, Red Flesh Color, and High Yields

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Abstract— Watermelon is one type of fruit that much preferred by the public both in this country and abroad, because of the sweet taste and fresh. Indonesian Tropical Fruit Research Institute (ITFRI) has conducted a series of watermelon breeding to produce new varieties. The proposal is intended to register and to get signed list of varieties of watermelon Serif Saga Agrihorti from government through the Horticulture Variety Registration Assessment Team (TP2VH) and the Indonesian Center for Plant Variety Protection and Licensing Agriculture (PPVTTP). The plant material used in this experiment was the candidate selected watermelon accession namely Serif Saga Agrihorti, BT-4, BT-4 p, BT-5, BT-6 and Torino as checking varieties. Serif Saga Agrihorti is a new superior variety (VUB) candidate to be tested, while BT-4, BT-4 p, BT-5, BT-6 are watermelon genotypes from ITFRI collection. Torino variety was already registered with No. 76/PVHP/2010 has a resemblance to the VUB candidate Serif Saga Agrihorti which has a spherical shape, green striped rind, red flesh color and has a seed. Serif Saga Agrihorti Watermelon (BT1) was resulted from self fertilizing. The selection methods which used in this variety assembly are a positive mass selection combined with a negative mass selection. Superiority traits of the new varieties candidate of Serif Saga Agrihorti watermelon which has sweeter taste with total soluble solid from 10.3 to 11.7 ° Brix, dark red flesh color, granular flesh texture, light striped green fruit skin color. These candidate varieties can adapt well in Solok with an altitude between 50-500 meters above sea level. The releasing of this candidate variety as a new variety of watermelon was expected to increase the farmers' income.

Keywords— watermelon; new variety; mass selection.

I. INTRODUCTION

Watermelon is one type of fruit that much preferred by the public both in this country and abroad, because of the sweet taste and fresh. This plant is rich in flavonoids antioxidants such as lycopene, beta-carotene, lutein, zeaxanthin, and cyptoxanthin. Antioxidants are known to prevent cancer of the colon, prostate, breast, endometrial, lung, cervix, and pancreas. Lycopene in watermelon is higher than tomatoes. Fresh Watermelon fruit contains 3.4 mg of lycopene per 100 grams, while tomato only has 2, 72 mg [1]. Besides, watermelon also has a fairly high economic value, and can be planted in the tropics and subtropics [2]. Farmers like farming watermelons for short life and easily traded. Watermelon production in Indonesia has reached 498 thousand tons in 2011 and that number is still not sufficient for domestic consumers. This time to complement the needs of watermelon seeds, mostly from imported seeds that are more expensive. To encourage agribusiness activity, especially in the fruit sectors and seed production needed

new watermelon varieties with good fruit quality and easily propagated seed. Therefore, it is necessary to prepare a watermelon seed of improved varieties according to consumer preferences from within the country, the inexpensive price and easily produced by farmers in the country.

Selection of varieties depend on the interests of consumers, namely a sweet taste, consistency pulp crumbs, and attractive flesh color. Indonesian Tropical Fruit Research Institute has conducted a series of watermelon breeding to produce new varieties [3]. One of the potential of new varieties (VUB) which has been produced is Serif Saga Agrihorti varieties, which are the result of the activity from self fertilizing from 2009 to 2012. The superiority of this new varieties candidate such as sweet taste with total soluble solid from 10.3 to 11.7 ° Brix, dark red flesh color, texture crumb flesh, striped bright green rind color.

Serif Saga Agri Horti Watermelon variety is a S6 line generation that has been stable and uniform. Production processes and techniques to maintain the purity of the seed

can be done easily by farmers. By maintaining the purity of the lines, watermelon Serif Saga Agri Horti will produce the stable in the next generation. So the opportunities for the provision of seeds can be done on their own farmers.

The objective of the research was to study the superiority of candidate varieties of watermelon Serif Saga Agrihorti so it can be considered for release varieties.

II. MATERIALS AND METHODS

A. Materials

The plant material used in this experiment was the selected candidate of watermelon lines Serif Saga Agrihorti, BT-4, BT-4 p, BT-5, BT-6 and Torino variety. Serif Saga Agrihorti is a candidate variety will be tested its superiority, while BT-4, BT-4 p, BT-5, BT-6 are a collection of ITFRI's watermelon genotypes. Torino varieties already registered with No. 76 / PVHP / 2010 has a similarity with the candidate variety of Serif Saga Agrihorti ie spherical shape, green striped rind, red flesh color and has a seed.

B. Time and Place

The research was carried out in January 2014 to October 2014. The location is situated on the Sumani experimental Garden, Indonesian Tropical Fruit Research Institute, Solok (350 m above sea level), the type of soil characteristics is andosols with sandy clay and pH 4.5-5.0. Solok has a Equatorial rain type (down throughout the year), with the peak of the highest rainfall occurs in November and December. The lowest rainfall took place in June and July. The average precipitation in the study site was 195 mm/month, number of rainy days 16 days/ month. Temperatures range from 23-32 ° C with a relative humidity 60-80%.

C. The Design of Experiment

Research has been prepared according to a randomized block design with six treatments and four replications, each replication consisted of 45 plants.

D. Implementation Research

Seedlings planted in seedbed with a size of 8 x 3 m and a spacing of 0.5 m with a seed / hole / lane in 1 seedbeds are 2 lanes, so that in one plot contained 30 plants. Before planting, seedbed covered by plastic mulch metallic (outer) size 6 m x 1.2 m. Among the seedbed are drainage measures 70 cm x 70 cm. At the beginning of fertilization is only given cow manure. Advanced Fertilization given at intervals of one week as much as 5 g of NPK (15:15:15) / plant. On entering the generative phase, the plants fertilized with an NPK dose of 3 g plus 2 g KCl / plant at intervals of one week. At the time of formation of the fruit is added in the form of micro fertilizer mikroplus as much as 2 cc / l at intervals of once a week along with the application of pesticides. Pest and weed control as needed.

Fruit entered physiological maturity at the age of about 35-40 days after pollination. The characteristics of ripe fruit, among others, the fruit skin color starts to fade and stretch stripe pattern. Harvesting is done by cutting the fruit stalk with a knife / sharp scissors, leaving the fruit stalk. The fruit was then characterized by predetermined criteria.

Observation of morphological characters have been done based on Guidelines for Preparation of Horticultural Varieties [4]. Morphological characters of watermelon include observation of qualitative and quantitative character. Observations qualitative data include: cross-sectional shape of the stem, stem color, leaf shape, leaf top color, flower shape, color petal, sepal color, the color of the stigma, stamen color, fruit type, fruit shape, rind fruit color, flesh color, texture of the flesh, seed shape and seed color.

Quantitative variables observed were related to production factors include: the time of flowering, harvesting age, fruit weight, rind thick, and Total Soluble Solids (°Brix).

Quantitative data were analyzed by using variance analysis. If F value is higher than the F table 5%, the character needs to be further testing with LSD (least significant difference). Calculations performed by using SAS software version 9.1.

III. RESULTS AND DISCUSSION

A. Qualitative Characters

The observation of the qualitative character of the plant and the fruit there is a difference between a watermelon Serif Saga Agrihorti and check varieties (Torino), this can be seen in Table 2. The results showed that there were differences in the qualitative character between candidate varieties of Serif Saga Agrihorti with varieties Torino (checking varieties) in plants and fruit, this can be seen in Table 2. The red color of the flesh of Serif Saga Agrihorti is stronger than Torino (Figure 1). Based on observations of flesh color by using the color charts produced by the Royal Horticultural Society of London, Serif Saga Agrihorti variety has flesh Red color G43A, while Torino varieties flesh color Red G43B. Red color quality G43A is stronger than Red 43 B.



Fig.1. The performance of watermelon varieties Serif Saga Agrihorti and Torino.

Color seed characters and seed shape are also different between the both varieties. Serif Saga Agrihorti Variety has black seed while Torino variety has brown seed. Seed form of Serif Saga Agrihorti was ovoid while Torino variety has flattened ovoid seed form. Although the economy is not providing added value, but the characters can be used as a special identifier for Serif Saga Agrihorti.

B. Quantitative Characters

Results of analysis of variance showed that some quantitative characters are significant differences between genotypes were tested. Age emerging flower in six genotypes tested ranged from 18.75 to 22 days after planting. Serif Saga Agrihorti flowering at the age of 22 days after planting (Table 2).

TABLE I
QUALITATIVE CHARACTER OF CANDIDATE VARIETIES SERIF SAGA AGRI HORTI AND 5 OTHER GENOTYPES

Characters	Serif Saga Agrihorti	Torino	BT-4	BT-4P	BT-5	BT-6
The Trunk cross section shape	Pentagonal square	Pentagonal square	Pentagonal square	Pentagonal square	Pentagonal square	Pentagonal square
Stem color	Light green	Light green	Light green	Light green	Light green	Light green
Leaflet shape	Having pinnate and lobes	Having pinnate and lobes	Having pinnate and lobes	Having pinnate and lobes	Having pinnate and lobes	Having pinnate and lobes
The color of the upper leaves	Light green	Light green	Light green	Light green	Light green	Light green
Flower shape	Trumpet	Trumpet	Trumpet	Trumpet	Trumpet	Trumpet
Color of Sepal	Yellowish green	Yellowish green	Yellowish green	Yellowish green	Yellowish green	Yellowish green
Color of Petal	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Color of stigma	Yellowish green	Yellowish green	Yellowish green	Yellowish green	Yellowish green	Yellowish green
Color of anther	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Fruit type	Have seeds	Have seeds	Have seeds	Have seeds	Have seeds	Have seeds
Fruit shape	Elliptical widened	Elliptic	Round	Round	Round	Round
Color of rind	Light green with dark green stripe pattern	Light green with dark green stripe pattern	Green	Green	Green	Green
Color of flesh	Red RG43A	Red RG43B	Yellow (YG9A)	Yellow (YG9A)	Yellow (YG7A)	Red RG42A
Flesh texture	Granule	Granule	Granule	Granule	Granule	Granule
Flesh taste	Sweet	Sweet	Sweet	Sweet	Sweet	Sweet
Seed shape	Ovoid	Flattened ovoid	Flattened ovoid	Flattened ovoid	Flattened ovoid	Flattened ovoid
Seed color	Black	Brown	Brown	Brown	Blackish brown	Black

TABLE II
THE AVERAGE AGE OF THE FLOWERING TIME OF SIX GENOTYPES OF WATERMELON

Genotypes	Flowering time (day after planting)				Average
	I	II	III	IV	
Serif Saga	25	22	21	20	22 a
BT-4	18	18	19	20	18,75 b
BT-4p	20	19	21	20	20ab
BT-5	20	19	18	19	19b
BT-6	20	21	20,5	19	20,13ab
Torino	25	24	20	20	22,25ab

TABLE III
THE AVERAGE OF HARVESTING TIME OF SIX GENOTYPES OF WATERMELON

Genotypes	Harvesting time (day after planting)				Average
	I	II	III	IV	
Serif Saga	56,00	57,00	60,00	56,00	57,25a
BT-4	54,00	54,00	53,00	55,00	54,00bc
BT-4p	55,00	53,00	54,00	50,00	53,00c
BT-5	55,00	54,00	53,00	54,00	54,00bc
BT-6	55,00	55,50	57,00	56,00	55,88ab
Torino	56,00	55,00	60,00	56,00	56,75a

Harvesting time of six genotypes were tested also showed significant differences in harvesting. The harvesting time difference ranged from 53.00 to 57.75 days after planting. Serif Saga Agrihorti harvested in 57.75 days after planting (Table 3).

Variables of fruit weight showed that Serif Saga is not significantly different from Torino, average fruit weight of both varieties is 5.11 kg and 5.08 kg. When comparing with four other genotypes (BT4, BT4P, BT5 and BT6) it turns out both varieties possessed higher fruit weight. Very high fruit weight is associated with increased production and productivity of the land (Table 4).

TABLE IV
THE AVERAGE OF FRUIT WEIGHT OF SIX GENOTYPES OF WATERMELON

Genotypes	Fruit weight (kg)				Average
	I	II	III	IV	
Serif Saga	5,40	5,55	5,18	4,33	5,11 a
BT-4	3,70	3,93	5,08	4,15	4,21 bc
BT-4p	3,43	3,40	4,05	4	3,72 c
BT-5	4,63	3,5	3,75	3,75	3,91 c
BT-6	4,55	3,80	4,33	4,85	4,38 abc
Torino	6,45	4,53	4,60	4,70	5,07 ab

Variables of the rind thickness indicates that varieties Serif Saga had no significant with BT4, BT4p, and Torino. Rind thick is closely related to the fruit shelf life. The thicker rind, the fruit shelf life will also be longer. Reference [5] shows that fruit shelf life is influenced by genetic factors, level of maturity, and texture of the rind. thin rind which tend to have a shorter shelf life (Table 5).

TABEL V
THE AVERAGE OF RIND THICKNESS OF SIX GENOTYPES OF WATERMELON

Genotypes	Thickness of rind (cm)				Average
	I	II	III	IV	
Serif Saga	1,20	1,25	1,23	1,10	1,19 bc
BT-4	1,10	1,28	1,33	1,37	1,27 b
BT-4p	1,40	1,29	1,28	1	1,24 b
BT-5	1,07	1,2	1,05	0,8	1,03 c
BT-6	1,53	1,60	1,50	1,35	1,49 a
Torino	1,50	1,13	1,17	1,30	1,27 b

Levels of total soluble solid (TSS) of the six genotypes testing showed there were significant differences between genotypes. TSS levels ranged from 9.92 - 10.97 Brix. Watermelon that has a high TSS levels usually has a sweet taste of flesh, so that more consumers preferred. Serif Saga Agrihorti had higher levels of total soluble solids is higher than the checking varieties (Table 6).

Watermelon Serif Saga Agrihorti has TSS 10.45 Brix levels while Torino variety has TSS is 9.92 Brix levels (Table 6).

TABLE VI
THE AVERAGE OF TOTAL SOLUBLE SOLID OF SIX GENOTYPES OF WATERMELON

Genotypes	TSS (°brix)				Average
	I	II	III	IV	
Serif Saga	10,25	12,00	10,50	10,00	10,43 bc
BT-4	10,67	11,50	10,75	10,63	10,88 ab
BT-4p	11,13	10,53	11,00	11,00	10,91 ab
BT-5	10,93	10,80	11,15	11,00	10,97 a
BT-6	10,25	9,73	10,20	9,85	10,00 cd
Torino	10,37	10,00	9,60	9,73	9,92 d

IV. CONCLUSIONS

Candidate variety of Serif Saga Agrihorti has superiority characteristic such as, attractive form, flesh color (dark red), and sweet taste. This variety candidate can adapt well in Solok in altitude between 50-500 meters above the sea level. With the candidate releasing of this variety into the new varieties of watermelon is expected to increase the farmers' income.

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