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GENETIC BEHAVIOR FOR SOME IMPORTANT ECONOMICAL TRAITS AND THE NATURE OF RESISTANCE FOR POWDERY MILDEW IN SQUASH.

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ABSTRACT

In this investigation six parental varieties of squash obtained form different sources were used. These varieties were : Eskandrani (P_1), Giado (P_2), Zucchino mezza lung bianco (P_3), Zucchino 544-005 (P_4), White bush scallop (P_5) and Zucchino nano verda di Milano (P_6).These parental varieties were crossed among them to obtain 15 F_1 hybrids through diallel crosses mating design excluding reciprocals. All genotypes which included the six parental varieties and their 15 F_1 hybrids were evaluated. Different yield and yield component traits as well as the nature of resistance for powdery mildew were studied.

The results indicated the presence of highly significance differences among genotypes. This finding was expected, where the parental varieties were obtained from different sources. The results also revealed that no parental variety exceeded the other parents for mean performances for all studied traits. The parent P_3 was the earliest and gave the highest yield. In the same time, the P_5 and P_6 were the highest for some traits.

The F_1 hybrid P_3xP_5 was the earliest hybrid, while the F_1 hybrid P_4xP_6 was the latest. P_5xP_6 was the lowest hybrid for F.Y./P. and No. F./P. The highest F_1 hybrid was P_2xP_4 for No. F./P. P_5xP_6 showed the high level of resistance for powdery mildew.

Heterosis values were observed for most hybrids. The best heterosis ($H_{M.P}$%)values were: -19.72(P_3 x P_5); -26.65(P_1 x P_2); -9.55(P_1 x P_6); 111.43(P_4 x P_5); 20.62(P_4 x P_6); 76.05(P_1 x P_5); 20.63(P_4 x P_5); 34.28(P_5 x P_6) and 800.3(P_1 x P_6) for D.1st F.F, No.1st F.F.N., 1st P.D., F.Y./P kg., W.F./P.g., No.F./P.. F.L.cm., F.D.cm. and D.S., estimated from the mid-parents, respectively.

The results also cleared that both additive and non-additive genetic variances including dominance could not be neglected in the inheritance of all studied traits of squash.

INTRODUCTION

In squash and other cucurbits, heterosis was investigated aiming to increase the productivity. In addition, the improvement of fruits quality is necessary. In this respect, El-Gazar (1981) and Abd El-Maksoud (1986) cleared that heterosis values in squash were significant and/or highly significant for fruits length, total number of fruits and total weight of fruits. In this respect, Dogra *et al.*, (1997) evaluated heterosis in cucumber. They mentioned that the highest values of heterosis was noticed in the cross K 75 X Gymt (57-35%). Similarly, Abd El-Hadi *et al.*, (2001), Sadek (2003), Abd El-Hadi and El-Gendi (2004) and Abd El-Hadi *et al.*,(2005a,b) evaluated heterosis in different F_1 hybrids of squash. They revealed that all studied F_1 hybrids exhibited significant or highly significant values of heterosis estimated from the mid-parents or against the better parent for most studied traits. They also added that the highest values of heterosis were 135.4 and 194.6% for fruits yield per plot estimated versus the M.P. and the B.p. respectively.

Concerning the nature of gene action, Farid (1990), El-Adl *et al.*, (1996), Abd El-Hadi *et al.*, (2004) and Abd El-Hadi and El-Gendi (2004) evaluated many F_1 hybrids of squash and other cucurbits. They cleared that both general and specific combining abilities were important indicating the importance of additive and non-additive genetic variances including dominance in the inheritance of all studied traits. On the other hand, Abd El-Hadi *et al.*, (2001) and Sadek (2003) illustrated that the non-additive genetic variances including dominance were the most important source of genetic variance for all studied traits. In another study by Abd El-Hadi *et al.*, (2005a). They cleared that additive gene action was more important in the inheritance of vegetative and earliness traits of squash.

The nature of resistance of powdery mildew in squash was evaluated by many authors. Arora *et al.*, (1992) claimed that the resistance of powdery mildew in squash was controlled by additive and dominant genes, although the additive component being predominant. In the same time, Michelle *et al.*, (1999) cleared that the varieties PX47592 and PX50592 showed high resistance for powdery mildew. In this respect, James and Stevenson (2001) indicated that the highest resistance for powdery mildew was observed in the yellow crookneck squash cultivar sunglo (PMT) and the Zucchini line HMX 0710.

MATERIALS AND METHODS

In this investigation, 15 F_1 hybrids of squash were obtained among six varieties through diallel crosses mating design excluding reciprocals. These varieties were : Eskandrani (P_1), Giado (P_2), Zucchino mezza lung bianco (P_3), Zucchino 544-005 (P_4), White bush scallop (P_5) and Zucchino nano verda di Milano (P_6). The seeds of varieties were obtained from different countries i.e., F_1 from Egypt, P_2, P_4 and P_6 from Italy, P_3 from Germany and P_5 from United States of America (U.S.A.). All these parental varieties represented a wide range of variability for all studied traits. In the summer growing season of 2003, the parental varieties were crossed to produce 15 F_1 hybrids. In addition, the six parental varieties were selfed to obtain enough seeds. All 21 genotypes (six parental varieties and their 15 F_1 hybrids) were evaluated in the growing season of 2004 in a field trial experiment. This investigation was conducted at the experimental station, Faculty of Agriculture, Mansoura University. The experimental design was a randomized complete blocks design with three replications. Each block was 21 plots. Plot was one ridge 5.0 m. long and 1.0 m wide. The distance between hills was 0.5m apart. Data were recorded on the following traits.

- Date of the first female flower (D.1^{st} F.F),
- First picking date (1^{st} P. D.),
- Number of the first female flowering node (No. 1^{st} F.F.N),
- Fruits yield per plant (F.Y. /P. Kg),

- Weight of fruits per plant (W.F./P.g),
- Number of fruits per plant (No. F. /P),
- Fruit length in centimeters (F. L. cm),
- Fruit diameter in centimeters (F. D. cm) and
- Disease severity (D. S.).

All agricultural practices were carried out as recommended for squash. Different analyses of variance were made to estimate different genetic parameters. The form of the analysis of variances and the expectations of the mean squares were made as outlined by Steel and Torrie (1960). The amounts of heterosis were calculated as the deviation of F_1 hybrids from the mid-parents ($H_{M.P.}$%) and the better parent ($H_{B.P.}$%). The analysis of variances of diallel crosses mating design were made according to Geriffing (1956) method-2 model-1. Genetic parameters were obtained according to Singh and Chaudhary (1985).

Under natural condition, disease severity percentage (powdery mildew) was recorded by counting disease plants in 10 plant from each plot. The number of spots (disease severity) (D.S.) appearing on the leaves of diseased plants were counted. This trait was estimated according to Sherwood and Hagedorm (1958) as follows:

D.S.1 % = (Disease class)(No. of diseased plants in that class) x 100/Total No. of plants X3 %

0 = No. symptoms,
1 = 1-10 lesion/plant,
2 = 11-20 lesion/plant,
3 = 21-30 lesion/plant and
4 = More than 30 lesions/plant.

RESULTS AND DISCUSSION

Squash, (*Cucurbita pepo*, L) consider as one of the important vegetable crops in Egypt. Thus, the improvement of quality and increasing the productivity were very important. In this respect, this investigation was conducted as an attempt to obtain new squash hybrids. In addition, the nature of resistance for powdery mildew disease in squash was also studied. In this investigation, six varieties of squash were crossed among them to obtain 15 F_1 hybrids through diallel crosses mating design excluding reciprocals. Then, the 21 genotypes which included the six parental varieties and their 15 F_1 hybrids were evaluated to study the genetic behavior of some important economical traits and disease tolerance specially for powdery mildew.

The analyses of variance were made for all studied traits. The obtained results of the analysis of variances and the mean squares are presented in Table 1.

Table 1: The results of the analysis of variances for all studied traits.

S.V.	d.f.	D.1st F.F	No.1st F.F.N.	1st P.D.	F.Y./ P.kg	W.F./ P.g	No. F./P.	F.L. cm	F.D. cm	D.S.
Replications	2	4.854	0.067	7.323	0.019	31.39	4.18	0.034	0.011	13.349
Genotypes	20	50.05**	0.993**	52.35**	0.659**	229.9**	36.61**	29.55**	4.139**	775.91**
Error	40	3.842	0.071	3.624	0.004	18.98	1.794	0.036	0.005	2.299

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

The results revealed that the mean squares of genotypes showed highly significance for all studied traits. This finding indicated the presence of genetic variability among all the evaluated genotypes. This variability mainly due to the different sources of the parental varieties and small values of error mean squares. On the other hand, the mean squares of replications were insignificant (desirable) for all studied traits. The genetic variability would be estimated through the analysis of variance of diallel crosses mating design.

The means of the parental varieties and their 15 F_1 hybrids were calculated for all studied traits and the results are presented in Table 2.

The results illustrated that no parental variety showed high performance means for all studied traits. It could be also noticed that the parental variety P_3 was the earliest for date of the first female flower (D1st. F. F) (43.7days) and first picking date (1st P.D.) (46.13 days) and gave the highest fruit yield per plant (F.Y./P) (1.96 kg) and number of fruits per plant (No. F./P) (16.9). In the same time, the variety P_1 was the best for of fruit per plant (W.F./P) (118.2g) and fruit length (F. L.) (13.8 cm.), while the parent P_5 showed the highest value for weight of fruit per plant (W.F./Pg) (123.8) and fruit diameter (F.D.) (5.62 cm.). Concerning disease resistance, one trait was studied: disease severity which indicate the percentage of infected plants. The parental variety (P_6) showed the highly resistance for powdery mildew with the mean of (O: no symptoms) (resistance) for this trait. On the other hand, the variety P_5 showed highest values with the mean of 50 for disease severity.

The results also revealed that there were no F_1 hybrid exceeded all the F_1 hybrids for all studied traits. It could be also noticed that the earliest F_1 hybrid was P_3xP_5, where showed the lowest number of days to give the first female flower (D_1st F.F.),(desirable), first picking date (1st P. D.) and short distance to show the first female flowering node with the mean values of 40.5 days, 42.63 days and 3.50, respectively. On the other hand, the F_1 hybrid P_4xP_6 was the latest hybrid with the mean values of 50.2, 51.7 days and 5.45 for the same traits, respectively. The results also cleared that the F_1 hybrid P_5xP_6 was the lowest hybrid for F. Y./P.kg and No. F./P.kg with the means of 2.09 kg and 16.10, respectively. While the highest F_1 hybrid for these traits was P_2xP_4 with the means of 2.86 kg and 23.9, respectively. In this respect, the F_1 hybrid P_4xP_5 gave the heaviest fruit per plant (W.F./P.g) with the mean of 140.4g, while the F_1 hybrid P_2xP_4 showed the lowest weight of fruits/plant with the mean of 114.1 g. Concerning disease resistance, the results indicated that the F_1 hybrid P_5xP_6 showed high resistance for powdery mildew, where showed (O) disease severity.

Table 2:The mean performances of the parental varieties and their 15 F_1 hybrids for all studied traits.

Genotypes	D.1st F.F	No.1st F.F.N	1st P.D.	F.Y./P.kg	W.F./P.g	No.F./P.	F.L.cm	F.D.cm	D.S.
P_1	50.73	5.35	52.96	1.65	118.2	13.53	13.8	3.17	9.33
P_2	52.60	4.33	55.53	1.59	108.9	15.06	12.96	2.93	19.33
P_3	43.70	3.95	46.13	1.96	112.1	16.90	13.8	3.10	10.33
P_4	45.40	3.78	47.53	1.54	109.3	14.40	13.06	3.11	29.33
P_5	57.20	4.12	60.53	0.91	123.8	7.10	2.74	5.62	50
P_6	44.70	3.81	46.76	1.54	108.9	13.9	12.33	2.84	0.0
P_1xP_2	41.96	3.55	44.8	2.25	118.4	18.8	13.76	3.09	46.33
xP_3	44.88	4.07	47.30	2.26	118.2	18.9	14.53	3.16	38.0
xP_4	42.43	3.52	45.13	2.32	114.8	19.16	13.46	3.00	60.0
xP_5	46.73	4.45	49.03	2.49	134.1	18.16	8.23	5.73	30.0
xP_6	42.63	3.78	45.10	2.34	114.2	19.6	13.73	2.98	42.0
P_2 x P_3	43.20	4.11	45.60	2.50	115.8	21.3	14.23	3.12	40.66
xP_4	41.93	3.40	44.66	2.86	114.1	23.9	13.73	3.20	17.33
xP_5	44.53	4.061	46.86	2.59	125.8	18.83	8.33	5.24	20.0
xP_6	46.70	4.85	48.96	2.24	115.1	19.06	14.2	3.13	20.0
P_3 x P_4	42.30	4.27	44.90	2.43	120.2	20.26	14.2	3.06	50.33
xP_5	40.50	3.50	42.63	2.56	127.9	19.70	8.86	5.80	20.33
xP_6	46.23	4.50	49.03	2.28	124.3	19.20	14.66	3.27	22.0
P_4 x P_5	43.53	3.91	46.03	2.59	140.4	19.40	9.53	5.65	16.33
xP_6	50.20	5.45	51.70	2.15	131.6	17.50	14.93	4.34	20.0
P_5 x P_6	46.73	4.73	48.96	2.09	129.3	16.10	8.66	5.68	0.0
L.S.D.o.05	3.23	0.439	3.14	0.104	7.19	2.21	0.312	0.116	2.502
L.S.D.o.01	4.32	0.587	4.20	0.139	9.60	2.95	0.418	0.155	3.347

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

On the other hand, the F_1 hybrid P_3xP_4 showed highly sensitivity for powdery mildew disease with the means of (50.33) for the same trait. These results indicated that the parental variety P_5 showed high resistance or played an important role for the appearance of resistance for powdery mildew. This parent could be use in breeding programs to obtain resistance genotypes.

The deviation of F_1 hybrids against their parents as heterosis values were estimated from the mid-parents ($H_{M.P}$%) and the better parent ($H_{B.P}$.%) for all studied traits and the results are presented in Tables 3 and 4, respectively.

The results cleared that all F_1 hybrids significantly exceeded the mid of their parents for all studied traits with few exceptions. Consequently, significant heterosis values versus the mid-parents($H_{M.P}$%) were observed for all studied traits with few exceptions. The best recorded heterosis values (desirable) were -19.72% (P_3xP_5), -26.65% (P_1xP_2), -20.06% (P_3xP_5), 111.43% (P_4xP_5); 20.62% (P_4xP_6); 80.47% (P_4xP_5); 20.63% (P_4xP_5); 34.28% (P_5xP_6) and -325.94% (P_3xP_6) for D.1st F. F.; No. 1st F.F. N; 1st P. D.; F. Y./P. kg; W.F. g.; No. F./P.; F.L. cm; F.D. cm and D.S., respectively. It could be also noticed that the hybrids which contained the parents P_4 and/or P_5 and P_6 showed desirable values of heterosis versus the mid-parents. This finding cleared the importance of general combining ability effect (g_i) for those parental varieties. Similar results were obtained by many authors among them: El-Gazar (1981), Abd-El-Maksoud (1986), Dogra *et al.*, (1997), Abd El-Hadi and El-Gendy (2004) and Abd El-Hadi *et al* (2005 A and B).

The results in Table 4 indicated that most F_1 hybrids showed heterosis values against the better parent ($H_{B.P}$%) for most studied traits. Concerning the earliness traits most F_1 hybrids exhibited negative (desirable) and significant heterosis values for that traits. In the same time, most F_1 hybrids exhibited significant and highly significant heterosis values for yield traits. The values of heterosis for yield traits ranged from 16.33% (P_3xP_6) to 79.87% (P_2xP_4); 0 (P_1xP_3) to 20.40% (P_4xP_6) and 11.83 (P_1xP_3) to 58.70% (P_2xP_4) for F. Y./P. kg, W. F. g. and No. F./P., respectively. It could be also regarded that the F_1 hybrids P_1xP_6, P_2xP_6, P_3xP_6, P_4xP_6 and P_5xP_6 showed high levels of resistance for powdery mildew.

The analysis of variances of diallel crosses mating design were made and the results are shown in Table 5. The results indicated that the mean squares of general combining ability (GCA) and specific combining ability (SCA) showed highly significance values for all studied traits. This finding indicated that both GCA and SCA play an important role in the expression of these traits.

These results were in agreement with those of Farid (1990), El Adl *et al.* (1996), and Abd El-Hadi and El-Gendi (2004).

The results also illustrated that the magnitudes of general combining ability (GCA) mean squares were larger than those of the mean squares for specific combining ability (SCA) for most yield traits (W. F./P g), (No. F./P.), (F. L. cm) and (F. D. cm). The results also showed that the earliness traits: D.1st F. F., N. 1st F. F. N and 1st P. D. and disease severity were non additively controlled.

Table3: The amounts of heterosis versus the mid-parents ($H_{M.P}$%) for all studied traits.

Crosses	D.1^{st} F.F	No.1^{st} F.F.N.	1^{st} P.D.	F.Y./P.kg	W.F./P.g	No.F./P.	F.L.cm	F.D.cm	D.S.
P_1xP_2	-18.78**	-26.65**	-17.71**	38.89**	4.27**	31.51**	2.84**	1.31*	223.31**
XP_3	-4.95**	-12.47**	-4.53**	25.21**	2.65*	24.22**	5.29**	0.80	286.57**
XP_4	-11.72**	-22.89**	-10.18**	45.45**	0.92	37.20**	0.22	-4.46**	210.40**
XP_5	-13.41**	-6.02**	-13.60**	94.53**	10.83**	76.05**	-0.48**	30.38**	1.13
XP_6	-10.66**	-17.47**	-9.55**	46.71**	0.57	42.91**	5.09**	-0.83	800.30**
P_2 x P_3	-10.28**	-0.72	-10.29**	40.85**	4.80**	33.29**	6.35**	3.48**	174.17**
XP_4	-14.43**	-16.15**	-13.33**	82.75**	4.58**	62.25**	5.53**	5.96**	-28.77**
XP_5	-18.89**	9.11**	-19.25**	107.20**	8.12**	69.95**	6.11**	22.57**	-42.30**
XP_6	-4.01	19.16**	-4.27**	43.13**	5.69**	31.63**	12.30**	8.49**	106.93**
P_3 x P_4	-5.05**	10.48**	-4.12**	38.86**	8.58**	29.46**	5.73**	-1.45**	153.81**
XP_5	-19.72**	-13.26**	-20.06**	78.40**	8.44**	64.17**	7.13**	33.03**	-32.60**
XP_6	4.54**	15.98**	5.57**	30.29**	12.49**	24.68**	12.21**	10.10**	-325.94**
P_4 x P_5	-15.15**	-1.01	-14.81**	111.43**	20.46**	80.47**	20.63**	29.44**	-58.83**
XP_6	11.43**	37.97**	9.66**	39.61**	20.62**	23.67**	17.61**	12.27**	36.38**
P_5 x P_6	-8.28**	19.29**	-8.73**	70.61**	11.13**	53.33**	14.93**	34.28**	-100.00**
L.S.D $_{0.05}$	1.104	0.150	1.072	0.035	2.455	0.754	0.106	0.039	0.854
L.S.D $_{0.01}$	1.475	0.200	1.433	0.047	3.279	1.00	0.142	0.053	1.141

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

Table 4: The amounts of heterosis versus the better parent ($H_{B.P}$%) for all studied traits.

Crosses	D.1st F.F	No.1st F.F.N.	1st P.D.	F.Y./P.kg	W.F./P.g	No.F./P.	F.L.cm	F.D.cm	D.S.
P_1xP_2	-17.29**	-18.01**	-15.41**	36.36**	0.17	24.83**	-1.43**	-2.52	396.57**
XP_3	2.7	11.51**	2.54	15.31**	0	11.83**	5.29**	-0.32	307.29**
XP_4	-6.54**	-6.88**	-5.05**	40.61**	-2.88	33.06**	-2.46	-5.36**	543.09**
XP_5	-7.88**	8.01	-7.42**	50.91**	8.32**	34.22**	-40.36	1.96**	221.54
XP_6	-4.63**	-0.79**	-3.55**	41.82**	-3.38	41.01**	-0.51**	-5.99	0
P_2 x P_3	-1.14**	4.05	-1.15**	27.55**	3.30*	26.04**	3.12**	0.65*	293.61**
XP_4	-7.64**	-10.05**	-6.04**	79.87**	4.39	58.70**	5.13**	2.89**	-10.35**
XP_5	-15.34**	11.89*	-15.61**	62.89**	1.62**	25.03**	-35.73**	-6.76**	3.47**
XP_6	4.47	27.30**	4.70	40.88**	5.69*	26.56**	9.57**	6.83**	0
P_3 x P_4	-3.20	12.96*	-2.67	23.98**	7.23**	19.88**	2.90**	-1.61**	387.22**
XP_5	-7.32**	-7.41**	-7.59**	30.61**	3.31**	16.57**	-35.80**	3.20**	96.81**
XP_6	5.79	18.11**	6.29*	16.33**	10.88**	13.61**	6.23**	5.48**	0
P_4 x P_5	-4.12**	3.44	-3.16**	68.18**	13.41**	34.72**	-27.03**	0.53**	-44.32**
XP_6	12.30**	44.18**	10.56**	39.61**	20.40**	21.53**	14.32**	7.40**	0
P_5 x P_6	4.54**	24.15**	4.70**	35.71**	4.44**	15.83**	-29.7**	1.07**	0
$L.S.D_{0.05}$	2.362	0.321	2.294	0.076	5.250	1.614	0.228	0.085	1.827
$L.S.D_{0.01}$	3.155	0.428	3.064	0.101	7.01	2.156	0.305	0.113	2.441

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

Table 5: The analysis of combining ability and the mean squares for all studied traits.

S. V.	D. f.	D.1st F.F	No.1st F.F.N.	1st P.D.	F.Y./P.kg	W.F./P.g	No.F./P.	F.L.cm	F.D.cm	D.S.
GCA	5	45.22**	0.414**	49.31**	0.216**	409.2**	38.28**	114.02**	14.31**	672.277**
SCA	15	51.67**	1.187**	53.36**	0.806**	170.07**	36.06**	1.389**	0.750**	810.45**
SCA/ GCA	-	0.875	0.348	0.924	0.267	2.406	1.061	82.08	19.07	2.299

*,** significant differences at 0.05 and 0.01 leveles of probability , respectively

Moreover, on the calculated ratio of GCA/SCA variances, the results showed that it more than the unity in W.F./Pg, No. F./P, F.L.cm, F.D.cm and D.S. This result cleared that the GCA variance or the additive genetic variance was more important than of the SCA or non-additive genetic variance including dominance in the inheritance of these traits. The reverse was true in the cases of D.1st F.F., No. 1st F.F.N, 1st P.D. and F.Y./P. kg. Which GCA/SCA ratios were less than unity. This result indicated that SCA variance was more important in the inheritance of these traits. These results were in common agreement with similar results obtained by Abd El-Hadi *et al.* (2001) and Sadek (2003).

These findings revealed that additive genetic variances played the important role in the inheritance of studied yield traits, while non-additive genetic variances including dominance controlled the inheritances of the earliness and disease severity trait. It could be also mentioned that the obtained values of heterosis for that traits which were obtained and described earlier mainly due to dominance effect (earliness and disease severity). Whereas, the values of heterosis which were obtained for studied yield traits mainly due to epistatic effects (add. x add.), (add. x dom) and (dom. x dom). Finally, the additive and non-additive gene action were more important in the inheritance of all studied traits and each of them could not be neglected.

. In general, the choice of parents to start breeding program was very important. It could be also concluded that the possibility of producing high yield of squash through hybridization among some promising parental varieties to obtain heterosis. These F_1 hybrids could be used to select in their segregating generations to obtain promising genotypes with great emphasis to powdery mildew resistance.

Similar results were obtained by many authors among them: Farid (1990), El-Adl *et al.*, (1996), Abd El-Hadi *et al.*, (2004) and Abd El-Hadi and El-Gendi (2004).

General combining ability effects (g_i) for the six parental varieties were estimated for all studied traits and the results are presented in Table 6.

The results indicated that the parental varieties P_2 showed desirable positive highly significant values of g_i for all studied yield traits but P_3 for F.Y./P. kg, No. F./P. and F.L. cm. Mean while, the GCA effects were found to be highly significant and positive (desirable) for P_4 (F.L. and No. F./P) and P_5 (W.F./P.g). On the other hand, the best and desirable negative g_i for earliness traits were noticed for the parental varieties P_3 and P_4. On the same time P_2 and P_6 showed desirable negative and highly significant values for D.S. In general, there were no parental variety showed the highest values of g_i for all studied traits.

The estimates of specific combining ability effects (S_{ij}) for all studied traits were obtained and the results are showen in Table 7.

The results illustrated that negative significant values (desirable) for earliness traits in 7 and 5 F_1 hybrids for D.1st F.F. and 1st P.D., respectively.

Table 6: General combining ability effects (gi) of the parental varieties for all studied traits.

Parents	D.1st F.F	No.1st F.F.N.	1st P.D.	F.Y./P.kg	W.F./P.g	No.F./P.	F.L.cm	F.D.cm	D.S.
P_1	0.061	0.089	0.071	-0.012	-0.713	-0.238	0.841**	-0.306**	5.556**
P_2	0.490	-0.019	0.654**	0.073**	4.338**	1.054**	0.700**	-0.387**	-0.944**
P_3	-1.889**	-0.124*	-.875**	0.113**	-1.404	1.196**	1.19**	-0.266**	0.181
P_4	-1.051**	-0.154**	-1.154**	-0.048	-0.258	0.679**	0.925**	-0.283**	4.014**
P_5	2.103**	0.012	2.233**	-0.113**	7.904**	-2.15**	-4.44**	1.574**	0.764**
P_6	0.286	0.196**	0.071	-0.109**	-1.192	-0.542*	0.783**	-0.332**	-9.569**
$L.S.D_{0.05}$	0.737	0.101	0.716	0.020	1.64	0.504	0.072	0.028	0.571
$L.S.D_{0.01}$	0.986	0.135	0.958	0.027	2.19	0.673	0.097	0.038	0.763

*,** significant differences at 0.05 and 0.01 leveles of probability , respectively.

Table7: Specific combining ability effects (s_{ij}) for the 15 F_1 hybrids for all studied traits.

Hybrids	D.1st F.F	No.1st F.F.N.	1st P.D.	F.Y./P.kg	W.F./P.g	No.F./P.	F.L.cm	F.D.cm	D.S.
P_1xP_2	-4.243**	-0.712	-4.03**	0.042	3.231	0.326	0.140	-0.040	14.5**
XP_3	1.036*	-0.091	0.999	0.012	0.098	0.285	0.419**	-0.089	5.042**
XP_4	-2.235*	-0.107	-1.888	0.137**	-4.448	1.068	-0.385**	-0.234**	23.208**
XP_5	-1.089	0.153	-1.376	0.461**	6.623**	2.897**	-0.258*	0.639**	-3.542**
XP_6	-3.373**	-0.701	-3.146**	0.308**	-4.182	2.722**	0.023	-0.205**	18.792**
$P_2 x P_3$	-1.060	0.064	-1.284	0.164**	1.289	1.393*	0.260*	-0.044	14.208**
XP_4	-3.164**	-0.615	-2.938**	0.593**	-1.557	4.51**	0.023	0.054	-12.958**
XP_5	-3.718**	0.428	-4.126**	0.480**	2.014	2.27**	-0.016	0.234**	-7.042**
XP_6	0.265	0.477	0.137	0.130**	0.377	0.897	0.631**	0.026	3.292**
$P_3 x P_4$	-0.418	0.36	-0.176	0.119**	1.610	0.735	0.002	-0.203**	18.917**
xP_6	-5.373**	-0.583	-5.83**	0.413**	1.114	2.997**	0.030	0.669**	-7.833**
XP_6	2.177*	0.239	2.733	0.123**	6.643	0.889	0.610**	0.048	4.167**
$P_4 x P_5$	-3.177**	-0.143	-3.151	0.508**	12.47**	3.214**	0.959**	0.540**	-15.667**
XP_6	5.307	1.213**	4.679	0.062	12.80**	0.295	1.14**	0.136**	-1.667**
$P_5 x P_6$	-1.314	0.330*	-1.442	0.166**	2.37	1.135	0.234*	0.619**	-8.417**
$L.S.D_{0.05}$	1.67	0.274	1.97	0.063	4.504	1.384	0.196	0.078	1.568
$L.S.D_{0.01}$	2.24	0.367	2.63	0.085	6.020	1.850	0.263	0.104	2.098

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

While, all the F_1 hybrids had unsignificant estimated values for No.1st F.F.N. Concerning yield traits, there were 12,3 and 7 F_1 hybrids showed positive significant values (desirable) for F.Y./P. kg, W.F. g and No. F./P., respectively.

On the other hand, the results indicated that the studied traits of resistance for powdery mildew showed negative significant (desirable) in 7 F_1 hybrids for D.S. trait. The results also cleared that positive values of SCA. effects for these traits were found in some hybrids. It also noticed that the F_1 hybrid P_3xP_5 had the desirable negative highly significant for earliness traits such as D.1st F.F. and 1st P.D. On the other hand the F_1 hybrid P_2xP_4 had the desirable positive highly significant values for studied traits such as F.Y./P. kg and No. F./P. While, P_4xP_5 had desirable negative highly significant estimates for D.S. In general, it could be concluded that the best combinations for earliness and powdery mildew resistance was the hybrids which had desirable negative significant SCA effects for these trait. On the other hand, the best combinations for studied traits were the hybrids which had desirable positive significant SCA effects for yield traits.

REFERENCES

Abd El-Hadi, A.H.; A.M. El-Adl; M.S. Hamada and M.A. Abdein (2005-A). Manifestation of heterosis and genetic parameters associated with it for some vegetative and earliness traits in squash. J. Agric. Sci. Mansoura Univ., 30(3): 1363-1379.

Abd El-Hadi, A.H.; A.M. El-Adl; M.S. Hamada and M.A. Abdein (2005-B). Heterosis and genetic behavior of some quantitative traits of squash at different environmental conditions. Alex. J.Agric. Res. 50 (2) 107 – 120.

Abd El-Hadi, A.H.; A.M. El-Adl; M.S. Hamada and M.A. Abdein (2005-B). Manifestation of heterosis and genetic parameters associated with it for some vegetative and earliness traits in squash. J. Agric. Sci. Mansoura Univ., 30(3): 1363-1379.

Abd El-Hadi, A.H. and Soher E.A. El-Gendy (2004). Effect of genotypes by locations interaction on economical traits of squash. J. Agric. Sci., Mansoura Univ., 29(10), 5667 -5687.

Abd El-Hadi, A.H.; M.M. Zaghloul and A.H. Gaber (2004). Nature of gene action, heterosis and inbreeding depression of yield and yield components traits in squash (*Cucurbita pepo,* L.). Zagazig J. Agric, Res., 31(6): 2707-2725.

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 inberd lines of sweet melon (*Cucumis melo var. aegyptiacus,* L.). J. Agric. Sci., Mansoura Univ., 26(5): 2831-2845.

Abd El-Maksoud M.M. (1986). Nature of gene action of economic traits in squash (*Cucurbita Pepo,* L.) M.Sc. Thesis, Fac. of Agric., Mansoura Univ.

Arora, S.K.; B. Singh; K.C Dhanju,. and T.R Ghai,. (1992). Genetics of resistance in summer squash to powdery mildew and cucumber mosaic virus. Plant disease Research 7:2, 215-220.

Dogra, B.S.; K.B. Raslogi; U.K. Kahli and H.K. Sharma (1997). Studies on combining ability in cucumber (*Cucumis sativus,* L.). annals Agric. Res., 18(4): 559-560 (C.F. Pl.Br. Abst., 68(7): 7112).

El-Adl, A.M.; Z.A. Kosba; Z.M. El-Diasty and A.H. Abd El-Hadi (1996). Types of gene action associated with the performances of hybrids among newly developed inbred lines of aggor, (*Cucumis melo var. chat,* L). J. Agric. Sc., Mansoura Univ., 21(8): 2821-2835.

El-Gazar, T.M. (1981). Combining ability and manifestation of heterosis in squash (*Cucurbita pepo,* L.) Ph.D. Thesis, Fac. of Agric. Mansoura Univ.

Farid, S.D.M. (1990). Efficiency of diallel crosses and factorial mating design in estimating genetic parameters of quantitative traits in cucumber, Ph.D. Thesis, Fac. of Agric., Mansoura Univ.

Griffing, B. (1956). Concept of general and specific combining ability in relation to diallel crosses system. Aust. J. Biol. Sci., 9: 463-493.

James, R.V. and W.R. Stevenson (2001). Evaluation of pumpkin and squash varieties for resistance to powdery mildew. Plant path. Wise.edu/wivegdis 201.

Michelle, L.I; S.A. Johaston and S.A. Garrison (1999). Disease tolerance of Zucchini and yellow squash varieties to choose for late season production. Uconn IPM. Integrated pest management, vegetables cucurbits diseases.

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

Singh, R.K. and B. Chaudhary (1985). Biometrical Methods In Quantitative Genetic Analysis. Katyani Publishers, New Delhi, Revised Ed.

Steel, G.D. and H. Torrie (1960). Principles and procedures of statistics. Mc. Raw. Hill Book Company, INC, New York, PP. 431.

Sherwood, R.J. and D.G. Hagedorm (1958). Determined common root rot potential of bea fields. Wis. Agric. Expt. Stn. Bull., 531-43.

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السلوك الوراثي لبعض الصفات الاقتصادية الهامة وطبيعة المقاومة لمرض البياض الدقيقي في قرع الكوسة.

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- استخدم في هذا البحث ستة من أصناف قرع الكوسة والتى تم الحصول عليها من مصادر مختلفة. وهذه الأصناف هي: Eskandrani (P_1), Giado (P_2), Zucchino mezza lung bianco (P_3), Zucchino 544-005 (P_4), White bush scallop (P_5) and Zucchino nano verda di Milano (P_6). تم التهجين بين هذه الأصناف وذلك للحصول على ١٥ هجينا للجيل الأول وذلك من خلال نظام التهجينات الدورية مع استبعاد الهجن العكسية. وقد تم تقييم الأصناف الستة وهجنها الخمس عشرة وتم دراسة العديد من الصفات الخضرية وصفات المحصول وكذا المقاومة لمرض البياض الدقيقي.
- اوضحت النتائج وجود فروق عالية المعنوية بين الاصناف وبين الهجن ، وقد كانت هذه النتيجة متوقعة وذلك لأن الأصناف المستخدمة في هذه الدراسة قد تم الحصول عليها من مصادر مختلفة.
- ولوحظ أيضا انه لا يوجد أحد الأصناف قد تفوق أو كان هو الأفضل لكل الصفات التي درست وإن كان **P_3** هو الأكثر تبكيرا وكذلك أعطى أعلى محصولا. وفي نفس الوقت كان **P_5** و **P_6** الأفضل لبعض الصفات.
- وفيما يخص بالهجن فقد كان الهجين **P_3 x P_5** هو اكثر الهجن تبكيرا في النضج بينما كان **P_4 x P_6** أكثر تأخرا في النضج. وكان **P_5 x P_6** اقل الهجن في محصول الثمار/النبات وعدد الثمار في النبات. وكان اعلى الهجن هو **P_2 x P_4** وذلك لصفة عدد الثمار/النبات. ومن ناحية أخرى كان الهجين **P_5 x P_6** هو الأكثر مقاومة لمرض البياض الدقيقي.
- أظهرت الدراسة وجود قوة اليجين لغالبية الهجن: حيث ان اعلى قيمة لقوة اليجين تم الحصول عليها هي: -١٩,٧٢% (P_3xP_5) ، -٢٦,٦٥% (P_1xP_2) ، - ٩,٥٥% (P_1xP_6) ، ١١١,٤٣% (P_4xP_5) ، ٢٠,٦٢% (P_4xP_6) ، ٧٦,٠٥% (P_1xP_5) ، ٢٠,٦٣% (P_4xP_5) ، ٣٤,٢٨% (P_5xP_6) ، ٨٠٠,٣٠% (P_1 xP_6) لصفات **عدد الأيام حتى الحصول على** أول زهرة مؤنثة **(D.1st .F.F.N)** ، عدد العقد حتى أول زهرة مؤنثة **(No.1st F.F.N.)** ، تاريخ أول جمعه **(1st P.D.)** ، محصول الثمار/نبات **(F.Y./Pkg)** ، وزن الثمار/نبات بالجرام **(W.F./P.g)** ، عدد الثمار/ نبات **(No. F./P.)** ، طول الثمار **(F.L.cm)** ، قطر الثمار **(F.D. cm)** ، شدة المرض **(D.S.)** على الترتيب.
كما أوضحت النتائج ايضا أهمية كل من التباين الوراثي الاضافي وغير الاضافي شاملا السيادة في وراثة الصفات محل الدراسة في قرع الكوسة.