Evaluation of some Faba Bean Genetic Segrigants for Resistance to Chocolate Spot Disease, Yield and Yield Components

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ABSTRACT

A field experiment was conducted during 2002/03 and 2003/04 growing seasons at Nubaria Research Station to evaluate some faba bean genetic segrigants for resistance to chocolate spot disease as well as seed yield along with some important yield attributing traits. The same genetic segrigants were sown under artificial infection at Giza Research Station. Data revealed that highly significant differences were detected among tested genetic segrigants for most characters in each seasons and combined data, which indicate wide genetic variability. All tested genetic segrigants were significantly less disease infected comparing with the susceptible check variety (Giza 40) under both natural and artificial conditions. This level of resistance is mainly due to different genetic factors accumulated from parental genetic segrigants which the hybrid population derived from the four genetic segrigants; X-1427, Nubaria 1, X-1618 and X-1554 which were the most promising genetic segrigants for yield and its components. The magnitude of genotypic variance was greater than that of environmental variance for all studied traits. High estimates of phenotypic and genotypic variances were observed for plant height, seed weight/plant, 100-seed weight and number of seeds/plant. In addition, high estimates of heritability were detected for 100-seed weight (99.7 g) followed by number of pods (99.5 g) and branches/plant (98.7 %). However, disease reaction exhibited the moderate magnitude of heritability (68.18 %). Disease incidence was insignificant or significant negative correlated with all studied traits, indicating that estimates seed yield and other components depending on level of disease infection. It could be concluded that stability of resistance against chocolate spot disease over seasons could be clearly indicate the essentially to diversity genetic sources and accumulations of desirable genes. So that, the resistance genetic segrigants, with more emphasis on genetic diversity within a cycle of selection and hybridization is more effective for faba bean improvement in Egypt.

INTRODUCTION

Faba bean (*Vicia faba*,L.) is the major legume crop among pulses 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 302,260 feddans with an average seed yield of 8.5 ardabs/feddan during the last five seasons 1999/2003/04. About 85 % of the total area is located in North Delta and a new reclaimed lands at Nubaria region where chocolate spot (*Botrytis fabae*) and rust (*Uromyces fabae*) diseases prevailed and severely attacked the crop with an average 39.7 % yield losses, particularly during wet seasons (Mohamed, 1982). Solh *et al* (1992) reported that both diseases (chocolate spot and rust) mentioned above reduced faba bean production in Delta by 50 % when a virulent pathogen and a susceptible host are brought together in an environment that favor disease development. During the last two decades, significant progress has been made in identification genetic resistance sources and developing high yield 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 method of fighting the pathogen. Elliot and Whittington (1979) demonstrated a high degree 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 tested entries showed high level of resistance to chocolate spot. Khalil *et al.* (1986) and El-Hady (1988) indicated that the presence of dominant genes for resistance to chocolate spot in some faba bean crosses and the additive gene effects were stable over a range of years and narrow sense heritability estimates ranged from 69 to 95 %. Khalil *et al.* (1994), Khalil *et al* (1996) and El-Hady *et al.* (1997) reported that the new released variety Giza 461 along with three populations (X-992, X-995 and X-1001) were less infected with foliar diseases and yielded 16.7 % more than the check cultivar. El-Hady *et al.* (1998) reported that moderate heritability values in broad sense were detected with a range of 68.11 to 79.2 % for resistance to chocolate spot disease indicating the presence of genetic variability among all studied crosses.

Seed yield is a complex trait and is quantitatively inherited with low heritability value (Bond, 1966). The low heritability and consequent limited genetic advance for yield in response to selection had lead many scientists to search for characters which are associated with yield but which are more highly heritable (De Pace, 1979). Therefore, yield it self may not be the best criterion for selection, so breeding for high yielding ability as associated with yield and its component viz., number of pods, seeds/plant and seed size (Rowlands, 1955). Moreover, Abdalla *et al.* (2000) indicated that the investigated land races are highly variable with respect to all studied yields and yield components. Judging by ranges and phenotypic coefficient of variability (PCV) for each trait, it is apparent that land races showed more variation for seed weight, seeds, pods, branches/plant and seed index. However, the estimates of genotypic coefficient of variability (GCV) showed lacking genetic variation for seeds/plant and seed yield/plot. On the other hand, genetic variation was obvious for branches/plant, seed index and plant height compared to other traits. Heritability values provide a measure of relative importance of genetic components to the phenotypic variation. Heritability estimates in faba bean varied according to materials and methods (Bond, 1966, Poulsen, 1977, El-Hosary and Sedhom, 1990, *El-Hady et al.* 1997 & 1998, Abdalla *et al.* 2000, El-Hifny *et al.*, 2001 and Attia *et al* 2002). The phenotypic correlation of each component to seed yield was previously reported by several investigators, Huang *et al.* (1983), Sindhu *et al.* (1985), Bakheit and Mahdy (1988) and El-Hady *et al.* (1991). The present investigation was carried out to evaluate some faba bean genotypes for resistance to chocolate spot disease as well as seed yield along with some important yield attributing traits.

One ardab=155 kg.

One feddan=4200 m^2.

MATERIALS AND METHODS

A total of thirteen F_6 faba bean promising genetic segrigants along with resistant check cultivar (Nubaria 1) and susceptible one (Giza 40) were evaluated under natural condition at Nubaria Research Station during 2002/03 and 2003/04 growing seasons. The pedigree and different characteristics of the tested genetic segrigants are presented in Table 1.

Table 1. Pedigree and characteristics of faba bean tested genetic segrigants at Nubaria and Giza Research Stations during 2002/03 and 2003/04 seasons.

No	Cross	Pedigree	Reaction to chocolate spot	Seed size	Maturity
1	X-1427	749/926/90* x Giza Blanca ***	Resistant	Medium	Early
2	X-1435	716/1036/89 x Giza 716 ***	Resistant	Medium	Late
3	X-1466	749/954/90 x X-903*	Resistant	Medium	Late
4	X-1471	749/926/90 x X-903*	Resistant	Medium	Late
5	X-1538	(749/954/90 x T.W) x (627/382/86 x Giza 716)	Resistant	Medium	Late
6	X-1554	716/1036/89 x X-900*	Resistant	Medium	Early
7	X-1556	L. 40/93 *** x X-843****	Resistant	Medium	Early
8	X-1558	x-908* x Giza 716	Resistant	Medium	Early
9	X-1569	x-899** x Giza 429****	Resistant	Medium	Late
10	X-1610	Giza Blanca x 735*/827/90	Resistant	Medium	Late
11	X-1618	Giza Blanca x 711*/778/90	Resistant	Medium	Early
12	X-1621	Giza Blanca x 483/662/84*****	Resistant	Medium	Late
13	X-1734	Giza Blanca x Giza 716	Resistant	Medium	Late
14	Nubaria 1	An individual ;plant selection from Giza Blanca	Resistant	Large	Late
15	Giza 40	An individual ;plant selection from Rebaya 40***	Susceptible	Medium	Early

* Resistant to chocolate spot disease

** large seeded

*** Early maturing genetic segrigants

**** *Orobanche* resistance

***** Good potentiality under water stress

A randomized complete block design with three replications was used. Each experimental plot consisted of four ridges, 60 cm between and three meters long (plot size = 7.2 m^2). Planting took place (in the first week of November) on two sides per ridge, in double seeded hills, 20 cm apart and cultural practices were adapted according to recommendation. The same mentioned genetic segrigants were sown under artificial infection (Art.) at Giza Research Station during 2002/03 and 2003/04 in a randomized complete block design with three replications. Each tested genetic segrigant was represented by five plants grown in one pot. The plants (80 days old) were artificially infected with a spore suspension (150,000 spores/ml) of chocolate spot disease using a hand sprayer. Inoculated plants were then covered with polyethylene sheets supported by metal frames to maintain a high relative humidity. After 12 hrs., plants were uncovered and sprayed twice a day with water, then covered again. This procedure was followed until the susceptible check (Giza 40) developed severe chocolate spot symptoms. Disease scale 1-9 was used according to Bernier *et al.* (1984), where; 1 = highly resistant and 9 = highly susceptible. Disease reaction was assessed and recorded during March at Nubaria and 15 days after artificial inoculation.

At harvest, ten individual guarded plants were taken at random from each experimental plot, on which the following characters were recorded, plant height (cm), number of branches/plant, number of pods/plant, number of seeds/plant, seed weight/plant (g) and 100-seed weight (g). Seed yield (ardab/feddan) was estimated on plot area basis.

Regular analysis of variance of RCBD was conducted according to the method of Snedecor and Cochran (1967). The homogeneity tests of error variances of both seasons indicated that error terms were homogenous then the combined analysis was used for the traits measured at both seasons. The genotypic and phenotypic variances (δ^2_g and δ^2_{ph}), the genotypic and phenotypic coefficient of variability (GCV & PCV %) and broad sense heritability (h^2B) were estimated from the pertinent mean squares expectations from the combined analysis as follows:

$$\delta^2_g = (MS_g - MS_{gs})/rs$$

$$\delta^2_{gs} = (MS_{gs} - Ms_e)/r$$

$$\delta^2_{ph} = (\delta^2 g + \delta^2 gs + \delta^2 e/rs)$$

$$h^2B = (\delta^2_g / \delta^2 ph) \times 100$$

$$P.C.V\% = \frac{(\delta^2_{ph})^{\frac{1}{2}}}{\overline{X}} \times 100$$

$$G.C.V\% = \frac{(\delta^2_g)^{\frac{1}{2}}}{\overline{X}} \times 100$$

where MSg= mean squares of genetic segrigants, MSgs= mean squares of genetic segrigant x season and Mse = mean squares of error, r = number of replications and s number of seasons.

RESULTS AND DISCUSSION

The statistical analysis of each season and over two seasons (combined) for all studied traits is presented in Table 2. Data revealed that highly significant differences were detected among the tested genetic segrigants for most characters in each seasons and combined data, which showed a wide genetic variability. The combined analysis showed that mean squares due to seasons were highly significant for disease reaction, plant height, number of branches, pods and seeds/plant. Therefore, it could be concluded that environmental effect significantly affected the expression of the present faba bean genetic segrigants concerning the above-mentioned traits. The sensitivity of faba beans to environmental effects is well known Darwish and Abdalla (1996). The mean squares of genetic segrigants x seasons interactions were highly significant for disease reaction, number of seeds/plant and seed weight/plant. These findings indicated that certain genetic segrigants carried alleles with different additive and additive x additive gene effects, which were constant from season to another. These results are in agreement with those reported by El-Hosary and Sedhom (1990) and Darwish and Abdalla (1996).

The range and mean performance of the different studied characters among some faba bean genetic segrigants is presented in Table 3. Results indicated that the mean values showed wide differences between the tested genetic segrigants for all characters with a range of 1.0-7.0, 1.2-8.0, 100.0-160.0, 3.0-9.0, 11.2-22.2, 39.0-70.0, 30.0-78.0, 73.6-116.0, 0.55-1.80 for disease reaction under natural and artificial conditions, plant height (cm), number of branches/plant, number of pods/plant, number of seeds/plant, seed weight/plant (g), 100-seed weight (g) and seed yield (ard/fed.), respectively, suggesting the presence of significant genetic variability. Results are presented in Table 3 revealed that all tested genetic segrigants were significantly less disease infected comparing with the susceptible check variety (Giza 40) under both field and artificial conditions. It could be noticed that the tested genetic segrigants were promising for chocolate spot disease resistance. This level of resistance is mainly due to different genetic factors accumulated from parental genetic segrigants, which the hybrid populations are derived from it. Two genetic segrigants (X-1427 and X-1466) possessed the tallest plants and recorded 155.0 and 144.2 cm, respectively. Meanwhile, the check variety Nubaria 1 followed by genetic segrigant X-1621 had the shortest plants with a mean of 109.2 and 115.0 cm in the same order. Furthermore, high mean values among number of branches/plant were detected for the following genetic segrigants: Nubaria 1, X-1435, X-1471 and Giza 40 and recorded 8.4, 5.3, 5.0 and 5.0 branches/plant, respectively. However, the genetic segrigants, X-1621, X-1610 and X-1618 possessed the lowest number of branches and recorded 3.7, 3.8 and 3.8 branches/plant, in the same order. Regarding number of pods/plant, the four genetic segrigants (X-1618, X-1554, X-1427 and X-1471) exhibited higher number of pods /plant with a mean of 21.7, 19.8, 19.7 and 19.0 pods/plant. On the other hand, the genetic segrigant Nubaria 1 followed by genetic segrigant Giza 40 had the lowest ones and recorded 13.1 and 14.2 pods/plant, respectively. With respect to number of seeds/plant, the results indicated that the genetic segrigant X-1618 followed by Nubaria 1, X-1554 and X-1427 recorded the highest number of seeds/plant with a mean values of 64.1, 63.6, 59.4 and 58.3 seeds/plant, respectively. However, the two genetic segrigants; X-1610 and X-1569 had the lowest number of seeds/plant and recorded 41.7 and 42.2 seeds/plant in the same order. For seed weight/plant, results indicated that the four following genetic segrigants: Nubaria 1, X-1618, X-1554 and X-1427 exhibited the highest seed weight/plant with a mean values of 71.2, 58.9, 55.0 and 54.6 (g), respectively. The lowest values were observed among the genetic segrigants: X-1610, X-1569 and X-1466 and recorded 32.6, 34.3 and 35.3 (g), respectively. For 100-seed weight, the genetic segrigant Nubaria 1 followed by X-1618, X-1558, X-1427 and X-1554 had the heaviest seed weight and recorded 112.6, 97.3, 94.2, 93.8 and 92.8 (g), respectively. On the other hand, the lowest values were detected for genetic segrigants Giza 40, X-1466 and X-1610 with a mean values of 75.2, 75.4 and 78.5 (g), respectively. Results are presented in Table 3, revealed that the genetic segrigant X-1618 followed by X-1427, X-1556, X-1554 and Nubaria 1 had the highest mean values of seed yield (ard/fed.) and recorded 12.10, 11.10, 9.82, 9.38 and 9.37 (ard/fed.), respectively. Meanwhile, Giza 40, X-1569, X-1466 and X-1435 possessed the lowest estimates with mean values of 6.10, 6.58, 7.34 and 7.43 ard/fed.) in the same order.

The phenotypic (δ^2_{ph}), genotypic (δ^2_g) variances, phenotypic (PCV) and genotypic (GCV) coefficients of variability and broad sense heritability (H^2_B) for yield and its some traits are presented in Table 4.

The results illustrated that the magnitude of genotypic variance was greater than that of environmental variance for all studied characters. Moreover, high estimates of phenotypic (δ^2_{ph}) and genotypic (δ^2_g) variances were observed for plant height (cm), seed weight/plant, 100-seed weight and number of seeds/plant, indicating better scope for the genetic improvement in these characters. In addition, high estimates of heritability were detected for 100-seed weight (g) followed by number of pods/plant and number of branches/plant and recorded 99.70, 99.50 and 98.70 %, respectively (combined data). On the other hand, disease reaction (artificial) exhibited the lowest magnitude of heritability 68.18 %. The estimates of GCV coupled with high broad-sense heritability were observed for number of branches/plant, seed weight/plant (g) and disease reaction (artificial). These findings detected that these characters showing to be highly heritable and can be taken as criterion for effective selection. A greater chance of success in indirect selection for yield might come from selecting for various morphological attributes such as number of pods/plant, number of seeds/plant and seed size may be used in the construction of selection indices for the improvement of yield. Finally, selection for the most characters under this study would be effective and satisfactory for successful breeding purposes. These results are in conformity with those of El-Hosary and Sedhom (1990), El-Hady *et al.* (1997 & 1998), El-Hifny *et al.* (2001) and Attia *et al.* (2002).

The phenotypic correlation coefficient among all possible pairs of yield and its components are presented in Table 5. Results suggesting that plant height was highly significant positively correlated with number of pods/plant (0.366). Moreover, number of branches/plant was highly significant or significant correlated with number of seeds/plant, seed weight/plant (g), 100-seed weight (g) and seed yield (ard/fed.) with estimates of 0.448, 0.607, 0.596 and 0.222 in the same order. Furthermore, number of pods/plant was highly significant positive correlated with each of number of seeds/plant, seed weight/plant and seed yield (ard/fed.) and recorded 0.589, 0.295 and 0.418, respectively. Meanwhile, number of seeds/plant was significantly positive correlated with seed weight /plant (g), 100-seed weight (g) and seed yield (ard/fed.) and recorded 0.901, 0.606 and 0.658, respectively. However, seed weight/plant was highly significant positive correlated with 100-seed weight, seed yield (ard/fed.) with values of 0.863 and 0.645, respectively. On the other hand, 100-seed weight was highly significant positive correlated with seed yield (ard/fed.) and recorded 0.532. finally, disease incidence was insignificant or significant negative correlated with all studied traits, indicating that estimates seed yield and other components depending on level of disease infection. These results were in harmony with those obtained by Rowlands (1955), Bond (1966), Mohamed (1982), Huang *et al.* (1983), Sindhu *et al.* (1985), Bakheit and Mahdy (1988), El-Hady *et al* (1991), Solh *et al.* (1992) and Khalil *et al* (1994 & 1996). Moreover, the relationship between seed yield and its components would be considerable value to breeders for screening breeding materials and can be choosing donor parents for the hybridization program as well as in making selection.

From reviewing the above-mentioned results, it could be concluded that stability of resistance against chocolate spot disease over seasons could be clearly indicate the essentially to diversity genetic sources and accumulations of desirable genesc So that, the resistance genetic segrigants, with more emphasis on genetic diversity within a cycle of selection and hybridization is more effective for faba bean improvement in Egypt.

Table 2: Significance of mean squares due to different sources of variation for faba bean studied traits in 2002/03, 2003/04 and combined data.

Trait	2002/2003		2003/2004		Combined			
	Genetic segrigant	Error	Genetic segrigant	Error	Season	Genetic segrigant	Genetic segrigant X season	Error
df	14	28	14	28	1	14	14	56
Disease reaction (Nat.)	2.946**	0.737	2.248	1.257	0.178	4.825	0.368	0.997
Disease reaction (Art.)	7.415**	0.394	10.658**	0.070	21.413**	14.424**	3.650**	2.232
Plant height (cm)	457.381**	22.738	358.571**	12.143	810.00**	799.405**	16.548	17.44
No. of branches/plant	5.263**	0.028	4.047**	0.107	1.228**	9.227**	0.083	0.068
No. of pods/plant	19.262**	0.322	16.973**	0.735	9.152**	36.020**	0.214	0.528
No. of seeds/plant	199.976**	5.146	132.500**	7.879	14.722**	315.404**	17.071**	6.513
Seed weight/plant, g	397.655**	3.974	276.746**	8.133	36.481	650.274**	24.124**	6.053
100-seed weight, g	279.406**	0.927	261.900**	2.240	6.165	539.688**	1.618	1.583
Seed yield (ard/fed.)	9.939**	0.764	9.002**	3.315	0.151	18.103**	0.838	2.039

** = Significant at 0.05 level.

Table 3: Range and mean performance for yield and some its components of some faba bean genetic segrigants (combined data) of 2002/03 and 2003/04 seasons).

Genetic segrigant	Disease reaction		Plant height, cm	No. of branches / plant	No. of pods/ plant	No. of seeds/ plant	Seed weight/ plant, g	100-seed weight	Seed yield (ard/fed.)
	Field	Artificial							
X-1427	3.4	2.8	155.0	4.0	19.7	58.3	54.6	93.8	11.10
X-1435	2.0	2.0	127.5	5.3	18.0	54.2	43.7	81.4	7.43
X-1466	3.0	2.7	144.2	3.4	16.3	47.4	35.3	75.4	7.34
X-1471	3.0	4.3	126.7	5.0	19.0	57.5	46.5	81.4	8.86
X-1538	3.0	4.0	132.5	4.5	17.6	49.7	40.4	80.9	7.84
X-1554	3.4	3.9	121.7	3.9	19.8	59.4	55.0	92.8	9.38
X-1556	4.7	4.0	124.2	4.6	17.8	51.0	41.3	81.4	9.82
X-1558	3.0	3.6	122.5	4.0	16.4	47.9	44.9	94.2	8.52
X-1569	3.4	4.7	131.7	3.5	14.5	42.2	34.3	82.3	6.58
X-1610	4.0	4.4	116.7	3.8	14.6	41.7	32.6	78.5	7.09
X-1618	3.0	4.8	128.3	3.8	21.7	64.1	58.9	97.3	12.10
X-1621	2.3	3.5	115.0	3.7	14.9	44.2	37.9	87.2	7.78
X-1734	3.0	4.5	136.7	4.1	17.9	53.5	45.7	86.2	7.85
Nubaria 1	2.0	2.9	109.2	8.4	13.1	63.6	71.2	112.6	9.37
Giza 40	6.4	7.0	133.4	5.0	14.2	47.9	33.0	75.2	6.10
Range	1.0-7.0	1.2-8.0	100.0-160.0	3.0-9.0	11.2-22.2	39.0-70.0	30.0-78.0	73.6-116.0	0.55-1.80
LSD 0.05 for									
Years (Y)	NS	**	**	**	**	NS	NS	NS	NS
Genetic segrigants (G)	1.16	1.73	4.83	0.30	0.84	2.95	2.85	1.46	1.65
Y x G	NS	2.44	NS	NS	NS	4.17	4.02	NS	NS

NS = Not Significant.

Table 4: Phenotypic (δ^2_{ph}), genotypic (δ^2_g), phenotypic and genotypic coefficients of variability (PCV & GCV) and broad sense heritability (h^2_B) for some faba bean characters during 2002/03 and 2003/04 (combined data).

Trait	Mean	δ^2_{ph}	δ^2_g	h^2_B	P.C.V. %	G.C.V. %
Disease reaction (Nat.)	3.29	0.80	0.74	93.50	27.19	26.15
Disease reaction (Art.)	3.93	2.64	1.80	68.18	41.34	34.14
Plant height (cm)	131.33	133.23	130.48	97.93	8.79	8.70
No. of branches/plant	4.57	1.54	1.52	98.7	27.15	26.98
No. of pods/plant	17.33	6.00	5.97	99.50	14.13	14.10
No. of seeds/plant	52.55	54.33	49.72	91.51	13.80	13.42
Seed weight/plant, g	44.99	111.39	104.36	93.69	23.14	22.71
100-seed weight, g	86.68	89.95	89.67	99.70	10.94	10.92
Seed yield (ard/fed.)	8.48	3.02	2.88	95.37	20.49	20.01

Table 5: Significance of correlation coefficients among all studied traits of some faba bean genetic segrigants (based on raw data) during 2002/03 and 2003/04 seasons.

Trait	Plant height	Branche s	Pods	Seeds	Seed weight/plant	100-seed weight	Seed yield (ard/fed)
Branches	-0.369**						
Pods	0.386**	-0.309**					
Seeds	0.026	0.448**	0.589**				
Seed weight/plant	-0.134	0.607**	0.295**	0.901**			
100-seed weight	-0.282*	0.596**	-0.045	0.606**	0.863**		
Seed yield (ard/fed.)	0.013	0.222*	0.418**	0.658**	0.645**	0.532**	
Chocolate spot (Nat.)	0.139	-0.188	-0.038	-0.207*	-0.228*	-0.196	-0.001

* and ** indicate significant at 5 % and 1 % level of probability, respectively.

REFERENCES

Abdalla, M.M.F., D.S. Darwish, A.A. Ali, and E. A.A. El-Emam. 2000. Investigation on faba beans *Vicia faba,L.* 15-variability and clustering of faba bean land races. Egypt. J. Plant Breed. 4: 257-272.

Attia, S. M, M.Sh. Said, Zakia M. Ezzat, A.M.A. Rizk, and Kh. A. Aly. 2002. Heterosis, combining ability and gene action in crosses among six faba bean genotypes. Egypt. J. Plant Breed. 6 (2): 191-210.

Bakheit, B.R. and E.E. Mahdy. 1988. Variation, correlations and path coefficient analysis for some characters collections of faba bean (*Vicia faba,L.*). FABIS Newsletter, 20: 9-14.

Bernier, C.C., S.B. Hanounik, M.M. Hussein, and H.A. Mohamed. 1984. Field manual of common faba bean diseases in the Nile Valley. Information Bulletin No. 3. ICARDA P.O. Box 5466, Aleppo, Syria.

Bond, D.A. 1966. Yield and components of yield in diallel crosses between inbred lines of winter beans (*Vicia faba,L*). J. Agric. Sci. Camb. 67: 325-336.

Darwish, D.S. and M.M.F. Abdalla. 1996. Investigations on faba bean, *Vicia faba,L.* 6- Performance of a new collection on land races. Proc. 7th Egypt Conf. Agron., 9-10 Sept. Fac. Agric. Mansoura Univ., 179-185.

De Pace, C. 1979. Characteristics with significant correlation to seed yield in broad bean population grown in Southern Italy. In Semi Current Research on *Vicia faba* in Western Europe Ed. BABND-GTScarascia Mugnozza and M.H. Poulsen Pub. EECEUR 6244 En-:uxebourg 144-167.

El-Hady, M.M. 1988. Diallel analysis of resistance to chocolate spot (*Botrytis fabae* Sard.) and other agronomic traits in faba bean (*Vicia faba,L.*). Ph. D. Thesis, Fac. Agric. Cairo University.

El-Hady, M.M., Gh. A.R.A. Gad El-Karim, M.A. Omar, and S.A. Khalil. 1991. Evaluation of some promising faba bean genotypes for combining ability. Egypt. J. Appl. Sci., 6 (10): 226-236.

El-Hady, M.M., Gh. A. Gad El-Karim, and M.A. Omar. 1997. Genetical studies in faba bean (*Vicia faba,L.*) .J. Agric. Sci. Mansoura Univ., 22(11):3561-3571.

El-Hady, M.M., Gh.A Gdd El-Karim, and N.M. Abou Zeid. 1998. Inheritance of resistance to chocolate spot disease *Botrytis fabae* and heterosis in faba bean (*Vicia faba,L.*). Egypt. J. Genet. Cytol. 27: 1-9,

El-Hifny, M.Z., M.M. Eissa, B.R. Bakheit, and S.B. Ragheb. 2001. Inheritance of some agronomic characters in five faba bean (*Vicia faba,L.*) crosses using six population method. Proc. 2nd Plant Breed. Conf. October, 2001 (Assuit Univ.).

El-Hosary, A.A. and S.A. Sedhom. 1990. Evaluation of some new lines of faba bean (*Vicia faba,L.*). Proc. 4th Conf. Agron., Cairo 15-16 Sept., 435-445.

Elliot, J.E.M and W.J. Whittington. 1979. An assessment of varietal resistance of chocolate spot (*Botrytis fabae*) infection of field beans (*Vicia faba*) with some indication of its heritability and mode of inheritance. J. Agric. Sci., Camb., 93: 411-417.

Huang, W.T., F.Q. Li, X.Y. Jiang, and H.Y. Li. 1983. Correlation and path coefficient analysis of characters in *Vicia faba,L.* Hereiditas. Chinese 5 (3): 21-23.

Khalil, S.A., A.M. Nassib, and N.M. Abou-Zeid. 1986. Performance of some bulk population for disease resistance in faba bean (*Vicia faba,L.*). Biol. Zentrabl. 105: 155-161.

Khalil, S.A., H.A. Saber, M.M. El-Hady, M.I. Amer, Samia A. Mahmoud, and N.M. Abou Zeid. 1996. Utilization of genetic resources in developing new faba bean (*Vicia faba*) cultivars. In Proceeding of Seminar, Rehabilitation of faba bean, 24-27 May 1995, Rabat, Morocco, 47-54.

Khalil, S.A., M.M. El-Hady, M.I. Amer, H.A. Saber, M.A.A. Omar, R.F. Dissouky, and M.M. Abo Zeid. 1994. A new released cultivar of faba bran (*Vicia faba,L.*) in the Nile Delta of Egypt. International Symposium on Pulses Research, 2-6 April 1994. New Delhi (Abstracts, 147-148).

Mohamed, H.A. 1982. Major disease problems of faba bean in Egypt. In Faba Bean Improvement Proceeding of the International Faba Bean Conference, Cairo, March, 7-11, 213-225.

Poulsen, M.H. 1977. Genetic relationships between seed yield components and earliness in *Vicia faba,L.* and the breeding implications. J. Agric. Sci. Camb. 89: 643-654.

Rowlands, D.G. 1955. The problem of yield in field beans. Agric. Prog. 30: 137-147.

Sindhu, J.S., D.P. Singh, and K.P. Singh 1985. Component analysis of the factors determining grain yield in faba bean (*Vicia faba,L.*). FABIS Newsletter, 13: 3-5.

Snedecor, G.W. and W.G. Cochran. 1967. Statistical Methods. 6th Ed. Iowa State Univ., Press. Ames. Iowa, USA pp. 593.

Solh, M.B., H.M. Halila, G. Hernandez-Bravo, B.A. Malik, M.I. Mihom, and B. Sadri. 1992. Biotic and abiotic stresses constraining the productivity of cool season food legumes in different farming systems: Specific examples. In: Expanding the Production and use of Cool season Food Legumes. Proceedings of the Second International Food Legume Research Conference on pea, lentil, faba bean, chickpea and grasspea, Cairo, Egypt 12-16 April, 219-230.

الملخص العربى

تقييم بعض الإنعزالات الوراثية من الفول البلدي للمقاومة لمرض التبقع البني والمحصول ومكوناته

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١- قسم بحوث المحاصيل البقولية-معهد بحوث المحاصيل الحقلية-مركز البحوث الزراعية-الجيزة

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أجريت هذه الدراسة بكل من محطة بحوث النوبارية (تحت ظروف العدوى الطبيعية بالتبقع البنى) ومحطة بحوث الجيزة (تحت ظروف العدوى الصناعية) خلال الموسم ٢٠٠٢/٢٠٠٣، ٢٠٠٣/٢٠٠٤ بغرض تقييم بعض الإنعزالات الوراثية من الفول البلدى لمقاومتها للتبقع البنى والمحصول ومكوناته.

أظهرت النتائج اختلافات عالية المعنوية بين الإنعزالات الوراثية لكل الصفات تحت الدراسة. كما أظهرت النتائج ان هناك تباين وراثى كبير بين الإنعزالات الوراثية وكانت كلها اقل إصابة بالتبقع البنى مقارنة بالصنف الحساس جيزة ٤٠ تحت ظروف العدوى الطبيعية والصناعية. أعطت الإنعزالات الوراثية x-١٤٢٧، نوبارية ١، x-١٦١٨، x-١٥٥٤ أعلى قيم للمحصول ومكوناته. وكان التباين الوراثى أعلى من البيئى لكل الصفات المدروسة وقد لوحظ ان التباين الظاهرى والتباين الوراثى عالى لكل من صفات طول النبات، وزن بذور النبات، وزن الـ ١٠٠ بذرة وكذلك عدد بذور النبات. وكانت درجة التوريث عالية لكل من صفات وزن الـ ١٠٠ بذرة (٩٩,٧ %)، عدد قرون النبات (٩٩,٥ %)، عدد أفرع النبات (٩٨,٧ %) بينما كانت متوسطة بالنسبة لمرض التبقع البنى (٦٨,٢ %).

من النتائج السابقة نستنتج ان ثبات المقاومة لمرض التبقع البنى يؤكد ضرورة التباعد الوراثى وتجميع الجينات المرغوبة لذا فان اختيار الإنعزالات الوراثية المقاومة للمرض والمتباعدة وراثياً مع دورة انتخابية مع التهجين بينها اكثر فاعلية فى تحسين محصول الفول البلدى.