Zagazig J.Agric. Res., Vol .31 No.(5) 2004 **2207 - 2222**

ESTIMATION OF HETEROSIS, INBREEDING DEPRESSION AND GENETIC PARAMETERS ASSOCIATED WITH THEM OF SOME ECONOMICAL TRAITS OF EGGPLANT (*Solanum melnogena*, L.)

Abd-El-Hadi, A.H.; A.M. El-Adl; Z.M. El-Diasty and E.A. El-Zaghawy
Genetic Dept. Fac. Agric. Mansoura Univ.

Accepted 29 / 6 / 2004

ABSTRACT: This investigation was conducted as an attempt to improve the productivity and quality of eggplant as a popular vegetable crop. Five varieties of eggplant were used to obtain 20 F_1 hybrids and their corresponding 20 F_2 generations through a complete diallel crosses mating design. Many traits were studied. The results indicated the presence of heterosis in the F_1 hybrids, F_{1r} (reciprocal) hybrids and all $F_{1,1r}$ hybrids versus mid-parents for all studied traits. In addition, heterobeltiosis were detected for most studied traits. The highest values of heterosis estimated from the mid-parents were 72.79, 76.21 and 74.6% for total yield per plot (kg) for F_1, F_{1r} and $F_{1,1r}$ hybrids, respectively. So, inbreeding depression were observed for all studied traits. The results indicated that specific combining ability variances (σ^2S) were larger than those of general combining ability variances (σ^2g) for most studied traits. Thus, the non-additive genetic variance including dominance (σ^2D) played a major role for the inheritance of eggplant traits. In the same time, additive genetic variances (σ^2A) was also present.

The results also revealed that the magnitudes of heritability in broad sense (h^2_b %) was larger than their corresponding values in narrow sense (h^2_n %) for all studied traits. The highest values of heritability in broad and narrow senses were 99.75 and 88.05% for total yield per plot (kg) in F_1 hybrids and weight of fruit (g) in the F_2 generations, respectively.

All pairs of studied traits showed significant genotypic (r_g) and phenotypic (r_{ph}) correlation. Thus, those pairs of studied traits

showed positive and significant linkage. The highest values of correlation were 0.99 (r_{ph}) [plant height x weight of fruit] and 0.91 (r_g) [total yield per plot x fresh weight of seedling]. Therefore, selection for improving one of these traits would improve the other.

As a result, eggplant breeders would design their programs to utilize the superiority of F_1 hybrids to select high yielding and high quality inbred lines in advanced segregating generations.

INTRODUCTION

Eggplant is considered as a popular important vegetable crops in Egypt. Thus, increasing productivity and the improving of the quality are very important. This investigation was conducted as an attempt to obtain more knowledge about the genetic behaviour of eggplant traits and recommend definitely the suitable breeding program.

Dharme (1979) studied nature of heterosis in eggplant and claimed that number of branches per plant showed the highest heterosis value followed by the number of fruits per plant. Similarly, Sawant *et al.* (1992) studied the nature of heterosis. They recorded the presence of heterosis for plant height, yield per plant, number of fruits per plant and fruit weight. Mankar *et al.* (1995) indicated that the values of heterosis were 49.09 % for number of branches/plant, 21.82 % for number of fruits/plant, 18.18 % for fruit length and 5.45 % for fruit weight. Similar results were found by El-Sharkawy *et al.* (1998). They mentioned that the heterosis values ranged from 14.97 to 77.68 % for average fruit weight and total yield per plant, respectively. In the same time, Sanjeet *et al.* (2000) revealed that yield showed heterosis values of 111 and 100.2% from the M.P. and the B.P., respectively. Similarly, Chadha *et al.* (2001) and Patil *et al.* (2001) regarded that fruit diameter, number of branches /plant, fruit yield, weight of fruit and length of fruit showed significant values of heterosis.

Gill *et al.* (1977), Charussrj *et al.* (1986), Lawende *et al.* (1992), Doshi *et al.* (1999) and Krishana and Rai (1999) reported that additive genetic variance was important in the inheritance of eggplant traits. On the other hand, Singh *et al.* (1981), El-Sharkawy *et al.* (1998) and Vaghasiya *et al.* (2000) cleared that non-additive genetic variances including dominance were more important variances in the inheritance of eggplant traits. However, Narendra and Ram (1981), Sidhu *et al.* (1981), Vadivel and Bapu (1988), revealed the importance of both additive and no-additive genetic variances for the inheritance of eggplant studied traits.

Concerning heritability, Vadivel and Bapu (1988) obtained high values of heritability for number of fruits/plant. Similar results were obtained by Saha *et al.* (1991) for plant height and number of branches/plot with values of 69.57 and 38.98%, respectively. In this respect, Rai *et al.* (1998) obtained high estimates of heritability (93.5%) for fruit weight. Sharma *et al.* (2000) indicated that heritability estimates was high for length of fruit, number of fruits/plant and yield /plant.

Randhawa *et al.* (1993) mentioned that number of fruits/plant and number of branches/plant had the highest direct effect on yield. In the same time, Sarnaik *et al.* (1999) and Baruah *et al.* (2000) revealed that plant height trait was significantly and positively correlated with fruit yield. Similarly, Prasath *et al.* (2001) cleared that yield was positively correlated with plant height, number of branches /plant, fruit weight and number of fruits/plant.

MATERIALS AND METHODS

The genetic materials used in the present investigation included five varieties of eggplant belonging to the species *Solanum melongena*, L. Seeds of all varieties were obtained from the Vegetable Research Institute, Agricultural Research Center (ARC). These varieties were: Long Purple, Black Beauty, Balady Dark Long, Balady Dark Round and Balady White Long.

In the growing season of 2000, the five parental varieties were crossed according to a complete diallel crosses mating design to produce 10 F_1 hybrids and their corresponding 10 F_{1r} (reciprocal) hybrids. In addition, the parental varieties were selfed to obtain more seeds. In the growing season of 2001, all the 25 genotypes were cultivated. The F_1 and F_{1r} hybrids were selfed to produce the F_2 and F_{2r} generations. In the same time, the parental varieties were crossed to obtain further seeds of F_1 and F_{1r} hybrids. In the growing season of

2002, all 45 genotypes were evaluated in a field trail experiment with three replications. Each block consisted of 45 plots. Each plot was one row 4.0 m long and 0.8 m wide. All agricultural practices were carried out as recommended for eggplant. The experiment was excuted in a private farm in Aziza village, El-Manzala, Dakhalia Governorate. The Faculty board has issued a permission for that purpose.

The data were recorded for the following traits:

1- Fresh weight per seedling in grams (F.W./S.g),
2- Plant height in centimeters (P.H. cm),
3- Number of branches per plant (No. B./P.),
4- Leaf area in centimeters square (L.A. cm^2),
5- Weight of fruit in grams (W.F. g),
6- Number of fruits per plant (No. F./P.),
7- Total yield per plot in kilograms (T.Y./Pt. kg),
8- Fruit length in centimeters (F.L. cm) and
9- Fruit diameter in centimeters (F.D. cm).

Several analyses of variances were made in order to test the significance of the differences among different genetic material. Heterosis against the mid-parents ($H_{M.P}$%) and the better parent ($H_{B.P}$%) as well as inbreeding depression (I.D.) were calculated. Differences between means were tested against the method least significant difference (L.S.D.) according to Steel and Torrie (1960).

The analyses of variances of diallel crosses were made according to the procedures described by Griffing (1956) method 1.

The estimates of GCA variance (σ^2 g) and SCA variance (σ^2 s) were calculated according to Matzingar & Kempthorne (1956) and Cockerham (1963)

The phenotypic (r_{ph}) and genotypic (r_g) correlations among pairs of studied traits were calculated according to the following equations:

Phenotypic correlation (r_{ph}) =

$$\frac{Cov_{ph_1ph_2}}{\sqrt{\sigma^2_{ph_1} \cdot \sigma^2_{ph_2}}}$$

Genotypic correlation (r_g) =

$$\frac{Cov_{g_1g_2}}{\sqrt{\sigma^2_{g_1} \cdot \sigma^2_{g_2}}}$$

The significance of (r_{ph}) and (r_g) were tested using "t"-test where the.

Calculated "t"-test for (r_{ph}) is:

$$\frac{r_{ph}}{\sqrt{\frac{1-(r_{ph})^2}{n-2}}}$$

Calculated "t"-test for (r_g) is:

$$\frac{r_g}{\sqrt{\frac{1-(r_g)^2}{n-2}}}$$

RESULTS AND DISCUSSION

The major objectives of this study were directed towards the investigation of the presence of heterosis, inbreeding depression and the types of genetic effects associated with them for some economical traits of eggplant. The genetic variability among genotypes would be studied to determine the validity of pursuing the different comparisons between the means and to estimate the amounts of heterosis and inbreeding depression. Then, the evaluation of the diallel crosses mating design with respect to the magnitudes of general (GCA), specific (SCA) combining abilities and the other genetic components.

The means and ranges of five parental varieties, F_1 hybrids, F_1 reciprocal hybrids mean of all F_1 hybrids and heterosis values versus mid-parents and better parent were calculated for all studied traits and the results are presented in Table 1. The results illustrated that the means of F_1 hybrids, the means of the F_1 reciprocal hybrids and all $F_{1,1r}$ hybrids significantly exceeded the mid-parents for most studied traits (P.H., No.B./P., W.F., No. F./P., T.Y./Pt and F.L.). Therefore, the values of heterosis versus the mid-parents were significant for these traits. The obtained values of heterosis ranged from: -10.88, -11.16 and –11.02 % to 72.79, 76.42 and 74.6% for F.D. and T.Y./Pt at the F_1 hybrids, F_{1r} hybrids and all $F_{1,1r}$ hybrids, respectively. The results indicated the presence of desirable heterobeltiosis for most studied traits. Most studied traits showed significant values of heterosis from the better parent. The highest values of economical heterosis versus the better parent were: 46.28, 49.34 and 47.81% for T.Y./Pt at the F_1 hybrids, F_{1r} hybrids and all $F_{1,1r}$ hybrids, respectively.

The means of F_1, F_{1r} and all $F_{1,1r}$ hybrids and the corresponding values of F_2 , F_{2r} and all $F_{2,2r}$ generations in addition to the values of inbreeding depression (I.D.) were determined and the results are presented in Table 2.

Table 1: The means, ranges of the five parents, F_1 hybrids, F_1 reciprocal hybrids, all F_1 hybrids, heterosis from mid-parents and better parent for all studied traits in eggplant.

Generations	F.W./S. (g)	P.H. (cm)	No. B./P.	L.A. (cm^2)	W./F. (g)	No. F./P.	T.Y./Pt. (kg)	F.L. (cm)	F.D. (cm)
M.P.	1.80	66.50	9.51	98.45	121.26	8.51	4.910	13.41	7.26
Range	1.70 (E) – 1.93 (B)	62.9 (D) – 68.7 (E)	8.10 (E) – 10.3 (B)	87.6 (A) – 114.4 (B)	82.00(E)–174.7 (B)	6.95 (B) - 10.7 (C)	3.7 (E) - 5.8 (B)	11.1 (B) – 15.2 (C)	5.1(E) – 9.8 (B)
F_1	1.70	95.69	11.73	95.59	149.80	11.64	8.484	15.29	6.47
Range	·161 (AC) – 1.80 (BD)	89.10 (AB) – 101.06 (CD)	10.53 (AE)– 12.8(ED)	85.73(BD)– 111.33(CD)	123.66(CE)– 214(BD)	8.80(BD) - 14.0(AC)	6.993(AD)- 9.6 (BC)	13.98(BD)- 16.85(AE)	4.85(CE) – 8.96 (BD)
F_{1r}	1.72	92.42	11.45	97.63	147.93	11.75	8.662	15.49	6.45
Range	1.64 (CB)– 1.81 (D.B)	83.96 (ED) – 95.20 (BA)	11.13 (AE)– 12.80(ED)	78.20(CB)– 123.43(CA)	125.00(EC)- 197.3(DB)	10.3(ED)- 14.05(EC)	7.5(DA)- 11.0(DB)	14.3(DB)- 16.9(EC)	4.7(EC) – 9.11 (DB)
$H_{(F1-M.P)}$ %	- 5.56**	43.89**	23.34**	- 2.91**	23.54**	36.78**	72.79**	14.02**	- 10.88**
$H_{(F1r-M.P)}$ %	- 4.44**	38.98**	20.40**	- 0.83	21.99**	38.07**	76.42**	15.51**	- 11.16**
LSD 0.05	0.025	2.791	0.44	1.801	12.34	1.644	0.561	0.535	0.275
0.01	0.034	3.726	0.585	2.404	16.48	2.195	0.748	0.714	0.367
$H_{(F1.1r-M.P)}$%	- 5.00**	41.44**	21.87**	1.90*	22.77**	37.49**	74.6**	14.77**	- 11.02**
LSD 0.05	0.0236	2.548	0.40	1.644	11.27	0.450	0.510	0.488	0.251
0.01	0.0316	3.401	0.53	2.194	15.04	0.601	0.681	0.651	0.335
$H_{(F1-BP)}$ %	- 11.92**	39.29**	13.88**	- 16.44**	- 14.25*	8.79*	46.28**	0.59	- 33.98**
$H_{(F1r-BP)}$%	- 10.88**	34.53**	11.17**	- 14.66**	- 15.32*	9.81*	49.34**	1.91	- 34.18**
LSD 0.05	0.0496	5.346	0.84	3.449	23.64	0.858	1.073	1.024	0.526
0.01	0.0663	7.135	1.117	4.604	31.55	1.146	1.433	1.367	0.703
$H_{(F1.1r-BP)}$%	- 11.40**	36.91**	12.52**	- 15.550**	- 14.79*	9.35*	47.81**	1.25	- 34.08**
LSD 0.05	0.0485	5.223	0.82	3.370	23.10	0.923	1.049	1.001	0.514
0.01	0.0647	6.971	1.09	4.498	30.83	1.231	1.401	1.336	0.687

*** Significant at 0.05 level ** Significant at 0.01 level**

Table 2: The estimated values of inbreeding depression (I.D.) from F_2, F_{2r} and all $F_{2,2r}$ generation for all studied traits in eggplant.

Traits / Generations	F.W./S. (g)	P.H. (cm)	No. B./P.	L.A. (cm^2)	W./F. (g)	No. F./P.	T.Y./Pt. (kg)	F.L. (cm)	F.D. (cm)
$\bar{F}_1$	1.70	95.69	11.73	95.59	149.80	11.64	8.484	15.29	6.47
$\bar{F}_{1r}$	1.72	92.42	11.45	97.63	147.93	11.75	8.662	15.49	6.45
$\bar{F}_{1.1r}$	1.71	94.06	11.59	96.61	148.87	11.70	8.573	15.39	6.46
$\bar{F}_2$	1.64	68.89	9.96	83.82	134.43	8.31	5.570	13.26	5.57
$\bar{F}_{2r}$	1.66	66.14	9.62	84.80	130.79	8.40	5.500	13.29	5.64
$\bar{F}_{2.2r}$	1.65	67.52	9.79	84.31	132.61	8.36	5.540	13.28	5.61
I.D. $_{\bar{F}_2}$%	-3.53**	-28.01**	-15.09**	-12.31**	-10.26	-28.61**	-34.35**	-13.28*	-13.91*
LSD 0.05	0.06	6.48	0.99	4.56	19.11	1.72	1.64	1.74	0.72
0.01	0.08	8.69	1.33	6.12	25.06	2.30	2.19	2.33	0.96
I.D. $_{\bar{F}_{2r}}$%	-3.49	-28.44**	-15.98**	-13.14**	-11.59**	-28.51**	-36.50**	-14.20*	-12.56**
LSD 0.05	0.07	6.84	1.18	4.64	12.78	1.04	1.14	1.09	0.58
0.01	0.09	9.16	1.60	6.22	17.14	1.40	1.52	2.47	0.77
I.D. $_{\bar{F}_{2.2r}}$%	-351	-28.22**	-15.53**	-12.73**	-10.92	-28.55**	-35.37**	-13.71**	-13.16
LSD 0.05	0.07	6.18	1.03	4.51	17.51	1.05	1.32	1.38	0.88
0.01	0.08	8.19	1.37	5.98	23.21	2.46	1.75	1.83	1.17

* Significant at 0.05 level ** Significant at 0.01 level

The results indicated that the means of F_2, F_{2r} and all $F_{2, 2r}$ generations were significantly lower than their corresponding F_1, F_{1r} and all $F_{1,1r}$ hybrids. Therefore, most studied traits showed highly significant values for I.D. The highest decrease in the F_2 , F_{2r} and all $F_{2, 2r}$ generations were noticed for T.Y./Pt, where I.D. recorded -34.35, -36.50 and –35.37%, respectively. Since it has been known that they are higher than the heterosis.

These results were expected to show higher inbreeding depression. Similar results were obtained by many authors among them El-Sharkawy *et al.* (1998), Sanjeel *et al.* (2000), Chadha *et al.* (2001) and Patil *et al.* (2001). They obtained significant values of heterosis.

The analysis of variances of diallel crosses were made for all studied traits at the F_1 hybrids and the F_2 generations and the results are shown in Table 3. The results revealed that the mean squares of S.C.A. were larger than those of G.C.A for most studied traits. However, it was noticed that most studied traits had significant mean squares of both G.C.A and S.C.A. Also, many traits showed significant values for reciprocal effect variances. This finding indicated the importance of the choice of the parental varieties to produce promising hybrids.

The variances of general combining ability (σ^2g), specific combining ability (σ^2s) and reciprocal effect (σ^2r) in addition to the standard errors for all studied traits were measured and the results are presented in Table 4. The results illustrated that the relative magnitudes of σ^2s were larger than those of σ^2g for all studied traits except F.D. (cm). These results were excepted and explain the high obtained values of heterosis which described earlier. It could be noticed that the magnitude of σ^2s at the F_1 were larger than the magnitudes of σ^2s at the F_2 generations. This finding was in agreement with the fact that σ^2s is decreasing from generation to the next. The results also cleared the importance of the values of σ^2r for all studied traits. The obtained values of standard error cleared that values of σ^2g, σ^2s and σ^2r were significant for most studied traits.

The calculated values of general combining ability (σ^2g) and specific combining ability (σ^2s) variances were translated to

Table 3: The results of the analyses of variances and the mean squares of the complete diallel crosses mating design from the F_1 hybrids and F_2 generations for all studied traits in eggplant.

Source of variance		d.f	F.W./S. (g)	P.H. (cm)	No. B./P.	L.A. (cm^2)	W./F. (g)	No. F./P.	T.Y./Pt. (kg)	F.L. (cm)	F.D. (cm)
G.C.A	F_1	4	0.0117**	6.64	1.352*	92.03**	2664.665**	14.402**	2.61*	5.741**	10.27**
	F_2		0.0108*	19.851	2.436**	168.805**	1329.067**	1.734*	0.637*	2.766*	9.137**
S.C.A	F_1	5	0.0055*	312.393**	2.454**	140.39**	709.172**	3.573**	6.11**	2.025*	0.58*
	F_2		0.0105*	12.002	0.355*	131.90**	247.009*	0.818*	0.490*	0.932*	1.307**
R.E	F_1	10	0.0018*	17.283	0.249	150.29**	133.319*	1.068*	0.42	0.389	0.030
	F_2		0.0011	33.869*	0.367*	64.022**	73.44	0.177	0.116	0.445	0.025
Error	F_1	38	0.0005	6.42	0.162	2.675	43.173	0.206	0.26	0.236	0.062
	F_2		0.0016	4.677	0.094	2.552	41.618	0.177	0.133	0.217	0.046

Table 4: The results of calculated values of the different genetic parameters obtained from the F_1 hybrids and F_2 generations and standard error for all studied traits in eggplant.

Genetic parameters		F.W./S. (g)	P.H. (cm)	No. B./P.	L.A. (cm^2)	W./F. (g)	No. F./P.	T.Y./Pt. (kg)	F.L. (cm)	F.D. (cm)
$\sigma^2 g$	F_1	0.0012 ± 0.00004	- 29.12 ± 0.51	- 0.10 ± 0.01	- 5.95 ± 0.21	150.32 ± 3.44	1.10 ± 0.016	0.032 ± 0.02	0.38 ± 0.02	0.97 ± 0.004
	F_2	0.0007 ± 0.00012	0.574 ± 0.37	0.21 ± 0.01	2.71± 0.20	604.29 ± 3.33	0.09 ± 0.014	0.016 ± 0.01	0.25 ± 0.02	0.79 ± 0.003
$\sigma^2 s$	F_1	0.0029 ± 0.0003	182.12 ± 4.10	1.36 ± 0.10	81.97 ± 1.70	396.42 ± 27.52	2.00 ± 0.131	34.22 ± 0.16	1.06 ± 0.15	0.31 ± 0.04
	F_2	0.0052 ± 0.0001	4.36 ± 2.98	0.15 ± 0.06	76.99 ± 1.63	122.66 ± 26.63	0.38 ± 0.113	0.212 ± 0.08	0.42 ± 0.14	0.75 ± 0.03
$\sigma^2 r$	F_1	0.0006 ± 0.0003	5.43 ± 3.21	0.04 ± 0.08	73.81 ± 1.33	45.07 ± 21.50	0.43 ± 0.103	0.08 ± 0.13	0.07 ± 0.12	- 0.01 ± 0.03
	F_2	- 0.0003 ± 0.0008	14.59 ± 2.33	0.14 ± 0.047	30.73 ± 1.27	15.91 ± 20.80	0.07 ± 0.88	- 0.008 ± 0.06	0.11 ± 0.11	- 0.01 ± 0.02

genetic variance components such as additive genetic variance (σ^2A) and non-additive genetic variance including dominance (σ^2D) and the results are presented in Table 5. The values of heritability in broad and narrow senses were also calculated and the results are shown in the same Table. The results indicated that the magnitudes of non-additive genetic variances were larger than their corresponding additive genetic variances for most studied traits at the F_1 hybrids and F_2 generations. However, additive genetic variances were present and could not be neglected. These findings were in agreement of the results obtained earlier and explained that both non-additive genetic variances including dominance σ^2D and additive genetic variances σ^2A played an important role in the inheritance of eggplant traits although the magnitudes of non-additive genetic variances including dominance σ^2D were more effective. The results were in agreement with results obtained by Singh *et al.* (1981), El-Sharkawy *et al.* (1998) and Vaghasiya *et al.* (2000).

Concerning heritability, the results cleared that the magnitudes of heritability in broad sense (h^2_b%) was always larger than values in narrow sense for all studied traits. This finding confirmed once more the importance of non-additive genetic variances including dominance for all studied traits. The results also indicated that the obtained values of heritability in broad sense (h^2_b%) ranged from (87.78 and 77.93%) to (99.75 and 99.34%) for (No. B./P. and P.H.) and (T.Y./Pt and F.D.) at the F_1 hybrids and F_2 generations, respectively. At the same time, the results revealed that the highest obtained values of heritability in narrow sense were 85.52 and 88.05% for F.D. and W.F. at the F_1 hybrids and the F_2 generations, respectively. These results were in agreement with the results obtained by Vadival and Bapu (1988), Saha *et al.* (1991), Rai *et al.* (1998) and Sharma *et al.* (2000).

The phenotypic and genotypic correlation coefficients among each pair of the studied traits were calculated and the results are presented in Table 6. The results indicated that the magnitudes of phenotypic correlations were close to the corresponding genotypic correla-tions for most cases. The results also indicated that No. F./P

Table 5: Estimates of additive (σ^2A), non-additive genetic variances including dominance (σ^2D) and heritability values in broad (h^2_b %) and narrow (h^2_n %) senses at all F_1 hybrids ($F_{1, 1r}$) and all F_2 generations ($F_{2, 2r}$) for all studied traits in eggplant.

Genetic parameters and heritability		F.W./S. (g)	P.H. (cm)	No. B./P.	L.A. (cm^2)	W.F. (g)	No. F./P.	T.Y./Pt. (kg)	F.L. (cm)	F.D. (cm)
σ^2A	F_1	0.0024	- 58.24	- 0.2	- 11.90	106.25	2.192	0.64	0.756	1.942
	F_2	0.0002	1.53	0.55	7.24	396.53	0.250	0.04	0.661	2.101
σ^2D	F_1	0.0029	182.12	1.36	81.97	343.30	2.003	34.22	1.064	32.4
	F_2	0.0094	7.7	0.275	136.87	216.38	0.694	0.37	0.755	1.333
h^2_b%	F_1	96.71	98.30	87.78	98.74	97.97	98.39	99.75	95.86	99.09
	F_2	91.09	77.93	85.90	98.97	96.96	90.60	84.62	92.71	99.34
h^2_n%	F_1	43.74	--	--	--	42.25	51.41	1.831	39.82	85.52
	F_2	2.83	16.24	62.66	6.52	88.05	29.93	11.099	49.93	67.312

Table 6: Phenotypic (r_{ph}) and genotypic (r_g) correlation values between pairs of traits obtained for all studied traits in eggplant.

Traits		P.H. (cm)	No. B./P.	F.W/S (g)	L.A. (cm^2)	W. F. (g)	No.F./P.	T.Y./Pt.	F.L. (cm)	F.D. (cm)
P.H.	r_{ph}		0.44*	0.61**	0.015	0.99**	0.59**	0.98**	0.19	0.17
(cm)	r_g		0.73**	0.72**	0.006	0.38**	0.64**	0.84**	0.30*	0.09
No.	r_{ph}			0.21	0.15	0.50**	0.77**	0.12	0.07	0.15
B./P.	r_g			0.23	0.05	0.57**	0.52**	0.08	0.01	0.02
F.W/	r_{ph}				0.97**	0.31	0.98**	0.96**	0.15	0.80**
S (g)	r_g				0.71**	0.20*	0.81**	0.91**	0.09	0.54**
L.A.	r_{ph}					0.20	0.70**	0.22	0.02	0.26
(cm^2)	r_g					0.22	0.55**	0.13	0.02	0.17
W.F.	r_{ph}						0.49*	0.53**	0.24	0.87*
(g)	r_g						0.08	0.59**	0.28	0.68*
No.	r_{ph}							0.67**	0.37	0.16
F./P.	r_g							0.67**	0.41	0.08
T.Y./	r_{ph}								0.12	0.025
Pt.	r_g								0.22	0.025
F.L.	r_{ph}									0.14
(cm)	r_g									0.37
F.D.	r_{ph}									
(cm)	r_g									

* Significant at 0.05 level ** Significant at 0.01 level

trait showed highly significant phenotypic (r_{ph}) and genotypic (r_g) correlation values with F.W/S. (0.98 and 0.81), P.H. (0.59 and 0.64), No.B./P. (0.77 and 0.52) and L.A. (0.70 and 0.55) for r_{ph} and r_g, respectively. In general, most pairs of studied traits showed positive values of correlation, whereas, some pairs showed insignificant correlation. Similar results were obtained by many authors among them Sarnaik *et al*. (1999), Baruah *et al*. (2000) and Parasath *et al*. (2001).

Generally, It could be concluded that it is possible to increase eggplant productivity through hybridization by recovering promising F_1 hybrids. Also, it is possible to select high yielding cultivars from the segregating generations of these superior hybrids through selection program.

REFERENCES

Baruah, S.J.N.; M. Binoy and H.A. Rachid (2000). The study yield potentiality of some brinjal cultivars in severely bacterial wilt intected condition. Vegetable Science, 27(1): 76-77.

Chadha, S.; S. Bahadur and J. Kumar (2001). Study the heterosis in brinjal. Karnataka Journal of Agricultural Sciences, 14(4): 1130-1133.

Charussrj, N.; C. Chanasobhon and P. Sriuives (1986). Study on the inheritance of some economically important characters in eggplant (*Solanum melongena,* L.). Kasetsart J. Natural Sci., 20(3): 239-248.

Cockerham, W.G. and G.M. Cox (1963). Experimental Design. 2nd ed. Hojn Wily & Sons, Inc. New York, USA pp. 595.

Dharme, C. M.V. (1979). Genic analysis of yield and yield components in brinjal (*S. melongena,* L.). Plant Breed. Abst., 49: 3207.

Doshi, K.M.; M.K. Bhalala and K.B. Kathiria (1999). The study of genetic variability for yield, fruit borer infestation, little leaf incidence and quality characters in brinjal. Gujarat Agricultural University Research Journal, 24(2): 27-30.

El-Sharkawy, E.S.M.; A.H. Abd El-Hadi and A.H. Amer (1998). The relative importance of genetic parameters in the F_1 hybrids and the F_2 generations for some quantitative traits of eggplant (*Solanum melongena,* L.). J. Agric. Sci., Mansoura Univ., Egypt, 7: 3177-3186.

Gill, H.S.; R.S. Arord and D.C. Pachour (1977). Inheritance of quantitative characters in eggplant. Plant Breed, Abst., 47: 12136.

Griffing, B. (1956). Concept of general and specific combining ability in relation to diallel crosses systems. Aust. J. Biol. Sci., 9: 436 - 493.

Krishana, V.S.R. and M. Rai (1999). Study on genetic variation, component association and direct and indirect selection in some exotic tomato germplasm. Indian J. Hort., 56(3): 262-266.

Lawande, K.E.; S.R. Gadakh; P.N. Kale and V.R. Joshi (1992). Generation mean analysis in brinjal (*Solanum melongena,* L.). J. Moharashtra Agric. Univ., 17(1): 62-63.

Mankar, S.W.; P.B. Kale; V.N. Dod; R.V. Wankhade and B.J. Jadhao (1995). Heterosis in eggplant (*Solanum melongena,* L.). Crop Research Hisar, 10(3): 331-337.

Matzinger, D.F. and Kempthorne (1956). The modified diallel table with partial inbreeding and interactions with environment. Genetics, 41: 822-833.

Narendra, K. and H.H. Ram (1981). Components of genetic variation in eggplant (*Solanum melongena,* L.). Crop Improvement, 16(1): 92-94.

Patil, S.D.; S.D. Warade and C.D. Badgujar (2001). The study of heterosis in brinjal (*Solanum melongena,* L.). Journal of Soils and Crops, 11(1): 47-51.

Prasath, D.; S. Natarajan and J.S. Thamburaj (2001). The study of correlation and path analysis in brinjal (*Solanum melongena,* L.). Horticultural Journal, 14(2): 143-147.

Rai, N.; A.K. Singh and D.A. Sarnaik (1998). Estimation of variability, heritability and scop of improvement for yield components in round brinjal (*Solanum melongena,* L.). Agric. Sci. Digestkarnal, 18(3): 187-190.

Randhawa, J.S.; J.C. Kumar and M.L. Chodha (1993). Path analysis for yield and its components in round brinjal (*Solanum melongena,* L.). Punjab J. Hort., 1(4): 127-132.

Saha, M.C.; M.A. Ouadir; M.W. Zaman and S.N. Mondal (1991). Inheritance studied in eggplant (*Solanum melongena,* L.). Annals of Bangladesh Agriculture, 1(1): 7-12.

Sanjeet, K; M.K. Banejree and G. Kalloo (2000). The study of morphocytological features of a heterotic sweet pepper hybrids. Capsicum and Eggplant Newsletter, 19: 54-57.

Sarnaik, D.A.; S.K. Verma and D.P. Verma (1999). The study of correlation studies in brinjal (*Solanum melongena,* L.). Advances in Horticulture and Forestry, 7: 91-94.

Sawant, S.V.; U.T. Desai; P.N. Kale and M.B. Goi (1992). Heterosis studied in brinjal (*Solanum melongena,* L.). J. of Moharashtra Agric. Univ., 17(3): 394-396.

Sharma, T.V.R.S.; Kishan-Swaroop and K. Swaroop (2000). The study of genetic variability and character association in brinjal (*Solanum melonga,* L.). Indian Journal of Horticulture, 57(1): 59-65.

Sidhu, A.S.; R.D. Bhutani; Kalloo and G.P. Singh (1981). Genetics of yield components in brinjal (*Solanum melongena,* L.). (C.F. Plant Breeding Abst., 51: 11071).

Singh, S.N.; H.N. Singh and M.H. Hezerika (1981). Fractional diallel analysis of some quantitative characters in brinjal. (C.F. Plant Breed. Abst., 51: 2658).

Steel, R.K.D. and J.H. Torrie (1960). Principles and procedures of statistics. Mc Graw Hill Book Compaang Inc., New York, USA.

Vadivel, E. and J.R.K. Bapu (1988). Heritability estimates in segregation generations of eggplant (*Solanum melongena,* L.). Capsicum Newsletter, 7: 87-88.

Vaghasiya, M.H.; K.B. Kathiria; M.K. Bhalala and K.M. Doshi (2000). Study of gene action to yield and its components in two crosses of brinjal (*S. melongena,* L.). Indian Journal of Genetics and Plant Breeding, 60(1): 127-130.

تقدير قوة الهجين والتدهور الناتج عن التربية الداخلية والقياسات الوراثية المصاحبة لهما لبعض الصفات الإقتصادية للباذنجان

أشرف حسين عبدالهادى، على ماهر العدل ، زكريا محمد الديسطى والسيد عبدالغنى الزغوى
قسم الوراثة – كلية الزراعة – جامعة المنصورة

أجريت هذه الدراسة كخطوة لتحسين انتاجية ومواصفات الباذنجان باعتباره محصول خضر شعبيا رخيص الثمن. استخدم خمسة أصناف من الباذنجان للحصول على عشرين هجينا وهجينا عكسيا من خلال نظام التهجين الدورى الكامل. تم الحصول على أنسال الجيل الثانى والجيل الثانى العكسى للعشرين هجينا جيل أول . تمت دراسة عديد من الصفات وقد كان ملخص النتائج كالآتى:–

– أظهرت النتائج وجود قوة هجين قياسا من الجيل الأول والجيل الأول العكسى والجيل الأول بأكمله مقارنة بمتوسط الآباء وذلك لجميع الصفات المدروسة وفى نفس الوقت تم الحصول على قيم جيدة لقوة الهجين فى هجن فاقت أفضل الآباء – وكانت أعلى القيم لقوة الهجين المتحصل عليها ٧٢,٧٩، ٧٦,٢١ و٧٤,٦% بالنسبة للجيل الأول والجيل الأول العكسى وكل الجيل الأول بأكمله لصفة المحصول الكلى لكل وحدة تجريبية. وأظهرت النتائج كذلك وجود قيم معنوية بالنسبة لمعامل التربية الداخلية لغالبية الصفات التى درست.

– أوضحت نتائج الدراسة أن القدرة الخاصة على التآلف كانت أعلى من القدرة العامة على التآلف وبالتالى كانت التباينات الغير تجميعية والتى تشمل السيادة أكثر أهمية من التباينات التجميعية فى توارث الصفات التى درست فى الباذنجان وإن كانت قيم التباينات التجميعية لا يمكن إهمالها.

– أوضحت النتائج أن قيم معامل التوريث فى المدى الواسع كانت دائما أعلى من قيم معامل التوريث فى المدى الضيق لكل الصفات التى درست وكانت أعلى قيم لمعامل التوريث المتحصل عليها فى المدى الواسع والمدى الضيق هى ٩٩,٧٥ و ٨٨,٠٥% لصفة المحصول الكلى لكل وحدة تجريبية لهجن الجيل الأول ووزن الثمرة فى الجيل الثانى على الترتيب.

– أوضحت النتائج وجود ارتباط وراثى ومظهرى بين أزواج الصفات التى درست وكانت أغلبية القيم موجبة ومعنوية. وكانت أعلى قيم الإرتباط هى ٠,٩٩ للإرتباط المظهرى (طول النباتX وزن الثمرة) و ٠,٩١ للإرتباط الوراثى (لصفة المحصول الكلى للوحدة التجريبية X الوزن الطازج للبادرات). لذلك فإن تحسين أى من هذه الصفات المرتبطة يتبعه تحسين للصفة الأخرى طالما أن هناك ارتباطا معنويا موجبا بين الصفتين.

وتوصى هذه الدراسة بإمكانية تحسين إنتاجية وجودة محصول الباذنجان من خلال برامج التهجين ثم الأنتخاب فى الأجيال الإنعزالية المتقدمة لإنتاج سلالات نقية أخرى.