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CROSSING AMONG SOME EGYPTIAN MELON LANDRACES FOR OBTAINING NEW HYBRIDS WITH GOOD YIELD AND QUALITY

M.M. Shahein[1], Shereen, S.F. El_Sayed[1], Y.T.E. Ellethy[2] and S.M. Abdel-Samea[2]

1. Vegetable Crops Department, Fac. Agric., Cairo University, Giza, Egypt.
2. Horticulture Research Institute, Agric. Res. Center., Giza, Egypt.

ABSTRACT

This study was conducted during the period from 2012 to 2014 at Kaha vegetable research farm (KVRF), Qalubia Governorate to evaluate five melon landraces [Quena 2(1), BeniSwif 1(2), Fayoum(3), Ismailawi(4), Giza-Berkash 2(5)] and diallel cross toproduce hybridsin the summer planting date. The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. The two F1 hybrids (2x3 and 2x4) had the lowest significant number of days to flowering (i.e flowering earliness) across significant number of days to ripening in 2014 among the evaluated ecotypes was produced by the melon landraces and hybrids 1 , 3, 2 , and 1x4) without across over all evaluated melon landraces and hybrids The lowest significant differences among them.F1 hybrids (4x1, 4x2, 3x2 and 3x4)produced the highest significant total yield/plant across all evaluated melon landraces and hybrids. In contrast, there were no significant differences among them with respect to total yield. In 2014, Three F1 hybrids (2x3, 5x1 and 4x5) produced the highest significant TSS value (13.5, 13.4 and 12.0%, respectively) across all evaluated entries. Besides, Hybrids 2x3, 5x3, 2x5 and 3x5 produced the highest significant values for netting but without significant differences among these three F1 hybrids. In brief, F1 hybrid (2x3) could be recommended as the best for several desired traits.

Key words: ***Egyptian melon landraces***, ***Hybrids***, ***Cucumismelo L.***

INTRODUCTION

Melon, (*Cucumis melo* L.), is an important horticultural crop across wide areas of the world. Within the genus *Cucumis*, it belongs to the subgenus melo, having 2n=24 chromosomes. Great morphological variation exits in fruit characteristics such as size, shape, colour and texture, taste and composition, and *C. melo* is therefore considered the most diverse species of the genus *Cucumis* (Stepansky *et al* 1999). Ban *et al* (2006) studied Plant spacing and cultivar affect melon growth and yield components. The objective of this study was to evaluate the effect of cultivars and in-row spacing on vegetative growth and yield components in melon (*Cucumis melo* L.). Volatile compounds are major determinants of melon fruit quality perceived by consumers, whose acceptance of melon is driven most often by sweetness, sourness, and also by an acceptable aroma bouquet or the presence of volatiles (Beaulieu & Lea, 2006 and Kourkoutas, Elmore, &Mottram, 2006). However, breeding programs have focused on the selection of new vegetable material which produce better colour, size, disease resistance, productivity and other traits, while, only at the end of the process, is any attention paid to aroma (Baldwin, 2002).In Egypt, Abo El-Noor (2002) evaluate dsix muskmelon cultivars namely: ShahdEldokki cv.,

Galia F1, Primal F1, Regal F1, Vicar F1 and Ideal F1. she also discussed their resistance to fusarium wilt disease. In that respect, Melon is considered as one of the most important vegetable crops grown in Egypt. According to the last estimates of the ministry of Agriculture and Land Reclamation, melon cultivated area reached 92050 fed. In 2008, yielding 923718 tons with an average of 9.9 tons/fed. All over the world, many investigators are interested in collecting their landraces or accession lines and estimate their agronomic traits or pathogenicity test in order to raise a new genotype for breeding programs. According to Ricciardi *et al* (2003).studied that Phenotypic and genetic characterization of (*Cucumis melo* L.) landraces collected in apulia and Albania, Silva *et al* (2005). Evaluation of melon genotypes for fruit yield and quality characteristics. Staub *et al* (2004). Diversity among melon landraces from Greece and theirgenetic relationships with other melon germplasm of diverse origins. Escribano and Lazaro (2009). Agro-morphological diversity of Spanish traditional melons (*Cucumis melo* L.) of the Madrid Provenance, Mohammadi *et al* (2014), and AbouKamer *et al* (2011) had obtained sweet melon F1 hybrids that performed better in one or more aspects than either parent. In Egypt, recently attention has been focused on screening Egyptian landraces from different geographic areas and evaluate its agronomic characters, before preserving them in the national gene bank.

The aim of this investigation was to collect some melon landraces, identify, characterize and evaluate them for yield, and fruit quality in order to establish a breeding program for melon to improve this crop and raise a new hybrids.

MATERIALS AND METHODS

This study was conducted during the period from 2012 to 2014 at Kaha vegetable research farm (KVRF), Qalubia Governorate to evaluate five melon landraces and their diallel crosses.

Experimental design

Five landraces [Quena 2(1), Beni Swif 1(2), Fayoum(3), Ismailawi(4), Giza-Berkash 2(5)] were collected. They were self- pollinated in Egypt was carried out twice in the open field at (KVRF), the first in April 2012 and crossed in the second August 2012. Diallel cross to produce

nineteen F1 hybrids in summer planting date were selected from these local melon the five landraces and there nineteen crosses were evaluated in the open field on 26 March in 2014.

The experimental design used was a randomized complete block design (RCBD) with three replicates. All local melon landraces which selected were randomly distributed in each replicate, that consisted of 25 plots, the plot (experimental plot) contained two ridges, 5.0 m long and 1.5 m wide (EP=15m^2). The distance between hills was 50 cm apart. For there, each ridge consisted of 10 hills. The seeds were sown at the rate of two seeds / hill. After full germination, plants were thinned to one plant / hill. All cultural practices were made as recommended for melon.

Characters measured

Vegetative traits

The data were recorded on ten plants randomly chosen within each plot of the three replicates for the following characters:

Number of days to flowering

Number of days to flowering (NDF) was measured as the days to an thesis of 50% female flowers.

Number of days to ripening

Number of days from flowering to fruit ripening (NDR) was measured as the days to fruit ripening of 50% from plants.

Total yield per plant

Total yield per plant (TY) was measured as the weight of all fruits harvested at ripening stage from each EP / number of plants throughout the picking season.

Fruit characteristics

1. Average fruit weight

Average fruit weight (AFW) was determined as the mean weight of five fruits, randomly chosen, from each EP.

2. Fruit dry weight

Dry weight (FDW) was measured as the weight of 100 g fresh weight from fruit which was dried at 70° c to stable weight.

3. Fruit firmness

Fruit firmness (FF) was measured in the ripe stage using a needle type penetrometer by bushing the penetrometer needle slowly at the equatorial plane. Each EP was represented by five randomly chosen fruits.

4. Fruit flesh thickness

Fruit flesh thickness (FFT) was determinate in a sample of five fruits/EP.

5. Total soluble solids

Total soluble solids (TSS) were determined in five ripe fruits of each EP by using a hand refractometer.

6. Netting

Netting was measured as the descriptor degrees from 0 to 5. 0 = without netting and 5 = full netting. Netting was measured in five ripe fruits of each EP.

Statistical analysis

Data obtained were statically analyzed using F-test (Snedecor and Cochran, 2014) and comparisons were based on the Duncan's multiple range test (Steel *et al* 1997).

RESULTS AND DISCUSSION

Characters measured

Number of days to flowering

Data obtained on NDF of melon ecotypes in the 2014 summer plantings are presented in Table (1). The results showed significant differences among the evaluated ecotypes and revealed a wide range of variation for this trait. Two (2x3 and 2x4) hybrids had the lowest significant NDF across all evaluated entries (49.0days for both). In 2014 the highest significant NDF across all evaluated melon landraces and hybrids was found for 5, 3x4, 5x1, 2x1, 4x3, 4x1, Shahd El-Dokki, 3x1, 5x3, 1 with NDF being 57.9, 57.4, 56.9, 56.9, 57.4, 56.9, 56.9, 56.8, 56.8, 56.7, 56.7 days, respectively, without significant differences between them. These results in agreement with El- Doweny *et al* (1990), El- Shimi and Ghoneim (2003) found that melon landraces of Sandafa, El-Wahat el-Bahria, Fayoum and Brolussi melon were earlier than the other melon landraces in time of opening 50% of female flowers.

Number of days to ripening

Data obtained on NDR of melon ecotypes in the summer seasons 2014 are presented in Table (3).The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. The lowest significant NDR in 2014 (i.e., earlier) among the evaluated ecotypes was produced by the melon landraces and hybrids1 (37.5 days), 3 (35.1 days), 2 (38.3 days), and 1x4 (38.0days) without significant differences among them .3x5, 3x1 and 4x5showed the highest NDR value in 2014 (44.6,43.0 and 43.3 days, respectively) compared with the evaluated melon landraces and hybrids. Abo El-Noor (2002) and Pandey *et al* (2008) found that fruits of the new muskmelon cultivar KashiMadhu become ready for first harvest in ~90 days from seed sowing.

Total yield per plant

Data obtained on TY/plant of melon landraces and hybrids in the 2014 summer plantings are presented in Table (1).The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. In 2014, 4x1, 4x2, 3x2 and 3x4produced the highest significant TY/plant across all evaluated melon landraces and hybrids without significant differences among them with TY being 12.70, 12.10, 11.99 and 11.50kg, respectively. The lowest TY/plant value across all evaluated melon landraces and hybrids was obtained from 3, 2x3 and 2x4with TY being 765, 5.36 and 5.36.Hussain*etal* (1986) found that Campo had the highest fruit yield (86.84 t/ha). Campo was recommended for breeding for yield. El- Shimi and Ghoneim (2003) found that Ismailawi and Waraki were superior for total yield (ton/ fed.) and fruit yield/plant while Fayoum melon landrace and Anannas El-Dokki recorded the lowest values for aforementioned characters. Jani (2007) found that 8 cultivars out of evaluated 19 melon cultivars from various regions in Albania produced high productivity.

Table 1. Fruit yield of melon landraces and hybrids of melon plants during the season 2014.

Melon landraces and hybrids	No of days to flower	No of days to ripening	Total Yield per plant kg
Landraces 1	56.2 abcd	37.5 fg	8.48de
Landraces 2	53.8abcdef	38.3 fg	8.98cde
Landraces 3	53.3 bcdef	37.1 g	7.65def
Landraces 4	54.4abcdef	39.5 defg	11.00abc
Landraces5	57.9 a	41.8 bcd	10.18bcd
Hybid1× 2	54.9 abcde	41.6 bcde	8.70cde
Hybid1 × 3	54.3 defgh	41.5 bcde	10.16bcd
Hybid1× 4	55.0 abcde	38.0 fg	8.20de
Hybid2 × 1	56.9 ab	42.3 abcd	10.00bcd
Hybid2 × 3	49.0 gh	41.9 abcd	5.36f
Hybid2 × 4	49.0 h	42.6 abc	5.36f
Hybid2 × 5	54.8 abcdef	40.1 cdef	5.22de
Hybid3 × 1	56.2 abcd	43.0 ab	9.92bcd
Hybid3 × 2	52.6 cdefg	42.2 abcd	11.99ab
Hybid3 × 4	57.4ab	41.9 bcd	11.50ab
Hybid3 × 5	55.4 abcde	44.6a	3.23de
Hybid4 × 1	56.7 abc	40.6 bcde	12.70a
Hybid4 × 2	53.6 bcdef	39.9 cdef	12.10ab
Hybid4 × 3	56.8 abc	41.8 bcd	8.96cde
Hybid4 × 5	50.6 fgh	43.3 ab	8.14de
Hybid5 × 1	56.9 ab	39.0 efg	7.30ef
Hybid5 × 2	51.5 efgh	40.9 bcde	6.60bcd
Hybid5 × 3	56.2 ab	41.0 bcde	7.32ef
Hybid5 × 4	55.8 abcd	42.0 bcd	7.25ef
Shahd El-Dokki	56.7 abc	41.9 bcd	6.66ef

Fruit firmness

Data obtained on FF of melon landraces and hybrids in the 2014 summer plantings are presented in Table (2). The results showed significant differences among the evaluated ecotypes and revealed a wide range of variation for this trait.

Table 2. Fruit yield of melon landraces and hybrids of melon plants during the season 2014.

Melon landraces and hybrids	Fruit flesh thickness, (cm)	Fruit firmness (pound/inch^2)	Netting
Landraces1	3.98defg	14.2i	1.3i
Landraces2	3.58gh	19.0fgh	3.2fgh
Landraces3	3.60gh	26.8bc	3. 7efg
Landraces4	4.40def	21.5def	2.9h
Landraces5	4.20defg	19.6fgh	2.5h
Hybid1× 2	3.88efgh	22.0efgh	2.7h
Hybid1 × 3	4.60bcd	20.9efgh	3. 7efg
Hybid1× 4	3.77fgh	31.0a	3.9bcdef
Hybid2 × 1	3.19h	21.3efgh	0.0j
Hybid 2 × 3	2.70i	27.1bc	4.6abcd
Hybid 2 × 4	2.60i	19.6fgh	0.00j
Hybid 2 × 5	4.01defg	28.0b	4.7ab
Hybid 3 × 1	4.96abc	21.5efgh	2. 7h
Hybid 3 × 2	5.23e	20.6fgh	3.8fgh
Hybid 3 × 4	4.47cde	18.9gh	2.9h
Hybid 3 × 5	4.42cdef	18.7h	5.0a
Hybid 4 × 1	4.05defg	22.7def	3.0gh
Hybid4 × 2	5.18ab	18.9gh	3.1gh
Hybid 4 × 3	4.57bcd	25.5bcd	3.9cdef
Hybid 4 × 5	4.07defg	27.6bc	3.9def
Hybid 5 × 1	4.05gh	21.3efgh	0.00j
Hybid 5 × 2	4.13defg	22.23defg	3.0gh
Hybid 5 × 3	4.13defg	24.4cde	4.7abc
Hybid 5 × 4	4.60bcd	27.1bc	2.6h
Shahd El-Dokki	4.12defg	27.1bc	4.2bcde

In 2014, the hybrid 1x4had the highest significant melon FF among all landraces and hybrids. By contrast, 1 melon landrace had the lowest

significant FF in 2014 (14.2 pound/inch^2 according to Abo El-Noor (2002) and Galala (2007).

Fruit flesh thickness

Data obtained on FFT of melon landraces and hybrids in the 2014 summer plantings are presented in Table (2).The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. Two F1 hybrids (4x2 and 3x1) had the highest significant FFT (5.18 and 4.96 cm) across all evaluated melon landraces and hybrids in 2014. Meanwhile, 2x4 and 2x3 recorded the lowest significant FFT (2.60and 2.70 cm, respectively) across all evaluated melon landraces and hybrids. Jani (2007) found that 8 cultivars out of evaluated 19 melon cultivars from various regions in Albania produced fruits with thick flesh. El- Shimi and Ghoneim (2003) found that the highest value for FFT was obtained by Warraki and Ananas El-Dokki.

Netting

Data obtained on netting of melon landraces and hybrids in the 2014 summer plantings are presented in Table (2). In 2014, the melon landraces and hybrids2x3, 5x3, 2x5 and 3x5 produced the highest significant values for netting but without significant differences between them (4.6, 4.7, 4.7 and 5.0) meanwhile, 2x1, 5x1 and 1 had the lowest significant values of netting over all evaluated ecotypes (0,0 and 1.3) but without significant differences between them. according to Escribano and Lazaro (2009), Jani (2007) found that 12 cultivars produced fruits with netted skin. El- Shimi and Ghoneim 2003 found that Marsa Mattrouh melon landrace exhibit the top rank in the two growing seasons.

Total soluble solids

Data obtained on TSS of melon landraces and hybrids in the 2014 summer plantings are presented in Table (3). The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. In 2014, three F1 hybrids (2x3, 5x1 and 4x5) produced the highest significant TSS value (13.5, 13.4 and 12.0%, respectively) across all evaluated melon landraces and hybrids without significant differences among the three superior hybrids.

Table 3. Fruit yield of melon landraces and hybridsof melon plants during the season 2014.

Melon landraces and hybrids	TSS%	Fruit weight (kg)	Dry weight fruit
Landraces1	**9.0i**	**2.5cdef**	**7.40cdefg**
Landraces2	**8.2i**	**3.0bcd**	**7.5cdefg**
Landraces3	**10.3efgh**	**1.6fgh**	**9.7a**
Landraces4	**10.3efgh**	**3.9 ab**	**8.6abcd**
Landraces5	**10.1gh**	**3.1abc**	**9.7abc**
Hybid 1x2	**12.0bc**	**2.9cde**	**8.3abcde**
Hybid 1x3	**10.2fgh**	**3.0bcd**	**8.7abc**
Hybid1x4	**11.9b**	**1.8efgh**	**8.4abcde**
Hybid 2x1	**10.0gh**	**3.0bcd**	**7.8bcdefg**
Hybid 2 × 3	**13.5a**	**0.8hi**	**7.0defg**
Hybid 2 **× 4**	**11.0bcdefg**	**0.5i**	**8.5abcd**
Hybid 2 **× 5**	**12.0bc**	**1.6fgh**	**9.4ab**
Hybid 3 × 1	**10.0h**	**3.0abc**	**7.6cdefg**
Hybid 3 × 2	**11.2bcdef**	**4.0a**	**8.4abcde**
Hybid 3 × 4	**10.1fgh**	**3.2abc**	**9.5a**
Hybid 3 **× 5**	**10.3efgh**	**2.4cdefg**	**8.1abcdef**
Hybid 4 **× 1**	**11.5bcd**	**4.1a**	**7.7bcdefg**
Hybid 4x2	**11.7cdefgh**	**3.9 ab**	**6.2g**
Hybid 4 **× 3**	**10.5defgh**	**2.6cdef**	**6.5fg**
Hybid 4 **× 5**	**12.0a**	**1.8efgh**	**6.4fg**
Hybid 5 **× 1**	**13.4a**	**1.4ghi**	**7.4cdefg**
Hybid 5 **× 2**	**10.7cdefgh**	**2.4cdefg**	**8.5abcde**
Hybid 5 **× 3**	**11.1bcdefg**	**1.5ghi**	**6.2g**
Hybid 5 **× 4**	**11.3bcde**	**2.0defg**	**6.8efg**
Shahd El-Dokki	**11. 1bcd**	**1.7fgh**	**7.7bcdefg**

The lowest significant TSS value across all evaluated melon landraces and hybrids was found in two landraces 1 and 2 (9.0 and 8.2%). El-Dweney (1978) found that the cultivars Charantais, Kahera h6 and Kahera3 produced the highest significant TSS across all evaluated ecotypes. El- Shimi and Ghoneim, 2003 found that Ismaelawi had the highest TSS.

Average fruit weight

Data obtained on AFW of melon landraces and hybrids in the 2014 summer plantings are presented in Table (3). The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. Entries 4, 5, 3x1, 3x2, 3x4, 4x1 and 4x2 the highest significant AFW (3.9, 3.1, 3.0, 4.0, 3.2, 4.1 and 3.9 kg) across all evaluated melon landraces and hybrids without significant differences among them in 2014. Four hybrids out of the nineteen F1 hybrids (2x3, 2x4, 5x1 and 5x3) had the lowest significant AFW (0.8, 0.5, 1.4 and 1.5 kg, respectively) in 2014 across all evaluated melon landraces and hybrids. The results of El-Dweney (1978) study indicated that the highest average fruit weight was found in fruits of Esmaellawy, Kahera3, Casaba Golden Beauty and Kahera6. Hussain *et al* (1986) found that Campo had the highest pulp weight (132 g). El-Shimi and Ghoneim (2003) found that Ismailawi and Waraki were superior for AFW while Fayoum melon landrace and Anannas El-Dokki recorded the lowest values for this trait.

Fruit dry weight

Data obtained on FDW/100 g fruit fresh weight of melon landraces and hybrids in the 2014 summer plantings are presented in Table (3). The results showed significant differences among the evaluated melon landraces and hybrids and revealed a wide range of variation for this trait. In 2014, 3, 2x5 and 3x4 melon landraces and hybrids exhibited the highest significant FDW / 100 g fresh fruit weight (9.7, 9.4 and 9.5 and g, respectively) over all evaluated melon landraces and hybrids without significant differences between them, but the lowest significant FDW/100 g fresh fruit weight was found in 4x2 and 5x3 (6.2 and 6.2 g). These results in agreement with El-Shimi and Ghoneim (2003) which revealed that Fayoum melon landrace exhibited the highest mean value for dry matter content followed by Kahera-6 in the second sample, for the second season. it was possible to identify valuable genotypes for future breeding programs aimed at improving melon traits, particularly for the *Inodorus* group, which is an important crop in many Southern Italian sites. Genotypes of interest were especially selected for earliness and lateness, fruit shape, soluble solids content, storage time and fruit firmness (Lotti *et al* 2008).

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استخدام بعض الطرز المحلية من القاوون للحصول على هجن جديدة ذات محصول وجودة عالية

محمد محمد شاهين[١]، شيرين سيد فتحى السيد[١]، يوسف طلعت امام الليثى[٢]

و شعبان محمد عبد السميع [٢]

١. قسم الخضر – كلية الزراعة – جامعة القاهرة

٢. معهد بحوث البساتين – مركز البحوث الزراعية

تمت هذه الدراسة خلال الفترة من ٢٠١٢ -٢٠١٤ فى محطة بحوث قها- القليوبية وذلك لتقييم ٥ مصادر محلية من القاوون و هم قنا ٢ و بنى سويف ١ و فيوم ٣ و إسماعيلاوى ٤ و جيزة – برقاش٢ و الهجن الناتجة عن التهجينات فيما بينهم فى كلا الاتجاهين فى الموسم الصيفى و أظهرت النتائج إختلافات معنوية بين المصادر المحلية و الهجن على مدى واسع من الاختلافات لهذة التجربة. الهجن٢ × ٣ و ٢ ×٤ أعطوا أقل قيمة معنوية (تبكير) بالنسبة لصفة عدد الأيام للتزهير مقارنة ببقية المصادر المحلية و الهجن. أقل عدد أيام للنضج جاءت كالتالى السلالات المحلية ١ و ٢ و ٣ و الهجن ١× ٤ كانوا مبكرين فى النضج مقارنة ببقية المصادر المحلية و الهجن. و قد أعطت الهجن ٤× ١ و ٤ ×٢ و ٣× ٢ و ٣× ٤ أعلى قيمة بالنسبة للمحصول الكلى للنبات مقارنة بالاباء و الهجن الاخرى بدون إختلافات معنوية بين الهجن المتفوقة و فى نفس الوقت فان هجن F1 ٢× ٣ و ٤ ×٥ و ٥ × ١أعطوا أعلى قيمة معنوية بالنسبة للمواد الصلبة الذائبة الكلية (١٣,٥ و ١٣,٤ و ١٢,٠ % TSS) مقارنة ببقية المصادر المحلية و الهجن. و قد أعطت هجن F1 ٢× ٣ و ٢ ×٥ و ٣ × ٥ أعلى القيم للشبكية بدون إختلافات معنوية بينهم. و أفضل هجين هو ٢ × ٣ فى غالبية الصفات المدرسة خاصة المحصول المبكر و المواد الصلبة الذائبة الكلية

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