J. Plant Production, Mansoura Univ., Vol. 9 (8): 657 - 662, 2018

Selection for Seed Yield in Cross Population Giza 429 x Giza 40 of Faba Bean

Haridy, M. H.
Agronomy Department, Faculty of Agriculture, Al Azhar University (Assiut Branch)

ABSTRACT

The present investigation was carried out during 2013/2014, 2014/2015 and 2015/2016 successive seasons, at Experimental Farm Faculty of Agriculture (Assiut Branch) Al-Azhar University. The obtained results showed that the expected response to selection was lower than the actual response to selection for the studied traits in respect to the two selection criteria number of pods/plant and seed yield/plant. The results showed that the average plants recorded lower values in F_3 generation and increased gradually in the next generation for the studied traits except, average for days to maturity which recorded higher values in F_3 generation and decreased gradually in the next generation for the two selection criteria. In plant height (cm), number of pods/plant, seed index (100-seed weight gm.) and seed yield/plant (gm) the average of the bulk populations was less than those for selected families in F_3, F_4 and F_5 generations, except, for number of days to maturity where in the bulk populations was higher than selected families in F_3, F_4 and F_5 generations for the two selection criteria. Phenotypic and genotypic coefficients of variability recorded higher values in F_3 generation and decreased gradually in the next generation for the studied traits. Positive and significant phenotypic and genotypic correlation coefficients were recorded between seed yield per plant and all the studied traits, except days to maturity it was negative and significant for the two selection criteria. Heritability in narrow sense was high (>50%) for plant height and 100-seed weight in F4 and F5 and varied from low to moderate for the remaining traits.

INTRODUCTION

Faba bean *(Vicia faba L.)* is a protein crop for temperate regions. In Egypt, there is little possibility for increasing the cultivated area. Therefore, it is important to obtain higher-yielding cultivars through breeding programs. Selection for increased seed yield from the Egyptian faba bean varieties alone would not be effective (Metwali and Bakheit, 2011) and (Haridy 2017). Genetic improvement of yield with its attributes is the primary objective of plant breeders. The importance of genetic variability in any breeding programs is well documented for various species as it provides basis for effective selection (Ahmed *et al.* 2008). Abd-El Haleem *et al.*(2012) used three selection procedures, i.e. direct selection for seed yield, index selection and independent culling levels for yield index. Pedigree and early generation seed yield testing methods are described in most plant breeding texts. These breeding procedures present advantage of the rapid fixation of favorable alleles through selection. Shalaby *et al.* (2001) applying and the present study the effectiveness of the selection methods for improving seed yield of faba bean. The main objective of the present study was to compare the relative efficiency of two selection procedures i.e. pedigree and bulk selection for improving earliness, seed yield and its attributes in faba bean.

MATERIALS AND METHODS

The present investigation was carried out at Experimental Farm Faculty of Agriculture, Al-Azhar University (Assiut Branch) during the period of 2013/2014, 2014/2015 and 2015/2016 growing seasons. The breeding materials used in this study was 1000 F_3- families traced back to random F_2 plants from the cross Giza 429 x Giza 40. The parents Giza 429 and Giza40 were obtained from Legume Crops Section, Field Crops Research Institute, Agriculture Research Center, Giza, Egypt.

Experiments Layout:

In 2013/2014 season, 1000 individual F_3 plants of the population, Giza 429 x Giza 40 was grown in a breeding nursery in non – replicated experimental in the field. Seeds were planted in ridges 3 meters long and 60 cm apart in hills spaced 20cm apart and one plant was left per hill. At maturity, 160 plants were selected for each two criteria, number of pods/plant and seed yield/plant to obtain the F_4 families. Parents and F_3 bulk population were also grown.

In the 2014/2015 growing season, the 200 F_4 families which were selected from population Giza 429 x Giza 40 with the original parents, F_4 - bulk random sample a mixture of equal number of seed from each plant were grown in a randomized complete block design with three replications to obtain F_5 families. Each plot was single row 3m long 60 cm apart and 20cm between hills for each of the selection criteria i.e. number of pods/plant and seed yield/plant. At maturity, 20 families were selected for two criteria from the 160 F_4 families of both experimental for number of pods/plant and seed yield/plant in the field and saved to give the F_5 families.

In 2015/2016 season, 20 F_5 families which were selected based on selection criteria number of pods/plant and seed yield/plant.) as well as F_5 bulk sample, with the parents and the chick cultivar (Misr 1) were sown on 25$^{th.}$ October in a randomized complete block design with three replications. Each family was grown in single row 3m long, 60 cm between rows and 20 cm between hills with one plant/hill. Recommended cultural practices for faba bean production were adopted throughout the growing seasons. The following traits were measured on a sample of ten random plants replicate from each family, parents, bulk, and check i.e. days to maturity, plant height (cm), number of pods/plant, seed index (100-seed weight gm.) and seed yield/plant (gm).

Statistical Analysis :

Data were analyzed using a randomized complete block design (RCBD) according to Guimaraes and Feshr (1989). Data of the studied populations were subjected to the regular analysis of variance of RCBD on plot mean basis. The different genetic parameters, i.e. variance, heritability, expected genetic advance were calculated. The genotypic and phenotypic variance (σ^2g and σ^2ph) under different breeding methods were calculated from the mean squares expectation (Table 1) as follows:

Table 1. The analysis of variance and expected mean squares.

Source of variance	d.F	M.S	E.M.S
Replications	r-1	M_3	$\sigma^2e+g\sigma^2$ r
Genotypes	g-1	M_2	$\sigma^2e+r\sigma^2g$
Error	(r-1)(g-1)	M_1	σ^2e

Where: r and g = number of replications and genotypes, respectively. σ^2e and σ^2g = error variance and genetic variance, respectively.

The realized response and the expected gain to selection:

The realized response "R" and the expected gain to selection "Δg" were calculated according to Falconer (1981), as follows:

Realized response "R" = the mean deviation of the offspring from population mean.

The expected gain $\Delta g = Sh^2$

S = the selection differential, the mean phenotypic value of the selected parents expressed as a deviation from the population mean, and it depends on selection intensity and phenotypic standard deviation, i.e.,

$S= i\sigma p.$

i=selection intensity. σp = the phenotypic standard deviation.

The response to selection depend upon the heritability of the character and the amount of selection applied as measured by selection differential

$\Delta g = h^2n\, i\sigma p.$

The phenotypic and genotypic coefficient of variability:

The phenotypic (PCV) and genotypic (GCV) coefficient of variability were calculated as ($\sigma p/ \bar{x}$)100 and ($\sigma g/\bar{x}$)100, respectively.

The genotypic variance $\sigma^2g = (M_2- M_1)/r$. The phenotypic variance $\sigma^2p = \sigma^2g + M_1/r$.

Heritability in the narrow sense: was estimated using the correlation and parent offspring regression according to (Smith and Kinman, 1965), as follows:

Parent–offspring generation	r_{xy}	$h = b/2r_{xy}$
F_3 , F_4	7/8	4/7 b F_4, F_3
F_4 , F_5	15/16	8/15 b F_5, F_4

According to Falconer (1981), from the equation of response, $R=Sh^2$ which discussed earlier from the point of view of predicting the response to selection, the heritability being estimated as the ratio of the response to selection differential.

Correlations among studied attributes:

The statistical analysis was carried out as illustrated by Steel and Torrie (1980). Phenotypic and genotypic correlations coefficients were computed as described by Johnson *et al.* (1955), as follows:

Phenotypic correlation $rp_{xy} = Covp_{xy} / (\sigma p_x . \sigma p_y)$.

Genotypic correlation $rg_{xy} = Covg_{xy} / (\sigma g_x . \sigma g_y)$.

RESULTS AND DISCUSSION

Two cycles of pedigree selection were achievement in one faba bean population *(Vicia faba* L.*)* derived from a cross between Giza 429/ Giza 40 in the F_3, F_4 and F_5 generations were used. Direct pedigree selection for number of pods/plant and seed yield/plant were applied.

Description of the base population (F_3 generation).

Means and variance of the characteristics of the individual plants in the F_3 generation in the one population was presented in Table (2). The one base populations used in this study consisted of 1000 F_3 plants for each population traced back to random sample from F_2 single plants. All traits in the F_3 generation showed wide range of variability in population. The average values were 168.98 for number of days to maturity; 141.45cm for plant height; 38.77 pods for number of pods/plant, 54.36 gm for seed index and 63.44 gm for seed yield/plant. The phenotypic variance (σ^2ph) valued 955.33 for days to maturity; 666.16 for plant height; 0.23 for number of branches/plant; 44.18 for number of pods/plant; 88.12 for seed index as well as 154.20 for seed yield/plant. The coefficients of variability (C.V%) were 17.8 for days to maturity, 18.2 for plant height, 11.9 for number of branches/plant, 16.7 for number of pods/plant, 15.6 for seed index and 13.4 for seed yield/plant.

Table 2. Means and phenotypic variance (σ^2ph) and coefficient of variation (CV%) of base population(F_3) for Giza 429 x Giza 40.

Item	days to maturity	Plant height	No. of pods/plant	Seed index	Seed yield/plant
Means ±S.E	168.98 ± 0.99	141.45 ± 0.77	38.77 ± 0.31	54.36 ± 0.27	63.44 ± 0.36
Max.	170.36	148.42	51.11	69.25	92.78
Min.	134.57	121.16	30.65	40.99	40.16
σ^2ph	955.33	666.16	44.18	88.12	154.2
CV%	17.8%	18.2%	16.7%	15.6%	13.4%
Giza 429	155.65	133.72	46.25	52.58	62.12
Giza 40	160.21	142.55	36.16	54.25	60.81

Analysis of variance and mean performance

Analysis of variance for selected families for two criteria i.e. number of pods/plant and seed yield/plant. along with the parents, the bulk population and check cultivar Misr 1 for days to maturity, plant height, number of pods/plant, seed index and seed yield per plant in cycle 1 (F_4 generation), cycle 2 (F_5 generation) of the population Giza 429 x Giza 40 are shown in Tables (3 and 4). Results revealed highly significant differences between families in F_3, F_4 and F_5 generations in the populations when the selection was practiced based on no. of pods/plant and seed yield/plant, respectively.

Number of pods/plant criterion:

Average number of days to maturity for selected families was 165.56, 151.22 and142.65 days in F_3, F_4 and F_5 generations, respectively. The selected families were earlier in maturity compared to bulk populations in F_3, F_4 and F_5 generations. In F_5 generation all families were earlier compared to the bulk populations and the check cultivar (Misr 1). These results are in agreement with those obtained by Ahmed *et al.* (2008).

For plant height mean performance of selected families were 148.12, 150.16 and 152.66 cm in F_3, F_4 and F_5 generations, respectively. Average value for plant height of the bulk populations was less than those for selected families in F_3, F_4, and F_5 generations. The average plant height of F_5 generation was higher than the highest parent (Giza 40) and the check cultivars (Misr 1). These results are in the line with the findings of Djukic *et al.* (2011).

Average number of pods/plant for selected families were 45.75, 47.35 and 52.65 pods in F_3, F_4 and F_5 generations respectively. Average number of pods/plant of the bulk populations was less than average selected families in F_3, F_4, and F_5 generations. Value of number of pods/plant of F_5 generation was greater than the greatest parent (Giza 429) and the check cultivar (Misr 1). These results are in harmony with the present findings of Metwali and Bakheit (2011).

It is interest to note that, seed index (gm) for selected families exhibited values 55.85, 57.88 and 63.44 pods in F_3, F_4 and F_5 generations, respectively. The selected families of population surpassed the bulk population in F_3, F_4 and F_5 generations. In F_5 generation, selected families of population surpassed the bulk population, the highest parent (Giza 40) and the check cultivar (Misr 1). These results took the same trend with those obtained by Shalaby *et al.* (2001), Ahmed *et al.* (2008) and Metwali and Bakheit (2011).

Mean performance of seed yield/plant for selected families were 77.34, 80.45 and 88.66 gm in F_3, F_4 and F_5 generations, respectively. The average of selected families in F_3, F_4 and F_5 generations of population surpassed the average of the bulk population. In F_5 generation, all families significantly surpassed the bulk, the highest parent Giza 429 and the check cultivar Misr 1, except, family no. 11, 34, 62 and 102. These results are in agreement with those of Abo -Elezz (2005) and Haridy (2017) .

Table 3. Means of families, bulk population, two parents and check cultivar for all studied traits at the two cycles of selection.

Item		Day to maturity	Plant height	Number of pods/plant	100-seed Weight	Seed yield/plant
	Families	151.22	150.16	47.35	57.88	80.45
	Bulk	150.12	147.66	45.89	56.16	76.25
	Parent 1	155.66	133.72	46.55	52.26	62.12
F_4	Parent 2	160.15	142.55	36.18	54.44	60.13
	Check cv.	153.12	150.12	46.34	56.11	67.22
	L.S.D 0.05	5.90	6.11	8.15	5.82	8.97
	L.S.D 0.01	8.98	9.01	12.00	7.61	10.63
	Families	142.65	152.66	52.65	63.44	88.66
	Bulk	144.26	151.26	48.27	61.56	81.81
	Parent 1	155.60	133.75	46.59	52.36	62.19
F_5	Parent 2	160.16	142.85	36.33	54.52	60.45
	Check cv.	152.89	150.22	46.54	56.19	67.25
	L.S.D 0.05	5.75	5.73	9.14	5.43	8.57
	L.S.D 0.01	7.70	7.68	11.94	7.27	11.47

Seed yield/plant criterion:

When the selection criterion was imposed on seed yield/plant, average number of days to maturity for selected families valued 168.98, 146.36 and 137.66 days in F_3, F_4 and F_5 generations, respectively. The selected families were earlier in maturity compared to bulk populations in the three generations. In F_5 generation, average number of days to maturity for selected families was earlier compared to the bulk populations, the earlier parent (Giza 429) and the check cultivar (Misr 1). These results are in harmony with those obtained by Ahmed *et al.* (2008).

It is clear that average of plant height for selected families was 141.45, 154.17 and157.67 cm in F_3, F_4 and F_5 generations, respectively. Average plant height of the bulk populations was less than those of selected families in F_3, F_4, and F_5 generations. Average of plant height for selected families was longer than the longest parent (Giza 40) and the check cultivar (Misr 1). These results are in agreement with the findings of Haridy *et al.* (2012) and Haridy (2017) .

Average number of pods/plant for selected families was 38.77, 52.37 and 58.67 pods in F_3, F_4 and F_5 generations, respectively. Number of pods/plant of the bulk populations was less than those of selected families in F_3, F_4, and F_5 generations. Average number of pods/plan for selected families was greater than the greatest parent (Giza 429) and the check cultivar (Misr 1). These results are in agreement with the findings of Metwali and Bakheit (2011) and Djukic *et al.* (2011).

Table 4. Means of families, bulk population, two parents and check cultivar for all studied traits at the two cycles of selection.

Item		Day to maturity	Plant height	Number of pods/plant	100-seed weight	Seed yield/plant
	Families	146.35	154.16	52.37	63.89	87.46
	Bulk	147.12	150.66	49.89	61.16	82.25
	Parent 1	154.46	134.92	47.85	53.59	63.42
F_4	Parent 2	158.85	143.85	37.58	55.88	61.53
	Check cv.	152.02	151.22	47.54	57.36	68.42
	L.S.D 0.05	5.60	6.31	8.35	6.12	9.37
	L.S.D 0.01	8.58	9.31	12.3	8.01	11.13
	Families	137.65	157.66	58.67	70.45	96.67
	Bulk	141.26	154.26	52.27	66.56	87.81
	Parent 1	154.30	134.85	47.79	53.66	63.59
F_5	Parent 2	158.96	143.95	37.43	55.72	61.75
	Check cv.	151.79	151.22	47.54	57.29	68.45
	L.S.D 0.05	5.55	5.83	9.24	5.63	8.87
	L.S.D 0.01	7.40	7.88	12.14	7.57	11.87

Seed index (gm) for selected families valued 54.36, 63.89 and 70.45 gm. in F_3, F_4 and F_5 generations, respectively. The selected families of population surpassed the bulk population in F_3, F_4 and F_5 generations. In F_5 generation, average seed index (gm) for selected families was surpassed the bulk population, the highest parent (Giza

40) and the check cultivar (Misr 1). These results took the same trend with those obtained by Shalaby *et al.* (2001) and Abo -Elezz (2005).

It is obvious to note that average of seed yield/plant for selected families was 63.44, 87.46 and 96.67 gm in F_3, F_4 and F_5 generations, respectively. The average of selected families in F_3, F_4 and F_5 generations of population surpassed the average of the bulk population. In F_5 generation, all families significantly surpassed the bulk, the highest parent Giza 429 and the check cultivar Misr 1, except, family no. 50, 85, 99 and 189. These results are in agreement with those of Sabah *et al.* (2002).

Genetic parameters:

The genetic parameters computed for the studied population were phenotypic (P.C.V) and genotypic (G.C.V) coefficient of variability on one hand and phenotypic (rp) and genotypic (rg) correlation on the other hand.

Table 5. Means of families for seed yield/plant in F_5 generations when selection was based on number of pods/plant and seed yield/plant in faba bean.

Number of pods/plant				Seed yield/plant			
Family No.	**Mean**	**Family No.**	**Mean**	**Family No.**	**Mean**	**Family No.**	**Mean**
5	89.86	94	88.86	16	96.97	233	97.87
8	89.96	102	82.66	44	96.87	244	97.97
11	80.66	414	89.16	50	89.67	298	98.17
34	81.66	425	89.26	77	97.17	311	98.27
55	91.06	477	89.06	85	88.67	348	99.07
57	90.16	490	90.96	90	97.07	395	97.27
59	90.86	512	91.77	99	94.67	430	98.87
60	91.16	544	91.46	130	99.78	455	99.17
62	86.66	555	88.75	171	99.47	496	98.97
95	90.26	575	88.96	185	96.56	516	97.87
Average			88.66				96.67

Table 6. Phenotypic (∂^2p), genotypic (∂^2g) their coefficients of variability and heritability estimates of the studied traits when selection was based on number of pods/plant in faba bean.

Traits		**^{2}p∂**	**^{2}g∂**	**PCV**	**GCV**	**Heritability in narrow sense**
Day to maturity	F_4	46.31	31.22	4.50	3.70	32.11
	F_5	39.22	32.25	4.39	3.98	32.82
Plant height (cm)	F_4	4.43	3.92	1.40	1.32	58.95
	F_5	4.31	4.11	1.34	1.33	59.17
Number of pods/plant	F_4	71.64	40.77	17.88	13.49	29.97
	F_5	61.54	51.25	14.90	13.60	30.61
100-seed weight(g)	F_4	35.25	21.25	10.26	7.96	50.42
	F_5	31.41	27.65	8.83	8.29	51.33
Seed yield /plant(g)	F_4	82.56	45.44	11.29	8.38	41.99
	F_5	72.34	60.16	9.59	8.75	44.06

Number of pods/plant criterion:

Estimates of phenotypic and genotypic coefficients of variability (Table 7) were 4.50 and 3.70; 4.39 and 3.98% in F_4 and F_5 generations in days to maturity, respectively. The corresponding values were 1.40 and 1.32; 1.34 and 1.33% in F_4 and F_5 generations in plant height, respectively. Moreover, in number pods/plant, the corresponding values were 17.88 and 13.49; 14.90 and 13.60% in F_4 and F_5 generations, respectively. Furthermore, the corresponding estimates were 10.26 and 7.96; 8.83 and 8.29% in F_4 and F_5 generations in 100 seed weight, respectively. Finally the corresponding values for seed yield per plant were 11.29 and 8.38; 9.59 and 8.75% in F_4 and F_5 generations, respectively. Small differences were observed between P.C.V. and G.C.V. in all generations, indicating the importance of the genetic effects controlling the inheritance of days to maturity and plant height.

Heritability in narrow sense was high (>50%) for plant height and 100-seed weight in F4 and F5 and varied from low to moderate for the remaining traits. Similar Results were obtained by Abd-El Haleem *et al.* (2012).

Seed yield/plant criterion:

Estimates of phenotypic and genotypic coefficients of variability (Table 8) were 4.63 and 3.95; 4.77 and 4.06% in F_4 and F_5 generations in days to maturity, respectively. The corresponding values in plant height were 4.27 and 3.55; 3.67 and 3.61% in F_4 and F_5 generations, respectively. Moreover, those estimates were 61.60 and 12.87; 14.40 and 13.33% in F_4 and F_5 generations in number of pods/ plant, respectively. Furthermore, the values were 10.50 and 7.23; 8.57 and 8.01% in F_4 and F_5 generations in 100 seed weight, respectively. The corresponding values in seed yield per plant were 10.20 and 8.04; 8.73 and 8.16% in F_4 and F_5 generations, respectively.

Table 7. Phenotypic (∂^2p), genotypic (∂^2g) and their coefficients ofvariability and heritability estimates of the studied traits when selection was based on seed yield/plant in faba bean.

Traits		**^{2}p∂**	**^{2}g∂**	**PCV**	**GCV**	**Heritability in narrow sense**
Day to maturity	F_4	45.87	33.45	4.63	3.95	40.72
	F_5	43.05	31.22	4.77	4.06	40.83
Plant height (cm)	F_4	43.29	29.95	4.27	3.55	20.45
	F_5	33.41	32.3	3.67	3.61	22.75
Number of pods/plant	F_4	75.56	45.43	16.60	12.87	33.12
	F_5	71.35	61.14	14.40	13.33	33.72
100-seed weight(g)	F_4	44.96	21.34	10.50	7.23	36.61
	F_5	36.42	31.81	8.57	8.01	39.67
Seed yield /plant(g)	F_4	79.57	49.44	10.20	8.04	42.74
	F_5	71.25	62.25	8.73	8.16	43.44

Heritability in narrow sense was low (< 30%) for plant height and in F4 and F5 and moderate for the remaining traits. These results are in agreement with those obtained by Lithy and Abdel-Aal (2004).

The actual and expected response to selection for the studied traits.

Number of pods/plant criterion:

Number of pods/plant criterion is presented in Table (8) for F_4 and F_5 generations of population (Giza 40 x Giza 429).

The actual response to selection for number of days to maturity (Table 8) was -9.67 and -8.57 days in the F_4 and F_5 generations, respectively. The expected response was biased estimated in F_4 and F_5 generations and valued -3.54 and -3.12 days, respectively. The actual response for plant height was 2.95 and 2.50 cm in F_4 and F_5 generations, respectively. The expected gain from indirect selection for plant height was 2.01 and 1.95 cm in the same respective order. The expected direct response to selection values for number of pods/plant in the population were 4.11 and 3.25 in F_4 and F_5 generations, respectively. The actual direct response for number of pods/plant was 6.12 and 5.30 in F_4 and F_5 generations, respectively. The actual response to selection estimates for seed index were 6.44 and 5.56 gm. in F_4 and F_5 generations of population, respectively. Whereas, the expected gain from indirect selection for seed index was 4.85 and 3.16 gm in F_3, F_4 and F_5 generations, respectively. The actual response for seed yield /plant was 9.56 and 8.21 gm in F_4 and F_5 generations, respectively. The expected response to selection for seed yield /plant was 6.18 and 4.45 gm in F_4 and F_5 generations of the population, respectively. These results are in agreement with those obtained by Haridy *et al.* (2012) and Haridy (2017).

Table 8. The actual and expected indirect response to selection for all studied traits when selection was based on number pods/plant and seed yield/plant in faba bean population (Giza 429 x Giza 40).

criteria		Number of pods/plant		Seed yield/plant	
Characters		Actual response	Expected response	Actual response	Expected response
Days to maturity	F_4	-9.67	-3.54	-9.85	-4.55
	F_5	-8.57	-3.33	-8.70	-4.42
Plant height	F_4	2.95	2.01	3.58	2.15
	F_5	2.50	1.99	3.50	2.17
No. of pods/plant	F_4	6.12	4.11	6.45	4.75
	F_5	5.30	3.89	6.30	4.7
Seed index	F_4	6.44	4.85	6.69	4.05
	F_5	5.56	4.66	6.56	3.95
Seed yield/plant	F_4	9.56	6.18	9.88	6.29
	F_5	8.21	6.07	9.21	6.05

Seed yield/plant criterion:

Seed yield/plant criterion for F_4 and F_5 generations of the population (Giza 429 x Giza 40) is presented in Table 8.

The actual response to selection for number of days to maturity (Table 8) was -9.85 and -8.70 days in the F_4 and F_5 generations, respectively. Whereas the expected response was biased estimated in F_4 and F_5 generations and exhibited -4.55 and -4.42 days, respectively. The actual response for plant height was 3.58 and 3.50 cm in F_4 and F_5 generations, respectively, while the expected gain from indirect selection for plant height was 2.25 and 2.17cm in F_4 and F_5 generations, respectively. The expected direct response to selection for number of pods/plant in population was 4.75 and 3.85 in F4 and F_5 generations of respectively, however the actual direct response for number of pods/plant was 6.45 and 6.30 in F_4 and F_5 generations, respectively. Moreover, the actual response to selection values for seed index was 6.69 and 6.56 in F_4 and F_5 generations of the population, respectively. The expected gain from indirect selection for seed index was 4.05 and 3.36 gm in F_3, F_4 and F_5 generations, respectively. In addition to, the actual response for seed yield /plant was 9.88 and 9.21 gm. in F_4 and F_5 generations, respectively. The expected response to selection for seed yield /plant was 6.29 and 5.33 in F_4 and F_5 generations of the population, respectively. Similar findings were obtained by Haridy (2017).

Phenotypic (rp) and genotypic (rg) correlation coefficients of F_5 generation for all studied

Based on selection criterion number of pods/plant, in F_5 generation, phenotypic and genotypic correlation coefficients between days to maturity and all other traits were negative with one exception for the two selection criteria (Table 9). Phenotypic and genotypic correlation coefficients were positive and significant between seed yield/plant and each of plant height (0.744 and 0.854), number of pods/plant (0.978 and 0.989), while it was negative and significant between seed yield/plant and days to maturity (-0.789 and -0.898) for the population. These results are in agreement with those found by Haridy *et al.* (2012) who found that, phenotypic and genotypic correlation coefficients were positive and significant between seed yield/plant and each of plant height, number of pods/plant, and seed index, while it was negative and significant between plant height and days to maturity.

Table 9. Phenotypic (above diagonal) and genotypic (below diagonal) correlation between pairs of studied traits at F_4 and F_5 generations when selection was based on number pods/plant in faba bean.

Traits		Days to maturity	Plant height	No. of pods/plant	Seed index	Seed yield/plant
Days to maturity	F_4	-	-0.679**	0.811**-	0.833-	0.789**-
	F_5	-	-0.757**	0.976**-	0.956**-	0.898**-
Plant height	F_4	-0.427	-	0.785**	0.618**	0.744**
	F_5	-0.517*	-	0.799**	0.872**	0.854**
No. of pods/plant	F_4	0.476*-	0.765**	-	-0.533*	0.978**
	F_5	-0.543*	0.878**	-	-0.535*	0.989**
Seed index	F_4	0.326-	0.534*	-0.222	-	0.454*
	F_5	0.415-	0.595**	-0.325	-	0.585**
Seed yield/plant	F_4	0.539*-	0.655**	0.752**	0.325	-
	F_5	- 0.665**	0.745**	0.846**	0.336	-

Based on seed yield/plant criteria, in F_5 generation, phenotypic and genotypic correlation coefficients (Table 10) were positive and significant between seed yield/plant and each of plant height (0.875 and 0.675), number of pods/plant (0.978 and 0.833) and seed index (0.592 and 0.447), while it was negative and significant between seed

yield/plant and days to maturity (-0.868 and -0.675) for the population. These results are in agreement with those found by Tadesse *et al.* (2011) who found that, phenotypic and genotypic correlation coefficients were positive and significant between seed yield/plant and each of plant height, number of pods/plant and seed index, while it was negative and significant between plant height and days to maturity.

Table 10. Phenotypic (above diagonal) and genotypic (below diagonal) correlation between pairs of studied traits at F_4 and F_5 generations traits when selection was based on seed yield/plant in faba bean.

Traits		Days to maturity	Plant height	No. of pods/plant	Seed index	Seed yield/plant
Days to maturity	F_4	-	-0.735**	-0.845**	0.875**-	0.734**-
	F_5	-	-0.834**	0.997**-	0.967**-	0.868**-
Plant height	F_4	-0.429	-	0.897**	0.636**	0.778**
	F_5	-0.527*	-	0.899**	0.887**	0.875**
No. of pods/plant	F_4	0.478*-	0.879**	-	-0.552*	0.972**
	F_5	0.544*-	0.883**	-	-0.597**	0.978**
Seed index	F_4	0.367-	0.565**	-0.321	-	0.464*
	F_5	-0.488*	0.599**	-0.365	-	0.592**
Seed yield/plant	F_4	0.542*-	0.654**	0.735**	0.322	-
	F_5	0.675**-	0.755**	0.833**	0.447*	-

REFERENCES

Abd-El-Haleem, S.H.M; M.M.Soliman; Nagat G. Abdallah; M.A.Bakheit and M.A. Raslan 2012. Direc tional selection in faba bean *(Vicia faba)* under infestation off *Orobanche crenata*. World. Appli. Sci. Jour. 16 (8): 1074-1081.

Abo-Elezz, A. A 2005. Comparative studies on pedigree and bulk selection in peanuts. Ph.D.Thesis, Fac. Agric., Assiut Univ., Egypt

Ahmed, M.S.H.; S.H.M. Abd-El-Haleem; M.A. Bakheit and Mohamed S.M.S. 2008. Comparison of three selection methods for yield and components of three faba bean (*Vicia faba* L.) crosses. World Jour of Agric. Sci. 4(5): 635-639.

Alan, O and H. Ceren. 2007. Evaluation of heritability and correlation for seed yield and yield components in faba bean. Jour. Agron. 6 (3): 484-487.

Djukic, V.; V. Djordjevic; D. Miladinovic; S.B.Tubic; J.W.Burton and J. Miladinovic 2011. Soybean breeding: comparison of the efficiency of different selection methods. Tur. Jour. Agric .(35) 469-480.

Falconer, D.S. 1981. Introduction to quantitative genetics. Longman New York.

Guimaraes, E.P. and W.R. Fehr. 1989. Alternative strategies of recurrent selection for seed yield of soybean. Euphytica 40 :111- 120.

Haridy, M.H (2017). selection for seed yield in one population of faba bean. and its components in faba bean. International Jour. of Agric. Econom. Develop., 5(1). 38-52

Haridy, M.H ; H.E.Yassien;A.S.A.Abo El-Hamed and N. A.Azzaz (2012). Response to selection for seed yield and its components in faba bean Minia Jour. Agric. Res. & Dev., 32(4):651-668.

Johonson, W.J.; H.F. Robanson and R.E. Comstock 1955. Estimates of genetic and environmental variability in soybeans. Agron. Jour. 47: 314 -322.

Lithy, R. E and A. I. N. Abdel-Aal 2004. Performance of faba bean genotypes under the environmental conditions of southern Egypt at Toshky. Minia Jour. Agric. Res. & Dev., 24 (1): 31- 52.

Metwali, E.M.R and M.A Bakheit (2011). Pedigree selection for seed yield and number of pods per main stem in two segregating populations of faba bean *(Vicia faba L.)*. World. Appli. Sci. Jour. 15 (9): 1246-1252.

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

Shalaby, F.Il.; Sabah M. Attia; H.M. Ibrahim; S.R. Saleeb; Kh.A. A. Assily and Sohir A. Mokhtar. 2001. Evaluation of B Some breeding methodologies in faba bean (*Vicia faba* L.) Mansoura Univ. Jour. Agric. Sci., 26 (9): 5205-5215.

Smith, J. D., and M.L. Kinman. 1965. The use of parent off-spring regression as an estimator of heritability. Crop Sci., 5: 595- 596.

Steel, RG.D. and J.H. Torrie. 1980. Principles and Procedures of Statistics. Mc Graw Hill Book Company, Inc. New.

Tadesse, T.; M. Fikere,; T.Legsse. and A. Parven. 2011. Correlation and path coefficient analysis of yield and its component in faba bean germplasm. Int. Jour. Biodvers. Conserv. Vol3(8): 376-382.

الانتخاب للمحصول في هجين العشيرة جيزة 429 x جيزة 40 في الفول البلدي

مختار حسن هريدي

قسم المحاصيل كلية الزراعة جامعة الازهر فرع أسيوط

أجريت هذة الدراسة خلال الموسم الشتوي لأعوام 2014/2013و 2015/2014و 2016/2015 بمزرعة كلية الزراعة جامعة الأزهر فرع أسيوط باستخدام عشيرة الهجين (جيزة 40 x جيزة 429) في الجيل الثالث و حتي الجيل الخامس في عشيرة واحدة من الفول البلدي وذلك لصفات عدد الايام حتي النضج وطول النبات وعدد القرون النبات ووزن 100 بذرة ومحصول بذور النبات. أوضحت النتائج ما يلي: كانت الاستجابة المتوقعة للانتخاب اقل من الاستجابة الفعلية للانتخاب في الجيل الثالث والرابع والخامس وذلك للصفات المدروسة. كان متوسط النباتات اقل ما يمكن في الجيل الثالث ثم زاد تدريجيا للصفات المدروسة عدا صفة عدد الايام حتي النضج والتي سجلت قيما عالية في الجيل الثالث ثم اتجهت اتجاة التبكير في الاجيال الرابع والخامس و ذلك في المقياسين الانتخابيين .كان متوسط الصفات تحت الدراسة في العشيرة المجمعة اقل من نظيرة في النباتات المنتخبة فى الجيل الثالث والرابع والخامس ماعد صفة عدد الايام حتي النضج وكان ذلك في المقياسين الانتخابيين. كانت تقديرات التباين المظهري والوراثي عالية في الجيل الثالث ثم اخذت في التناقص التدريجي الصفات تحت الدراسة ماعدا صفة عدد الايام حتي النضج وكان ذلك في المقياسين الانتخابيين .اظهرت النتائج وجود ارتباط مظهري ووراثي موجب ومعنوي بين محصول بذور النبات وطول النبات وعدد قرون النبات ووزن ل100 بذرة، في حين كان الارتباط سالبا ومعنويا مع صفة عدد الايام حتي النضج وكان ذلك في المقياسين الانتخابين. أوضحت النتائج أن درجة التوريث الصغري كانت أكبر من 50% في صفة الطول وكذلك وزن 100بذرة بينما تراوحت في الباقي مابين متوسط ومنخفض.