Development of Melon Hybrids at The Center For Tropical Fruit Studies, Bogor Agricultural University

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Keywords: hybrid melon breeding, fruit characteristics

Abstract

In order to meet high demand on hybrid melon (*Cucumis melo* L.) in Indonesia, Center for Tropical Fruit Studies conducted breeding program for both of netted melon (*C. melo* var. reticulatus), and winter melon (*C. melo* var. inodorus). The objective of our breeding program is to develop and release consumer prepered melon hybrid varieties having quality fruit characters of sweet, crispy, and thick flesh, heavy weight, long shelf-life, and better after-taste. The breeding program was started since 2002, by utililized top-cross approach for development of base population. About 18 lines selected were crossed and generated 193 hybrids, and the more promising hybrids, indicated with quality characters and uniformity, were intensively bechmarked with popular leading comearcial varities. Recently the breeding program has resulting in two promising hybrids, IPB-MH7 and IPB-MH52. IPB-MH7 has white-green skin and very thick, white flesh. IPB-MH52 has bright-yellow, non-netted fruit skin, green flesh, and also performed well in greenhouse. Those hybrids have been registered in Indonesia Plant Variety Protection Office in 2007.

INTRODUCTION

In order to meet high demand on hybrid melon (*Cucumis melo* L.) in Indonesia, Center for Tropical Fruit Studies conducted breeding program for both of netted melon (*C. melo* var. Reticulatus), and winter melon (*C. melo* var. Inodorus). The objective of our breeding program is to develop and release consumer prepered melon hybrid varieties having quality fruit characters of sweet, crispy, and thick flesh, heavy weight, long shelf-life, and better after-taste.

Melon has a wide range of diversity (Nayar and Singh, 1994; Robinson and Walters, 1999). For the type of fruits, the most Indonesian consumers still prefers netted melon (*C. melo* var. Reticulatus), followed by winter melon (*C. melo* var. Inodorus) and then true cantaloupe (*C. melo* var Cantaloupensis). The fruits of inodorus cultivars are usually marketed for the middle to high economic society. The true cantaloupes are not so popular in Indonesia, because commonly they have watery flesh and short shelf-life.

MATERIAL AND METHODS

The breeding program was started since 2002, by utililized top-cross approach for development of base population. About 18 lines selected were crossed and generated 193 hybrids. The more promising hybrids were selected by conducting preliminary trial without replication.

Field data of four promising hybrids (IPB-MH7, IPB-MH35, IPB-MH52, IPB-,H150) was collected from five environments trial: (1) Tajur, dry season 2008 (Monita *et al.*, 2008); (2) Magelang, rainy season 2008 (Wibowo *et al.*, 2008); (3) Tajur, rainy season 2006 (Isnaini *et al.*, 2007); (4) Tajur, dry season 2006 (Andriyani and Sobir, 2006); (5) Tajur, rainy season 2005 (Andriyani and Sobir, 2006). The experiment in each environment was arranged in Randomized Complete Block Design with three replications. Check varieties used are Apollo and Super Salmon. Four important characteristics are measured: (1) stem diameter, (2) fruit weight, (3) sugar content, and (4) flesh thickness (Deptan, 2006).

Because the hybrid set is different among environments, the hybrid means is calculated by using Least Square Method, utilizing LSMEANS statement in SAS Software (SAS Institute, 2004). The mean difference between each hybrid and the check varieties is compared by using Dunnet-Hsu method, utilizing /pdiff=controlu('*check variety name*') parameters of LSMEANS statement. Linear correlation among characters is also calculated based on the five environments data, using CORR procedure in SAS (SAS Institute, 2004).

RESULTS AND DISCUSSION

General Description

All of the hybrids, except IPB-MH150, are belong to *C. melo* var. Inodorus group, which have non-netted fruit skin (Table 1). Both IPB-MH7 and IPB-MH52 have unique characteristics. IPB-MH7 has cream fruit skin with green color on the top of the fruit. IPB-MH52 fruit has bright yellow skin and green flesh. The fruits of both IPB-MH7 and IPB-MH150 are round, in contrast with that of IPB-MH35 and IPB-MH52 which are oval.

Stem Diameter

From the result of Least Square Means analysis presented in Table 2, we found that IPB-MH7 and IPB-MH150 has thicker stem (1.02 cm) than Apollo (0.90 cm) and Salmon (0.78 cm). Beside, both IPB-MH35 and IPB-MH52 stem are thicker than Salmon. In the experiment conducted at Tajur in dry season 2008, the stem of both IPB-MH7 and IPB-MH52 are higher than Apollo (Table 2).

Fruit Weight

The fruit weight is considered as one of the important characters of melon in Indonesia, because the farmers will usually only produced one fruit per plant. The heavier the fruit, the higher the farmers' gain. Among four hybrids evaluated, none of them can be heavier than Apollo. However, IPB-MH7 fruit (1.38 kg) is heavier than Salmon (1.15 kg) (Table 3).

Sugar Content

The fruit flesh of IPB-MH35 is sweeter (15.5 ^{o}Brix) than both Apollo (12.2 ^{o}Brix) and Salmon (11.0 ^{o}Brix). IPB-MH52 fruit has higher sugar content (13.1 ^{o}Brix) than Salmon (Table 4). Beside fruit weight, sugar content is also considered as important character in melon. For the sweet hybrids, their fruit flesh is considerably sweet even the fruits are harvested before morphological mature stage.

Flesh Thickness

From Table 5 we identify that IPB-MH7 has the best flesh thickness (3.24 cm). The fruit is very massive, with almost no hole inside. Apollo and Salmon flesh is about 2.75 and 2.57 cm thick, respectively.

Correlation Between Characters

From the result of correlation analysis presented in Table 6, we found that there are several significant relationship among observerd characters. Flesh thickness is positively correlated with fruit weight and stem diameter (r = 0.53* and 0.74**, respectively), and negatively correlated with sugar content (r = -0.67**). Beside, stem diameter also has positive correlation with fruit weight (r = 0.49*). Therefore, stem diameter could be one of the important characteristics that used for selection.

CONCLUSION

Now the breeding program has resulting in two promising hybrids, IPB-MH7 and IPB-MH52. IPB-MH7 has white-green skin and very thick, white flesh. IPB-MH52 has bright-yellow, non-netted fruit skin, green flesh, and also performed well in greenhouse. Those hybrids have been registered in Indonesia Plant Variety Protection Office in 2007.

ACKNOWLEDGEMENTS

We would like to thanks to Indonesia Ministry for Research and Technology and Directorate General of Higher Education for the research grants. Beside, we also thanks to the members of the CTFS Melon Team: Endang Gunawan MSi, Hidayatullah, M. Khaidir and Agus Suryani, for their best contribution to this program.

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Tables

Table 1. General description of four melon hybrids evaluated

Hybrids	Cultivar Group	Fruit Skin Color	Frut Flesh Color	Fruit Shape
IPB-MH7	Inodorus	Cream, with green on top	White	Round
IPB-MH35	Inodorus	Yellow	White	Oval
IPB-MH52	Inodorus	Yellow	Green	Oval
IPB-MH150	Reticulatus	Cream	Orange	Round
Apollo*	Inodorus	Yellow	White	Oval
Salmon*	Inodorus	Cream	Pale orange	Oval

* check variety

Table 2. Stem diameter of four melon hybrids evaluated in five environments

Hybrids	Stem diameter (cm)					
	Tajur, DS 2008	Magelang, RS 2008	Tajur, RS 2006	Tajur, DS 2006	Tajur, RS 2005	Least Square Means
IPB-MH7	1.04 a	1.09	1.12	0.89	0.97	1.02 ab
IPB-MH35	0.91	-	-	0.81	0.86	0.91 b
IPB-MH52	0.94 a	0.94	-	0.79	0.91	0.92 b
IPB-MH150	-	-	1.12	0.98	0.90	1.02 ab
Apollo (a)	0.86	0.96	1.04	-	-	0.90
Salmon (b)	-	-	-	0.72	0.69	0.78

DS = dry season, RS = rainy season.
a, b = significantly higher than Apollo and Salmon, respectively, - = data not available.

Table 3. Fruit weight of four melon hybrids evaluated in five environments

Hybrids	Fruit weight (kg)					
	Tajur, DS 2008	Magelang, RS 2008	Tajur, RS 2006	Tajur, DS 2006	Tajur, RS 2005	Least Square Means
IPB-MH7	1.38	1.88	1.34	1.12	1.18	1.38 b
IPB-MH35	0.93	-	-	0.75	0.73	0.92
IPB-MH52	1.26	1.44	-	0.95	1.14	1.19
IPB-MH150	-	-	1.06	0.85	0.71	1.02
Apollo (a)	1.47	1.76	1.21	-	-	1.35
Salmon (b)	-	-	-	0.90	1.00	1.15

DS = dry season, RS = rainy season.
a, b = significantly higher than Apollo and Salmon, respectively, - = data not available.

Table 4. Sugar content of four melon hybrids evaluated in five environments

Hybrids	Sugar content (^{o}Brix)					
	Tajur, DS 2008	Magelang, RS 2008	Tajur, RS 2006	Tajur, DS 2006	Tajur, RS 2005	Least Square Means
IPB-MH7	10.7	13.1	10.5	11.6	11.4	11.5
IPB-MH35	15.9 a	-	-	15.7 b	15.2 b	15.5 ab
IPB-MH52	11.1	14.8	-	12.7	10.7	11.7
IPB-MH150	-	-	10.0	13.8	13.4	13.1 b
Apollo (a)	13.1	14.1	9.2	-	-	12.2
Salmon (b)	-	-	-	11.2	10.9	11.0

DS = dry season, RS = rainy season.
a, b = significantly higher than Apollo and Salmon, respectively, - = data not available.

Table 5. Flesh thickness of four melon hybrids evaluated in five environments

Hybrids	Flesh thickenss (cm)					
	Tajur, DS 2008	Magelang, RS 2008	Tajur, RS 2006	Tajur, DS 2006	Tajur, RS 2005	Least Square Means
IPB-MH7	3.13	2.85	4.18 a	3.07	2.99	3.24 ab
IPB-MH35	1.96	-	-	1.17	1.77	1.91
IPB-MH52	2.32	2.37	-	2.00	2.18	2.45
IPB-MH150	-	-	3.77	2.17	2.07	2.61
Apollo (a)	2.63	2.89	3.49	-	-	2.75
Salmon (b)	-	-	-	2.14	2.24	2.57

DS = dry season, RS = rainy season.
a, b = significantly higher than Apollo and Salmon, respectively, - = data not available.

Table 6. Correlation coefficients between characters

Characters	Fruit weight	Stem diameter	Sugar content
Stem diameter	0.49*		
Sugar content	-0.17	-0.27	
Flesh thickness	0.53*	0.74**	-0.67**