Evaluation of some Hybrids Faba Bean (*Vicia Faba L.*)to Chocolate Spot Disease (*Botrytis Fabae Sard*).

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ABSTRACT

Two genetic breeding stocks for resistance to chocolate spot disease ICARUS and ILB 938 with the commercial variety (Nubaria 1) which is recommended for planting in new reclaimed land and the highly susceptible cultivar Giza 40 were used as parental genotypes to study the mode of inheritance of resistance to chocolate spot disease caused by (*Botrytis fabae*, Sard), yield and some of its components and earliness in flowering in faba bean using the diallel mating design under artificial infection.

Six crosses (Nubaria1x Giza 40, ILB938X Giza 40, Giza 40 x Nubaria1, Nubria1x ICARUS, Giza 40 x ILB938 and Nubria1x ILB938) had significant constant negative heterosis percentage in the studied characters according to mid- parent for chocolate spot disease.

Six crosses revealed negative heterosis percentage in the studied characters according to high- parent for chocolate spot disease and number of branches/plant .

Moreover, high GCA/SCA ratio's, which largely exceeded the unity were obtained with regard to chocolate spot disease, days to flowering, days to maturity, number of seeds/plant and 100-seed weight.

Parent ILB938 seemed to be the best combiner for chocolate spot disease, the parent Giza 40 was the best combiner for days to flowering and days to maturity, plant height and number of pods/plant and parent Nubria1 gave the best combiner for number of branches/plant, number of seeds/plant, seed yield/plant and 100-seed weight.

INTRODUCTION

Faba bean (*vicia faba*,l.) is the major legume crop in Egypt due to its high nutritive value in both energy and protein content, and its use as a break crop in intensive cereal systems. The average cultivated area devoted to faba bean represented 266,000* feddan with an average seed yield of 9.17 ardab /feddan during the last five season 2002/2006. About 85% of the total area is located in North Delta and reclaimed lands at Nubaria region where chocolate spot (*Botrytis fabae Sard*) and rust (*Uromyces fabae*) diseases prevailed and severely attacked the crop with an average 39.7% yield losses, particularly during wet season **(Mohamed,1982)** . Both diseases (chocolate spot and rust) reduced faba

bean production when a virulent pathogen and a susceptible host are brought in an environment that favor disease development.
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During the last two decades the food legumebreeding program had identified and developed high yielding varieties with improved level of resistance to both diseases. Disease management is based mainly on partial protection. However, development of resistant cultivars is the best practical, most efficient and economical approach. A high degree of additive genetic control the resistance of chocolate spot disease. **Mohamed (1982)** tested the resistance level of several segregating generations, introductions and cultivars under field conditions at Sakha and Nubaria Research Stations. Some of the tested entries showed high level of resistance **El-Hady (1988)** indicated that the presence of dominant genes for resistance to chocolate spot in some faba bean crosses and the additive gene effect were stable over a rang of years and narrow sense heritability estimates ranged from 69%-95%. **El-Hady et al (1998)** reported that moderate heritability values in broad sense were detected with a range of 68.11to 79.2% for resistance to chocolate spot disease which indicated the presence of genetic variability among all studied crosses.
Seed yield is a complex trait and is quantitatively inherited with low heritability value. The low heritability, and consequently limited genetic advance for yield in response to selection had led many scientists to search for characters which are associatedwith yield but which are more highly heritable. Therefore, yield itself may not be the best criterion for selection, so breeding for high yielding ability as associated with various morphological attributes such as number of pods, seed/plant and seed size may be used in the construction of selection indices for yield improvement Several authors reported that the manifestation of heterosis effects in faba bean ranged from significantly negative to significantly positive estimates for yield and its components **(Abo El-Zahab et al,1994; El-Hosary et al, 1998; El-Tabbakh and Ibrahim, 2000 El-Hosary et al, 2002; El-Galaly ,2003and Abou-Zied 2007).**
Combining ability helps the breeder to identify the best combiners which may be hybridized either to exploit heterosis or to build up the favorable fixable genes **(Helal,1997; El-Mahdy,1998 ;Mansour et al,2001;El-Tabbakh and Ibrahim, 2000 ;El-Hosary et al ,2002; Henen,2005and Abou-Zied, 2007)**

MATERIALS AND METHODS

The present investigation was carried out under insect free cages at Nubaria Research Station during 2001/02, 2002/03, and 2003/04, growing seasons to study the mode of inheritance of resistance to chocolate spot disease caused by (*Botrytis Fabae,* Sard), yield and some yield components in faba bean using the diallel mating design. Two chocolate spot disease resistan faba bean genotypes (ICARUS and ILB 938) from Colombia along with the commercial variety for planting in new reclaimed land at Nubaria region (Nubaria 1) and the highly susceptible variety (Giza 40)were used as parental genotypes in the current investigation. These parents are briefly described as follows:

1- **Giza 40 (P_1)** an individual plant selection from Rebaya 40 and is widely grown in Upper Egypt. It is classified as highly susceptible to chocolate spot disease, medium seeded type (50-60 gm) light brown seeds and early flowering.
2- **Nubaria 1 (P_2)** an individual plant selection from Spanish variety (Rena Blanca) resistant to foliar diseases (chocolate spot and rust), late flowering with high yielding capacity large seeded, (100-110 gm) light brown seed and white hilum.
3- **ICARUS (P_3)** an introduction from Colombia, it was developed by mass selection from ILB 938 for large seed size. It is identified as highly resistant for chocolate spot disease, late flowering with low yielding ability, medium seeded type (60-70 gm) with green colored seed coat.
4- **ILB 938 (P_4)** an introduction from Colombia. It is identified as highly resistant for chocolate spot disease, late flowering with low yielding ability, medium seeded type (60-70 gm) with green colored seed coat

In 2001/03 season, all possible crosses combinations (including reciprocal crosses) among the four faba bean parents previously mentioned were made under insect free cages at Nubaria Research Station.

In 2002/04 season, seeds of each F_1 were sown under insect free cages to obtain F_2 plants, also re-hybridizations were made.

In 2003/04, season all diallel mating progenies (12 F_1's and 12 F_2's) as well as their respective parental genotypes were sown in randomized complete block design with three replications. Seeds were took place in rows, 3m length, 45 cm apart with one seeded/ hills spaced at 20 cm. The parents, F_1's and F_2's were planted in 2,1,5 rows, respectively.

The isolate of (*Botrytis fabae,* Sard) was originally isolate from faba bean leaves collected from Nubaria by Legumes Pathology Research,

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Table(1): Mean square of all faba bean studied characters among to growing season .

Characters	Source of variance					
	Replication		Genotypes		Error	
	F_1	F_2	F_1	F_2	F_1	F_2
Degree of freedom	2	2	15	15	30	30
Chocolate spot disease score	0.250$^{N.S}$	1.760$^{N.S}$	5.254**	5.041**	0.117	0.242
Days to flowering	2.438$^{N.S}$	266.396$^{N.S}$	1344.010**	1310.832**	1.926	85.440
Days to maturity	2.646$^{N.S}$	238.063$^{N.S}$	294.776**	316.306**	3.001	89.951
Plant height (cm)	5.396$^{N.S}$	322.438$^{N.S}$	500.439**	442.730**	4.351	102.504
Number of branches/plant	0.188$^{N.S}$	3.646$^{N.S}$	6.200**	5.040**	0.188	0.242
Number of pods/plant	2.771$^{N.S}$	8.688$^{N.S}$	23.854**	11.610**	2.436	3.510
Number of seeds/plant	15.771$^{N.S}$	76.521$^{N.S}$	283.499**	139.543**	9.215	27.543
Seed yield/plant (g)	12.896$^{N.S}$	47.271$^{N.S}$	233.465**	108.750**	5.340	17.071
100-seed Weight (g)	3.646$^{N.S}$	181.896$^{N.S}$	464.132**	536.933**	2.357	62.163

N.S : not significant
** : Significant at 1%level of probability

Table (2): Mean performance of different faba bean characters in parents and their F_1 and F_2' s .

Characters / Crosses	Chocolate spot disease score		Days to flowering (day)		Days to maturity (day)		Plant height (cm)		Number of branches/ plant		Number of pods/plant		Number of seeds /plant		Seed yield/plant (g)		100-seed weight (g)	
Giza 40 (P_1)	6.33		44.66		153.34		119.00		3.33		9.00		25.00		14.34		57.33	
Noubira 1(P_2)	4.00		65.00		176.33		99.34		8.33		6.33		25.66		26.66		104.33	
ICRAUS (P_3)	1.66		109.33		187.67		83.00		4.66		10.00		18.66		13.33		73.00	
ILB 938 (P_4)	1.00		109.66		188.00		90.33		6.00		9.00		17.33		12.00		68.33	
Generations	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
$P_1 \times P_2$	5.00	5.31	55.00	51.66	164.67	161.33	131.00	109.66	5.34	4.61	16.33	12.66	49.33	37.00	36.34	26.33	74.00	70.33
$P_1 \times P_3$	3.66	4.06	78.66	75.33	169.00	165.34	122.33	106.66	4.00	3.63	14.33	12.00	33.34	20.00	21.67	16.00	64.00	65.66
$P_1 \times P_4$	3.00	3.8	82.66	79.32	169.00	166.00	126.66	115.66	5.00	4.276	15.00	10.00	33.00	15.34	20.66	14.66	61.33	58.33
$P_2 \times P_3$	3.00	3.56	92.33	87.00	181.67	177.33	112.00	97.66	6.67	6.30	10.66	8.33	36.00	25.33	33.00	23.66	91.66	94.00
$P_2 \times P_4$	2.66	3.16	87.33	83.34	180.33	177.00	122.00	118.00	7.00	5.566	12.00	9.33	35.67	21.66	31.66	19.33	89.34	95.00
$P_3 \times P_4$	2.00	2.21	113.34	109.34	188.34	186.00	117.34	93.66	4.00	3.766	14.33	10.66	26.00	19.00	18.00	13.34	70.34	60.33
$P_1 \times P_1$	4.00	4.28	59.00	55.33	170.67	168.00	118.00	114.00	6.66	6.28	15.00	12.34	52.65	39.00	44.00	33.33	83.33	86.00
$P_1 \times P_1$	3.00	3.40	85.67	82.00	177.34	176.00	108.32	112.66	4.33	3.65	15.00	14.00	37.66	33.34	26.00	22.56	69.00	67.00
$P_3 \times P_1$	2.34	2.56	99.34	94.66	184.33	183.00	118.00	94.66	5.33	4.45	11.00	9.00	27.67	22.34	22.00	18.66	81.33	82.33
$P_4 \times P_1$	3.00	3.61	86.33	82.30	177.34	174.00	117.00	112.60	3.34	2.97	11.67	9.34	26.67	23.00	17.66	15.00	65.67	66.00
$P_4 \times P_2$	2.34	2.64	98.33	93.67	181.66	179.00	122.33	114.34	6.00	5.13	10.66	8.00	31.33	22.00	25.33	18.34	82.33	83.00
$P_4 \times P_3$	2.00	2.36	110.33	107.00	188.00	187.67	112.66	92.66	4.00	3.54	10.00	9.00	23.66	21.00	19.00	16.67	78.33	76.66
L.S.D at 0.05	2.31	1.24	2.88	15.41	3.47	15.81	0.722	16.88	2.60	1.79	5.06	3.12	3.85	8.75	2.55	6.88	2.31	13.14
L.S.D at 0.01	3.11	1.68	3.88	20.75	4.68	21.29	0.97	22.73	3.50	2.12	14.63	4.20	8.98	11.78	3.44	9.27	3.11	17.70

F_1 First generation

F_2 Second generation

Table(3): Heterosis percentage for relative to mid (M.P) and higher – parents(H.P) the studied characters

Characters / crosses	Chocolate spot disease score		Days to flowering		Days to maturity		Plant height (cm)		Number of branches/plant		Number of pods/plant		Number of seeds /plant		Seed yield/plant (g)		100-seed weight (g)s	
	M-P	H-P	M-P	H-P	M-P	H-P	M-P	H-P	M-P	H-P	M-P	H-P	M-P	H-P	M-P	H-P	M-P	H-P
$P_1 \times P_2$	-3.20**	21.01**	0.30	-15.38**	0.09	-6.61**	20.00**	10.08**	-8.57**	-36.00**	113.08**	6.66**	94.70**	92.20**	77.20**	36.20**	-8.45**	-29.00**
$P_1 \times P_3$	0.005	-42.18**	2.16	-28.05**	-7.14**	-9.94**	21.12**	2.79	0.025	-14.20**	50.80**	43.33**	52.90**	33.33**	56.60**	51.20**	-1.79	-12.32**
$P_1 \times P_4$	-18.17**	-52.28**	7.12**	-2.46	-0.97	-10.0**	21.02**	6.43**	7.14**	-16.60**	66.60**	11.11**	55.90**	32.00**	56.90**	44.19**	-2.38*	-10.24**
$P_2 \times P_3$	5.88**	-25.00**	5.92**	-15.54**	6.55**	-3.19	22.85**	12.74**	2.58**	-19.90**	30.61**	6.66**	62.40**	40.25**	65.00**	23.70**	3.38*	-12.13**
$P_2 \times P_4$	6.66**	-33.50**	0.01	-20.36**	-0.82	-4.07**	28.65**	22.81**	-2.32**	-15.90**	56.55**	33.33**	65.89**	38.96**	63.70**	18.19**	3.47*	-14.38**
$P_3 \times P_4$	49.9**	20.48**	3.50*	3.35*	0.26	0.18	35.39**	29.9**	-24.90**	-33.30**	50.87**	43.33**	44.00**	39.28**	42.1**	35.00**	-0.47	-3.65**
$P_2 \times P_1$	-22.58**	-36.80**	7.59**	-9.23**	3.54**	-3..20	8.09**	-0.84	14.29**	-19.99**	95.69**	66.66**	107.80**	105.19**	114.63**	64.00**	3.09*	20.12**
$P_3 \times P_1$	25.00**	-52.66**	11.25**	-21.64**	-2.56	-5.50**	7.26**	-8.97**	8.35**	-7.14**	57.89**	50.00**	72.52**	50.60**	87.95**	81.30**	5.88**	-5.47**
$P_3 \times P_2$	-17.64**	-41.50**	13.95**	-9.13**	8.11**	-1.77	29.43**	18.78**	-17.94**	-35.99**	16.49**	10.00**	24.80**	7.79**	10.00**	-17.20**	-5.79**	-22.04**
$P_4 \times P_1$	-18.17**	-52.60**	11.87**	-21.21**	3.71**	-5.67**	11.79**	-1.68	-28.57**	-44.45**	29.63**	29.63**	25.98**	6.60**	34.18**	23.20**	4.50**	-1.90*
$P_4 \times P_2$	-6.68**	-41.5**	-10.19**	-10.33**	-0.27	-3.37*	29.00**	23.14**	-16.27**	-27.99**	39.16**	-29.63**	45.70**	22.00**	29.30**	-5.00*	16.5**	-21.08**
$P_4 \times P_3$	49.98**	20.48**	0.76	0.61	0.09	0.00	30.01**	24.72**	-24.99**	-33.33**	5.26**	43.33**	31.48**	26.78**	50.00**	42.5**	10.84**	7.30**
S . E	0.11	5.34	1.92	1.92	3.00	3.00	4.35	4.35	0.188	0.188	2.43	2.43	9.21	9.21	5.34	5.34	2.35	2.35
L.S.D at 0.05	0.90	0.90	3.67	3.67	4.58	4.58	5.51	5.51	1.147	1.147	4.13	4.13	8.03	8.03	6.11	6.11	4.86	4.06
L.S.D at 0.01	0.64	0.64	2.61	2.61	3.26	3.26	3.93	3.93	-8.57**	0.818	2.94	2.94	5.72	5.72	4.36	4.36	2.89	2.89

N.S : not significant
* : Significant at 5%level of probability
** : Significant at 1%level of probability

H.P : Higher parent .
M.P : Mid - parent .
S.E : Standard error .

Table (4): Estimate of general (g.c.a),(s.c.a) and reciprocal effect for faba bean at $F_1$and F_2 generations .

Characters	Genotypes	G.C.A	S.C.A	Reciprocal	G.C.A/S.C.A
Chocolate spot disease score	F_1	7.819^{**}	0.302^{**}	0.167^{*}	5.870
	F_2	4.350^{**}	0.031^{ns}	0.0134^{ns}	0.200
Days to flowering	F_1	2147.7^{**}	24.69^{**}	21.45^{**}	17.90
	F_2	2126.7^{**}	9.163^{ns}	19.818^{ns}	27.40
Days to maturity	F_1	455.69^{**}	2.99^{**}	14.8^{**}	46.30
	F_2	477.213^{**}	3.22^{ns}	21.75^{ns}	3.500
Plant Height (cm)	F_1	239.6^{**}	254.10^{**}	43.02^{**}	0.003
	F_2	504.50^{**}	106.6^{*}	10.6^{ns}	0.290
Number of branches/plant	F_1	8.324^{**}	0.384^{**}	0.62^{**}	5.200
	F_2	274.671^{**}	126.50^{**}	0.678^{*}	0.250
Number of pods/plant	F_1	6.764^{**}	13.66^{**}	2.83^{**}	0.092
	F_2	7.614^{**}	5.37^{*}	0.796^{ns}	0.120
Number of seeds/plant	F_1	189.449^{**}	127.88^{**}	13.6^{*}	0.110
	F_2	116.76^{**}	36.76^{*}	21.13^{ns}	0.600
Seed yield/plant (g)	F_1	200.606^{**}	75.196^{**}	20.70^{**}	0.360
	F_2	122.509^{**}	18.95^{*}	10.40^{ns}	1.600
100-seed Weight (g)	F_1	705.886^{**}	4.622^{**}	29.22^{**}	38.00
	F_2	784.08^{**}	4.95ns	50.47^{*}	9.070

N.S : Not significant
* : Significant at 5% level of probability
** : Significant at 1% level of probability

GCA : General combining ability .
SCA : Specific combining ability .

Table (5): Estimates of general combining ability effects (g.)for chocolate spot disease. yield and its components of four- parent diallel crosses.

Characters	Generation	Giza 40	Nubaria 1	ICARUS	ILB 938
Chocolate spot disease score	F_1	1.2292**	0.3542	-0.6458**	-0.9375*
	F_2	1.2083	0.3750	-0.6667*	-0.9167**
Days to flowering	F_1	-18.9792**	-8.3958**	13.7292**	13.6458**
	F_2	-18.6875**	-8.6458*	13.6458**	13.6875**
Days to maturity	F_1	-10.5625**	-0.3125	5.6458**	5.2292**
	F_2	-10.7083**	-0.8833	5.9583*	5.3333*
Plant Height (cm)	F_1	6.4583**	1.5417*	-6.6250**	-1.3750
	F_2	9.6667**	0.6250	-9.7500**	-0.5417
Number of branches/plant	F_1	-0.8333**	1.4583**	-0.5417**	-0.0833
	F_2	-0.7708	1.2708**	-0.3958*	-0.1042*
Number of pods/plant	F_1	1.2708*	-0.8542	0.0208	-0.4375
	F_2	1.1042*	-0.8958	0.4375	-0.6458
Number of seeds/plant	F_1	4.1042**	4.2708**	-3.5208*	-4.8542**
	F_2	3.1042*	3.2292*	-1.8125	-4.5208*
Seed yield/plant (g)	F_1	0.5208	6.8542**	-3.0625*	-4.3125**
	F_2	0.6250	5.1667**	-1.875	-3.9167*
100-seed Weight (g)	F_1	-9.3542**	12.9792**	-0.7708	-2.8542
	F_2	-9.9583**	13.6667**	-1.0833	-2.6250

* : Significant at 5% level of probability
** : Significant at 1% level of probability

Table (6): Specific combining ability effects (s_{ij}) for chocolate spot disease ,yield and its components of faba bean 4- parent diallel crosses.

Characters	Generation	$P_1 \times P_2$	$P_1 \times P_3$	$P_1 \times P_4$	$P_2 \times P_3$	$P_2 \times P_4$	$P_3 \times P_4$
Chocolate spot disease score	F_1	-0.21458	-0.3125*	-0.3542*	-0.1042	0.0208	0.5208**
	F_2	-0.3333**	-0.1250	-0.2083*	0.0417	0.2917**	0.3334**
Days to flowering	F_1	-1.688**	1.354*	3.771**	4.438**	1.521	1.604*
	F_2	-2.271	0.604	2.729	2.729	0.354	-2.271
Days to maturity	F_1	1.188	0.729	0.979	0.313	-1.104	-0.003
	F_2	0.583	0.042	0.001	-0.583	-2.125	0.167
Plant Height (cm)	F_1	2.791**	1.7917**	3.0417**	6.3750**	8.2917**	9.2917**
	F_2	-3.708	4.500	4.792	0.042	10.833**	-1.792
Number of branches/plant	F_1	0.1250	0.2917	-0.1667	-0.1667	-0.1250	-0.6250
	F_2	0.1458**	0.1458**	-0.3125**	-0.3958**	-0.6875**	-0.3542**
Number of pods/plant	F_1	3.3542**	1.4792*	0.6042	-0.2292	0.7292	0.6875
	F_2	2.3542*	1.5208*	-0.7292	-0.8125	0.2708	0.1042
Number of seeds/plant	F_1	11.395**	3.6875*	-0.6458	-0.1458	2.8542*	1.9792
	F_2	7.563**	1.271	-3.521	-1.668	-0.979	2.229
Seed yield/plant (g)	F_1	8.9375**	2.5208**	-0.8958	-0.1458	2.1042*	2.0208*
	F_2	5.083**	1.625	-0.833	-1.083	-1.375	1.333
100-seed Weight (g)	F_1	-0.813	0.771	-0.146	-1.563	-0.146	2.104*
	F_2	-1.875	1.042	-0.083	-0.75	1.958	0.875

* : Significant at 5% level of probability
** : Significant at 1% level of probability

Table (7): Estimates of reciprocal effects (r_{ij}) for chocolate spot disease ,yield and its components for 4- parent diallel crosses .

Characters	Crosses	$P_2 \times P_1$	$P_3 \times P_1$	$P_4 \times P_1$	$P_3 \times P_2$	$P_4 \times P_2$	$P_4 \times P_3$
Chocolate spot disease score	F_1	0.500*	0.333	0.333	0.001	0.1667*	0.001
	F_2	0.500**	0.3334**	0.001	0.333**	0.001	0.001
Days to flowering	F_1	2.000*	-3.500**	-3.500**	-1.833*	-5.500**	1.500
	F_2	-1.833	-3.333	-3.833	-1.500	-5.167	1.167
Days to maturity	F_1	-3.00**	-4.167**	-1.333	-4.000**	-0.500	0.167
	F_2	-3.333	-5.3333	-2.833	-4.000	-1.000	-0.833
Plant Height (cm)	F_1	6.522**	7.000**	-3.000	4.833**	-0.167	2.333
	F_2	-2.167	-3.000	1.500	-3.500	1.833	0.500
Number of branches/plant	F_1	-0.6667**	-0.1667	0.667**	0.8333**	0.5000*	0.001
	F_2	-0.8333**	0.1667**	0.333*	0.6667**	0.3334*	0.001
Number of pods/plant	F_1	0.667	-0.3334	-0.1667	1.6667*	0.6667	2.1667*
	F_2	0.167	-1.000	-0.333	0.333	0.6667	0.833
Number of seeds/plant	F_1	-1.667	-2.167	4.167*	3.166*	2.167	1.167
	F_2	-1.00	-6.667	1.500	-3.833	-0.167	-1.00
Seed yield/plant (g)	F_1	-3.833*	-2.167	5.500**	1.500	3.167*	-0.500
	F_2	-3.500	-3.333	2.500	-0.167	0.500	-1.167
100-seed Weight (g)	F_1	-4.667**	-2.500**	5.167**	-2.167**	3.500**	-4.000**
	F_2	-7.833	-0.666	5.833*	-2.333	6.333*	-3.167*

* : Significant at 5% level of probability
** : Significant at 1% level of probability

الملخص العربي

تقييم بعض هجن الفول البلدي للمقاومة لمرض التبقع البني

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أجرى هذا البحث فى محطة بحوث النوبارية خلال المواسم الزراعية الثلاثة 2002/2001 ، 2003/2002 ، 2004/2003م بهدف دراسة وراثة صفة مقاومة نبات الفول البلدى (*Vicia faba*) لمرض التبقع البنى والذى يسببة فطر *Botrytis fabae* Sard بالاضافة الى المحصول العالى ومكوناتة وصفة التبكير فى تزهير الفول بإستعمال نظام الهجن التبادلية ولقد وجد أن هناك سلالتين مقاومتين لمرض التبقع البنى وهما ICARUS وسلالة ILB 938 مع صنف تجارى (نوبارية 1) الذى يوصى بزراعته فى الأراضى المستصلحة حديثاً مع صنف (جيزة 40) والذى يصاب بشدة بمرض التبقع البنى كصنف إختبارى ولقد إستخدمت التراكيب الوائية الأربعة فى هذا البحث وهى:

أعطت ستة هجن [نوبارية1(P_2) x جيزة 40 (P_1) & جيزة 40 (P_1) x IBL938(P_4) & جيزة 40 (P_1) x نوبارية1 (P_2) & نوبارية1 (P_3) x ICARUS (P_3) & جيزة40 (P_1) x ICARUS] (P_3) قوة هجين سالبة بالنسبة لمتوسط الأبوين وهى القيم المفضلة لمقاومة مرض التبقع البنى. وسجل هجين واحد نوبارية1 (P_2) x IBL 938 (P_4) قوة هجين سالبة بالنسبة لمتوسط الأبوين لصفة ميعاد التزهير.

وفيما يخص عدد الأفرع/نبات فقد أظهرت كل الهجن نسبة قوة هجين سالبة وعالية المعنوية طبقاً للأب الأعلى

كان التباين الراجع إلى كل من القدرة العامة والخاصة على التآلف معنويا لجميع الصفات تحت الدراسة وكانت النسبةG.C.A/S.C.A أكبر من الوحدة فى صفات: مرض التبقع البنى ،

وميعاد التزهير ، وميعاد النضج ، وعدد البذور ، ووزن 100 بذرة فى الجيل الأول والثانى أى أن التأثير المضيف هو المتحكم الأكبر فى توريث هذة الصفات.

أعطت السلالة ILB 938 أفضل النتائج بالنسبة للقدرة العامة على التآلف لصفة مرض التبقع البنى وسجل الصنف جيزة (40) أفضل النتائج فى ميعاد التزهير ، وميعاد النضج ، وطول النبات ، وعدد القرون - بينما أظهر الصنف نوبارية (1) أعلى قيمة فى صفة عدد الأفرع ، وعدد البذور ، ومحصول النبات ، ووزن 100 بذرة