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PERFORMANCE OF FABA BEAN PARENTS IN DIFFERENT HYBRID COMBINATIONS AND LOCATIONS

BY

Hassan, A.M.*; Abd El-Sabour, M.S. *; Bekhit, M.M.* and Abdou, S.A.A.**

* Department of Genetics, Faculty of Agriculture, Moshtohor, Banha Univ., Egypt.

** National Research Center, Dokki, Giza.

ABSTRACT

The present study was carried to investigate type and relative amount of genetic variance componentes and their interaction with the location, in addition to evaluating heterosis of some quantitative characters in faba bean (*Vicia faba L.*). For this objective, a diallel crossing was performed without reciprocals, including eight varieties (Rena blanka, Triple white, Tenova, Tena, Giza 2, Giza 716, Giza 461 and Giza 429) which were evaluated in a completely randomized block design with three replications over two locations. The most important studied characters were plant height, number of pods per plant, first pod position, pod length, yield/plant, number of seeds per plant, number of seeds per pods and 100-seed weight per plant.

For the effect of location, significant mean squares were detected for all traits except plant height. Mean squares for genotypes, parents and hybrids were highly significant for all characters. Significant mean squares of parents vs. hybrids were showed for all traits except number of pods per plant and pod length.

Both variances of general and specific combining abilities (GCA and SCA) were found to be highly significant for all traits. The magnitudes of the ratios of GCA/SCA showed that the additive and additive X additive types of gene action were the more important factors for all traits except number of pods per plant. The interactions between locations and both types of combining abilities were highly significant for all traits.

The parental line Giza 716 was the best combiner for plant height, first pod position, seed yield per plant, number of seeds per plant and 100-seed weight. The parental line Rina blanka expressed significant desirable GCA effect for plant height, pod length per plant, seed yield per plant, number of seeds per plant and 100-seed weight. The highest desirable SCA effects were observed in crosses; (Tinova x Giza 716), (Tinova x Giza 461) and (Giza 2 x Giza 429) for plant height, number of pods per plant and yield and its components, (Rena blanka x

Tena) and (Triple white x Giza 716) for first pod position and yield and its components.

The cross Rena blanka x Giza 461, Triple white x Tenova and Tena x Giza 429 showed the highest useful heterosis for all traits.

INTRODUCTION

Increase in yield potential of faba bean (*Vicia faba L.*) cultivars has found to be small, in spite of large variation of most traits, including grain yield. Therefore, the obtaining of genetically improved cultivars is the main objective of breeding programs, which can be increased by a careful choice of parents. One of the most commonly used methodologies for choosing parents is using of diallel cross, which informs about the parents' potential when in hybrid combinations, and also about gene action involved in determining quantitative traits (El-Hosary (1985), El-Hosary and Sedhom (1988), Abd El-Aziz (1993), El-Mahdy (1998) and Hassan (2001). Griffing's (1956) diallel analysis procedure is among the most useful ones, especially its method II model 1, which allows estimating both exact SCA and GCA. As GCA depends predominantly on additive effects of the genes, it informs about the potential of the segregating populations for selection of high grain yield lines (Machado *et al.*, 2002). It has been the parameter employed to choose promising segregating populations, which should have the highest averages. As for SCA, which depends predominantly on non-additive effects of the genes, it allows to identify populations which are potentially more useful to liberate variability in the segregating generations (Berger *et al.*, 2002).

The purpose of this research was to choose the most promising faba bean populations for selection of genotypes, based on general and specific combining abilities for grain yield, and to verify the significance of heterosis for the obtained hybrids in two different locations. Therefore, the main goal is to improve the yield potentiality of Egyptian faba bean genotypes.

MATERIAL AND METHODS

Eight field bean varieties; (Rina Blanka as P_1 from Spain, Triple White as P_2, Tinova as P_3, Tina as P_4 from Germany and Giza 2 as P_5, Giza 716 as P_6, Giza 461 as P_7 and Giza 429 as P_8 from Egypt) were used in a diallel cross without reciprocals giving a total of 28 crosses during 1995/1996 season. The plants were grown in isolated cages untill seed harvesting at maturity. During 1996/1997, the eight parents and their hybrids were grown in a randomized complete block design with three replications at two different locations; the experimental field of Genetic department, Faculty of Agriculture, Moshtohor and Nubaria station. In the two locations, each plot consisted of two rows with 10 plants per row, spaced 70 cm between rows and 20 cm with one seed per hill. The normal agricultural operations were applied as recommended at these locations. The observed data on the studied traits were estimated and recorded as means. The studied traits were plant height (cm), number of pods per plant, position of first pod on main stem (cm), pod length (cm), seed yield per plant (gm), number of seeds per plant, number of seeds per pod and 100-seed weight (gm). The data were recorded for all traits on all the resulted plants.

Estimates of both general and specific combining ability (GCA and SCA) were computed according to Griffing's (1956) diallel analysis (method 2 model I).

The combined analysis was estimated over the two locations (environments) to test the interaction of the different genetic components with the location.

Heterosis expressed as the percentage of increase in F_1 mean performance above the better parent. For testing the significance of heterotic effects, L.S.D. values were estimated as suggested by Wynne *et al.*, 1970.

RESULTS AND DISCUSSION

The choice of breeding procedures for the genetic improvement of faba bean is mainly conditioned by the type and relative magnitudes of genetic variance components in the population. The diallel cross analysis was therefore used to investigate the nature of heterosis and partitioning the genetic variance into its components, and to assess the relative importance of general and specific combining ability (GCA and SCA, respectively), amount and causes of heterosis.

The analysis of variance for ordinary and combining ability combined over two locations for the studied characters are found in Table (1). The locations mean squares were found to be highly significant for all traits except the plant height and seed yield per plant.

The genotypes, parents and the resulted crosses mean squares were revealed highly significance for all traits in the combined analysis of variance.

The combined two locations analysis revealed significant parents x locations interaction for all the studied traits except number of seeds per pod while crosses x locations interaction was found to be highly significant for all the studied charactrs. Insignificant genotypes, parents and crosses by locations mean square were only revealed for plant height. These results therefore may reveal the high repeatability of the tested genotypes in different locations. Significant parents vs. crosses by locations mean squares, were detected for number of pods per plant, first pod position per main stem, pod length, seed yield per plant, number of seeds per plant, number of seeds per pod and 100-seed weight, indicating that the average heterosis overall crosses for these traits fluctuated from location to another. On the contrary, insignificant parents vs crosses by locations mean squares were obtained for the rest traits. This finding, therefore, may reveal the high repeatability of the overall heterosis in different years.

The variance associated with general and specific combining abilities was highly significant for all traits, indicating that both additive and nonadditive types of gene action were involved in determining the performance of singlecross progeny. To reveal the nature of genetic variance which had the greater role, GCA/SCA ratio was estimated. With the exception of number of pods per plant, high values largely exceed the unity were detected, revealing that the largest part of the total genetic variability associated with these cases was a result of additive and additive by additive gene action types. For number of pods per plant, however, non additive type of gene action seemed to be more prevalent. The type of variability reported by Abdalla and Fischbeck (1980) and Mahmoud *et al.*, (1984) among stocks of Vicia faba is rather confirmed by the variation found in the present study for yield and its components.

The interactions between locations and both types of combining abilities were highly significant for all the studied characters, indicating that the magnitude of all types of gene action varied from location to location. These findings confirm those mentioned above from the ordinary analysis of variance. The interactions between both types of combining abilities and seasonal changes were reported to be significant for flowering time in faba bean (Bond, 1966) and for maturity time in soybean (Paschal and Wilcox. 1975) and in faba bean (El-Hosary, 1981 and 1985) and for chocolate spot and rust disease in faba bean (El-Kady, 1968).

Estimates of GCA effects (g_i) for individual parental genotypes in each character combined over two locations are found in Table (2). High positive values would be of interest under all traits in question except flowering date, maturity date, chocolate spot and rust resistance degree where high negative ones would be useful from the breeder point of view. The parental genotype Rina blanka was the best because it had high significant positive GCA for plant height, pod length, seed yield per plant, number of seeds per plant and 100-seed weight. The parental genotype Giza 716 seemed to be the best combiner for first pod position on main stem and number of seeds per pod in addition to plant height and seed yield per plant. The parental cultivars Giza 461 exhibited significant positive GCA effect for plant height, seed yield per plant, number of seeds per plant and number of seeds per pod. This finding indicates that those varieties are the best general combiners for seed yield per plant. The parental line 429 expressed highly significant desirable "g_i" for plant height and first pod position on main stem. Agreement between the parental performance and its GCA effects was revealed in all traits, except number of pods per plant and pod length. Such agreement might add another proof about the performance of additive genetic variance in these traits. The disagreement between intrinsic performance of parental lines and their GCA effects for these two traits, seemed to be due to Triple white, Tinova, Tina and Giza 2 behaved as a high potent parents when crossed with the other parents. Thereby, its hybrids owned number of pods and pod length which were either equal to or higher than that of the eight genotypes partner, leeding to an appreciable high GCA effects.

Specific combining ability effects of the parental combinations were estimated for all the characters studied (Table 3). The desirable inter- and intra-allelic interactions were obtained in majority of hybrids for plant height (10 crosses) and number of pods per plant (9 crosses) and First pod position on main stem (11 crosses) and pod length per plant (6 crosses) and seed yield per plant (9 crosses) and number of seeds per plant (7 crosses) and number of seeds per pod (6 crosses) and 100-seed weight (10 crosses). The highest desirable SCA effects were in crosses Tinova x Giza 716 ,Tinova x Giza 461, Triple white x Giza 716, Giza 2 x Giza 429, Triple white x Giza 429, Tinova x Tina, and Rina blanka x Tina for seed yield per plant and its components. These crosses might be of interest in breeding programs towards pure line varieties as most of them involve at least one good combiner for the trait in view. Also, the results indicated the possibility of selection for improvement of seed yield per plant by selection of any component of yield where high additive type of gene action was prevalent.

Similar conclusions were obtained by Abd-Allah (1977) for 1000-seed weight, El-Hosary (1987) for all the studied traits except number of pods per plant. Mahmoud and El-Ayoby (1987) who found that highly significant variation in specific combinning ability for all the studied traits. El-hosary and Sedhom (1988) concluded that all traits showed highly significant variability in specific combinning ability except number of seeds per pod. Abo-Noas *et al.*, 1989 showed significant variation for yield and its components.

Table (4) reveal the heterotic effects for F_1 hybrids over two locations relative to better parent (BP). For plant height, significant positive heterotic effects were obtained in 14 crosses; two of them were superior (Triple white x Tinova) and (Rina blank x Tina). For number of pods per plant, 8 crosses; four of them were superior (Triple white x Tinova), (Triple white x Giza 461), (Rina blanka x Giza 429) and (Tina x Giza 429) exhibited highly significant positive heterotic effects. For pod position on the main stem, the percentage of heterosis ranged from 3.71 to 29.18 %. The four crosses; (Tinova x Giza 2), (Triple white x Tina), (Giza 2 x Giza 716) and (Rena blanka x Giza 716) gave highly significant positive heterosis for this trait. Concerning pod length, only one cross showed highly significant positive heterotic effect (Tina x Giza 429). The most desirable heterotic effects were presented by (Rina blanka x Giza 2), (Rina blanka x Giza 716), (Rina blanka x Giza 461) and (Rina blanka x Giza 429) for seed yield per plant, crosses (Tina x Giza 461) and (Giza 461 x Giza 429) for number of seeds per plant, crosses (Rina blanka x Giza 461), (Triple white x Tinova) and (Triple white x Giza 461) for number of seeds per pod, crosses (Rina blanka x Giza 2), (Rina blanka x Giza 716), (Triple white x Giza 2), (Tina x Giza 716), (Tina x Giza 461) and (Giza 716 x Giza 429) for 100-seed weight.

The crosses; Rina blanka x Giza 461, Triple white x Tinova, Tina x Giza 429 showed the highest useful heterosis for most of traits followed by Rina blanka x Giza 716, Rina blanka x Giza 429, Triple white x Giza 2 and Triple white x Giza 461 for any three traits. These crosses, therefore, may be of specific importance in hybrid faba bean breeding programs. It could be concluded that the diversity of geographic origins is a key to genetic diversity and thus to hybrid vigor itself, geographically divers parents should produce more vigorous hybrids than parents of similar geographic origin. Similar conclusion was reached by El-Hosary (1981 and 1985) and others.

Table (1): Mean square estimates of ordinary analysis and combining ability analysis for yield and some other characters at two different locations (Moshtohor and Nubaria).

Source of variance	D.F.	Plant height (cm)	Number of pods / plant	First pod position (cm)	Pod length (cm)	Seed yield / plant	Number of seeds / plant	Number of seeds / pod	100 seed weight (gm)
Locations	1	0.13	159.31**	25.9952**	05.19**	17.93	167.55**	00.67**	781.76**
Rep. within loc.	4	2.69	00.89	1.3055	00.06	20.48*	21.25	00.03	11.37
Genotypes	35	533.03**	62.73**	54.2742**	11.90**	1092.52**	663.62**	00.38**	1700.01**
Parents	7	1120.62**	32.59**	59.6327**	20.95**	1419.15**	599.26**	00.45**	1630.65**
Crosses	27	365.15**	72.71**	49.818**	10.07**	1038.58**	688.05**	00.36**	1704.01**
Parents Vs. crosses	1	952.44**	04.26	137.0834**	00.23	262.68**	454.52**	00.45**	2077.57**
Genotypes X Locations.	35	166.85**	97.79**	48.4477**	01.40**	685.24**	986.58**	00.35**	403.26**
Parents x Locations	7	41.7**	17.79**	7.7307**	00.56**	146.64**	178.46**	00.02	41.53**
Crosses x Locations	27	205.15**	121.29**	60.1922**	01.58**	845.30**	1229.76**	00.43**	497.0**
Par. Vs. crosses x Loc.	1	08.96	23.19**	16.3652**	02.40**	133.9**	77.80*	00.46**	404.36**
G.C.A	7	2086.77**	51.05**	108.176**	54.20**	4164.42**	769.86**	01.06**	6671.13**
S.C.A	28	144.59**	65.66**	40.799**	01.40**	324.55**	637.05**	00.21**	457.24**
G.C.A x Locations	7	175.85**	151.33*	41.601**	01.42**	1519.18**	1471.73**	00.32**	6489**
S.C.A x Locations	28	164.60**	84.40**	50.159**	01.40**	476.76**	865.3**	00.36**	341.85**
Error	140	4.63	3.03	1.8299	00.10	7.63	20.23**	0.03	09.15
G.C.A / S.C.A		14.43	0.78	2.65	38.6	12.83	1.21	4.93	14.59

* and ** significant at .05 and .01 levels of probability, respectively.

Table (2): Estimation of General combining ability effects for the eight parents evaluated over the two locations for yield and other attributes.

Genotypes		Plant height (cm)	Number of Pods per Plant	First Pod Position on main stem (cm)	Pod length / Plant	Yield / Plant (gm)	Number of Seeds per Plant	Number of Seeds / Pod	100-Seed Weight (gm)
Rina Blanka	$(\hat{g}_i)$	07.73**	00.18	-00.42*	02.02**	16.32**	04.29**	00.20**	20.36**
	Mean	90.05	21.10	22.85	11.70	67.10	73.00	3.40	91.55
Triple White	$(\hat{g}_i)$	-08.81**	00.77	-00.86**	-00.80**	-08.31**	-02.31*	-00.21**	-08.62**
	Mean	54.70	18.00	19.05	06.35	23.00	49.85	2.80	46.10
Tinova	$(\hat{g}_i)$	-06.07**	00.78	-01.77**	-00.89**	-09.04**	00.94	-00.14*	-13.84**
	Mean	58.45	23.35	18.70	05.95	24.05	63.30	2.65	37.85
Tina	$(\hat{g}_i)$	-04.14**	-00.53	-01.05**	-00.46**	-04.52**	-03.43**	-00.06**	-02.85**
	Mean	69.05	19.05	21.25	06.80	33.80	55.80	2.95	60.40
Giza 2	$(\hat{g}_i)$	00.32	-00.59	-00.08	-00.19**	-01.41**	-01.90**	00.01	-00.55
	Mean	77.85	24.10	20.80	07.45	48.55	78.50	3.25	61.75
Giza 716	$(\hat{g}_i)$	04.14**	-01.16	01.82**	00.66**	04.69**	-00.50	00.09**	08.73**
	Mean	89.00	22.05	24.45	09.40	54.65	73.50	3.30	74.05
Giza 461	$(\hat{g}_i)$	05.82**	01.41	00.36*	-00.02	04.42**	06.22**	00.06**	00.41
	Mean	85.60	24.10	25.35	07.75	50.30	72.65	3.00	69.10
Giza 429	$(\hat{g}_i)$	01.03**	-00.86	02.01**	-00.33**	-02.15**	-03.31**	00.04*	-03.65**
	Mean	82.10	20.10	27.70	07.40	39.55	61.40	3.50	64.40
L.S.D. 0.05 $(\hat{g}_i)$		0.52	0.42	0.32	0.07	0.66	1.08	0.04	0.72
L.S.D. 0.01 $(\hat{g}_i)$		0.68	0.55	0.43	0.1	0.87	1.42	0.05	0.96
L.S.D. 0.05 $(\hat{g}_i - \hat{g}_j)$		0.78	0.63	0.49	0.11	1.0	1.63	0.06	1.09
L.S.D. 0.01 $(\hat{g}_i - \hat{g}_j)$		1.08	0.83	0.65	0.15	1.32	2.15	0.08	1.45

*and ** significant at 0.05and 0.01 levels of probability respectively

Table (3): Estimation of specific combining ability effects for the twenty eight crosses evaluated over the two locations for yield and other attributes.

Genotypes	Plant height (cm)	Number of Pods per Plant	First Pod Position on main stem (cm)	Pod length / Plant	Yield / Plant (gm)	Number of Seeds per Plant	Number of Seeds / Pod	100-Seed Weight (gm)
Rina Blanka x Triple White	01.01	-00.45	00.13	00.18	-01.96*	-11.15**	-00.05	15.80**
Rina Blanka x Tinova	02.01**	-00.52	-00.85	-00.42**	00.34	01.74	00.14**	-01.06
Rina Blanka x Tina	10.93**	09.72**	-01.88**	00.20	13.93**	28.77**	00.04	-03.87**
Rina Blanka x Giza 2	04.26**	01.35**	-04.3**	-00.82**	-09.39**	-07.16**	-00.45**	-05.31**
Rina Blanka x Giza 716	-03.68**	-01.47**	02.57**	00.04	-05.65**	-02.38	00.00	-09.93**
Rina Blanka x Giza 461	-04.10**	-02.29**	02.06**	-00.21*	-02.95**	-06.44**	-00.01	-00.19
Rina Blanka x Giza 429	-02.76**	-03.38**	-01.50**	00.61**	-04.18**	-06.76**	00.13*	12.39**
Triple White . x Tinova	03.64**	-01.25*	-00.23	00.57**	01.33	-03.16*	-00.03	10.50**
Triple White x Tina	-00.75	-02.90**	01.41**	00.09	-04.07**	-10.21**	-02.14**	02.20*
Triple White x Giza 2	02.36**	02.37**	00.12	00.15	04.95*	10.87**	00.10	-02.21*
Triple White x Giza 716	-02.92**	-01.57*	06.26**	00.36**	06.23**	-05.06**	-00.06	15.64**
Triple White x Giza 461	00.85	-00.59	02.33**	-00.61**	-01.16	-05.06**	-00.19**	00.71
Triple White x Giza 429	07.17**	00.47	00.93*	00.49**	03.35**	-01.42	-00.07	06.04**

Table (3): Count.

Genotypes		Plant height (cm)	Number of Pods per Plant	First Pod Position on main stem (cm)	Pod length / Plant	Yield / Plant (gm)	Number of Seeds per Plant	Number of Seeds / Pod	100-Seed Weight (gm)
Tinova	x Tina	01.34	02.29**	00.56	00.06	08.69**	04.68**	-00.13*	08.89**
Tinova	x Giza 2	04.05**	-03.14**	03.07**	-00.39**	-07.97**	-06.95**	00.13*	-04.00**
Tinova	x Giza 716	06.68**	02.27**	-00.02	01.20**	14.19**	13.44**	00.17**	01.81
Tinova	x Giza 461	03.81**	05.75**	02.33**	-00.04	08.12**	11.08**	-00.14**	03.04**
Tinova	x Giza 429	01.43*	-02.47**	-01.46**	-00.02	-04.23**	-05.60**	0.013*	-00.30
Tina	x Giza 2	00.78	-02.75**	02.37**	00.09	07.76**	-03.34*	00.15**	14.23**
Tina	x Giza 716	00.78	01.95**	01.05*	-00.73**	-03.82**	-03.87**	-00.35**	-01.44
Tina	x Giza 461	01.03	-01.16*	03.74**	-00.01	-08.65**	-04.32**	-00.02	-11.05**
Tina	x Giza 429	-05.14**	04.33**	00.92*	-00.58**	15.25**	12.69**	00.07	-03.04**
Giza 2	x Giza 716	-01.67*	-01.08	01.20*	-00.40**	-04.47**	-00.52	-00.06	-05.07**
Giza 2	x Giza 461	01.67*	-02.14**	03.34**	00.21*	-01.23	-03.12*	00.02	04.06**
Giza 2	x Giza 429	03.90**	03.78**	-02.11**	01.06**	00.30	05.10**	00.17**	00.17
Giza 716	x Giza 461	-02.39**	-00.72	02.16**	-00.12	00.38	-07.87**	-00.41**	-05.15**
Giza 716	x Giza 429	-07.23**	-01.55**	-03.00**	-00.21*	-01.63	-04.40**	-00.04	08.48**
Giza 461	x Giza 429	03.04**	-02.69**	-01.81**	-00.27**	-06.96**	-01.31	00.23**	-04.92**
L. S.D.	0.05 $(\hat{S}_{ij})$	1.37	1.11	0.86	0.20	1.76	2.87	0.11	1.93
L. S.D.	0.01 $(\hat{S}_{ij})$	1.81	1.47	1.14	0.26	2.33	3.79	0.14	2.55
L. S.D.	0.05 $(\hat{S}_{ij}-\hat{S}_{ik})$	2.36	1.91	4.93	0.18	3.31	1.49	0.34	4.48
L. S.D.	0.05 $(\hat{S}_{ij}-\hat{S}_{kl})$	3.13	2.54	6.55	0.24	4.41	1.97	0.45	5.96
L. S.D.	0.01 $(\hat{S}_{ij}-\hat{S}_{ik})$	2.22	1.80	4.60	0.17	3.12	1.40	0.32	4.23
L. S.D.	0.01 $(\hat{S}_{ij}-\hat{S}_{kl})$	2.95	2.39	6.18	0.23	4.16	1.86	0.43	5.63

*and ** significant at .05 and .01 levels of probability respectively.

Table (4): Percentages of heterosis over better parents (BP) and their significance at the two locations for eight characters of the 28 F_1 generations of faba bean.

Crosses		Plant Height (cm)	Number of Pods / Plant	First pod position	Pod length	Yield / plant (gm)	Number of seeds / Plant	Number of Seeds / Pod	100-Seed Weight / Plant (gm)
Rina Blanka	x T. White	16.71**	05.23**	00.01	-20.32**	-24.37**	-14.45**	-25.86**	05.40*
Rina Blanka	x Tinova	14.85**	-05.08**	-08.23**	-26.18**	-22.04**	-06.88**	-03.75	-18.71**
Rina Blanka	x Tina	21.97**	07.79**	-20.18**	-25.95**	-29.79**	-21.63**	-21.93**	-11.34**
Rina Blanka	x Giza 2	-02.54	-25.54**	-03.70**	-11.41**	-17.39**	-02.7**	-24.91**	10.50**
Rina Blanka	x Giza 716	-11.39**	-12.98**	29.60**	-02.26**	07.21**	-05.72**	-15.67**	24.18**
Rina Blanka	x Giza 461	15.45**	06.19**	-05.69**	-04.92**	18.69**	00.01	19.50**	-00.02
Rina Blanka	x Giza 429	-02.07	20.36**	-04.22**	-22.69**	10.46**	-03.49**	05.42	-09.74**
Triple White .	x Tinova	58.64**	41.25**	02.36*	01.34**	71.67**	-04.13**	43.27**	-07.58**
Triple White	x Tina	-01.37	07.71**	15.99**	-01.69**	-22.43**	-08.12**	-01.08	-21.31**
Triple White	x Giza 2	15.96**	-14.25**	09.78**	00.56*	-25.23**	-16.17**	-28.74**	13.90**
Triple White	x Giza 716	05.97**	-05.84**	11.70**	-23.64**	-26.96**	-20.41**	-24.65**	-05.79*
Triple White	x Giza 461	16.16**	23.06**	01.84	-09.16**	-02.78	-10.86**	07.70*	-07.69**
Triple White	x Giza 429	-03.91*	02.50	-04.78**	-13.94**	-24.77**	-10.81**	-06.90	-19.84**
Tinova	x Tina	-08.82**	-15.69**	09.35**	-06.62**	-16.65**	-06.15**	-14.12**	-13.81**
Tinova	x Giza 2	10.29**	-21.03**	13.29**	-06.93**	-37.85**	-17.37**	-33.58**	-08.03**
Tinova	x Giza 716	13.83**	-06.61**	02.29*	-12.88*	-20.06**	-14.75**	-15.27**	-05.65*
Tinova	x Giza 461	-03.35*	-10.96**	-16.63**	-09.98**	-28.77**	00.38**	-10.77**	-20.06*
Tinova	x Giza 429	11.47**	-16.48**	-00.32	-06.81**	-18.45**	-05.83**	-08.68*	-13.76**
Tina	x Giza 2	02.65	-04.64**	08.12**	-00.44	-09.96**	-07.60**	-12.27**	02.64
Tina	x Giza 716	-01.84	01.34	03.71**	-12.92**	-02.00	-14.11**	-12.92**	13.05**
Tina	x Giza 461	-01.84	-17.59**	01.26	-03.08**	04.03	03.77**	-13.67**	16.87**
Tina	x Giza 429	15.41**	20.13**	-17.43**	10.22**	-03.15	01.69**	00.43	- 02.74
Giza 2	x Giza 716	08.17**	-30.11**	17.94**	-14.78**	-26.8**	-04.35**	-31.26**	- 01.26
Giza 2	x Giza 461	07.77**	01.64	-00.13	-10.17**	-12.79**	-17.71**	-18.78**	- 02.48
Giza 2	x Giza 429	-00.94	-18.81**	01.51	-02.23**	-14.5**	-20.19**	-48.76**	- 07.43**
Giza 716	x Giza 461	-10.82**	-13.59**	-11.49**	-08.91**	-17.37**	-06.85**	-12.04**	- 09.48**
Giza 716	x Giza 429	-06.02**	-17.56**	-10.26**	-14.38**	-16.56**	-08.30**	-25.11**	11.41**
Giza 461	x Giza 429	06.10**	-18.71**	-11.21**	-06.03**	-20.51**	07.51**	-10.72**	-12.00**
L.S.D. 0.05		3.13	2.82	2.19	0.50	4.47	0.27	7.27	4.89
L.S.D. 0.01		4.17	3.72	2.89	0.66	5.90	0.36	9.61	6.46

*and ** significant at .05 and .01 levels of probability respectively.

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اداء آباء الفول البلدى فى التهجينات و المواقع المختلفة

عبد الوهاب محمد حسن*، محمد سراج الدين عبد الصبور*،
مخلوف محمد محمود بخيت*، سامى عطية عبده**

* قسم الوراثة – كلية زراعة مشتهر – جامعة بنها، مصر.
** المركز القومى للبحوث، الدقى، مصر.

يهدف هذا البحث لدراسة التباين و تقدير قوة الهجين والقدرة العامة والخاصة على التآلف ، ولقد استخدمت في هذه الدراسة ثمانية أصناف أبوية محلية وأجنبية على درجة عالية من التباين الوراثي هي: **رينا بلانكا، تربل وايت، تينوفا، تينا، جيزة ٢، جيزة ٧١٦، جيزة ٤٦١ و جيزة ٤٢٩.** وكانت أهم الصفات المدروسة هي صفة المحصول ومكوناته (طول النبات – عدد الفروع والقرون للنبات – ارتفاع أول قرن على النبات – طول القرن – وزن محصول النبات – عدد بذور النبات – عدد بذور القرن – وزن المائة بذرة).

تم التهجين النصف دائري بين الأصناف الأبوية في صوبه التهجينات في الموسم الشتوي ١٩٩٥/ ١٩٩٦ وفى الموسم الشتوى١٩٩٦/١٩٩٧ تم تقييم جميع الهجن الناتجة من الموسم الأول (٢٨ هجين) بالإضافة إلى الأصناف الأبوية في تصميم تجربة قطاعات كاملة العشوائية باستخدام ثلاثة مكررات وذلك في موقعين هما كلية الزراعة بمشتهر ومنطقة النوبارية بهدف تقدير قوة الهجين كنسبة مئوية لانحراف الجيل الأول عن متوسط الأبوين وكذلك أفضل الأبوين ، كذلك تم تقدير القدرة العامة و الخاصة على التآلف. كان التباين الراجع لتأثير المواقع مرتفع المعنوية مع جميع صفات المحصول و مكوناته فيما عدا صفتي طول وعدد فروع النبات، فحين أظهرت كل من التراكيب الوراثية والأباء وكذلك الهجن تباين عالي مع جميع الصفات للموقعين والتحليل المشترك بينهم ،و كذلك كانت معنوية التباين الناتجة من التفاعل بين الآباء و الهجن ، وبين التراكيب الوراثية والمواقع ،وبين الهجن والمواقع فيما عدا بعض الصفات. أظهر الصنف رينا بلانكا تفوقا في صفة طول النبات في موقع مشتهر ومتوسط طول القرون في الموقعين ومحصول البذور وعددها للنبات في النوبارية وكذلك صفتي متوسط عدد بذور القرن ووزن المائة بذرة بالموقعين معا وذلك عند

مقارنته مع باقي الآباء. أعطى الهجين **رينا بلانكا × جيزة 461** أطول نباتات بالموقعين بينما الأب **تربل وايت** هو اقصر النباتات في الموقعين. تفوق الهجين **رينا بلانكا × تينوفا** في عدد الفروع بالموقعين بينما الأقل هو **تربل وايت** بمشتهر و **تينوفا** في النوبارية، ظهر انخفاض في عدد قرون النبات في كل من **رينا بلانكا × جيزة 716** بموقع مشتهر و **رينا بلانكا × جيزة 2** بالنوبارية ، وبينما التفوق كان مع الهجين **تربل وايت × تينوفا** بموقع النوبارية والهجين **تربل وايت × جيزة ٤٦١** بموقع مشتهر. كان الهجين الأعلى محصول في البذور هو **رينا بلانكا × جيزة 716** بالنوبارية و **رينا بلانكا × جيزة 429** بمشتهر، بينما الأقل كان **تربل وايت × تينوفا** بمشتهر. كان التباين الراجع لقوة الهجين معنويا لكافة الصفات تحت الدراسة في الموقعين وكذلك بيانات التحليل المشترك . تم الحصول على قوة هجين عالية بالنسبة للمحصول في تسعة هجن شملت ثلاثة منهم على الصنف **رينا بلانكا** بمشتهر و ثلاثة عشر هجين شملت أربعة منهم على نفس الصنف ولكن بالنوبارية .