

ESTIMATING THE GENETIC PARAMETERS OF YIELD AND YIELD COMPONENT TRAITS IN SQUASH (*Cucurbita pepo*, L.)

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ABSTRACT

The main objective of this investigation was to determine the genetic parameters, heritability in both broad and narrow senses, combining abilities and correlation for yield and yield component traits in squash (*Cucurbita pepo*, L.). For this purpose, five squash varieties were used. These varieties were: Eskandrani (P₁); Zucchini tondo di piacenza (P₂); Black beauty (P₃); Zucchini romanesco (P₄) and Coppi (P₅). During the summer season of 2011, a complete diallel crosses mating design was made to evaluate the performances of the 20 F₁ hybrids including the reciprocal will their five parental varieties in a field trial at the Experimental Station, Faculty of Agriculture, Mansoura University.

Data were recorded on the following traits, number of fruits per plant (No.F./P.), fruits yield per plant (F.Y./P.Kg), fruit length (F.L.cm), fruit diameter (F.D.cm) and fruit shape index (F.Sh.I).

The results indicated that the mean squares for all genotypes were highly significant for all yield and yield component traits.

The results of means showed that Eskandrani (P₁) was the highest parent for Number of fruits per plant No.F./P. the parental variety Zucchini romanesco (P₄) was the highest variety for F.L.cm and F.Sh.I. However, the highest F₁ hybrid for fruit yield per plant was Eskandrani (P₁) × Zucchini tondo di piacenza (P₂) with the mean value of 11.24 kg. Whereas, the highest F_{1r} hybrid was Zucchini romanesco (P₄) × Eskandrani (P₁) with the mean value of 10.51 kg.

The results revealed that the GCA effects (g_i) were highly significant for the two parents: Eskandrani (P₁) and Zucchini romanesco (P₄) for F.L.cm, F.D.cm and F.Sh.I traits. At the same time, the results also revealed that the GCA effects were highly significant for the parents: Zucchini tondo di Piacenza (P₂) for F.L.cm and F.D.cm; Black beauty (P₃) for F.D.cm and F.Sh.I and Coppi (P₅) for F.Sh.I.

The results indicated the importance of both (GCA) and (SCA) combining abilities. General combining abilities (GCA) were larger than specific combining abilities (SCA) for all yield and yield component traits except fruits yield per plant (F.Y./P.Kg). The estimates of heritability in broad sense (h^2_b) were larger in magnitudes than those of narrow sense (h^2_n) for all studied traits. The values of heritabilities in broad sense ranged from 0.513 to 0.894 for yield and yield component traits.

INTRODUCTION

Kasrawi (1994) and Ahmed *et al.*, (2003) investigated the heterosis effects using a set of diallel crosses among five summer squash lines over two seasons. The results revealed that the heterosis over the mid-parent values were present for all the yield traits. Similarly, Li-Jian-wu *et al.*, (1995), observed positive heterosis values in cucumber for total yield; early yield; fruit number and average fruit weight. Negative heterosis was obtained for vine length trait. Yield and yield components were affected by fruit number and average fruit weight.

Firpo *et al.*, (1998). reported high heterosis for total fruit number and precocious fruit number in the crosses between inbred lines derived from a summer squash (*C. pepo*) population. Also they concluded that inbreeding and crossing methods could be a useful tool in increasing the population means for yield traits through developing hybrid or a synthetic variety. However, in pumpkins, Mohanty (2000). evaluated a set of diallel crosses among eight lines and investigated the heterotic effects for yield components. The results revealed that exploitation of heterosis appeared to be limited. Ten crosses showed highly significant heterosis values relative to their best parent for yield trait. In the same time, In sweet melon, Abd El-Hadi *et al.*, (2001). studied heterosis for fruit trait and found that the means of the F_1 hybrids significantly exceeded their mid-parents. Also, El-Diasty *et al.*, (2002). evaluated 16 F_1 hybrids and their eight parents using (4 x 4) factorial mating design. The results indicated that the highest value of heterosis from the better parent was 41.05% for number of male flowers per plant. While, heterosis value of F_1 versus the better parent was 19.68% for number of fruits per plant. In watermelon, Souza *et al.*, (2005) found that most hybrids showed positive heterosis for most studied quality traits in relation to the parental means and the standard cultivar.

Through the estimation of heterosis values from the mid-parent and the better parent for yield and its component traits, it was observed that the average means of the F_1 hybrids significantly exceeded the mid-parent for most studied yield traits. However, Ghobary and Ibrahim., (2010) found that the average fruit weight was increased from 101.9 (g) in the base population (P_0) to 114.3 (g) in the (P_3) population. This increment was estimated by 13.4 %. Average numbers of total fruits and marketable fruits per plant were increased from 6.0 and 5.5 fruits per plant in the P_0 population to 8.1 and 7.6 fruits per plant in the P_3 population, respectively. Such increase was estimated as 35 % and 38.2 %, respectively. Average weights of total fruits and marketable fruits per plant were increased from 0.640 and 0.579 (kg) in the P_0 to 0.927 and 0.868 (kg) in the P_3 population, respectively.

Lopez-Anido *et al.*, (1998) and Abd El-Hadi *et al.*, (2005). found significant effects for both GCA and SCA for early and total yield per plant in squash. In this respect, Hatem *et al.*, (2009). found that GCA was greater than SCA for early and total yield in melon, suggesting that additive genetic variance was more important than non-additive one. Similarly, Ana and Staub (2002) studied combining ability of yield and its components in cucumber and evaluated six F_1 hybrids for fruit number and length/ diameter ratio. They found that combining ability was significantly influenced from year to year for most traits. General combining ability was significant for all traits in each year, but specific combining ability was only significant for fruit number. In the same time, Kamooch (2002) studied five parental lines and their ten possible hybrids and indicated that general or specific combining ability, contributed highly significant differences and seemed to be responsible for the effects noticed among the single crosses. The parental line P_3 appeared to be the highest for total yield productivity, but did not differ significantly for P_5 and P_4 .

Concerning the GCA, the P₃ showed highest GCA followed by P₅ and P₄ without any significant differences.

El-Shimi *et al.*, (2003) in melon, showed that genetic variances were considerably larger than those of environmental variances for all studied traits. In addition, dominance genetic variances were larger than additive genetic variance for all studied traits except for number of fruits per plant and average fruit weight. On the other hand, Abd El-Hadi *et al.*, (2004) showed that general combining ability (GCA) were larger than their corresponding estimates of specific combining ability (SCA) for all studies traits. They showed that the non-additive genetic variances including dominance (σ^2D) were the most important source of genetic variances. Additive genetic variances (σ^2A) also were very important. Reciprocal effects (σ^2r) were presented for all studied traits, but their estimates were smaller than the additive (σ^2A) and non-additive genetic variance including dominance (σ^2D). On the other hand, in squash Ahmed *et al.*, (2003) found that the tester Whitaker is a good combiner for yield as shown by its significant positive GCA estimate, while Eskandarany showed a significant negative GCA estimate. Also, Shamil and Wiam (2011) showed that general combining ability in squash was significant for diameter, weight and total yield/plant. The reciprocal effect was significant for all studied trait except number of fruits/plant.

Abd El-Hadi *et al.*, (2001) studied the heritability in F₁ hybrids among new selected inbred lines of sweet melon (*Cucumis melo* ver. *aegyptiacus*, L.). The heritabilities for fruit weight, fruit length and fruit diameter were 95.70; 98.60 and 82.12% for broad sense and 26.40, 82.05 and 96.40% for narrow sense, respectively. However, in watermelon, El-Mighawry *et al.*, (2001) indicated the heritability estimate in narrow sense was moderate for fruit shape index of about 0.524 and it was low for fruit length 0.23.

Karuppiah *et al.*, (2002) found that when heritability and genetic advance were considered together, number of female flowers per plant, yield per plant, number of fruits per plant and flesh thickness recorded high values of both. On the other hand, in melon, El-Shimi *et al.*, (2003) estimated heritability in broad sense and found it be considerably high for number of fruits plant; fruit yield plant; total yield; average fruit weight and flesh thickness. It was higher in magnitudes than the estimates in narrow sense for these traits. However, Sadek (2003) in squash, showed that heritability in broad sense was larger in magnitude than corresponding value in narrow sense for all studied traits. The highest value in broad sense was 97.64% for fruit diameter, while in narrow sense it was 87.93% for the same trait.

Abd El-Hadi *et al.*, (2004) in squash, found that heritability in broad sense were larger than their corresponding values in narrow sense. The estimate values of heritability in narrow sense were ranged form 0.00 to 60.38% for first picking date and fruit shape index in F₁ hybrids while, ranged from 0.00 to 67.50% for fruit weight and fruit length from F₂ generations, respectively. Similarly, Abd El-Salam *et al.*, (2010) and Kumar and Wehner (2011) found that broad sense heritability was high than narrow sense but it was moderate for yield / feddan and fruit diameter. Also, Jahan *et al.*, (2012) found that high heritability was coupled with high genetic

advance for number of fruits per plant, individual fruit weight and fruit yield which suggested that improvement would be effective through phenotypic selection.

MATERIALS AND METHODS

The genetic materials used in the present investigation included five squash varieties belong to the species (*Cucurbita pepo*, L.). This varieties included: Eskandrani (P₁); Zucchini tondo di piacenza (P₂); Black beauty (P₃); Zucchini romanesco (P₄) and Coppi (P₅).

During the summer season of 2010, seeds of these varieties were cultivated at the Experimental Station, Faculty of Agriculture, Mansoura University. At the flowering time all single crosses including reciprocals were made among these five parental varieties according to a complete diallel crosses mating design to produce 10 F₁ hybrids and their 10 F₁ reciprocals. In addition, the five parental varieties were also self pollinated to obtain enough seeds from each variety.

In the growing season of 2011, the genetic materials resulted were evaluated in a field trial at the Experimental Station, Faculty of Agriculture, Mansoura University. The experimental design used was the Randomized Complete Blocks Design with three replications. All genotypes were randomly distributed in each block. Each replication consisted of 25 plots (five parental varieties, their 10 F₁ hybrids and 10 F₁ reciprocal hybrids). The plot or the experimental unit was one ridge 5.0 m. long and 1.0 m. wide. The distance between hills was 0.5 m. with each ridge contained 10 hills. Seeds were planted at the rate of 4 seeds per hill. After full germination plants were thinned to one plant per hill. Land preparation, fertilizer applications and other field practices for squash crop were done according to the recommendations of the Egyptian Ministry of Agriculture.

Data were recorded on the following traits, fruits yield per plant (F.Y./P.Kg), fruit length (F.L.cm), fruit diameter (F.D.cm) and fruit shape index (F.Sh.I).

Differences among genotypic means for all studied traits were tested for significance using F-test according to Steel and Torrie (1960). The form of the analysis of variance and the expectation of mean squares are presented in Tables 1. The tests of significance among the differences of genotypic means were made using the least significant difference method LSD at both 5% or 1% levels.

Table 1: Form of the analysis of variance and the expectations of mean squares for all genotypes.

S.V.	d.f.	M.S.	E.M.S.
Replications	k-1		$\delta^2 e + g\delta^2 k$
Genotypes	g-1	M ₂	$\delta^2 e + r\delta^2 g$
Error	(k-1)(g-1)	M ₁	$\delta^2 e$

Where:-

k: is the number of replications.

g: is the number of genotypes.

M₁: is the error mean square.

M₂: is the genotypes mean square.

$\delta^2 e$: is the error variance.

$\delta^2 g$: is the variance of genotypes.

$\delta^2 k$: is

the variance of replications.

The analysis of the diallel crosses mating design were made on the 10 F₁ and the 10 F_{1r} hybrids using the methods described by Griffings III 1956 and later on out lined by sing and chaudary (1985). The form of the analysis of variance was as presented in Table 2.

Table 2: Form of the analysis of combining abilities and the expectations of mean squares.

S.V.	d.f.	M.S.	E.M.S.
Reps	k-1		
Crosses	p(p-1) -1		
G.C.A.	p-1	Mg	$\delta^2 e + 2k\delta^2 r + 2k\delta^2 s + 2r(p-2)\delta^2 g$
S.C.A.	p(p-3)/2	Ms	$\delta^2 e + 2k\delta^2 r + 2k\delta^2 s + \delta^2 s$
Rec.	p(p-1)/2	Mr	$\delta^2 e + 2k\delta^2 r$
Error	(k-1)(P(P-1)-1)	Me	$\delta^2 e$

Where:-

K,P: are number of replications, parents and crosses, respectively.

$\delta^2 g$: is the variance of general combining ability.

$\delta^2 s$: is the variance of specific combining ability.

$\delta^2 r$: is the variance of reciprocal effects.

$\delta^2 e$: is the error variance.

Me; Mr;Ms and Mg are the respective mean squares of error; rec; S.C.A. and G.C.A, respectively.

RESULTS AND DISCUSSION

The mean performances of five parental varieties, their F₁ and F_{1r} hybrids for all studied traits are presented in Table 3.

The mean values of the five parental varieties showed that P_1 was the highest parent for No.F./P. The parental variety P_4 was the highest variety for F.L.cm and F.Sh.l. While, the two parental varieties P_5 and P_2 were the highest parents for F.Y./P.Kg and F.D.cm, respectively. In the same time, P_2 was the lowest parent for F.Y./P.Kg, F.L.cm and F.Sh.l. While, the parental variety P_4 was the lowest for F.D.cm.

The results of the analysis of variance and mean squares for yield and yield component traits for all genotypes are presented in Table 4.

The results indicated that the mean squares for all genotypes were highly significant for all yield and yield component traits. These results indicated the presence of large variations among these five parents and their $F_{1,1r}$ hybrids for yield and yield component traits.

The results indicated that the highest F_1 hybrid for fruit yield per plant was $P_1 \times P_2$ with the mean of 11.24 kg. Whereas, the highest F_{1r} hybrid was $P_4 \times P_1$ with the mean of 10.51 kg. On the other hand, F_1 hybrid $P_1 \times P_4$ was the lowest for this trait with a mean of 8.828 kg., while, $P_4 \times P_2$ F_{1r} hybrid was the lowest with mean of 9.214 kg.

In general, the means of F_1 hybrids ranged from 10.13 to 14.20 fruits; 8.828 to 11.24 kg ; 8.577 to 13.493 cm; 28.48 to 43.63 cm and 0.207 to 0.493 for No.F./P.; F.Y./P.Kg; F.L.cm; F.D.cm and F.Sh.l, respectively. On the other hand, the mean values of the F_{1r} hybrids ranged from 10.86 to 15.16 fruits; 9.214 to 10.51 kg; 9.477 to 14.72 cm; 19.49 to 45.10 cm and 0.217 to 0.53 for the same traits, respectively.

These results were in agreement with the results obtained by Sadek (2003) and Abd El-Hadi *et al.*, (2005).

The analysis of variance and mean squares of general and specific combining abilities for all studied traits are presented in Table 5.

The results revealed that the mean squares of the genotypes were highly significant for F.L.cm, F.D.cm and F.Sh.l., while, F.Y./P.Kg was insignificant. The mean squares due to general combining ability were highly significant for No.F./P.; F.L.cm; F.D.cm and F.Sh.l. This indicated that additive genetic variance was more important in the inheritance of these traits.

The values of GCA mean squares were higher than those of SCA means for F.L.cm, F.D.cm and F.Sh.l. indicating that additive genetic variance was more important in the inheritance of these traits. On the other hand, the values of SCA mean squares were larger than those of GCA for F.Y./P.Kg. This indicated that non- additive genetic variance was more important in the inheritance of this trait.

The magnitudes of GCA and SCA mean squares were equal for No.F./P. trait showing that both of them were more important in the inheritance of this trait.

These results were in agreement with the results obtained by Abd El-Hadi *et al.*, (2004).

Table 3 : The mean performances of five parental varieties, their F₁ and F_{1r} hybrids for yield and yield component traits in 2011 growing season.

Genotypes	No.F./P.	F.Y./P.Kg	F.L.cm	F.D.cm	F.Sh.l.
P ₁	10.73	9.737	13.403	28.85	0.477
P ₂	8.70	8.956	7.317	47.13	0.157
P ₃	10.30	9.422	12.56	29.21	0.433
P ₄	10.70	9.420	14.833	26.11	0.563
P ₅	6.80	9.861	12.6	35.68	0.377
P ₁ x P ₂	10.13	11.24	12.97	29.20	0.46
P ₂ x P ₁	11.20	9.913	11.387	33.25	0.31
P ₁ x P ₃	10.16	9.408	12.153	29.00	0.463
P ₃ x P ₁	15.16	9.652	13.463	29.30	0.443
P ₁ x P ₄	14.20	8.828	11.793	29.76	0.437
P ₄ x P ₁	12.40	10.51	14.72	27.71	0.53
P ₁ x P ₅	12.50	10.43	10.96	32.85	0.363
P ₅ x P ₁	10.86	9.539	13.487	31.58	0.44
P ₂ x P ₃	10.46	10.97	9.127	35.26	0.29
P ₃ x P ₂	15.03	9.904	9.477	45.10	0.217
P ₂ x P ₄	12.60	9.349	9.003	39.20	0.253
P ₄ x P ₂	13.667	9.214	10.437	36.76	0.337
P ₂ x P ₅	10.933	10.84	8.577	43.63	0.207
P ₅ x P ₂	10.967	10.09	9.577	35.43	0.277
P ₃ x P ₄	13.367	9.608	13.493	28.48	0.493
P ₄ x P ₃	13.333	10.07	11.833	19.49	0.427
P ₃ x P ₅	13.767	10.05	12.687	28.65	0.447
P ₅ x P ₃	13.067	9.938	12.187	33.98	0.367
P ₅ x P ₄	13.433	9.739	13.01	29.75	0.443
P ₄ x P ₅	11.6	10.44	11.037	28.41	0.397
L.S.D _{0.05}	1.762	13.31	1.338	5.949	0.052
L.S.D _{0.01}	2.351	17.76	1.785	7.936	0.069

Table 4 : Analysis of variance and mean squares for yield and yield component traits in 2011 growing season.

S.V.	d.f	No.F./P	F.Y./P.Kg	F.L.cm	F.D.cm	F.Sh.l
Replications	2	0.255	19.076	2.247	17.298	0.005
Genotypes	24	11.82**	108.97**	11.583**	117.87**	0.033**
Error	48	1.152	65.73	0.664	13.13	0.001

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

Table 5 : Analysis of variance and mean squares for general (GCA) and specific (SCA) combining ability for Yield and yield component traits.

d.f.	No.F./P.	F.Y./P.Kg	F.L.cm	F.D.cm	F.Sh.l.
24	11.821**	108.967	11.583**	118.337**	0.033**
4	4.894**	23.407	16.536**	165.95**	0.053**
10	4.605**	38.322	1.190**	13.00**	0.002**
10	2.895**	39.488	1.462**	15.290**	0.003**
48	0.384	21.911	0.221	4.487	0.001

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

The relative magnitudes of different genetic parameters and heritability for yield and yield component trait are presented in Table 6 .

The results showed that both additive (σ^2_A) and non-additive genetic variances including dominance (σ^2_D) were positive and highly significant for yield and its component traits except for F.Y./P.Kg which was insignificant. The results indicated that these two genetic variances play a major role in the genetic expression of yield and yield component traits. The magnitudes of additive genetic variance which was larger than the dominance genetic variance for F.L.cm, F.D.cm and F.Sh.l. traits suggested that additive genetic variance was predominant in the inheritance of these traits. The reciprocal variances were smaller than the additive genetic variances for F.L.cm, F.D.cm and F.Sh.l. traits. In general, the heritability in broad sense (h^2_b) were high and larger than their corresponding values of heritability in narrow sense (h^2_n) for all studied traits. Heritability in broad sense ranged from 0.241 to 0.943 for F.Y./P.Kg and F.L.cm, respectively . In the same time, the highest value of h^2_n was 0.865 for F.Sh.l.

These results were also in agreement with the results obtained by AbdEl-Salam *et al.*, (2010) and Kumar *et al.*, (2011).

General combining ability effects of the five parental varieties for all studied traits are presented in Table 7.

The results revealed that the GCA effects (g_i) were showed highly significant and desirable for parent P_1 and P_4 for F.L.cm and F.Sh.l traits. At the same time, the results revealed that the GCA effects were significant for parent P_2 for F.D.cm and parent P_3 for F.Sh.l .

These results were also in agreement with the results obtained by Hatem *et al.*, (2009), Souza *et al.*, .(2002) and Abd El-Hadi et al. (2004)

Specific combining ability effects of the five parental varieties for all studied traits are presented in Table 8.

For No.F./P. the F_1 hybrids $P_3 \times p_5$ and $P_4 \times p_5$ gave the highest values of specific combining ability effect of 1.691 and 0.917, respectively.

The F_1 hybrid $P_1 \times P_2$ gave the highest positive and significant value of (6.199) For F.Y./P.Kg. At the same time, the F_{1r} hybrid $P_2 \times P_1$ gave the highest positive and significant value of (6.653) for the same trait.

For F.L.cm the F_1 hybrid $P_1 \times P_2$ and F_{1r} hybrid $P_4 \times P_5$ gave highly significant positive values. However, the F_{1r} hybrid $P_4 \times P_1$ gave highly significant negative value. The F_1 hybrid $P_1 \times P_2$ gave the highly significant

negative value of -5.475 for F.D.cm. Out the F_{1r} hybrids P₅ x P₂ and P₄ x P₃ gave the highly significant positive values for the same trait.

For F.Sh.I. the F₁ hybrid P₁ x P₂ gave the highly significant positive value of (0.063). While, the F_{1r} hybrids P₂ x P₁ and P₅ x P₃ gave highly significant positive values of 0.075 and 0.040 for the same trait. The F_{1r} hybrid P₄ x P₁ and P₄ x P₂ gave the highly significant negative values -0.047 and -0.041 for the same trait.

Table 6: The relative magnitudes of different genetic parameters and heritability for yield and yield component trait .

Genetic parameters and heritability	F.Y./P.kg	F.L.cm	F.D.cm	F.Sh.I.
σ^2A	-2.827	3.078	30.67	0.010
σ^2D	9.768	0.577	5.067	0.0006
σ^2r	8.789	0.621	5.401	0.001
σ^2E	21.91	0.221	4.489	0.000
$H^2_b\%$	0.241	0.943	0.888	0.915
$H^2_n\%$	0.000	0.794	0.762	0.865

Note: Negative values were considered equal to zero during the calculation of heritability in broad and narrow se

Table 7 : General combining ability effects (g_i) of the five parents for yield and yield component traits.

Parents	No.F./P.	F.Y./P.kg	F.L.cm	F.D.cm	F.Sh.I.
P ₁	-0.0340	0.1467	1.0904**	-2.5113**	0.0557**
P ₂	-0.6040	0.5853	-2.1649**	6.6637**	-0.1179*
P ₃	0.6527	-0.4113	0.2704*	-1.7913**	0.0171**
P ₄	0.7560	-2.2553	0.8157**	-3.3797**	0.0601**
P ₅	-0.7707	1.9347	-0.0116	1.0187	-0.0149**
L.S.D. _{0.05}	0.352	2.66	0.27	1.20	0.011
L.S.D. _{0.01}	0.469	3.55	0.36	1.61	0.014

*and ** Significant at 0.05 and 0.01 levels of probability, respectively

Table 8: Specific combining ability effects (sij) of the 20 F_{1,1r} hybrids for yield and yield component traits.

Hybrids	No.F./P	F.Y./P.Kg	F.L.cm	F.D.cm	F.Sh.l
P ₁ x P ₂	-0.539	6.199*	1.569**	-5.475**	0.063**
P ₂ x P ₁	-0.533	6.653*	0.792*	-2.025	0.075**
P ₁ x P ₃	0.204	-3.288	-0.236	0.905	-0.004
P ₃ x P ₁	-2.500	-1.223	-0.655*	-0.150	0.010
P ₁ x P ₄	0.340	-0.054	-0.333	2.085	-0.017
P ₄ x P ₁	0.900	-8.413*	-1.463**	1.025	-0.047**
P ₁ x P ₅	0.644	-1.084	-0.539	1.161	-0.023*
P ₅ x P ₁	0.817	4.457	-1.263	0.633	-0.038*
P ₂ x P ₃	0.857	5.360	-0.487	2.763*	-0.030*
P ₃ x P ₂	-2.283	5.347	-0.175	-4.917**	0.0367*
P ₂ x P ₄	1.137	-4.366	-0.614*	2.151	-0.031*
P ₄ x P ₂	-0.533	0.677	-0.717*	1.210	-0.041**
P ₂ x P ₅	0.481	3.274	-0.430	-0.699	-0.009
P ₅ x P ₂	-0.017	3.747	-0.500	4.100**	-0.035*
P ₃ x P ₄	0.097	2.191	-0.106	-3.460*	-0.001
P ₄ x P ₃	0.017	-2.300	0.830*	4.567**	0.033*
P ₃ x P ₅	1.691	-0.456	0.494	-0.459	0.020*
P ₅ x P ₃	0.350	0.540	0.250	-2.667*	0.040**
P ₅ x P ₄	0.687	2.375	-0.464	-1.104	-0.009
P ₄ x P ₅	0.917	-3.517	0.987**	0.667	0.023*
L.S.D(sij)_{0.05}	0.726	5.49	0.55	2.48	0.02
L.S.D(sij)_{0.01}	0.968	7.31	0.74	3.31	0.03
L.S.D(rij)_{0.05}	0.881	6.65	0.67	3.01	0.03
L.S.D(rij)_{0.01}	1.174	8.87	0.89	4.01	0.04

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

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قياسات الثوابت الوراثية لصفات المحصول ومكوناته في قرع الكوسة.
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تهدف هذه الدراسة إلي تقدير معامل التوريث في مدها الواسع والضيق والقدرة العامه والخاصه علي التالف لبعض صفات المحصول ومكوناته في قرع الكوسة.

ففي الموسم الصيفي ٢٠١٠ تم زراعه بذور خمس أصناف في المزرعه البحثيه بكلية الزراعة لجامعه المنصوره. وهذه الأصناف الخمسه هي: إسكندراني(الأب الأول) و زوكينو توندو داي باسينزا(الأب الثاني) و بلاك بيوتي(الأب الثالث) و زوكينو رومانسكو(الأب الرابع).

وفي عام ٢٠١١ تم تقييم الخمسه آباء والعشره هجين وعكسيه الناتجه من تهجينهم بنظام التزاوج الدوري الكامل .

أظهرت دراسه المتوسطات أن الأب الرابع كان الأعلى من حيث طول الثمره ودليل شكل الثمره . بينما أعلى هجين بالنسبه لصفه محصول الثمار لكل نبات كان الأب الأول X الأب الثاني بمتوسط ١١.٢٤ كيلوجرام وأعلى هجين عكسي كان الأب الرابع X الأب الأول بمتوسط ١٠.٥١ كيلوجرام.

أظهرت النتائج أهميه كل من القدره العامه علي التالف والقدرة الخاصه علي التالف وكانت القدره العامه علي التالف أكبر من القدره الخاصه علي التالف بالنسبه لمعظم صفات المحصول ومكوناته. وكانت قيم معامل التوريث في مدها الواسع أعلى منه في مدها الضيق لجميع الصفات محل الدراسه حيث تراوحت قيم معامل التوريث في مدها الواسع ما بين ٠.٢٤١ إلي ٠.٩٤٣ بالنسبه لصفات المحصول ومكوناته.

وتؤكد الدراسه أهميه كل من تباين القدره العامه والخاصه على التالف مما يؤكد أهميه كل منهما في برامج التربييه بالانتخاب أوبالتهجين في تحسين صفات المحصول وذلك من خلال الانتخاب في الأجيال الانعزاليه المتقدمه.

قام بتحكيم البحث

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