J. of Plant Production, Mansoura Univ., Vol. 11 (9):841-845, 2020

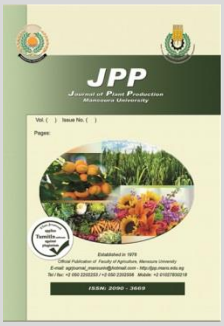
Journal of Plant Production

Journal homepage: www.jpp.mans.edu.eg
Available online at: www. jpp.journals.ekb.eg

Evaluation of New Summer Squash Hybrids (*Cucurbita pepo* L.) Compare with some Commercial Cultivars

El-Gazzar, T. M.[1]; M. M. Nada[1]; A. H. Hussein[2] and A. R. Dawood[2*]

[1] Vegetables and Floriculture Dept., Fac. Agric., Mansoura Univ., Egypt.
[2] Vegetables Breeding Dept., Hort. Res. Inst., Agric. Res. Center, Giza, Egypt.



ABSTRACT

In this investigation four parental lines and their six F_1 hybrids - half diallel Mating Design - as well as three commercial cultivars were evaluated for some economic traits; vegetative growth, flowering and earliness, fruits, yield and yield component traits in field trial during 2018 and 2019 early summer seasons. The experimental design was a randomized complete block design (RCBD) with three replicates. Each replicate consisted of 13 plots. The results could be summarized as follow: the results of mean values showed that no parental line was superior for all studied traits. Meanwhile, the parent (P_3) exhibited the best values for most studied traits specially earliness and yield traits. Moreover, the obtained results confirmed that the highest mean values recorded in the F_1 hybrids were P_3xP_4 for stem length, number of male flowers/ plant and number of female flowers/ plant, average fruit weight, fruit yield/plant and total yield/ fed.; P_1xP_3 for sex ratio and fruit diameter; P_1xP_2 for fruit length and fruit shape index; P_1xP_4 for fruits number/ plant. The three crosses (F_1 hybrids) P_1xP_2, P_1xP_4 and P_3xP_4 had better mean values over the commercial F_1 hybrids for sex ratio, fruit length, fruit shape index, fruits number/plant, fruits yield/ plant and total yield/ fed.

Keywords: Breeding cucurbites - *Cucurbita pepo* L- Breeding Vegetables - New Summer squash hybrids - Evaluation

INTRODUCTION

Cucurbit crops are economically important worldwide. Among all agricultural products, vegetable production in the world reached its highest rate (45%) between 1985 and 1995 (Harrison, 2002). Eating habits are changing in favor of vegetables parallel to cultural and economic developments in Egypt, as in many other countries throughout the world. Fruits and vegetables crops have a remarkable place in the diet of develop countries (Skreden *et al*., 2017). Summer squash (*Cucurbita pepo*, L.) which has an annual production, is produced in a wide number of climatic zones, has significant economic value, as well as it has a wide variation in terms of size, color and shape of the fruits (Paris, 1986). Summer squash is among the most widely grown and appreciated vegetable crops in the Mediterranean Basin (Paris, 2008). Also, summer squash is one of the most important vegetable crops of cucurbitaceae family grown throughout the world for its higher returns to the farmers. Squash is cultivated under open field condition. Therefore, it's available in the market all the year around. The cultivated area reached 59057.32 feddan and yielded 477283 tones with average 8.082 tones/fed. (FAOSTAT, 2018). All the area is cultivated with imported seed to Egypt with high cost. Therefore, it is necessary to improve local squash hybrids with good fruit quality and resistance to certain diseases (Hussein *et al*., 2013).

For great importance of this crop, many efforts have been made for yield and its quality assessment and improvement by breeding programs to produce new hybrids have a high productivity and tolerance to diseases and insects. Nowadays, squash cultivation in Egypt depends on hybrids, which imported from foreign country by hard currency. These processes have high cost for a farmer. These investigations try to solve this problem by imported germplasm that used as parental genotypes that had genetic stability which used in hybridization program to produce F_1 hybrids, which can compete with imported hybrids in yield and quality traits. Similar to the superior individual performance, parental selection for crosses can take into account high adaptability traits and yield stability. Considering these points, the selection of parents is also high important for breeding programs aiming for a border area of coverage, mainly for location that show distinct soil and climate conditions (Ivandro *et al*., 2014). Major breeding goals for squash improvement are non-bitterness and larger fruit size, fruit shape and color variation, bush growth habit, less branching, femaleness, earliness, the zucchini fruit type, F_1 hybrids (Prohens and Neuz, 2008).

Therefore, the main objective of this study to realize parental imported germplasm that crossing together with each other's in half diallel mating design to obtain F_1 hybrids which evaluated for some economic traits to determine the best genotypes for commercial production. Also, to show the best genotypes could be used in program of squash breeding.

MATERIALS AND METHODS

This work was conducted at Qaha Research Farm for Vegetable Crops, Hort. Res. Inst., Agric. Res. Center, Qalubia Governorate, Egypt, during 2018 and 2019 in early summer seasons to evaluate some new summer squash hybrids and their parents compared to commercial cultivars. To produce F_1 hybrids, twenty genotypes (PIs) imported from USDA gene bank, USA. These genotypes (PIs) of summer squash were evaluated in a greenhouse (black net) during 2017 in early summer season (5th of March), eight genotypes had chosen from the twenty imported genotypes for some objectives such as: homogeneity earliness, fruit shape, color and stem length, at the same time it self-pollinated. Seeds from the eight self-pollinated genotypes cultivated and evaluated for a second cycle in a greenhouse (fiberglass) during 2017 in late summer

* **Corresponding author.**
E-mail address: ahmed_dawood1@yahoo.com
DOI: 10.21608/jpp.2020.118044

season (27th of August), to realize their homogeneity. Four evolved genotypes were acceptable for most horticultural traits had chosen from the eight stable genotypes to self-pollination as well as cross in a half diallel mating design. The genetic materials used in the present investigation include four stable lines (parents), which characterized as follow:

P_1 (PI 179268): Short stem, middle internodes and branches, late flowering, high sex ratio, low yield and fruits/plant, fruit was longer with bright green color.

P_2 (PI 175710): Short stem, internodes and branches, late flowering, low sex ratio, high yield and fruits/plant, fruit light green color and polygonal.

P_3 (PI 169435): Taller stem, internodes and branches, early flowering, high sex ratio, high yield and fruits/plant, light green color and polygonal.

P_4 (PI 288241): Short stem, middle internode, taller branches, late flowering, high sex ratio, middle yield and fruits/plant, fruit bright green color and polygonal.

In the early summer seasons of 2018 and 2019, the 10 genotypes which included the four parental genotypes and their six F_1 hybrids along with Eskandrany var. and two commercial F_1 hybrids were cultivated and evaluated for economical traits as shown in Table 1.

Table 1. Imported four parental genotypes and their six crosses in half-diallel cross mating design, as well as three commercial cultivars.

Squash genotypes	
Parents genotypes	P_1 (PI 179268)
	P_2 (PI 175710)
	P_3 (PI 169435)
	P_4 (PI 288241)
F_1 hybrids	P_1xP_2
	P_1xP_3
	P_1xP_4
	P_2xP_3
	P_2xP_4
	P_3xP_4
Commercial cultivars	Eskandrany var. (Local)
	Milet F_1 hybrid (Foreign)
	Azyad F_1 hybrid (Foreign)

The experiment was designed in a randomized complete block design (RCBD) with three replicates. Each replicate consisted of 13 plots which included four parental genotypes and their six F_1 hybrids, as well as three commercial cultivars. The plot was one ridge 10 m long and 1.6 m wide. The distance between hills was 0.5 m with each ridge contained 20 hills. Seeds were hand planted at the rate of two seeds per hill, the cultivation date was 4th of March for the two seasons. After full germination, plants were thinned to one plant per hill. Each plot had 20 plants; at the first of growing season five plants per experiment plot were labeled for measuring vegetative and flowering traits, while fruits and yield traits were measuring on all plants per plot throw out the harvest season.

Data were recorded on the following traits: all vegetative traits were estimated at the end of the seasons; stem length (cm) (from the soil surface to the end of plant stem), internode length (cm): (distance between two nodes) and branches number per plant. For studying flowering behavior (throw out the season), such as the number of male flowers/ plant, the number of female flowers/ plant, days to first female flowers anthesis and sex ratio (male to female flowers ratio). As well as, Fruit traits were measured on harvested fruits during harvested season as; fruit length (cm): (measured from fruit neck to fruit end by tape measure), fruit diameter (cm): (measured by varnier caliper at the mid fruit), fruit shape index: (fruit length/ fruit diameter) and average fruit weight (g): (fruits weight per plot/ fruits number per plot). In addition, fruits harvest day after another day per plot, which counted and weighed throw out the seasons. At the end of the seasons recorded data of harvested yield calculated to estimate yield and its component traits: fruits number per plant (number of fruits per plot/ number of plants per plot); fruits yield per plant (kg): (fruits yield per plot/ plants number per plot) and total yield per fed. (ton): (fruits yield per plant (kg) x plants number per fed. (5000 plants) / 1000).

Differences among genotypic means for all traits were tested for significance using F-test according to Steel and Torrie (1960). The means of these observations for genotypes were separated using LSD at 0.05 level of probability (SAS program, V 9.1, 2005).

RESULTS AND DISCUSSION

In this investigation, the means of all studied traits for all genotypes; four parents (new lines), six F_1 hybrids and three commercial cultivars were calculated for comparison of the differences among them. The performance of these genotypes evaluated for vegetative and some economic traits as follow:

Vegetative traits:-

Data of vegetative traits represented in Table 2 revealed significant differences among squash genotypes for stem length, internode length and branches number/plant.

Table 2. Mean performance of four parental genotypes and their six F_1 hybrids and commercial cultivars for vegetative traits in 2018 and 2019 seasons.

Traits / Genotypes	Stem length (cm)		Internode length (cm)		Branches number/ plant	
	2018	2019	2018	2019	2018	2019
Parents						
P_1	38.30 h	39.89 g	2.56 a-e	2.67 abc	2.44 bc	2.33 abc
P_2	43.22 gh	45.67 efg	1.75 fg	1.75 de	1.00 e	1.00 d
P_3	71.44 a	74.33 a	3.11 a	3.08 a	3.33 a	3.00 a
P_4	54.89 def	50.67 efg	2.44 b-e	2.33 bcd	2.67 ab	3.00 a
F_1 hybrids						
P_1xP_2	48.33 fg	52.00 ef	2.11 c-f	2.33 bcd	1.56 de	1.67 bcd
P_1xP_3	63.41 bc	65.22 abc	2.72 abc	2.92 ab	2.11 bcd	2.33 abc
P_1xP_4	61.78 bcd	63.33 a-d	2.06 def	2.19 b-e	2.00 bcd	2.00 a-d
P_2xP_3	52.00 f	51.00 efg	1.92 ef	2.00 cde	1.44 de	1.33 cd
P_2xP_4	52.78 ef	53.33 c-f	2.17 b-f	2.25 b-e	2.22 bcd	2.67 ab
P_3xP_4	67.89 ab	69.67 ab	2.78 ab	2.83 ab	1.67 cde	2.00 a-d
Commercial cultivars						
Esk. Var.	39.67 h	43.00 fg	2.05 def	2.22 b-e	1.67 cde	2.00 a-d
Milet F_1	59.59 cde	57.78 b-e	1.26 g	1.26 e	1.00 e	1.00 d
Azyad F_1	47.70 fg	45.78 efg	2.44 b-e	2.33 bcd	1.00 e	1.00 d
F-test	**	**	**	**	**	*
LSD 5%	7.29	12.21	0.63	0.77	0.87	1.28
LSD 1%	9.87	16.55	0.85	1.04	1.18	1.73

***,** Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.**

Means having the same letter in the same column are not significantly different at 0.05 level of probability.

The means of vegetative traits were obtained for all genotypes parents, F_1 hybrid and commercial cultivars. The means showed that parent P_3 was exceeded all other parental lines for all studied vegetative traits. However, parental line P_3 exhibited the highest mean values for stem length (71.44 and 74.33 cm), internode length (3.11 and 3.08 cm) and branches number/plant (3.33 and 3.00) in the first and second seasons, respectively. On the other hand, the parent P_2 (1.75 and 1.75 cm) was the best parent for internode length (desirable), as well as the parent P_2 gave the lowest mean values for branches number/plant (1.00 and 1.00), while the parent P_1 had the lowest mean values for stem length (38.30 and 39.89 cm) in the 1st and 2nd seasons, respectively.

Concerning F_1 hybrids, data in the same Table showed that most of the means were distributed around the mid of their parents but the cross P_3xP_4 gave the highest values for stem length, as well as the cross P_2xP_4 for branches number/plant. On the other hand, the best cross for internode length was cross P_2xP_3 which less than all hybrids in the first and second seasons, respectively.

Regarding to commercial cultivars, data in the same Table stated that the Milet F_1 hybrid recorded the highest stem length values, as well as it recorded the lowest internode length (desirable). However, Eskandrany var. detected the highest values for branches number/plant, in the both seasons. These results are in harmony with those mentioned by El-Gendy (1999), Gabr (2003), Sadek (2003), Abdein (2005), Refai and Mohamed (2009), Moualla *et al*. (2011), Mohan *et al*. (2012), Omran *et al*. (2012), El-Gazzar *et al*. (2015), Habiba *et al*. (2015), El-Shoura and Abed (2018) and Elias *et al*. (2020).

Flowering traits:-

Data in Table 3 indicated that there were significant differences among all studied genotypes for number of flowers (male and female) and earliness traits. The results listed in Table 3 clearly showed that parental lines P_2 and P_4 were the better parents for traits which gave the best values for numbers of male and female flowers/ plant respectively. Parent P_3 gave the lowest mean values (54.89 and 55.67 day) for days to first female flower anthesis, as well as P_2 parent had (1.11 and 1.13) for sex ratio in the 1st and 2nd seasons, respectively. In general, P_2 is the best parent for all flowering traits which earlier one and lowest sex ratio.

Regarding F_1 hybrids, data represented in Table 3 indicated that P_2xP_3 had the lowest mean values for days to first female flower anthesis (54.44 and 55.33 day). In addition P_1xP_3 had the lowest mean value for sex ratio (0.60 and 0.69) which mean expected high number of fruits and yield per plant in the 1st and 2nd seasons, respectively.

Table 3. Mean performance of four parental genotypes, their six F_1 hybrids and commercial cultivars for earliness and flowering traits in 2018 and 2019 seasons.

Traits	Number of male flowers/ plant		Number of female flowers/ plant		Days for first female flower anthesis		Sex ratio	
Genotypes	2018	2019	2018	2019	2018	2019	2018	2019
				Parents				
P_1	42.27 d	48.13 c	10.67 i	11.27 e	59.00 a-d	59.00 abc	3.98 a	4.34 a
P_2	16.59 g	17.87 g	15.07 h	16.13 cd	59.44 a-d	59.33 ab	1.11 de	1.13 de
P_3	51.53 b	53.40 bc	15.27 gh	15.53 de	54.89 de	55.67 bcd	3.38 b	3.43 b
P_4	59.47 a	56.80 a	17.80 ef	16.40 cd	59.44 a-d	60.33 ab	3.39 b	3.49 b
				F_1 hybrids				
P_1xP_2	32.60 e	34.13 d	16.60 fgh	16.47 cd	60.33 ab	61.00 a	1.97 c	2.10 c
P_1xP_3	12.80 h	14.53 g	21.40 bc	21.07 ab	60.22 abc	59.67 ab	0.60 f	0.69 e
P_1xP_4	22.67 f	27.60 de	20.33 cd	20.76 ab	60.67 a	60.00 ab	1.13 de	1.35 d
P_2xP_3	19.47 fg	25.53 ef	16.47 fgh	16.33 cd	54.44 de	55.33 bcd	1.18 d	1.54 d
P_2xP_4	43.40 cd	48.20 c	19.60 cde	19.60 bc	59.56 a-d	59.67 ab	2.21 c	2.46 c
P_3xP_4	48.00 bc	53.80 bc	22.87 ab	21.80 ab	55.00 cde	56.00 a-d	2.10 c	2.50 c
				Commercial cultivars				
Esk. Var.	18.47 fg	26.40 def	19.20 cd	19.13 bcd	53.22 e	52.67 d	0.97 def	1.38 d
Milet F_1	18.40 fg	15.74 g	24.27 a	22.40 a	53.44 e	53.33 d	0.76 ef	0.74 e
Azyad F_1	20.00 fg	19.93 fg	20.20 cd	20.67 ab	55.33 b-e	54.00 d	0.99 de	0.97 de
F-test	**	**	**	**	**	*	**	**
LSD 5%	4.91	8.11	2.19	4.12	4.30	5.25	0.38	0.61
LSD 1%	6.66	10.99	2.96	5.59	5.82	7.12	0.52	0.82

***,** Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.**
Means having the same letter in the same column are not significantly different at 0.05 level of probability.

As for commercial cultivars, data in the same Table declared that the Azyad F_1 in the 1st season and Eskandrany var. in the 2nd growing season gave the highest number of male flowers/ plant, whereas Eskandrany var. recorded the lowest mean values for first female flower (53.22 and 52.67 day) which less than all parents and all crosses. In addition, Milet F_1 showed the highest number of female flowers/ plant (24.27 and 22.40) and lowest sex ratio values (0.76 and 0.74) in the 1st and 2nd seasons, respectively. Likely, it may be stated that cross P_1xP_3 only that gave the lowest sex ratio value over the all commercial cultivars, while Eskandrany var. for days to female flower anthesis gave the best values (lowest values) over the all studied crosses for earliness fruits in the both seasons. These results are in confirmatory with those suggested by many workers found also significant differences among cucurbits regarding flowering and earliness traits among them, El-Gendy (1999), Ercan and Kurum (2003), Gabr (2003), Sadek (2003), Abdein (2005), Refai and Mohamed (2009), Ghobary and Ibrahim (2010), Moualla *et al.* (2011), Shamloul and Askar (2011), Jahan *et al.* (2012), Mohan *et al.* (2012), El-Adl *et al.* (2014), El-Gazzar *et al.* (2015), Nada (2015), El-Shoura and Abed (2018) and Elias *et al.* (2020).

Fruit characteristics:-

Fruit traits were measured by several characteristics. Significant variation was detected among genotypes for fruit length, fruit diameter, fruit shape index and average fruit weight.

Concerning squash parents, data presented in Table 4 showed that the means had significant variation among parents for all traits. The results showed that no specific parent is superior or inferior for all traits which arranged from 10.24 and 10.23 (P_2) to 12.80 and 12.80 cm (P_1); 2.30 and 2.50 (P_2) to 2.73 and 2.70 cm (P_4); 3.89 and 4.06 (P_2 and P_3) to 4.75 and 4.74 (P_1) and 54.35 and 56.93 (P_2) to 56.93 and 70.48 g (P_4) for fruit length, fruit diameter, fruit shape index and average fruit weight in the 1st and 2nd seasons, respectively.

Regarding the mean values of F_1 hybrids indicated that there were significant differences among crosses (Table 4). The cross P_1xP_2 or P_1xP_3 obtained the best mean values for most traits. The highest mean values were 12.00 and 12.00 cm; 3.60 and 3.60 cm and 4.81 and 4.80 for fruit length, fruit diameter and fruit shape index in the 1st and 2nd seasons, respectively.

Concerning commercial cultivars, data in the same Table confirmed that Eskandrany var. recorded the highest mean values (13.16 and 13.17 cm) and (4.53 and 4.54) for fruit length and fruit shape index, as well as Milet F_1 gave the highest mean values (3.26 and 3.27 cm) and (64.97 and 65.67 g) for fruit diameter and average fruit weight in the 1st and 2nd seasons, respectively. As well as, it may be detected that some crosses for all studied fruits traits surpassed the commercial cultivars resulted in the hybrid vigor that caused by the highest mean values of new lines comprised in these crosses, except Eskandrany var. surpassed for fruit length in the both seasons. Mohan *et al.* (2012) showed that there were significant differences among the genotypes of squash and cucurbits in fruit characteristics. Similar results were reported by, El-Gendy (1999), Abd El-Hadi *et al.* (2001), El-Lithy (2002), Ercan and Kurum (2003), Gabr (2003), Sadek (2003), Abdein (2005), Refai *et al.* (2009), Ghobary and Ibrahim (2010), Shamloul and Askar (2011), Jahan *et al.* (2012), Omran (2012), El-Gazzar *et al.* (2015), Habiba *et al.* (2015), Nada (2015) and Elias *et al.* (2020).

Table 4. Mean performance of four parental genotypes, their six F_1 hybrids and commercial cultivars for fruit traits in 2018 and 2019 seasons.

Traits	Fruit length (cm)		Fruit diameter (cm)		Fruit shape index		Average fruit weight (g)	
Genotypes	2018	2019	2018	2019	2018	2019	2018	2019
				Parents				
P_1	12.80 ab	12.80 ab	2.67 ef	2.70 de	4.75 a	4.74 a	59.62 fgh	63.71 bc
P_2	10.24 e-h	10.23 efg	2.30 g	2.50 e	3.89 c	4.26 ab	54.35 hi	56.93 cd
P_3	10.82 def	10.97 c-f	2.70 de	2.70 de	4.01 c	4.06 abc	61.68 efg	63.29 bc
P_4	11.37 cd	11.40 cde	2.73 de	2.70 de	4.26 bc	4.23 ab	70.09 bc	70.48 ab
				F_1 hybrids				
P_1xP_2	12.00 bc	12.00 abc	2.47 fg	2.50 e	4.81 a	4.80 a	66.26 cde	65.98 abc
P_1xP_3	10.47 d-f	10.50 d-g	3.60 a	3.60 a	2.94 e	2.92 e	71.78 b	70.95 ab
P_1xP_4	10.70 d-g	10.70 c-g	2.77 de	2.90 cd	3.80 cd	3.77 bcd	70.69 bc	72.03 ab
P_2xP_3	11.04 de	11.73 bcd	2.71 de	2.73 cde	3.99 c	4.32 ab	57.89 gh	57.67 cd
P_2xP_4	9.57 h	9.60 g	3.33 b	3.30 ab	2.93 e	2.91 e	68.51 bcd	71.69 ab
P_3xP_4	9.83 h	9.70 fg	3.29 bc	3.27 ab	3.02 e	2.97 e	78.60 a	74.83 a
				Commercial cultivars				
Esk. Var.	13.16 a	13.17 a	2.83 d	2.90 cd	4.53 ab	4.54 a	50.94 i	52.48 d
Milet F_1	10.81 def	10.73 c-g	3.26 bc	3.27 ab	3.36 de	3.29 de	64.97 def	65.67 abc
Azyad F_1	9.97 gh	10.40 efg	3.09 c	3.07 bc	3.26 e	3.39 cde	57.17 gh	58.21 cd
F-test	**	**	**	**	**	**	**	**
LSD 5%	0.96	1.33	0.23	0.37	0.48	0.76	5.37	9.78
LSD 1%	1.29	1.81	0.31	0.50	0.65	1.02	7.27	13.26

***,** Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.**
Means having the same letter in the same column are not significantly different at 0.05 level of probability.

Yield and its components:-

In respect with yield and its component traits, the results of yield components are consisted of fruits number per plant, fruit yield per plant and total yield/ fed. presented in Table 5. The means of genotypes showed that there were significance differences among genotypes for all traits.

Table 5. Mean performance of four parental genotypes, their six F_1 hybrids and commercial cultivars for yield and its component traits in 2018 and 2019 seasons.

Traits	Fruits number/ plant		Fruits yield/ plant (Kg)		Total yield/ fed. (Ton)	
Genotypes	2018	2019	2018	2019	2018	2019
			Parents			
P_1	9.69 g	9.27 e	0.61 f	0.64 e	3.05 e	3.19 e
P_2	14.17 de	13.50 d	0.81 def	0.85 de	4.07 de	4.23 de
P_3	15.19 cde	15.21 cd	0.90 c-f	0.89 de	4.50 cde	4.45 cde
P_4	11.47 fg	12.51 de	0.74 f	0.80 de	3.68 e	4.00 de
			F_1 hybrids			
P_1xP_2	16.24 bcd	15.64 bcd	1.06 be	1.05 bcd	5.31 bcd	5.24 bcd
P_1xP_3	18.77 ab	19.37 a	1.27 b	1.25 abc	6.36 b	6.25 abc
P_1xP_4	19.39 a	20.21 a	1.34 ab	1.34 ab	6.70 ab	6.70 ab
P_2xP_3	13.34 ef	13.82 d	0.80 ef	0.80 de	4.02 de	3.98 de
P_2xP_4	18.73 ab	18.02 abc	1.06 b-e	1.10 bcd	5.30 bcd	5.52 bcd
P_3xP_4	18.32 ab	18.89 ab	1.61 a	1.48 a	8.03 a	7.41 a
			Commercial cultivars			
Esk. Var.	17.28 abc	17.43 abc	0.82 def	0.85 de	4.12 de	4.26 de
Milet F_1	18.44 ab	19.26 a	1.16 bc	1.23 abc	5.78 bc	6.14 abc
Azyad F_1	19.28 a	19.40 a	1.10 bcd	1.13 a-d	5.48 bcd	5.65 a-d
F-test	**	**	**	**	**	*
LSD 5%	2.56	3.60	0.30	0.37	1.52	1.84
LSD 1%	3.47	4.87	0.41	0.50	2.05	2.94

***,** Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.**
Means having the same letter in the same column are not significantly different at 0.05 level of probability.

Regarding parental lines, the results showed that the parent P_3 gave the highest mean values for all yield traits. Therefore, parent P_3 consider the superior parent for all traits and scored (15.19 and 15.21 fruit), (0.90 and 0.89 kg) and (4.50 and 4.45 ton/ fed.) for fruits number/plant , fruits yield/plant and total yield/ fed. in the 1st and 2nd seasons, respectively.

Concerning F_1 hybrids (Table 5), data indicate that there were significant differences among the means of crosses for all yield traits. The results cleared that no specific cross exceed their parents for all traits, but most of them exceeded their parent in some others. As well as, the mean values of crosses ranged from 13.34 and 13.82 (P_2xP_3) to 19.39 and 20.21 fruits (P_1xP_4) for fruits number/plant and 0.80 and 0.80 (P_2xP_3) to 1.61 and 1.48 kg (P_3xP_4) for fruits yield/plant and 4.02 and 3.98 ton (P_2xP_3) to 8.03 and 7.41 ton (P_3xP_4) for total yield/ fed. in the 1st and 2nd seasons, respectively.

As for, the commercial cultivars, data in the same Table concluded that Azyad F_1 gave the highest fruits number/plant (19.28 and 19.40 fruit), as well as Melit F_1 gave the maximum fruits yield/plant (1.16 and 1.23 kg) and total yield/fed. (5.78 and 6.14 ton/ fed.) in the 1st and 2nd seasons, respectively. At the same time, it could be confirmed that the most crosses for all studied yield and its component traits gave the better mean values over the commercial cultivars resulted in the hybrid vigor that caused by the maximum values for new lines comprised in these crosses in the both seasons. Many investigators, El-Gendy (1999), Abd El-Hadi *et al.* (2001), El-Lithy (2002), Gabr (2003), Sadek (2003), Abdein (2005), Feyzian *et al.* (2009), Refai and Mohamed (2009), Ghobary and Ibrahim (2010), Moualla *et al.* (2011), Shamloul and Askar (2011), Jahan *et al.* (2012), Mohan *et al.* (2012), Omran *et al.* (2012), El-Gazzar *et al.* (2015), Habiba *et al.* (2015), Nada (2015), El-Shoura and Abed (2018) and Elias *et al.* (2020) found highly significant differences among squash genotypes for these traits.

REFERENCES

Abd El-Hadi, A.H.; Z.A. Kosba; Z.M. El-Diasty; El-S. H. Askar and G.M. Shamloul (2001). Evaluation of F_1 hybrids among new selected inbred lines of sweet melon (*Cucumis melo* var. aegyptiacus L.). J. Agric. Sci., Mansoura Univ., 26(5):2831-2845.

Abdein, M.A. (2005). Quantitative genetic of some economic traits in squash (*Cucurbita pepo*, L.). M.Sc. Thesis, Fac. Agric., Mansoura Univ., Egypt.

El-Adl, A.M.; A.H. Abd El-Hadi; Horeya M. Fathy and M.A. Abdein (2014). Heterosis, heritability and combining abilities for some earliness traits in squash (*Cucurbita pepo* L.). Alexandria Science Exchange Journal, 35(3):203-214.

El-Gazzar, T.M.; E.A. Tartoura and M.M. Nada (2015). Evaluation of new inbred lines and their hybrids in balady squash variety (*Cucurbita pepo* L.). J. Plant Production, Mansoura Univ., 8 (2): 135-143.

El-Gendy, Soher E.A. (1999). Estimation of genetic parameters in some squash hybrids through two mating designs. Ph.D. Thesis, Fac. of Agric. Mansoura Univ., Egypt.

Elias, M.S.; K.D. Hassan' S. Odeh and S.R. Mohiaddin (2020). Study of growth, yield and phytosterol squash (*Cucurbita pepo* L.) and medical pumpkin (C*ucurbita pepo*) and their hybrid. Iraq J. of Agric. Sci., 5 (2): 675-684.

El-Lithy, Y.T.E. (2002). Inheritance of some economic traits in squash (*Cucurbita pepo*) and evaluation of new hybrid produced. J. Agric. Sci. Mansoura Univ., 27(12):8517-8533.

El-Shoura, A.M. and M.Y. Abed (2018). Heterosis and combining ability for development of squash hybrids (*Cucurbita pepo* L.). J. Plant Production, Mansoura Univ., 9 (12): 1181-1187.

Ercan, N. and R. Kurum (2003). Plant, flower, fruit and seed characteristics of five generation inbred summer squash lines (*Cucurbita pepo* L.). Pak. J. Bot., 35(2): 237-241.

FAOSTAT (2018). Available online: http://faostat.fao.org (accessed on FAOSTAT DATA 24 September 2020).

Feyzian, E.; H. Dehghani; A.M. Rezai and M.J. Javaran. (2009). Diallel cross analysis for maturity and yield-related traits in melon (*Cucumis melo* L.). Euphytica, 168:215–223.

Gabr, A. H. M. (2003). Nature of gene action and performance of hybrids in squash (*Cucurbita pepo* L.). M.Sc. Thesis, Fac. Agric., Mansoura Univ., Egypt.

Ghobary, H.M.M. and Kh.Y. Ibrahim (2010). Improvement of summer squash through inbreeding and visual selection. J. Agric. Res. Kafer El-Sheikh Univ., 36(3):340-350.

Habiba, Rehab M.M.; A.M.M. El-Adl and Isra A.H. Othman (2015). Intra and inter-specific hybrids in summer squash. J. Agric. Chem. and Biotech. Mansoura Univ., 6 (12): 597-613.

Harrison, K.M. (2002). World trends driving horticulture expansion in emerging economics. Acta hort., 621: 115-125.

Hussein, A.H.; A.M. Abd Rabou; H.S. Zein and N.A Zaid (2013). Inheritance of some economic characters and powdery mildew resistance in summer squash. Arab J. Biotech., 16(2): 225-242.

Ivandro B.; Fernando I.F. Carvalho and A.C. Oliveira (2014). Parental selection strategies in plant breeding programs. Review Article, J. Crop Sci. Biotech. 10 (4): 211-222.

Jahan, T.A.; A.K.M.A. Islam; M.G. Rasul; M.A.K. Mian and M.M. Haque (2012). Heterosis of qualitative and quantitative characters in sweet gourd (*Cucurbita moschata* Duch. ex Poir). African J. Food Agric. Nutrition and Development (AJFAND). 12(3): 6186-6199.

Mohan, N.B.; M.B. Madalageri; R. Mulge; S. Adiger and H.G. Kencharaddi (2012). Genetics of vine yield and yield contributing traits in Ash gourd (*wax gourd*). Plant archives, 12(2): 731-736.

Moualla, M.Y.; M.G. Boras and A.K. Marie (2011). Studying the genetic behavior of squash yield and its components *Cucurbita pepo*, L. Tishreen University Journal for Research and Scientific Studies - Biological Sciences Series, 33(1): 109-126.

Nada, M.M. (2015). Development of new squash line from Balady variety by selection. Ph.D. Thesis, Fac. Agric., Mansoura Univ., Egypt.

Omran, S.A.; W.A.E. Ramadan and Y.A.M. Mostafa (2012). Heterosis and combining ability in watermelon hybrids. J. Plant Production, Mansoura Univ., 3(12):3139-3148.

Paris, H.S. (1986). A proposed subspecific classification for *Cucurbita pepo*. Phytologia, 61: 133-138.

Paris, H.S. (2008). Summer squash, pp. 351-379. In: J. Prohens, and F. Nuez (eds). Handbook of Plant Breeding. Vegetables J. Springer, Heidelberg.

Prohens, J. and F. Nuez (2008). Handbook of plant breeding, Vegetables I: Asteraceae, Brassicaceae, Chenopodicaceae, and Cucurbitaceae. Springer Science Business Media, LLC, 233 Spring Street, New York, USA, pp: 351-373.

Refai, E.F.S. and M.F. Mohamed (2009). Population and single plant-derived inbred line Analyses for sex expression in summer squash (*Cucurbita pepo* L.) Cv (Eskandrani). Ass. Univ. Bull. Environ. Res. 12(1):109-120.

Sadek, Mariam S. (2003). Inheritance of some economical traits in squash (*Cucurbita pepo* L.). M.Sc. Thesis, Fac. Agric., Mansoura Univ., Egypt.

SAS, Institute (2005). SAS User's Guide; Statistics, Version 9.1. SAS Inst., Cary, NC. USA.

Shamloul, G.M. and E.H. Askar (2011). Genetic behavior of yield and quality traits in sweet melon Esmalawi variety (*Cucumis melo* var. agyptiacus)., J. Plant Production, Mansoura Univ., 2(12):1731-1739.

Skreden, M.; E. Bere; L.R. Sagedal; I. Vistad and N.C. Øverby (2017). Changes in fruit and vegetable consumption habit from pre-pregnancy to early pregnancy among Norwegian woman, PMC Pregnancy and Childbirth 17 (1): p 107.

Steel, R.G. and J.H. Torrie (1960). Principles and procedures of Statistics McGraw Hill Book Company, INC, New York.

تقييم هجن جديدة من الكوسة مقارنة مع بعض الأصناف التجارية

طه محمد الجزار[1]، محمد مسعد ندا[1]، أحمد حلمي حسين[2] وأحمد رجب داود[2]*

[1] قسم الخضر والزينة - كلية الزراعة - جامعة المنصورة - مصر

[2] قسم تربية الخضر - معهد بحوث البساتين - مركز البحوث الزراعية - الجيزة – مصر

تم إجراء هذا البحث لتقييم أربعة أباء والهجن السته الناتجة منها بنظام التزاوج النصف دائري وثلاث أصناف تجارية للمقارنة لبعض الصفات الاقتصادية: النمو الخضري، الزهري و التبكير، الثمري والمحصول ومكوناته في الموسم الصيفي المبكر لعامي 2018 و 2019. وكان التصميم المستخدم هو القطاعات الكاملة العشوائية في ثلاث مكررات، حيث احتوت كل مكررة علي 13 وحدة تجريبية وكانت أهم النتائج المتحصل عليها ما يلي: أظهرت النتائج أنه لا يوجد أب واحد يتفوق على كل الآباء لجميع الصفات المدروسة وأظهرت النتائج أن الأب P_3 كان ذات متوسطات افضل لمعظم الصفات خاصة صفات التبكير و المحصول علاوة على ذلك أيدت النتائج المتحصل عليها أنه بالنسبة لهجن الجيل الأول سجل الهجين P_3xP_4 أعلى القيم لصفات لطول الساق، عدد الأزهار المذكرة/ نبات، عدد الأزهار المؤنثة/ نبات، متوسط وزن الثمرة، محصول الثمار للنبات و المحصول الكلي للفدان، و سجل الهجين P_1xP_3 أفضل القيم و المتوسطات لصفتي النسبة الجنسية وقطر الثمرة، و سجل P_1xP_2 أعلي القيم لطول الثمرة ودليل شكل الثمرة و P_1xP_4 أعلي المتوسطات لعدد الثمار/ نبات. تفوقت الهجن الثلاثة P_1xP_2، P_1xP_4 وP_3xP_4 علي الهجن التجارية وأعطت أفضل القيم والمتوسطات لصفات النسبة الجنسية، طول الثمرة، دليل شكل الثمرة، عدد الثمار/نبات، محصول الثمار/نبات والمحصول الكلي للفدان.