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Genetic Analysis and Heterosis of Some Yield Characters under Saline and Non -Saline Treatments in Faba Bean (*Vicia faba* L.)

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Abstract: A set of five parental half diallel crosses in faba bean *(Vicia faba L.)* was evaluated to study combining ability and heterosis of some yield characters under saline and non-saline conditions. Significant genotypic differences among the parents and their hybrid were observed for almost all characters. Mean squares due to GCA and SCA were significant for flowers number per plant under control and 5000 ppm , pods no. per plant under 1000 and 5000 ppm, pod length under all saline treatment seeds no. Per pod under 1000 ppm and 100 seeds weight under control, 1000 and 3000 ppm revealing the presence of both additive and non-additive gene effects for these characters. Mean squares due to GCA only were significant for flowers no. per plant under 1000 ppm, pods no. per plant under control and 3000 ppm, pod length under control, seeds no. per pod under 3000 and 5000 ppm and 100 seed weight under 5000 ppm indicating that these characters were mainly controlled by additive gene effects. The parents which showed better combining ability were Giza 717, Giza 429 and Giza 417 for pods number per plant under 5000 ppm, Giza blanka, Giza 717 and Giza 429 for pod length under 5000 ppm and Giza blanka and Giza 429 for seeds no. per pod under 5000 ppm. The ratio σ^2 A / σ^2 D showed a predominance of dominant gene action for all characters under all treatments except for number of flowers per plant under 3000 ppm and number of pods per plant under control which are mainly controlled by additive gene action. The hybrids which have been identified as promising genotypes based on the significance of heterosis under control were(P_3xP_4) for flower number per plant , pods no. per plant and pod length and (P_1xP_2) for 100 seeds weight , while the promising hybrids under salinity were (P_1xP_4) and (P_4xP_5) under 1000 and 5000 ppm respectively for flowers number ,(P_4xP_5) under 1000 ppm and (P_3xP_4) under 3000 and 5000 ppm for number of pods per plant , (P_4xP_5) under 1000 and 3000 ppm and (P_2xP_3) under 5000 ppm for pod length , both (P_2xP_4) and (P_2xP_5) under 1000 ppm , (P_1xP_4) under 3000 ppm and (P_3xP_4) under 5000 ppm for number of seeds per pod and (P_4xP_5) under 1000 ppm , (P_1xP_3) under 3000 ppm and (P_1xP_5) under 5000 ppm for 100 seeds weight , meanwhile the promising hybrids based on the significance of both SCA and heterosis were , (P_4xP_5) and (P_1xP_3) respectively under 5000 ppm for flowers number per plant , (P_2xP_5) under control and 5000 ppm and (P_3xP_4) and (P_3xP_5) respectively under 3000 ppm for pods number per plant , (P_2xP_4) and (P_2xP_5) respectively under 1000 ppm and for seeds number per pod.

Keyword: Faba bean, general and specific combining ability, heterosis, saline

INTRODUCTION

Increasing the area of faba bean and some of the main legume crops which provide the Egyptians with cheap protein foods consider one of the most important aims of agriculture policy in Egypt.

Salinity in soil and irrigation water is a problem that restricts yield and yield components of various crops .Faba bean area can be increased by using under ground water and El-salam canal water which considered low quality irrigation water for most crops. Increasing area unit productivity through utilizing salt tolerant varieties produced from breeding programs must be an important aim of faba bean breeders. Successful hybridization program depends upon genetic information about the nature of gene action which controls the characters under study beside identification of promising parents and crosses. Many investigators studied the genetic behavior of growth and yield characters in fada bean under salinity and drought conditions; AL-katib et al. (1994), Shao et al (1994),Ashraf and Waheeb(1998).

EL-Bendary (1998) , Dua (1998) , El-Hosary et al (1998), Chauhn and Singh (2000) and El-Hosary et al. (2002).The present investigation was conducted to study heterosis as well as combining ability for flowers number per plant, pod number per plant, pod length, seeds number per pod and 100 seeds weight (gm).

MATIRIALS AND METHODS

Five broad bean varieties obtained from the agriculture research center namely; Giza blanka as P1, Giza 717 as P2, Giza 429 as P3, Giza 417 as P4 and Giza 674 as P5 were used and evaluated at the Experimental farm of the faculty of Agriculture , S.C.U. Diallel crosses were made between the five parents during the season 2003-2004 to obtain ten F1 hybrids. During the season 2004-2005, seeds of the five parental genotypes and their F1,s were sown in plastic pots, containing air dried sandy soil in randomized block design with three replicates, each replicate represented by five pots, each pot contain four plants for control and the salt treatments. Three concentrations of salt irrigation (1000ppm-3000ppm-5000ppm) were prepared by resolving 1, 3 and 5gm of sea salts respectively in one litter of irrigation water as salt treatments beside the control (0ppm) were used. The other normal agricultural procedures were applied. Five plants from each replicate were randomly chosen for recording the observations for five yield characters, flower number/plant ,pods number per plant, pod length, seeds number per pod and 100 seeds weight (gm).The analysis of variance for combining ability was done following Griffing b (1956) model 1-method 2. Heterosis was measured as a percentage of increase or decrease in F1' s over better parental values according to Bhatt (1971).

RESULTS AND DISCUSSION

The analysis of variance for five yield studied characters (Table, 1) showed significant differences among the parents and their hybrids for almost all characters under saline and non-saline treatments ,suggesting the presence of considerable genetic variability for these characters .Mean squares due to general combining ability (GCA) (Table,1) were significant for all the studied characters under all treatments, except for flowers no. per plant under3000ppm and seeds no. per pod under control indicating the importance of additive effects in the genetic control of these characters .Meanwhile, mean squares due to specific combining ability (SCA) were significant for flower numbers under control and 5000ppm, pods number per plant under 1000 and 5000ppm, pod length under all saline treatments, seeds number per pod under 1000ppm and 100seeds weight under control, 1000ppm and 3000ppm, revealing the importance of non additive effects also in the genetic control of these characters. Data in table (1) showed that variances due to GCA were higher than their respective SCA for almost all characters suggesting the predominance of additive gene effects in controlling these characters. Similar results were reported by Ashraf and waheeb(1998),El-Hosary et al (1998), El-Hosary et al(2002)and Aly and Ammar (2003).

Data in (Table, 2) showed that the parents which had positive and significant general combining ability effects were Giza717, Giza 429 and Giza 417 for pods number per plant under 5000 ppm , Giza Blanka, Giza 717 and Giza 429 for pod length under 5000 ppm and Giza Blanka and Giza 429 under 5000 ppm for seeds no. per pod suggesting that these characters were controlled by dominant genes and that these parents are good combiners for the three characters under 5000 ppm saline treatments . These results indicated that the parent Giza 429 which had high and positive GCA for the three characters under 5000 ppm is considered the best combiner under saline treatments, in the same time the parent 674had negative and significant GCA effects for the same characters under the same saline treatments.

The estimates of the specific combining ability effects (Table, 2) showed that the crosses which had positive and significant SCA effects under normal conditions were(P_1xP_4) and (P2xP5) for pods number per plant and (P2 x P4) for pod length . Meanwhile, the crosses which had positive and significant SCA effects under saline treatments were (P1 x P3) and (P4xP5) under 5000 ppm for flowers no. per plant, (P1xP4) and (P2xP5) under 1000 ppm, (P1xP2), (P2xP5), (P3xP4) and (P3xP5) under 3000 ppm and (P1xP4), (P2xP5) and (P3xP4) under 5000 ppm for pods no. per plant, (P1xP2) , (P1xP5) and (P3xP4) under 1000 ppm and (P1xP5) and (P2xP4) under 3000 for pod length and(P1xP4),(P2xP4) , (P2xP5) and (P3xP5) under 1000 ppm for seeds no. per pod. The crosses which had negative significant SCA effects under normal conditions were (P1 x P2), (P1 x P5) and (P4 x P5) for pods number per plant and (P4 x P5) only for seeds number per pod.

Under saline treatments the crosses which had negative significant SCA effects for flowers number per plant were (P1 x P5) , (P2xP4) and (P3 x P5) under 5000 ppm , for pods number per plant were (P1 x P2) ,(P1 x P5) and (P4 x P5) under 1000 ppm , (P1 x P3) , (P2 x P3) and (P4 x P5) under 3000 ppm and (P4 x P5) under 5000 ppm , for pod length were (P1 x P3) ,(P1 x P4) and (P2 x P5) under 1000 ppm , (P2 x P5) under 3000 ppm and (P3 x P4) under 5000 ppm and for seeds number per pod were (P1 x P2) , (P1 x P5) ,(P2 x P3) , (P3 x P4) and (P4 x P5) under 1000 ppm and the crosses (P1 x P3) only under 5000 ppm .

Most of the crosses which had positive significant SCA effects values under the saline treatment 5000 ppm for most characters involved at least one good general combiner parent. These results showed that none of the crosses exhibited significant and positive SCA effects for every character under normal or saline treatments, so no single cross could be considered the best hybrid. The cross (P2 x P5) exhibited significant desirable SCA effects for pods number per plant under normal and saline treatments and for seeds number per pod under 1000 ppm . In some crosses , the two involved parents had high GCA effects but gave low SCA effects such as (P4 x P5) , (P3 x P4) and (P3 x P5) for flower number under control , 1000 and 3000 ppm respectively , (P4 x P5) under control , 1000 and 3000 ppm and (P2xP3) and (P2xP4) under 5000 ppm for pods no. per plant ,(P1xP2) under 5000 ppm for pod length, (P1 x P3) and (P3 x P4) under normal condition , (P4 x P5) under 1000 ppm , (P1 x P3) and (P1 x P4) under 3000 ppm and (P1 x P3) under 5000 ppm for seeds number per pod and (P3 x P5) under 1000 ppm and (P3 x P4) and (P3 x P5) under 3000 ppm for 100 seeds weight . Jinks and Jones (1958) suggested that the low values of SCA effects in such cases might be attributed to some internal cancellation of favorable genes or to genetic similarity of the involved parents, at the same time , low GCA and high SCA values were observed in the crosses (P2 x P3) under control , (P2 x P5) under 1000ppm and (P1 x P2) and (P1 x P3) under 5000 ppm for flowers number per plant , (P1 x P3) and (P2xP3) under control , (P1xP2) under 3000 ppm and (P1xP5) under 5000 ppm for pods number per plant, (P2 x P4) and (P2 x P5) under control , (P2 x P4) and (P3 x P4) under 1000 ppm , (P2 x P3) and (P2 x P4) under 3000 ppm and (P4 x P5) under 5000 ppm for pod length , (P1 x P3) and (P1 x P4) and (P2xP4) under 1000 ppm and (P2 x P5) under 5000 ppm for seeds number per pod and (P2 x P4) under 1000 ppm and (P2 x P3) and (P3 x P4) under 5000 ppm for 100 seeds weight , this might be attributed due to the genetic diversity among the parents (Table,2).

The ratio between additive and dominance variance (σ^2A/σ^2D) revealed that additive gene action were more important for flowers number under 3000 ppm and for pods number per plant under control. Meanwhile dominant gene action was more important in the genetic control for all the characters under all treatment except for flower number under 3000 ppm and number of pods per plant under control. The results revealed the importance of both additive and dominance effects for all the characters under saline and non saline treatments.

Table (1): Mean squares for five yield characters under saline and non-saline treatments

Source of Variance	d.f	Flowers no./plant				Pods no./plant				Pod length				Seeds no. /pod				1oo seeds weight			
		Con.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm
Genotypes	14	47.3*	41.7*	15.3	22.5*	3.4*	1.4*	2.4*	1.1*	20.6	2.2*	2.5*	3.2*	1.0*	0.6*	1.1*	1.4*	152.4*	136.3*	358.3*	261.9*
GCA	4	71.1*	68.4*	22.1	16.3*	6.9*	1.9*	5.6*	2.3*	6.2*	4.4*	2.9*	6.0*	0.64	0.36*	1.8*	3.1*	121.7*	60.6*	585.5*	473.9*
SCA	10	17.8*	21.0	6.37	19.3*	0.91	0.64*	0.33	0.86*	0.6	0.74*	1.1*	0.74*	0.31	0.33*	0.13	0.24	89.5*	101.8*	135.8*	113.8

* Significant at 0.05 probability level

Table (2): General and specific combining ability effects for five yield characters under saline and non saline treatment

	Flowers no. / plant				Pods no. / plant				Pod length				Seeds no. / pod				Loo seeds weight			
	con.	1000 ppm	3000 ppm	5000 ppm	cont.	1000 ppm	3000 ppm	5000 ppm	cont.	1000 ppm	3000 ppm	5000 ppm	cont.	1000 ppm	3000 ppm	5000 ppm	cont.	1000 ppm	3000 ppm	5000 ppm
P1	-3.00	-3.00	-2.60	-0.10	-1.10	-0.40	-0.80	-0.3*	0.70	1.10	0.80	0.7*	0.10	0.00	0.40	0.3*	4.20	1.80	-1.60	6.00
P2	-1.50	-1.50	-0.02	-1.80	-0.20	-0.60	-0.80	0.3*	-1.00	-0.60	-0.70	0.1*	-0.40	-0.30	-0.7*	-0.5*	-0.90	-3.90	-13.10	-7.30
P3	-0.60	0.40	0.40	-0.50	-0.10	0.20	0.80	0.5*	1.10	-0.40	-0.20	0.6*	0.20	0.00	0.30	0.8*	3.50	0.90	2.40	-4.90
P4	4.40	4.40	1.60	0.50	1.30	0.40	0.60	0.3*	-0.50	-0.50	-0.10	-0.10	0.30	0.00	0.20	0.10	-0.29	-1.30	4.90	-3.10
P5	0.60	-0.30	0.50	1.90	0.10	0.30	0.20	-0.7*	-0.30	0.40	0.30	-1.3*	-0.20	0.20	-0.10	-0.7*	-3.90	2.40	7.50	9.40
P1xP2	-4.10	-2.30	-0.50	1.40	-0.8*	-0.5*	0.3*	-0.30	-0.50	0.8*	-0.60	-0.40	-0.40	-0.3*	0.10	0.10	10.50	7.80	-5.20	1.40
P1xP3	-1.00	1.90	3.10	3.6*	0.10	0.10	-0.4*	-0.50	0.50	-0.4*	0.30	0.70	-0.30	0.10	-0.30	-0.5*	1.60	3.10	9.30	-4.90
P1xP4	2.00	4.80	-1.20	-1.80	0.9*	0.8*	0.20	0.7*	-0.30	-0.8*	-0.60	0.20	0.30	0.4*	-0.20	0.20	-4.00	-11.50	-8.50	-2.70
P1xP5	3.10	-0.60	-1.40	-3.2*	-0.2*	-0.4*	-0.10	0.10	0.30	0.5*	0.8*	-0.40	0.40	-0.2*	0.40	0.30	-8.10	0.60	4.40	6.20
P2xP3	0.80	-0.30	-0.50	-0.10	0.20	-0.20	-0.4*	-0.10	-0.60	-0.10	0.50	0.50	0.20	-0.3*	0.20	0.30	-5.70	-2.60	4.80	10.70
P2xP4	2.80	1.00	0.60	-2.1*	-0.30	-0.10	-0.20	-0.50	0.8*	0.10	0.9*	0.00	0.40	0.4*	-0.10	-0.40	-2.10	2.00	4.40	-6.70
P2xP5	0.60	1.70	0.40	0.80	0.9*	0.7*	0.3*	0.8*	0.30	-0.8*	-0.8*	-0.10	-0.20	0.2*	-0.20	0.10	-2.70	-7.20	-4.00	-5.30
P3xP4	-0.40	-1.20	-1.50	-1.00	-0.10	-0.20	0.5*	0.6*	0.10	0.5*	-0.60	-0.90	-0.20	-0.3*	0.30	0.40	-0.30	1.20	-4.80	2.20
P3xP5	0.70	3.40	-1.10	-2.4*	-0.20	0.30	0.3*	-0.10	-0.10	0.10	-0.20	-0.30	0.30	0.5*	-0.20	-0.20	4.40	-1.70	-4.30	-8.00
P4xP5	-4.30	-4.60	2.10	4.9*	-0.6*	-0.6*	-0.5*	-0.8*	-0.60	0.20	0.20	0.70	-0.5*	-0.5*	-0.10	-0.20	6.40	8.30	8.90	7.20

Table (3): Addetive (σ^2 A) and dominance (σ^2 D) genetic variance and the ratio σ2 A/ σ^2 D for five yield characters under saline and non-saline treatments

Source of variance	Flowers no./plant				Pods no./plant				Pod length				Seeds no. /pod				1oo seeds weight			
	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm
σ^2 A	5.30	2.70	3.30	0.70	2.70	0.10	0.50	0.50	0.60	0.10	0.80	0.10	0.10	0.20	0.60	0.02	50.20	19.50	92.70	83.30
^{2} D	84.00	36.00	1.70	25.40	2.40	3.00	3.80	5.10	6.30	0.90	3.60	1.90	0.60	0.60	0.90	1.60	115.00	137.70	202.70	111.80
^{2} A/ σ^2 D	0.06	0.08	1.90	0.03	1.10	0.03	0.10	0.10	0.10	0.10	0.20	0.10	0.20	0.30	0.70	0.01	0.40	0.10	0.50	0.70

Table (4): Expression of hetrosis % over better parental values in ten F1 hybrids for five yield characters under saline and non-saline treatments

	Flowers no./plant				Pods no./plant				Pod length				Seeds no. /pod				1oo seeds weight			
	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 Ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm	Cont.	1000 ppm	3000 ppm	5000 ppm
P1xP2 (1)	-0.44*	-0.43*	-0.05*	-0.08*	-0.71*	-0.55*	-0.73*	-0.20*	-0.42*	0.38	-0.09*	0.50	-0.45*	-0.36*	0.17*	0.50*	0.05*	0.06*	-0.29*	-0.08*
P1xP3 (2)	-0.23*	-0.48*	0.00	0.19*	-0.53*	-0.25*	-0.45*	-0.20*	-0.08*	0.11*	0.35	0.67	-0.33*	-0.18*	0.13*	0.60*	0.01*	0.06*	0.09*	-0.13*
P1xP4 (3)	0.19	0.21*	-0.15*	-0.35*	-0.12*	0.00	-0.36*	0.20*	-0.35*	0.06*	0.00	0.10*	-0.09*	-0.09*	0.29*	0.60*	-0.11*	-0.13*	-0.10*	-0.07*
P1xP5 (4)	0.05*	-0.23*	-0.39*	-0.23*	-0.53*	-0.27*	-0.55*	-0.20*	-0.27*	0.48	0.32	-0.21*	-0.18*	-0.18*	0.00	0.00	-0.16*	0.05*	0.01*	0.14*
P2xP3 (5)	-0.02*	-0.23*	0.00	-0.41*	-0.08*	-0.33*	-0.14*	0.80*	-0.05*	-0.08*	-0.09*	0.17*	-0.27*	-0.30*	0.00	0.60*	0.06*	-0.01*	-0.06*	-0.01*
P2xP4 (6)	0.36	0.30	-0.04*	-0.38*	0.17*	-0.18*	-0.33*	0.40*	-0.03*	-0.01*	0.00	0.00	0.00	0.13*	-0.40	-0.33*	-0.04*	-0.02*	-0.15*	-0.22*
P2xP5 (7)	0.04*	0.02*	-0.12*	-0.05*	0.17*	0.00	-0.33*	0.60*	-0.08*	-0.01*	-0.24*	-0.29*	-0.33*	0.13*	-0.50	-0.50	-0.06*	-0.09*	-0.22*	-0.17*
P3xP4 (8)	0.33*	-0.08*	-0.14*	-0.21*	0.36*	-0.08*	0.44*	0.83*	0.10*	0.0	-0.18*	-0.07*	-0.25*	-0.27*	0.0	0.67*	-0.03*	0.02*	-0.08*	-0.20*
P3xP5 (9)	0.18*	-0.08*	-0.18*	-0.21*	0.0	0.0	0.22*	0.0	0.10*	0.08*	-0.03*	-0.21*	-0.25*	0.0	-0.20*	0.0	0.01*	0.03*	-0.10*	-0.18*
P4xP5 (10)	0.05*	-0.17*	0.33	0.22*	-0.18*	0.17*	-0.27*	-0.40*	-0.47*	0.11*	0.06*	-0.20*	-0.36*	-0.27*	0.14*	-0.20*	-0.09*	0.11*	0.24	0.10*

* Significant at 0.05 probability level

The most useful method for using SCA is the utilization of heterosis. Heterosis over better parent (Table, 4) showed that the crosses which had positive and significant heterotic effect over better parent and considered the best crosses for flowers number per plant were (P_3x P_4) and (P_3 x P_5) under control, (P_1 x P_4) and (P_2 x P_5) under 1000 ppm and (P_4 x P_5) and (P_1 x P_3) under 5000 ppm respectively. For pods number per plant the best cross which had positive and significant heterotic effects were (P_3 x P_4) under control,(P_4 x P_5) under 1000 ppm, (P_3 x P_4) and (P_3 x P_5) respectively, under 5000 ppm. The best crosses which had positive and significant heterotic effects over better parent for pod length were both (P_3 x P_4) and (P_3 x P_5) under control, both (P_1 x P_3) and (P_4 x P_5) under 1000 ppm , (P_4 x P_5)under 3000 ppm and (P2xP3) and (P1xP4) respectively, under 5000ppm.However the crosses had positive and significant heterotic effects over better parents and could be considered the best crosses for seeds number per pod were both (P_2 x P_4) and (P_2 x P_5) under 1000ppm , (P_1 x P_4), (P_4 x P_5)and (P_1 x P_2) respectively, under 3000ppm and (P3xP4) ,all of (P_1 x P_3) , (P_1 x P_4) and (P_2 x P_3)and (P_1 x P_2) respectively, under 5000ppm for 100seeds weight the crosses which had positive and significant heterotic effects and considered the best crosses were (P_2 x P_3) and (P_1 x P_2) under control , (P_4 x P_5) and both (P_1 x P2) and (P_1 x P_3) under 1000ppm respectively , (P_1 x P_3) and (P_1 x P_5) under 3000ppm respectively, and (P_1 x P_5)and (P_4 x P_5) under 5000ppm.

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التحليل الوراثي و قوة الهجين لبعض صفات المحصول تحت ظروف الملوحة في الفول

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استخدم التهجين الدائري ذو الاتجاه الواحد لخمسة أباء من الفول بغرض دراسة القدرة علي الائتلاف و قوة الهجين لبعض صفات المحصول تحت ظروف الملوحة (١٠٠٠و٣٠٠٠و ٥٠٠٠ جزء في المليون). أظهرت النتائج وجود فروق وراثية معنوية بين الاباء و الهجن الناتجة عنها بالنسبة لمعظم الصفات تحت معظم المعاملات، كما كانت القدرة العامة علي الائتلاف هي المعنوية فقط بالنسبة لصفة عدد الازهار في النبات تحت المعاملة ١٠٠٠ جزء في المليون و بالنسبة لصفة عدد القرون في النبات تحت المعاملة العادية و معاملة الملوحة ٣٠٠٠ جزء في المليون و بالنسبة لصفة طول القرن تحت المعاملة العادية و بالنسبة لصفة عددالبذور في القرن تحت معاملتي الملوحة ٣٠٠٠، ٥٠٠٠، جزء في المليون و بالنسبة لصفة وزن ١٠٠ بذرة تحت معاملة ٥٠٠٠ جزء في المليون مما يدل علي وجود الفعل الجيني المضيف فقط بالنسبة لهذة الصفات تحت هذه المعاملات ، بينما كانت كلا من القدرة العامة و القدرة الخاصة علي الائتلاف معنوية تحت بقية المعاملات لنفس الصفات مما يدل علي وجود الفعل الجيني المضيف و غير المضيف لهذه الصفات.

كانت أفضل الأباء بالنسبة للقدرة علي الائتلاف هي (جيزة ٧١٧) ، (جيزة ٤٢٩)، (جيزة٤١٧) بالنسبة لصفة عدد القرون في النبات تحت ظروف الملوحة ٥٠٠٠ جزء في المليون و الاباء (جيزة بلانكا)، (جيزة ٧١٧) ، (جيزة ٤٢٩)بالنسبة لصفة طول القرن تحت ظروف الملوحة ٥٠٠٠ جزء في المليون بينما كانت الأباء (جيزة بلانكا) ، (جيزة ٤٢٩) هي الأفضل بالنسبة لصفة عدد البذور في القرن تحت ظروف الملوحة ٥٠٠٠ جزء في المليون أيضا .

أوضحت النسبة بين التباين الوراثي الراجع للاضافة الي التباين الوراثي الراجع للسيادة أهمية الفعل الجيني الراجع للسيادة في جميع الصفات تحت جميع المعاملات ما عدا صفتي عدد الازهار في النبات تحت ظروف الملوحة ٣٠٠٠ جزء في المليون و صفة عدد القرون في النبات تحت الظروف العادية حيث كان الفعل الجيني المضيف هو الاكثر أهمية .

اعتمادا علي معنوية قوة الهجين يمكن اعتبار ان الهجن المبشرة تحت ظروف المعاملة العادية هي (P_3xP_4) بالنسبة لصفات عدد الأزهار في النبات و عدد القرون في النبات و طول القرن و الهجن (P_1xP_2) بالنسبة لصفة وزن ١٠٠ بذرة بينما كانت الهجن المبشرة تحت معاملات الملوحة هي ($P_1x P_4$) تحت ١٠٠٠ جزء في المليون ، (P_4xP_5) تحت ٥٠٠٠ جزء في المليون بالنسبة لصفة عدد الأزهار في النبات و الهجن (P_4xP_5) تحت ١٠٠٠ جزء في المليون و (P_3xP_4) تحت ٣٠٠٠و ٥٠٠٠ جزء في المليون بالنسبة لصفة عدد القرون في النبات و الهجن (P_4xP_5) تحت ١٠٠٠و ٣٠٠٠ جزء في المليون و (P_2xP_3) تحت ٥٠٠٠ جزء في المليون بالنسبة لصفة طول القرن و الهجن (P_2xP_4) و (P_2xP_5) تحت ١٠٠٠ جزء في المليون و (P_1xP_4) تحت ٣٠٠٠ جزء في المليون و (P_3xP_4) تحت ٥٠٠٠ جزء في المليون بالنسبة لصفة عدد البذور في القرن بينما كانت الهجن (P_4xP_5) تحت معاملة ١٠٠٠ جزء في المليون و (P_1xP_3) تحت المعاملة ٣٠٠٠ جزء في المليون و (P_1xP_5) تحت معاملة ٥٠٠٠ جزء في المليون هي أفضل الهجن بالنسبة لصفة وزن ١٠٠ بذرة.

اعتمادا علي معنوية كلا من القدرة الخاصة علي الائتلاف مع قوة الهجين فان الهجن المبشرة هي (P_4xP_5) و(P1xP3) تحت معاملة ٥٠٠٠ جزء في المليون بالنسبة لصفة عدد الازهار في النبات و الهجن (P_2xP_5) تحت المعاملة العادية و معاملة ٥٠٠٠ جزء في المليون و (P3xP4)تحت المعاملة ٣٠٠٠ جزء في المليون بالنسبة لصفة عدد القرون في النبات و الهجين (P_2xP_4) تحت معاملة ملوحة ١٠٠٠ جزء في المليون بالنسبة لصفة عدد البذور فى القرن.