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TYPES OF GENE ACTION AND HYBRID VIGOUR FOR YIELD AND QUALITY TRAITS OF MELON (CUCUMIS MELO, L.).

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ABSTRACT

This study was carried out in two successive summer seasons (2012 and 2013), at the Experimental Farm of Research Station, Qanater El-Khairya, El- Kalupia Governorate, Agriculture Research Center. The main objectives of this investigation were to estimate of magnitude of additive and non-additive gene effects for some traits in an attempt to stablish some inbred lines. The study also aimed to estimate heterosis degree, relative to mid, better parents and the standard cultivar to determine the hybrid vigour for some important characters. Phenotypic correlation coefficients between all possible pairs of the different studied traits were estimated. The following traits were assessed: early and total yield as fruit number and weight, average fruit weight, shape index, skin and flesh colour, flesh thickness, β carotene, vitamin C and sugars contents. The obtained results showed that both additive and non-additive gene effects were involved, the additive gene effects appeared to be playing the main role in the inheritance of all studied traits, since the estimated GCA: SCA ratio values ranged from 4.4 to 57.8. None of the parents found to be good combiner for all characters. Generally the two parents Magyar Kincs and Muszkotàly were the best combiner for breeding to most characters. It is noticed that the best F_1 combinations were resulted from crossing between these two parents or between one of them and other parent.

Hybrid vigour was detected for early and total yield, as well as, most fruit characters. In some crosses, high better parent heterosis and potence ratio values were given for these traits supporting the over dominance hypothesis. Other degrees of dominance were observed by many crosses concerning some traits. High estimated standard heterosis were reflected by three crosses i.e., Shahd El-Dokki X Muszkotàly, Shahd El-Dokki X Magyar Kincs and Magyar Kincs X Muszkotàly for yield and most important traits. Hence, it could be suggested that these crosses may be recommended as new promising F_1 hybrids for commercial production of melon after further evaluation. Desirable correlations were detected between many pairs of character. In many cases phenotypic correlations used to help breeders in selecting and improving quantitative of difficulty measured characters through the selection for simply and correlated ones.
Keywords: Combining ability, heterosis, dominance, hybrid vigour, heterobeltiosis potence ratio, correlation, selection.

NTRODUCTION

Melon (Cucumis melo L.) is an economically important species of Cucurbitaceae family. According to Luan et al (2010), melon is the most polymorphic species of the cucurbits, which is particularly true for fruit related traits. The cultivation of hybrid cultivars has had a major role in the improvement of crop production and fruit quality over the past few years

(Duvick, 1999). Heterosis/ or hybrid vigour refers to the phenomenon of which a F_1 hybrids exhibits phenotypic characteristics superior to the mean of the two parents (mid-parent heterosis) or either of them (better parent heterosis), or the commercial cultivar (Standard heterosis). Heterosis also has an important role in the fitness of natural population.

Among the methodolies used to choose the parents and segregating populations, the diallel analysis deserves consideration. From the diallel crosses, the general and specific combining abilities can be estimated. The general combining ability (GCA) is related to additive effects, and allows the identification of parents with the high frequency of favorable alleles. Meanwhile, the SCA effects indicate the most promising hybrid combinations (Valério *et al*., 2009). In addition, the diallel scheme helps analyze the nature and magnitude of gene effects that control traits of the economic importance. Knowledge on traits inheritance is useful to define the strategy of breeding program (Feyzian *et al*., 2009).

In view of those consideration regarding types of gene effects and degree of dominance (or hybrid vigor), the objectives of this study were to determine the additive and non-additive action magnitudes, as well as, degree of dominance to identify the best combiner parents and the best F_1 combinations for yield and fruit quality in melon.

Several studies were conducted on both of combining ability and heterosis degree in melon. With regard to combining ability effects, most studies showed that both additive and non-additive effects were involved in the inheritance of most studied traits in melon. High variance values for both general and specific combining abilities, with different GCA : SCA ratios, El-Adl *et al.,* 1996 and Chaudhary *et al*., 2006 for early and total yield as fruit number and weight . The two types of gene actions were also observed for average fruit weight and total yield by Feyzian et al., (2009) and for total yield as fruit number and weight, flesh thickness ant total soluble solids by Barros *et al.,* (2011).

The additive gene effects were more important than the non-additive ones (Kalb and Davis, 1984 a,b; Maiero *et al.,* 1987; Om *et al*., 1987). Also Hatem, (1992) and Om *et al*., (1987) reported that additive effects played the main role in the inheritance of soluble solid, vitamin C and β-carotene content.

The estimated GCA : SCA ratio showed that the non-additive gene effects controlled TSS and β-carotene in melon (Tarsem and Reetinder, 2002). Feyzian *et al*., (2009), plant height, number of branches per plant, flowering and maturity dates, number of fruit / plant, average fruit weight, total fruit yield, fruit flesh thickness, fruit shape index, fruit netting degree, fruit skin colour, β-carotene, vitamin C and total sugars contents were also controlled by non-additive gene effects.

Hybrid vigour or heterobeltiosis was detected for most plant and fruit characters of melon by many investigators. Among those were, Hatem 1992 & Hatem et al., 1995 for early yield traits, total yield as fruit number and weight and average fruit weight. Greish *et al*.,(2005) for plant high, plant growth rates, fruit weight, fruit length, fruit width and total soluble solids

(TSS). Feyzian *et al.,* (2009) for average fruit weight, total yield, and acceptable yield. Fernandez-Silva *et al*., (2009) for high fruit shape index.

Desirable complete dominance was also observed in many traits of melon by Abadia *et al.,* (1985), Hatem(1992), Shamloul (2002) and Abou Kamer (2011). On the other hand, the study of Burger *et al*., (2002 & 2003) showed that the fruit of F_1 plants a sucrose content of F_1 fruits was slightly higher than that of the low sucrose parent, indicating that low sucrose content nearly complete dominance. They added that the high sucrose accumulation in melon fruit flesh is controlled by a single recessive gene (su) and the high acid content is controlled by a single dominant gene.

Partial dominance for high fruit number was observed by Hatem *et al*., (1996) in melon. Also incomplete dominance /or no dominance was observed for early fruit number in melon by Hatem *et al*., 1996.

Correlation:-

Correlations between several characters were studied in melon by many investigators. The estimated correlation coefficients were significant or highly significant positive between weight, length and fruit diameter, as well as between fruit diameter and each of seed cavity diameter and flesh thickness as reported by Gomez *et al*., (1985). Association among flesh thickness, fruit weight and yield were found by Dahliwal *et al.,* (1996). According to Benedettelli *et al*., (1999) the soluble solids was positively correlated with mean fruit weight. The study of Abd El-Salam *et al*., (2002) showed that positive correlations were detected between number of fruits per plant and each of total yield, average fruit weight, TSS, fruit length and fruit flesh thickness.The estimated correlation coefficient between the primary branches number and total yield was r= 0.82 (Taha *et al*., 2003 and Zalapa *et al*., 2008) Flesh thickness was positively correlated with fruit diameter (Rawhia, 2004) She added that good positive relations were found between fruit weight and each of fruit length, fruit diameter, seed cavity diameter / fruit diameter. The positive correlation was also found by Chamnan and Kasem (2006) and Lathet and Piluek (2006) mentioned that fruit number had highly positive correlation to yield. Abou Kamer (2011) reported that total fruit yield / plant was correlated with each of plant length, fruit number, average fruit weight. He also found positive correlation between total sugars and each of TSS % and reducing sugars.

On the contrary, negative correlations were detected between some characters. Benedettelli *et al.,* (1999) found that marketable fruit yield is negatively influenced by both flesh and skin thickness, with probably affect melon fruit cracking. Negative association between flesh thickness and fruit seed cavity diameter was also observed by Rawhia (2004). According to Chamnan and Kasem (2006), the width of marketable fruit showed negative correlation to fruit length and fruit shape. Width of fruit showed negative correlation with fruit length and fruit shape, Lathet and Piluek (2006). Negative correlations were also reported by Zalapa *et al*., (2008) between branch number, fruit weight and average fresh weigh per plant. Also between days to anthesis and early pistillate flowering and maturity, as well as, between the percentage of plant with early pistillate

MATERIALS AND METHODS

The present investigation was carried out during the two successive years of 2012 and 2013. The genetic materials used in this study were five parental lines of melon (Cucumis melo L).

Three sweet melon viz, Ananas El-Dokki (1), Shahd El-Dokki (2) and Ismaellawy (3) belong to species C. melo var. Aegyptiacus, were provided by the Vegetable Research Department, Horticulture Research Institute, Agriculture Research Center, Ministry of Agriculture. Two lines viz, Magyar Kincs (4) and Muszkotàly (5), belong to C. melo var. reticulates were obtained from Hungary. Main characteristics of these genotypes are presented in table 1.

Table (1): Main characteristics of the studies parental lines and check hybrid cultiver.

Characters / Genotypes	Fruits		
	Fruit shape index.	**Fruit flesh colour (interior colour).**	**Sweetness.**
1- Ananas El-Dokki.	Round shape	Very light green	Sweet test and good flavor
2- Shahd El-Dokki .	Long oval shape	Orange flesh	Sweet test and good flavor
3- Ismaellawy .	Oblong	Greenish yellow	Medium Sweet and good flavor
4- Magyar Kincs.	Round shape	Light green	Sweetness and excellent flavor
5- Muszkotàly.	Round shape	Light orange	Medium Sweet and flavor
6- Arafa (Commercial hyp.).	Round shape	Light green	Sweet test and sweet-smelling

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Characters / Genotypes	Fruits		
	Fruit netting ratio.	**Average fruit weight(Kg.).**	**Fruit skin colour.**
1- Ananas El-Dokki.	Light netted	0.750 – 1.400	Canary yellow
2- Shahd El-Dokki.	Heavily netted	0.800 – 2.100	Brown reddish
3- Ismaellawy.	Medium	4 – 6	Yellowish green, light green sutures
4- Magyar Kincs.	Netted	0.750 – 0.900	Greenish yellow
5- Muszkotàly.	Medium	0.600 – 0.800	Golden yellow, light green sutures
6- Arafa (Commercial hyp.).	Netted	0.650 – 0.900	Greenish yellow

In the summer season of 2012, the five parents were planted in the field and all possible crosses, without reciprocals, were made to generate the experimental materials (F_1 combinations). The seed of the five parental lines and 10 crosses in additition to Arafa hybrid, were planted in summer season of 2013, for evaluation at the Experimental farm, Research Station Qanater El-Khiria, Vegetable Research Department, Horticulture Research Institute, Agriculture Research. Center. Seeds were sown on 10 March 2013, for measuring the different types of genes effects in the terms of general and specific combining abilities (GCA and SCA), heterosis degree and correlation coefficient regarding some plant and fruit traits. A randomized complete block design with three replicates was adopted. Treatments in each replicate (5 parental lines + 10 F_1's + Arafa hyb.) as the check were randomly assigned to the main plot. Each entry was planted in a two rows, 5m. long and 1.25 m. width. The seeds were planted in hill 50 cm. apart. Three weeks later, seedling were thinned to one plant per hill. The agricultural practices for melon production, i.e., irrigation, fertilization, weeding and pests control were practiced as recommended in the area. The studied characters were: flowering data and maturity and maturity dates.

The number of days from planting to the first flower (Female or Hermaphrodite flower opening and to first fruit maturity.

Total fruit yield as fruit number and weight per plant and average fruit weight per plant (Kg.).

Fruit characteristics:

- Fruit flesh thickness (%): measured as ratio between flesh thickness to the fruit diameter, fruit shape index: was calculated by dividing the fruit length by fruit diameter as reported by Wininger and Ludwing (1974), fruit netting degree: was rated from 1-10 where 1, denote the extremely smooth skin fruit, while 10 denote the heavily rough skin fruit, fruit skin colour:-was rated from 1-10 where 1, denote the yellowish skin, while 10 denoted the copperish yellow and fruit total soluble solids (T.S.S. %): determined using the Zeiss hand refractometer. These measurements were taken on five fruits per replicate.

Fruit chemical analysis:

- β carotene content: was determine as β carotene (mg./ 100gm. fresh weight) using the method described by Nakdiman and Gabelman (1971), ascorbic acid (V.C) was determined according to A.O.A.C, 1990, total sugars (%) in fruit juice: determined as reducing and non-reducing sugars using the phenol, sulphric acid method according to the method of Dubis *et. a*l., (1972).

Statistical analysis:

- Analysis of variance was made in order to test the significancy of the differences among the mean of tested populations as shown by Cochran and Cox (1957). Differences among means for all traits were tested by Duncan method.

The average degree of heterosis (ADH %) was calculated as percent increase or decrease of the F_1 performance above the mid-parents ($\overline{MP}$) value and the better parent (BP) values (Sinha and Khanna, 1975). Standard heterosis (ST) was also estimated based on the check cultivar. Potence ratio (PR) was also calculated to determine the nature of dominance and its direction (Smith, 1952).

Significance of the estimated heterosis was tested with "t" test at error degrees of freedom by Chaudhary *et al*. (1978), as follows:

t for heterosis over mid-parents value = $\overline{F}_1 - \overline{MP} / \sqrt{\frac{Me}{r} * \frac{3}{2}}$

t for heterosis over high parent value = $\overline{F}_1 - \overline{HP} / \sqrt{\frac{Me}{r} * 2}$

where, Me = error variance; r = number of replications.
- The analysis of general and specific combining abilities was don according to method (2) model (1) of Griffing (1956).
- The relationships between some traits were determined by estimating the correlation coefficients.

RESULTS AND DISCUSSION

I- Types of gene action:-

Additive and non-additive gene actions were detemined by estimating general and specific combining ability. The analysis of variance showed significant variation among most studied characters, indicating a wide range of variability among the studied genotypes. Highly significant variation due to general (GCA) and specific (SCA) combining abilities were observed, indicating the importance of both additive and non-additive types of gene actions in the inheritance of all traits. Similar results were reported by Chaudhary *et al.,* (2006) for early and total yield as fruit number and weight, Feyzian *et al.,* (2009) for average fruit weight and Barros *et al.,* (2011) for flesh thickness and soluble solids content.

Estimated GCA:SCA ratio values revealed that the additive gene effects were more important than the non-additive ones for the inheritance of all studied traits. The estimated values ranged from 4.441 (for total fruit weight) to 57.840 (for average fruit weight) as shown in Table (2).

Table 2: Mean squares for combining ability (GCA and SCA) for some characters in melon.

Characters / Source of variation	Number of days to first female or hermaphrodite flower.		Number of days from sowing to fruit early maturity.		Early yield (number of fruit).		Early yield (fruit weight).	
	MS	F	MS	F	MS	F	MS	F
GCA	127.35	652.97**	319.50	5301.21**	20.29	730.69**	3.99	171.88**
SCA	12.56	64.38**	18.35	304.47**	0.46	16.71**	0.461	19.70**
GCA/SCA	10.143		17.411		43.718		8.723	
	Total fruit number / plant.		Total fruit weight / plant.		Average fruit weight.		Fruit flesh thickness%.	
GCA	49.63	8428.21**	3.30	798.39	6.11	1008.97**	429.93	452.18**
SCA	1.81	307.92**	0.74	179.79	0.11	17.44**	37.276	39.20**
GCA/SCA	27.371		4.441		57.840		11.535	
	Fruit shape index.		Fruit netting degree.		Fruit skin colour.		TSS.	
GCA	0.68	48.20**	10.12	1886.99**	11.66	57.18**	15.93	1814.35**
SCA	0.02	1.44**	1.35	251.92**	1.20	5.88**	1.08	122.47**
GCA/SCA	33.453871		7.490		9.715491463		14.814	
	β-carotene content.		V.C content.		Total sugars.			
GCA	18.76	2601.15**	123.09	2567.16**	5474.93	63575.16**		
SCA	1.57	217.99**	14.01	292.26**	655.41	7610.61**		
GCA/SCA	11.93214438		8.784		8.353			

*** Significant at 0.05 level of probability.**
**** Significant at 0.01 level of probability.**

These findings agreed with those of Hatem *et al.,* (1992) and Om *et al*., (1987) for inheritance of total soluble solids, vitamin C and β-carotene contents and other traits. While it was disagree with those of Tarsem and Reetinder (2002) and Feyzian *et al.,* (2009) who reported that flowering and maturity dates, number of fruits per plant, total yield and the chemical fruits were mainly controlled by non-additive gene effects.

General combining ability (GCA) effects:

The estimated significant positive GCA values are desirable for all studied characters, except number of days from sowing to first female flower and maturity since the negative values are considered as the favour. Obtained GCA effect values of the parents (Table 3) revealed that none of the parents found to be good combiner for all characters. However, the good combiner parents were:.

Table 3: Estimated general combining ability (GCA) effects for the parental lines regarding some characters in melon.

Characters / Parents	**Number of days to first female or hermaphrodite flower.**	**Number of days from sowing to fruit Early maturity.**	**Early yield (number of fruit / plant).**	**Early yield (fruit weight / plant).**
Ananas El-Dokki	2.543**	- 2.220**	-1.003**	- 0.709**
Shahd El-Dokki	4.686**	3.051**	-1.8314**	- 0.744**
Ismaellawy	8.243**	18.52**	- 3.346**	- 1.359**
Magyar Kincs	- 8.800**	-10.920**	3.340**	1.441**
Muskotàly	- 6.671**	- 8.434**	2.84**	1.370**
	Total fruit number / plant.	Total fruit weight / plant.	Average fruit weight.	Fruit flesh thickness.
Ananas El-Dokki	- 0.614**	- 1.274**	- 0.473**	- 9.857**
Shahd El-Dokki	- 0.407**	0.554**	- 0.073**	0.143
Ismaellawy	- 7.150**	- 1.281**	2.783**	- 16.571**
Magyar Kincs	4.214**	1.211**	- 1.124**	16.286**
Muskotàly	3.957**	0.790**	- 1.113**	10.000**
	Fruit shape index.	Fruit netting degree.	Fruit skin colour.	TSS.
Ananas El-Dokki	- 0.109**	- 1.963**	- 0.747**	-0.556**
Shahd El-Dokki	0.201**	0.273**	3.728**	-1.841**
Ismaellawy	0.832**	-2.277**	- 2.272**	-2.991**
Magyar Kincs	- 0.458**	2.416**	- 0.590**	2.966**
Muskotàly	- 0.466**	1.551**	- 0.119	2.423**
	β-carotene content.	V.C content.	Total sugars.	
Ananas El-Dokki	-2.057**	4.699**	15.549**	
Shahd El-Dokki	4.843**	- 6.862**	- 42.075**	
Ismaellawy	- 1.565**	- 7.635**	- 58.912**	
Magyar Kincs	- 1.412**	9.115**	53.966**	
Muskotàly	0.191**	0.683**	31.472**	

*** Significant at the 0.05 level of probability according to "T" test.**
**** Significant at the 0.01 level of probability according to "T" test.**

Magyar Kincs and Muszkotàly for most characters such as number of days from sowing to first hermaphrodite flower, and early fruit maturity, early fruit number, early fruit weight, total yield as fruit number and weight, fruit flesh thickness, fruit netting degree, T.S.S., V.C. and total sugar). Ananas El-Dokki for earliness (number of days from sowing to early fruit maturity, V.C. content and total sugar contents)). Shahd El-Dokki for total yield as fruit weight, fruit netting degree, fruit skin colour and β-carotene content. Ismaellawy for average fruit weight, Shahd El-Dokki and Ismaellawy for fruit shape index, and average fruit weight It is clear that the two parents Magyar Kincs and Muszkotàly could be considered as the best combiner for breeding to most traits, Ananas El-Dokki for breeding to V.C. content and total sugars, while Shahd El-Dokki and Muszkotàly for β-carotene content

Specific combining ability (SCA) effects:-

None of the hybrids exhibited favorable SCA effects for all characters (Table 4). The F_1 combinations which showed the desirable SCA effects differed from trait to another. The highest desirable SCA values were found in the crosses 1X 4, 1 X5, 2 X4, 2 X 5, 3 X 4 and 3 X 5 for days to first female flowering; 1 X 2, 1 X 3 2 X 4, 2 X 5, 3 X 4 and 3 X 5 for early maturity; 1 X 4, 1 X 5, 2 X 4, 2 X 5, 3 X 4 and 3 X 5 for early yield as fruit number and weight; 1 X 4, 1 X5, 2 X 4 and 2 X 5 for total fruit number and weight, in addition to 1 X 3 and 2 X 3 for fruit weight; 1 X 3, 1 X 4, 2 X 3 and 4 X 5 for average fruit; 1 X 2, 1 X 4, 1 X 5, 2 X 4, 3 X 4 and 3 X 5 for flesh thickness; 1 X 2, 1 X 4, 1 X 5, 2 X 4, 2 X 5, 3 X 4 and 3 X 5 for TSS; 1 X 2, 1 X 5, 2 X 3, 2 X 4, 2 X 5, 3 X 5 and 4 X 5 for β-carotene; 1 X 2, 1 X 3, 1 X 4, 2 X4, 2 X 5, 3 X 4 and 3 X 5 for vitamin C and 1 X 2, 1 X 3, 2 X 4, 2 X 5, 3 X 4 and 3 X 5 for sugars content.

The highest estimated SCA values were: 9.6,-8.7, 13.6, 2.6, 2.7, 12.7 and 65.7 in the cross Ismaellawy X Magyar Kincs for day to flowering; number of days from sowing to fruit early maturity, fruit flesh thickness, fruit netting degree, TSS, V.C content and total sugars respectively; 1.7 in the cross Ananas El-Dokki X Muszkotàly for early yield fruit number; 1.8 in the cross Shahd El-Dokki X Magyar Kincs for early yield fruit weight; 3.4 in the cross Shahd El-Dokki X Muskotàly for total fruit number; 2.3 in the cross Ananas El-Dokki X Magyar Kincs for total fruit weight; 0.69, in the cross Ananas El-Dokki X Ismaellawy for average fruit weight 0.5 and 4.4 in the cross Ananas El-Dokki X Shahd El-Dokki for fruit shape index and β-carotene contents, respectively and 3.6 in the cross Shahd El-Dokki X Ismaellawy for fruit skin colour.

It is noticed that the most of good combinations which showed highly significant SCA values were resulted from the crossing between the two parental lines Magyar Kincs and Muszkotàly, which showed highly significant GCA effect values or between one of them and other parents. In other wards the best F_1 crosses in each character had at least one of the best combiner parent (4 or 5) Magyar Kincs and Muszkotàly, as shown in table (4).

Table 4 : Estimates of specific combining ability (SCA) effects for the studied F_1 crosses regarding some characters in melon.

Parents	Characters	SCA effect			
		Shahd El-Dokki	Ismaellawy	Magyar Kincs	Muskotàly
Ananas El-Dokki 1	Number of days to first female or hermaphrodite flower.	- 0.295	2.648**	- 3.910**	- 3.138**
	Number of days from sowing to fruit early maturity	- 0.438**	- 8.310**	2.333	0.548*
	Early yield fruit number	- 0.586**	- 0.771**	1.243**	1.743**
	Early yield fruit weight	- 0.590**	- 0.026	0.5238**	1.345**
	Total fruit number	- 1.012**	- 0.319**	0.667**	1.474**
	Total fruit weight	- 0.683**	1.902**	2.260**	1.431**
	Average fruit weight	- 0.035	0.687**	0.293**	0.017
	Fruit flesh thickness	10.048**	-7.238**	10.905**	10.190**
	Fruit shape index	0.500**	0.245*	-0.094	-0.103
	Fruit netting degree	0.383**	-1.167**	2.040**	1.605**
	Fruit skin colour	2.297**	- 0.303	- 0.134	- 0.106
	TSS	0.374**	- 0.326**	0.517**	0.260**
	β-carotene content	4.427**	- 0.509**	- 0.401**	0.879**
	V.C content	6.394**	4.467**	0.427*	- 2.35**
	Total sugars	1.543**	11.820**	- 2.328**	0.086
Shahd El-Dokki 2	Number of days to first female or hermaphrodite flower.		1.505**	- 3.952**	- 3.381**
	Number of days from sowing to fruit early maturity		- 0.281	- 7.138**	- 4.523**
	Early yield fruit number		- 0.543**	1.571**	0.871**
	Early yield fruit weight		- 0.540**	1.810**	1.631**
	Total fruit number		- 0.826**	3.010**	3.367**
	Total fruit weight		0.274**	0.931**	0.702**
	Average fruit weight		0.326**	- 0.413**	- 0.520**
	Fruit flesh thickness		-4.238**	3.905**	- 1.810*
	Fruit shape index		- 0.064	- 0.209	- 0.221*
	Fruit netting degree		1.248**	0.555**	0.119
	Fruit skin colour		3.601**	- 0.160	- 0.181
	TSS		- 0.840**	1.652**	1.195**
	β-carotene content		0.892**	1.008**	0.910**
	V.C content		- 4.622**	3.288**	3.330**
	Total sugars		- 30.705**	62.336**	58.350**
Ismaellawy 3	Number of days to first female or hermaphrodite flower.			- 9.610**	- 8.438**
	Number of days from sowing to fruit early maturity			- 8.710**	- 7.995**
	Early yield fruit number			0.586**	0.186
	Early yield fruit weight			0.124	0.495**
	Total fruit number			- 2.3476	- 2.740**
	Total fruit weight			- 1.033**	- 0.462**
	Average fruit weight			- 0.957**	- 0.590**
	Fruit flesh thickness			13.619**	10.905**
	Fruit shape index			- 0.1798	- 0.092
	Fruit netting degree			2.605**	2.419**
	Fruit skin colour			0.790	1.169**
	TSS			2.652**	2.595**
	β-carotene content			- 0.299**	0.988**
	V.C content			12.671**	1.982**
	Total sugars			65.723**	15.098**

*** Significant at 0.05 level of probability according to the (T) test.**
**** Significant at 0.01 level of probability according to the (T) test**

Con.

Parents	Characters	SCA effect			
		Shahd El-Dokki	Ismaellawy	Magyar Kincs	Muszkotàly
Magyar Kincs 4	Number of days to first female or hermaphrodite flower.				5.405**
	Number of days from sowing to fruit early maturity				2.848**
	Early yield fruit number				- 0.800
	Early yield fruit weight				- 0.805
	Total fruit number				- 0.005
	Total fruit weight				- 0.005
	Average fruit weight				0.375**
	Fruit flesh thickness				- 7.952**
	Fruit shape index				0.133
	Fruit netting degree				-2.124**
	Fruit skin colour				- 0.213
	TSS				- 0.812**
	β-carotene content				0.880**
	V.C content				- 1.988**
	Total sugars				- 33.541**

*** Significant at 0.05 level of probability according to the (T) test.**
**** Significant at 0.01 level of probability according to the (T) test**

Π- Degree of dominance:-

Average degree of heterosis (ADH%) from mid-parents (MP-heterosis), better parent (BP-heterosis or heterobeltions) and check cultivar (Standard heterosis) as well as potence ratios were estimated for all studied characters in the developed F_1 crosses to determine degree of dominance. Data are presented in tables 5 and 6.

All degree of dominance was found for the studied traits in the evaluated F_1 crosses as follows.

Over-dominance (hybrid vigour or heterobeltiosis):-

The hybrid vigour was observed for several traits in many F_1 crosses. It appeared for early fruit weight in the cross 2 X 5; total fruit yield in the crosses 1 X 3, 1 X 4, 2 X4, 2 X 5 and 4 X 5; total fruit number in the cross 4 X 5; total soluble solids (TSS) in the cross 4 X 5; β-carotene in the crosses 1 X 2, 1 X 5, 3 X 5 and 4 X 5; vitamin C in 1 X 4 and 3 X 4; and for total sugar content in the crosses 1 X 4, 1 X 5, 2 X 4 and 2 X 5. The estimated heterosis values related to the better parent (BP-heterosis) were significantly positive for these traits in the previous crosses. The postulated over dominance was also verified by the high estimated potence ratio values, which were more than unit as shown in table (6).

Similar results were reported by several investigators for several characters (Hatem, 1992 & 1995; Greish *et al* 2005; Feyzian et al., 2009 and Fernandez-Silva *et al.,* 2009). They reported hybrid vigour for different traits.
On the other hand, no hybrid vigour was observed for the traits: number of days to female flowering and to fruit maturity, early fruit number, average fruit weight, flesh thickness and fruit shape index.

Complete dominance:-

Desirable complete dominance was found for several traits in most studied crosses. It was observed in six crosses (1 X 2, 1 X 4, 1 X 5, 2 X 3, 3 X 4 and 3 X 5) for number of days to the first female flower, while it was observed in the crosses 1 X 5 and 2 X 4 for early fruit weight. The complete dominance was also detected in the crosses 2 X 5 (for total fruit number), 1 X 5 (for total fruit weight), 1 X 4 (for average fruit weight), 1 X 2, 1 X 5 and 2 X 4 (for flesh thickness), 1 X 2, 2 X 3 and 3 X 5 (for fruit colour), 2 X 5 and 1 X 2 (for β-carotene and vitamin C content, respectively). The estimated BP-heterosis values were not significant and the estimated potence ratios were about (±1 supporting the dominance hypothesis. The complete dominance for some traits was also reported by Abadia *et al.,* (1985); Shamloul (2002) and Abou Kamer (2011).

Partial dominance:-

The partial dominance is considered when the estimated MP-heterosis was significantly positive but BP-heterosis was significantly negative in the studied traits, except the trait number of days to flowering or maturity. In this case the estimated MP-heterosis and BP-heterosis values will be significantly negative and significantly positive, respectively. The partial dominance was observed in the following crosses : all crosses, except the cross 4 X 5 (for number of days to maturity); 1 X 4, 1 X 5, 2 X 4, 2 X 5 and 3 X 4 (for early fruit number); 1 X 4 and 3 X 5 (for early fruit weight); 1 X 4, 1 X 5 and 2 X 4 (for total fruit number); 1 X 2 and 2 X 3 (for total fruit yield); 1 X 3 (for average fruit weight); 1 X 4, 3 X 4 and 3 X 5 (fruit flesh thickness); all crosses, except 4 X 5 for (TSS) and 1 X 2, 1 X 3, 2 X 3 and 3 X 5 (for total sugar). It is noticed that the number of crosses, which showed partial dominance are different relative to the character. The obtained potence ratio values (between -1 and +1 but not equal zero) are in accordance with the postulated partial dominance hypothesis. Partial dominance for high fruit number was also observed by Hatem *et al.,* (1996) in melon.

No-dominance:-

The no-dominance / or incomplete dominance was found in all studied traits, except days to maturity, fruit colour, fruit netting degree, TSS and β-carotene content. The crosses which reflected no-dominance were: 1 X 3 (for days to flowering), 1 X 3, 2 X 3 and 3 X 5 (for early fruit number); 3 X 4 (for early fruit weight); 1 X 2 (for total fruit number); 3 X 5 (for total fruit weight); 1 X 2 and 2 X 3 (for average fruit weight); 2 X 3 and 2 X 5 (for flesh thickness); 1 X 3, 2 X 3, 2 X 4, 2 X 5, 3 X 4 and 3 X 5 (for shape index); 1 X 5 (vitamin C) and 4 X 5 (for total sugars). These crosses gave insignificant MP-heterosis values, low potence ratio values. The absence of dominance was previously reported by Hatem *et al*., (1996) in melon for early fruit number.

With regard to the standard heterosis (ST-heterosis), which was estimated relative to the hybrid cultivar Arafa, data are shown in Table (7). Significant ST values were obtained in the studied crosses for certain traits as follows: the cross 1 X 2 for average fruit weight, shape index, β-carotene and vitamin C contents. The cross 1 X 3 for average fruit weight, shape index and vitamin C. the cross 1 X 4 for total fruit weight and vitamin C. the cross 1 X 5 for early fruit yield, β-carotene, vitamin C and total sugars. The cross 2 X

3 for shape index, average fruit weight and β-carotene. The cross 2 X 4 for days to maturity, early fruit yield, total fruit yield, β-carotene, vitamin C and total sugars. The cross 2 X 5 for early and total yield, β-carotene, vitamin C and sugars content. The cross 3 X 4 for average fruit weight, shape index, vitamin C and sugars. The cross 3 X 5 for average fruit weight, shape index and β-carotene. The cross 4 X 5 for early and total yield, TSS, β-carotene and total sugars.

Table (5): Estimated mid-parents (MP) and better parents (BP) heterosis for the studied characters.

Hybrids #	Number of days to first female or hermaphrodite flower.		Number of days from sowing to fruit early maturity		Early yield fruit number		Early yield fruit weight	
	Heterosis (%)		Heterosis (%)		Heterosis (%)		Heterosis (%)	
	MP	BP	MP	BP	MP	BP	MP	BP
1 x 2	-2.60**	-0.44	-2.24**	0.88**	3.30	-11.32	8.45	0
1 x 3	-1.65	5.31**	-6.67**	4.40**	-14.29	-43.40**	8.57	-1.30
1 x 4	-7.83**	1.49	-0.86**	2.84**	24.47**	-13.33**	21.19**	-10.06*
1 x 5	-6.38**	1.34	-1.52**	1.07**	29.28**	-8.59*	41.70**	8.2
2 x 3	-2.83**	1.69	-3.90**	3.92**	-12.73	-36.84**	1.56	0.00
2 x 4	-8.02**	3.72**	-5.99**	0.75*	29.48**	-17.04**	50.00**	5.66
2 x 5	-6.79**	3.30**	-4.55**	1.17**	20.48**	-21.88**	54.50**	11.64*
3 x 4	-14.44**	1.49	-7.56**	7.67**	14.47*	-35.56**	9.91	-23.27**
3 x 5	-12.65**	1.75	-7.03**	7.02**	7.59	-39.06**	22.49**	-12.33*
4 x 5	0.00	1.60	-1.03**	0.00	2.66	0.00	3.61	-0.63

*** Significant, ** Highly significant and …. No significant differences were found between the parents**

 # 1= Ananas El-Dokki, 2= Shahd El-Dokki, 3= Ismaellawy, 4= Magyar Kincs and 5= Muszkotàly .

Con.

Hybrids #	Total fruit number		Total fruit weight		Average fruit weight		Fruit flesh thickness	
	Heterosis (%)		Heterosis (%)		Heterosis (%)		Heterosis (%)	
	MP	BP	MP	BP	MP	BP	MP	BP
1 x 2	2.33	-2.72*	4.57**	-8.90**	1.13	-15.61**	10.06**	2.07
1 x 3	-16.88**	-43.88**	19.53**	12.53**	11.57**	-27.02**	1.24	-1.21
1 x 4	6.19**	-14.52**	21.16**	3.83**	11.92**	3.77	11.46**	-2.28*
1 x 5	11.61**	-8.84**	16.42**	0.93	2.57	-4.42	10.11**	-1.90
2 x 3	-13.59**	-40.00**	3.82**	-4.45**	0.42	-26.65**	0.57	-8.81**
2 x 4	23.96**	-3.94**	8.15**	6.08**	-19.71**	-36.91**	5.34**	-0.91
2 x 5	27.57**	0.22	6.64**	6.02**	-22.54**	-38.90**	1.49	-2.84*
3 x 4	-24.44**	-54.15**	-1.62*	-11.04**	-19.10**	-48.90**	11.70**	-4.11**
3 x 5	-26.63**	-55.17**	0.63	-7.87**	-13.60**	-45.30**	9.24**	-4.74**
4 x 5	3.594**	1.66**	4.34**	2.93**	0.72	0.18	0.00	-1.83

*** Significant, ** Highly significant and …. No significant differences were found between the parents**

 # 1= Ananas El-Dokki, 2= Shahd El-Dokki, 3= Ismaellawy, 4= Magyar Kincs and 5= Muskotàly .

Con.

Hybrids #	Fruit shape index		Fruit netting degree		Fruit skin colour		TSS	
	Heterosis (%)		Heterosis (%)		Heterosis (%)		Heterosis (%)	
	MP	BP	MP	BP	MP	BP	MP	BP
1 x 2	17.29*	4.69	10.08**	-3.68**	18.81**	2.36	4.51**	-1.80*
1 x 3	8.25	-13.60*	6.17**	-0.35	9.06	-5.16	3.67**	-8.47**
1 x 4	-1.44	-5.23	18.98**	-3.49**	1.98	-0.77	5.66**	-3.01**
1 x 5	-1.19	-5.75	15.72**	-4.15**	2.59	-1.98	4.23**	-3.38**
2 x 3	-1.77	-13.58*	19.68**	-0.79	32.29**	1.49	3.40**	-3.28**
2 x 4	-8.26	-20.89**	9.07**	-0.22	5.79	-6.68	11.28**	-3.46**
2 x 5	-8.18	-21.38**	5.90**	-0.69	6.02	-4.91	9.14**	-4.46**
3 x 4	-6.86	-27.80**	26.27**	-2.40**	13.16	-3.86	17.17**	-3.92**
3 x 5	-4.40	-26.33**	24.56**	-1.84*	15.68*	-3.22	16.47**	-3.69**
4 x 5	-0.84	-1.67	-3.81**	-6.33**	0.13	-1.73	3.04**	1.96**

*** Significant, ** Highly significant and …. No significant differences were found between the parents**
 # 1= Ananas El-Dokki, 2= Shahd El-Dokki, 3= Ismaellawy, 4= Magyar Kincs and 5= Muskotàly .

Con.

Hybrids #	β-carotene content		V.C content		Total sugars	
	Heterosis (%)		Heterosis (%)		Heterosis (%)	
	MP	BP	MP	BP	MP	BP
1 x 2	38.46**	4.53**	8.07**	-0.49	8.71**	-12.95**
1 x 3	6.04**	-2.99*	7.91**	-2.36**	9.93**	-14.64**
1 x 4	6.94**	-2.87*	4.25**	2.14**	5.76**	1.25**
1 x 5	18.89**	2.59*	0.09	-1.32**	3.23**	1.021**
2 x 3	14.56**	-7.51**	0.92*	-0.99*	3.40**	-0.76*
2 x 4	15.18**	-6.45**	6.61**	-3.65**	32.76**	2.91**
2 x 5	16.90**	-0.49	4.33**	-2.66**	28.42**	1.18**
3 x 4	1.70	0.89	14.89**	2.08**	32.48**	-0.25
3 x 5	13.04**	5.97**	4.55**	-4.17**	13.03**	-13.57**
4 x 5	12.47**	6.23**	1.28**	-2.14**	-0.12	-2.33**

*** Significant, ** Highly significant and …. No significant differences were found between the parents**
 # 1= Ananas El-Dokki, 2= Shahd El-Dokki, 3= Ismaellawy, 4= Magyar Kincs and 5= Muskotàly .

From this results, it is clear that the three F_1 crosses "Shahd El-Dokki X Magyar Kincs, Shahd El-Dokki X Muszkotàly, and Magyar Kincs X Muszkotàly" are the best of all in early and total yield, since they showed the highest ST-heterosis values. Furthermore, these crosses gave highly significant ST-heterosis values concerning β-carotene, vitamin C and total sugars content. Therefore, it could be suggested that these crosses may be recommended as new good F_1 hybrids for commercial production of melon after further evaluation.

Table (6): Estimates of potence ratio for the studied characters.

Crosses \ Characters	Number of days to first female or hermaphrodite flower.	Number of days from sowing to fruit early maturity	Early yield fruit number	Early yield fruit weight	Total fruit number	Total fruit weight	Average fruit weight	Fruit flesh thickness
1x2	-1.20	-0.72	0.20	1.00	0.45	0.31	0.06	1.29
1x3	-0.25	-0.63	-0.28	0.86	-0.35	3.14	0.22	0.50
1x4	-0.85	-0.24	0.56	0.61	0.26	1.27	1.52	0.81
1x5	-0.84	-0.59	0.71	1.35	0.52	1.07	0.35	0.83
2x3	-0.64	-0.52	-0.33	1.00	-0.31	0.44	0.01	0.06
2x4	-0.71	-0.90	0.53	1.19	0.82	4.18	-0.72	0.85
2x5	-0.70	-0.80	0.38	1.42	1.01	11.40	-0.84	0.33
3x4	-0.92	-0.53	0.19	0.23	-0.38	-0.15	-0.33	0.71
3x5	-0.89	-0.54	0.10	0.57	-0.42	0.07	-0.23	0.63
4x5	0.00	-1.00	1.00	0.85	1.90	3.17	1.33	0.00

Con.

Crosses \ Characters	Fruit shape index	Fruit netting degree	Fruit skin colour	TSS Content	Fruit moisture content	β-carotene content	V.C content	Total sugars
	1.44	0.71	1.17	0.70	0.07	1.18	0.94	0.35
1x3	0.33	0.94	0.60	0.28	0.27	0.65	0.75	0.35
1x4	-0.36	0.82	0.71	0.63	-1.17	0.69	2.05	1.29
1x5	-0.25	0.76	0.56	0.54	-5.00	1.19	0.06	1.48
2x3	-0.13	0.95	1.06	0.49	-0.20	0.61	0.48	0.81
2x4	-0.52	0.97	0.43	0.74	0.00	0.66	0.62	1.13
2x5	-0.49	0.89	0.52	0.64	-0.31	0.97	0.60	1.06
3x4	-0.24	0.89	0.74	0.78	0.33	2.13	1.19	0.99
3x5	-0.15	0.91	0.80	0.79	-0.58	1.95	0.50	0.42
4x5	-1.00	-1.42	0.07	2.86	-0.29	2.12	0.37	-0.05

Table (7): Estimates of standard (ST) heterosis for the studied characters.

Hybrids #	Characters							
	Number of days to first female or hermaphrodite flower	Number of days from sowing to fruit early maturity	Early yield fruit number	Early yield fruit weight	Total fruit number	Total fruit weight	Average fruit weight	Fruit flesh thickness
1 x 2	18.42**	5.57**	-61.16**	-43.80**	-38.89**	-10.37**	46.69**	-7.51**
1 x 3	25.26**	9.26**	-75.21**	-44.53**	-64.74**	-6.91**	175.31**	-23.47**
1 x 4	0.421	0.15	-3.31	4.38	-11.97**	6.22**	20.67**	0.47
1 x 5	3.47**	0.48	-3.31	15.33**	-9.62**	0.46	11.14	-2.82*
2 x 3	26.32**	15.71**	-80.17**	-52.55**	-66.03**	-5.99**	176.71**	-17.37**
2 x 4	2.63*	-1.89**	-7.44*	22.63**	-1.07	8.53**	9.67	1.88
2 x 5	5.47**	0.58	-17.36**	18.98**	-0.64	5.53**	6.22	-3.76**
3 x 4	0.42	4.85**	-28.10**	-10.95*	-52.78**	-8.99**	92.77**	-1.41
3 x 5	3.89**	6.40**	-35.54**	-6.57	-55.56**	-8.29**	106.36**	-5.63**
4 x 5	0.53	-2.62**	11.57**	15.33**	4.70**	5.30**	0.61	0.94

*** - Significant at 5 % level, and ** - Significant at 1% level.**
#1= Ananas El-Dokki, 2=Shahd El-Dokki, 3= Ismaellawy,4= Magyar Kincs and5= Muskotàly Chick F_1:- Arafa.

Con.

Hybrids #	Characters						
	Fruit shape index	Fruit netting degree	Fruit skin colour	TSS Content	β-carotene content	V.C content	Total sugars
1 x 2	47.92**	-14.29**	36.03**	-15.50**	69.69**	6.33**	-10.39**
1 x 3	60.72**	-33.49**	-8.88	-21.24**	-3.21*	4.33**	-12.12**
1 x 4	5.12	3.51**	0.78	-0.16	-1.53	13.75**	13.94**
1 x 5	4.54	-2.58**	3.39	-2.64**	16.99**	5.44**	8.64**
2 x 3	60.75**	-11.71**	34.88**	-26.82**	50.13**	-10.96**	-38.56**
2 x 4	11.77	7.03**	24.02**	-0.62	51.87**	7.30**	15.80**
2 x 5	11.09	0.94	26.37**	-3.72**	61.54**	1.09*	8.81**
3 x 4	34.30**	4.68**	-2.35	-1.09	2.29	13.68**	12.25**
3 x 5	37.03**	-0.23	2.09	-2.95**	20.86**	-0.48	-7.05**
4 x 5	0.68	0.47	3.66	4.96**	21.15**	8.99**	9.90**

*** - Significant at 5 % level, and ** - Significant at 1% level.**

 # 1= Ananas El-Dokki, 2= Shahd El-Dokki, 3= Ismaellawy, 4= Magyar Kincs and 5= Muskotàly .

Chick F_1:- Arafa.

5-Phenotypic correlation:-

Correlation coefficients among the studied traits were estimated. Significant positive/ or negative and insignificant values were obtained as shown in table (8). These estimates are an important aspect which should be utilized for planning better selection program. The relationship between the characters may be due to either a peliotrophic effect of a gene on different parts of plant of the plants or the linkage. The estimated (r) values of the most important characters, i.e. early and total yield, average fruit weight, fruit netting degree, fruit skin colour, flesh thickness, fruit shape index, β-carotene vitamin C and total sugars contents showed that: significant positive correlations were found between total fruit yield and each of fruit flesh thickness, fruit netting degree and total soluble solids content. It also were positive between early fruit yield and each of total fruit yield as fruit number and weight, flesh thickness, fruit netting degree, vitamin C and total sugars content. Average fruit weight with flesh thickness. Sugar content versus, vitamin C, total soluble solids, fruit netting degree, flesh thickness and early and total yield were also observed. The positive correlations were previously found for such traits by many investigators among them were Gomez et al (1985); Dahliwal et al (1996); Abd El-Salam et al (2002); Taha et al (2003) and Abou Kamer (2011).

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Significant negative correlations were observed between early fruit yield and each of average fruit weight and fruit shape index. Average fruit weight versus shape index, fruit netting degree, TSS, vitamin C and sugar contents. The sugars content was also negative correlated with shape index, early and total yield as fruit number and weight. This findings are confirmed those of Benedettelli et al (1999); Rawhia (2004); Chamnan and Kasem (2006) and Zalapa et al (2008).

On the other hand, insignificant correlation coefficients were found among some characters. In general the two characters fruit skin colour and β-carotene content exhibited insignificant (r) values with most studied characters. Insignificant correlation was also reported by Lathet and Piluek (2006), who found that fruit shape and size were not related to fruit number and yield per plant in melon.

1- Number of days to first female or hermaphrodit flower anthesis. 2- Number of days from sowing to fruit early maturity. 3- Early yield (number of fruit/plant). 4- Early yield (fruit weight /plant). 5 - Total fruit number/plant. 6- Total fruit weight/plant. 7- Average fruit weight (Kg.). 8- Fruit flesh thickness (%). 9 - Fruit shape index. 10- Fruit netting degree. 11- Fruit skin colour. 12- TSS.13- β-carotene content (mg/100g.FW). 14- V.C content (mg./100g. FW). 15 - Total sugars content (mg. / g. FW).

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التفاعل الجينى وقوة الهجين للمحصول وصفات الجودة فى الشمام

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أجريت هذه الدراسة فى عامى " ٢٠١٢ و ٢٠١٣م " فى محطة البحوث الزراعية بالقناطر الخيرية التابعة لمعهد بحوث البساتين – مركز البحوث الزراعية. وذلك بهدف قياس تأثيرات القدرة العامة والخاصة على التآلف للسلالات الأبوية والهجن الناتجة منها بنظام الدائرة التلقيحية الناقصة, فى محاولة لتحديد أفضل الآباء كقرين مُفضل للتربية للصفات الهامة, وكذلك أفضل الهجن من حيث تأثيرات القدرة الخاصة على التآلف للصفة أو الصفات تحت الدراسة. والدراسة أيضاً تهدف إلى قياس درجة قوة الهجين على أساس متوسط الأبوين, الأب الأفضل , الصفات التجارية لتحديد طُرز التأثيرات الجينية التى تتحكم فى الصفات المدروسة وكذلك تحديد الهجن التى تعطى قوة هجين لصفات المحصول وجودة الثمار, ثم حساب معامل الإرتباط بين أزواج الصفات المختلفة .

ولتحقيق هذه الأهداف تم تقييم خمسة سلالات مع عشرة هجن نتجت من التهجين بين تلك السلالات وبعضها بنظام الدائرة التلقيحية الناقصة بالإضافة إلى هجين تجارى (ككنترول) , فى تجربة مصممة بطريقة القطاعات العشوائية الكاملة و ثلاثة مكررات. وتم تسجيل القياسات على صفات :- عدد ووزن الثمار للمحصول المبكر والكلى للنبات, بالإضافة إلى بعض صفات الثمار مثل متوسط وزن الثمرة, والشكل, لون الجلد الخارجى واللحم , سمك اللحم محتوى الثمرة من صبغة بيتا كاروتين, فيتامين ج والسكريات الكلية.

وكان من أهم النتائج :- جميع هذه الصفات محكومة بعوامل وراثية ذات تأثير إضافى ولا إضافى additive and non-additive – وكذلك التأثير الإضافى يلعب الدور الأهم فى وراثتها حيث أن نسبة GCA/SCA كانت تتراوح بين ٤.٤ إلى ٥٧.٨ . لم يظهر أى من السلالات الأبوية قدرة عامة على التآلف لجميع الصفات. وبصفة عامة فقد أظهر الأبوان Magyar Kincs وMuszkotàly قدرة عالية ومعنوية لمعظم الصفات- ولذلك يمكن إعتبارهما أفضل قرين مفضل للتربية لصفات كثيرة. ومن الملاحظ أن الهجن التى أظهرت أعلى قدرة خاصة ومعنوية على التآلف للعديد من الصفات نتجت من التهجين بين هاتين السلالتين معاً أو بين إحداهما وسلالة أخرى. بالنسبة لقوة الهجين فقد ظهر التفوق الهجينى Hybrid vigour / or heterobeltiosis فى عدد من الهجن لصفات المحصول المبكر والمحصول الكلى وكذلك فى معظم الصفات الثمرية, حيث تفوقت هذه الهجن على الأب الأفضل فى الصفة وأعطت قوة الهجين وكذلك ألـ Potence ratio عالية. كما ظهرت درجات السيادة الأخرى لبعض الصفات فى بعض الهجن. كما ظهرت درجات السيادة الأخرى لبعض الصفات فى بعض الهجن. وعند حساب ألـ Standard heterosis على أساس الهجين Arafa، أظهرت ثلاثة هجن Shahd El-Dokki X Muszkotàly, Shahd El-Dokki X Magyar Kincs , and Magyar Kincs X Muszkotàly تفوقاً على الهجين التجارى فى صفات المحصول وكثير من الصفات الأخرى. وعلى ذلك يمكن التوصية بترشيح هذه الهجن للزراعة على نطاق تجارى بعد إجراء مزيد من التقييم.

وبالنسبة لقياس معامل الإرتباط الظاهرى (Phenotypic correlation) فقد كانت القيم المحسوبة عالية المعنوية وفى الإتجاه المفيد بين عدد من أزواج الصفات مما يساعد المربى على الإنتخاب للصفات الكمية الصعبة القياس بالإنتخاب للصفات البسيطة الأسهل قياساً والمرتبطة بها.

Table (8): Correlation coefficients between different quantitative and qualitative characters of melon.

Characters	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.879**	-0.939**	-0.916**	-0.776**	-0.612*	0.779**	-0.911**	0.849**	-0.884**	-0.042	-0.988**	0.094	-0.768**	-0.896**
2		-0.85**	-0.801**	-0.862**	-0.586*	0.932**	-0.803**	0.918**	-0.747**	-0.2519	-0.909**	-0.028	-0.807**	-0.899**
3			0.949**	0.903**	0.680**	-0.800**	0.880**	-0.901**	0.809**	-0.029	0.950**	-0.127	0.693**	0.859**
4				0.854**	0.735**	-0.712**	0.848**	-0.816**	0.809**	-0.001	0.915**	-0.024	0.611**	0.843**
5					0.702**	-0.900**	0.791**	-0.920**	0.694**	0.216	0.809**	0.111	0.578*	0.770**
6						-0.492	0.771**	-0.522	0.770**	0.362	0.578*	0.371	0.283	0.439
7							-0.759**	0.945**	-0.675**	-0.345	-0.809**	-0.13	-0.676**	-0.796**
8								-0.751**	0.962**	0.302	0.876**	0.224	0.604*	0.717**
9									-0.687**	0.029	-0.877**	0.103	-0.688**	-0.851**
10										0.382	0.825**	0.269	0.504	0.644**
11											0.003	0.894**	-0.132	-0.082
12												-0.131	0.802**	0.927**

13													-0.347	-0.245
14														0.911**

*** - Significant at 5 % level, and ** - Significant at 1% level.**