PERFORMANCE OF SOME FABA BEAN (*Vicia faba L.*) GENOTYPES GROWN UNDER DELTA CONDITION

By

Farag[1], S. T., M. A. Abd El-Galeel[2] and M. F. El-Nady[3]

1- Vegetable Res. Dept., Hort. Res. Institute, ARC, Egypt.
2- Food Sci. Techn. Dept. Fac. of Agric. Kafr El-sheikh, Tanta Univ. Egypt.
3- Dept. of Agric. Botany, Fac. of Agric. Kafr El-sheikh, Tanta Univ. Egypt.

ABSTRACT

Two field experiments were carried out at the Experimental Farm of El-Gemmeiza Agriculture Research Station during the winter seasons of 2001/2002 and 2002/2003. The investigation aimed to study performance of 16 faba bean genotypes over 2 seasons.

Data obtained showed significant differences among all of the tested faba bean genotypes concerning all studied traits in both seasons. The genotype Icarus was significantly taller than those of the other genotypes in both seasons, while the line ILB 4726 and the cv. Riene Mora recorded the greatest number of branches per plant in both seasons. Concerning number of pods per plant , the genotypes Giza 461 and Giza Blance produced greatest number of pods per plant in the first and second season, respectively. The genotypes Aquadolce and Riena Mora gave the greatest number of seeds per pod, while, the cv. Icarus produced the lowest number in both seasons. Regarding the remaining traits i.e., pod weight, length, 100-green seed weight and total green pod yield, the genotype Reina Mora gave the highest values. Generally, the highest total green pod yield was given by the cvs. Reina Mora, Luz De Otono and Giza Blance during the two seasons. Comparing these three cvs. with the check cultivar (control), they out yielded the control by 19.2 to 51.8 % in the first season and 14.7 to 71.6 % in the second one. The chemical composition of green seeds the results showed that the highest values of crude protein and lipids % were observed in Giza Blanca and Giza 716 respectively. Also, the highest values of crude fibers % and dry weight % of green seeds were obtained in Giza 716 and Aquadolce respectively. Concerning genotypes dry seeds, the results indicated that the highest values of crude protein and lipids % were recorded in Giza 641 and Giza 643, respectively. The crude fibers %, ash %, carbohydrates %, total phenoles and cooking time of genotypes seeds were determined. Significant correlations were observed between various pairs of

characters. Based on the correlation coefficient, number of seeds per pod, pod weight, length and 100-green seed weight, appeared to be yield attributes for selection.

The present study suggests that the cvs. Reina Mora and Luz De Otono can be uses as parents in faba bean breeding programs, since they are high yielding in both seasons in total green pod yield.

INTRODUCTION

Faba bean (*Vicia faba L.*) is one of the important legume crops in Egypt, which can be used as vegetable, pulse, fodder, green manure and as cover corp. In several African countries, particularly Egypt, faba bean is the most important legume seed consumed directly as human food. The most popular way of preparing faba bean in Egypt is stewed faba bean (fool medamas), which people eat for breakfast and supper, as well as in sandwiches at any time of the day. Other popular ways of preparing faba beans are as bean cakes (falafel or taamia) and germinated beans (fool nabet). It is cultivated for local consumption, since the pods are harvested at the green stage for fresh marketing uses. Faba bean seeds contain 59.9% carbohydrate, 1.3% fat and 18.6-37.8% protein content (Kaul and Vaid 1996 and Tewati and Virk 1996). Improving the quality of the produced faba bean seeds should be taken into consideration (Mahmoud *et al.*, 1998).

Significant varietal differences among faba bean genotypes regarding plant growth, yield and yield components were observed by many investigators, El-Murabaa *et al.* (1987), Della (1988), Nanda *et al.* (1988), Salih and Aly (1989), Wali *et al.* (1990), Khare and Singh (1991), Link *et al.* (1994), Bora *et al.* (1997), Multa (1998), Bassiouny (2001) and Farag and Helal (2004),

The relationship between several properties of faba bean were studied by many workers. In a study on path analysis among 24 strains of faba bean, Sindhu *et al.* (1985) found, that the number of flowers and seeds/plant had strong direct positive effects on grain yield, whereas primary branches and pods/ plant had a direct negative effect, although the two characters showed significant positive correlations with yield. On the other hand, Bakheit and Mahady (1988) found that pods/plant had the highest positive direct effect on seed yield in the 21 genotypes in their study. They also found that seed weight and seeds/pod were the other traits with a major direct positive effect on yield. Multa (1998) found that, most agro-morphological characters

except 1000-seed weight showed positive and significant correlation with seed yield.

To increase the productivity of faba bean, attention must be given to the development of new high yielding genotypes or hybrids for the growers and consumer through breeding programs. Before the initiation of any breeding program, in order to improve one or some quantitative characters, it is necessary that the materials used should be subjected to genetic analysis. The main objectives of present studies were to evaluate the 16 faba bean genotypes under Egyptian conditions for their adaptability and productivity, to be replaced instead of the old ones.

MATERIALS AND METHODS

Two field experiments were carried out during the winter seasons of 2001/2002 and 2002/2003 at the Farm of El-Gemmeiza Agriculture Research Station, Gharbia Governorate, to study the performance of some faba bean genotypes for their yield, its components, physical characters and nutritional traits.

Sixteen faba bean (*Vicia faba L.*) genotypes were used. They included 12 and four introduced stocks. The improved local genotypes are: Giza Blanca, Giza 643, Giza 716, Giza 717, Giza 957, Giza 461, Sakha 1 (Field crops Research Institute), Mansoura 1, Kassasin 1, Kassasin 7, Aquadolce and Koprosy (Horticulture Research Institute). The four introduced comprise Icarus, ILB 47126 (ICARDA, Aleppo), Reina Mora and Luz De Otono (Spain). The genotype Aquadolce was used as check cultivar since it widely cultivate in Egypt.

The experiments were laid out in randomized complete block design with five replications. The seeds were sown on 18th October 2001 and 14th October 2002. Plot area for each genotype was 13 m^2, it was consisted of four ridges (0.65 meter in width and five meters in length). Distance between plants was 20 cm apart, with one plant per hill. The cultural practices, i. e. irrigation, fertilization and pest control were carried out as commonly used in the district. Ten randomly plants were used for recording the metric traits.

The studied traits were:

A- Plant growth (1- Plant height. 2- Number of branches, which estimated at the end of the growing seasons).

B- Green-pod crop (1- Number of pods per plant. 2- Number of seeds per pod. 3- Pod weight, 4- Pod length. 5- Weight of 100-

green-seeds, which measured at the time of green harvest. 6- Total green-pod yield (gm/plant).

C- Seeds composition: Protein was assayed by the Kjeldahl methods (AOAC, 1990) for total –N. The factor 6.25 was used to convert-N to its crude-protein equivalent. Moisture and crude fibers % were determined as recommended by A.O.A.C. (1990). Ether extract (lipid %) and seeds cooking time were determined according to AOCS (1984).Carbohydrates were calculated by differences, energy values were computed by multiplying protein and carbohydrates % by 4.0 and lipids % by 9.0. Total phenoles were determined by Folin Denis reagent according to the method described by Swain and Hills (1959).

Seeds chemical composition and cooking time were determined only in 2002 / 2003 season.

Statistical analysis:

Data of the two seasons were subjected to conventional methods of analysis of variance according to Snedecor and Cochran (1982). Mean values represented the various investigated genotypes were compared by the Duncan multiple range test (Duncan, 1955). Correlation analysis was used to determine the relationship between some pairs of characters by estimating the correlation coefficients (Steel and Torrie, 1960).

RESULTS AND DISCUSSION

Plant growth characters:

Data concerning plant height listed in Table (1 and 2) showed significant differences among the studied faba bean genotypes in the two experimental seasons. Plant height was ranged from 99.00 to 120.7 cm, with a mean of 107.1 cm, in the first season, while in the second season, these values ranged from 96.8 to 117.0 cm, with a mean of 107.4 cm. In addition, plant height in the check cultivar (Aquadolce) was 111.2 and 113.3 cm. in the first and second season, respectively. Comparison of the studied genotypes with check cv. showed that, only three cvs. i. e. kassasin 7, Icarus and Giza 957 had taller plants than the check cultivar in both seasons.

Data presented in Table (1 and 2) showed the number of branches per plant. In the first season, number of branches ranged from 5.1 to 7.5 with a mean of 6.6 branches per plant, compared with 6.77 in the check cultivar. The line ILB 4726 gave the highest number of branches per

plant (7.5), followed by the genotypes Reina Mora and Icarus. While. the lowest number of branches per plant (5.1 and 6.0 branches/plant) was given by cvs. Giza 461 and Giza Blanca, respectively. In the second season, the genotype Reina Mora had the highest number of branches per plant, while the cv. Giza 643 produced the lowest number. When the evaluated genotypes compared with the check cultivar, it is revealed that seven genotypes exceed the control in this trait. Obtained data are in harmony with those reported by Khare and Singh (1991), Bora *et al.* (1997), Multa (1998), Adak *et al.* (1999), Bassiouny (2001) and Farag and Helal (2004), they found significant differences among faba bean genotypes for these traits.

Green-pod crop:

Data in Tables (1 and 2) showed that, the studied faba bean genotypes greatly differed in number of pods per plant and number of seeds per pod in both experimental seasons. The genotypes Reina Mora and Aquadolce produced the highest number of pods per plant and number of seeds per pod (30.3 and 5.1, respectively). The genotypes Giza Blanca and Reina Mora had the highest number (30.33 and 5.13, respectively) in the second season. On the other hand, the genotypes Kobrosy and Luz De Ontono gave the lowest number of pods per plant, in the first and second season, where the genotype Icarus produced the lowest number of seeds per pod (3.3 and 3.2) in the first and second season, respectively. Comparison of the studied genotypes with the check cultivar showed that, there were twelve and ten cvs. exceeded the control in number of pods per plant.

Regarding pod weight and length, the genotypes differ significantly in these respect (Table 1 and 2). In both seasons, the genotype Reina Mora had the highest pod weight and length values. In the first season, the least pod weight and length values (10.90 and 10.95 cm) were given by the genotypes Icarus and Giza 461, respectively. In the second one, the cvs. Giza 461 and Kassasin 7 gave the least pod weight and length values 10.8 gm and 10.6 cm, respectively. Comparing various genotypes with the check cv. showed that the genotypes Reina Mora and Luz De Otnoa were longer and heavier than those of the check cultivar. These results are confirmed by those of Bora *et al.* (1997). Multa (1998), Bassiouny (2001) and Farag and Helal (2004), who reported that, there were significant differences in pod weight and length among faba bean genotypes.

Table (1): Mean performance of the studied faba bean genotypes with regard to plant growth, as well as, some pod characteristics during 2001/2002 season.

Characters / Genotypes	Season 2001/ 2002							
	Plant height (cm)	Number of branches/plant	Number of pods/ plant	Number of seeds /pod	Pod weight (g)	Pod length (cm)	100-green seed weight (g)	Total green pod yield/plant (g)
Giza Blanca	110.3 bc	6.0 e	29.8 b	4.4 c	16.2 e	16.7 d	200.3 e	486.0 c
Mansoura 1	102.3 ef	6.6 cd	20.0 j	4.3 cd	17.1 d	16.0 e	195.0 f	343.6 gh
Kassasin 1	111.0 bc	6.7 cd	23.0 h	4.9 b	13.7 fg	14.2 f	180.6 hi	315.9 i
Kassasin 7	111.3 bc	6.5 de	26.0 d	4.2 cd	12.5 hi	11.4 jk	188.7 g	327.4 hi
Icarus	120.6 a	7.1 abc	26.6 c	3.3 i	10.9 j	13.4 g	184.6 gh	291.4 j
Aquadolce	111.1 bc	6.7 cd	21.3 i	5.2 a	19.1 c	17.6 c	215.4 c	408.3 d
Giza 643	107.0 d	6.3 de	23.6 g	3.7 fg	11.2 kl	12.0 ij	167.4 j	264.6 k
Giza 716	104. 3 e	6.1 e	27.0 c	3.6 gh	13.9 f	12.5 hi	153.8 k	377.9 e
Giza 717	109.0 ed	6.9 bcd	24.6 e	3.8 hi	12.9 h	11.9 ij	145.1 l	318.7 i
Giza 957	111.6 b	6.6 cd	24.3 ef	3.9 ef	11.8 jk	12.8 gh	175.8 i	288.2 j
Sakha 1	103.0 ef	7.1 abc	24.1 f	4.4 c	14.4 f	13.4 g	163.5 j	348.8 fg
Giza 461	111.0 bc	5.1 f	30.3 a	3.5 h	12.0 ij	10.9 k	154.2 k	364.6 ef
ILB 4726	101.3 fg	7.5 a	22.6 h	3.8 fg	13.1 gh	11.7 j	210.0 d	298.3 j
Reina Mora	99.0 g	7.3 ab	21.6 i	4.7 b	28.5 a	23.0 a	239.4 a	620.1 a
Luz De Otono	99.6 g	6.8 cd	18.3 l	4.1 de	27.2 b	20.5 b	221.4 b	499.2 b
Kobrosy	101.0 fg	6.6 cd	18.3 k	3.7 fg	13.7 fg	14.7 f	194.4 f	261.1 k
Mean	107.12	6.66	23.91	4.11	15.54	14.58	186.85	363.47

Mean within a column followed by different letter are significantly different at $p \leq 0.5$ level according to LSR test.

Table (2): Mean performance of the studied faba bean genotypes with regard to plant growth, as well as, some pod characteristics during 2002/2003 season.

Characters / Genotypes	Season 2002/ 2003							
	Plant height (cm)	Number of branches/ plant	Number of pods/ plant	Number of seeds/ pod	Pod weight (g)	Pod length (cm)	100-green seed weight (g)	Total green pod yield/plant (g)
Giza Blanca	107.3 f	6.4 ef	30.3 a	4.1 e	16.5 d	17.0 c	205.4 d	501.6 b
Mansoura 1	103.8 f	6.9 cd	22.2 j	4.4 cd	16.8 d	16.5 cd	201.8 d	375.3 d
Kassasin 1	110.3 d	7.1 cd	22.4 j	4.5 c	14.7 e	15.0 e	179.1 fg	363.0 de
Kassasin 7	114.0 bc	6.8 de	25.6 ef	4.0 ef	12.1 g	10.6 i	183.6 f	313.0 f
Icarus	117.0 a	7.4 cd	29.7 b	3.2 i	11.6 ghi	13.0 f	180.6 fg	346.4 e
Aquadolce	113.3 bc	6.9 cd	23.5 h	4.9 b	18.5 c	16.8 c	212.4 bc	437.3 c
Giza 643	105.0 ef	5.9 f	24.2 g	4.0 ef	12.0 gh	12.9 f	162.9 h	291.8 gh
Giza 716	105.0 ef	6.8 de	29.0 g	4.0 ef	11.1 ij	12.4 fg	150.5 j	323.4 f
Giza 717	111.8 cd	7.2 cd	25.9 e	3.9 f	11.0 ij	11.8 gh	142.5 k	285.8 h
Giza 957	114.2 bc	6.8 de	23.0 i	3.7 g	11.3 hij	12.9 f	177.9 g	262.4 i
Sakha 1	101.0 gh	6.8 de	26.0 e	4.3 d	12.2 g	12.7 f	157.5 i	318.1 f
Giza 461	115.6 ab	5.9 f	28.1 d	3.7 g	10.8 j	11.4 h	148.5 j	304.8 fgh
ILB 4726	103.2 fg	7.8 ab	25.3 f	3.4 h	12.1 g	11.4 h	211.1 c	305.8 fg
Reina Mora	99.4 h	7.9 a	23.8 gh	5.1 a	31.4 a	24.4 a	232.3 a	750.4 a
Luz De Otono	96.7 i	7.0 cd	17.8 l	4.5 cd	28.7 b	19.3 b	216.6 b	515.4 b
Kobrosy	100.0 h	7.0 cd	19.9 k	3.7 g	12.9 f	15.9 d	189.6 e	258.6 i
Mean	107.35	6.96	24.84	4.14	15.27	14.67	184.49	372.11

Mean within a column followed by different letter are significantly different at $p \leq 0.5$ level according to LSR test.

Data of 100-green-seed-weight, showed that, the genotypes significantly differ for this trait (Table 1 and 2). In both experimental seasons, the lightest one was Giza 717 cv., while the heaviest one was Reina Mora genotype. Comparing the data of the studied genotypes with the check cultivar show that, the highest genotypes since they surpassed the check cultivar by about 11.2 and 2.9 %, respectively. Similar results were obtained by Salih and Khairi (1990), Multa (1998), Adak *et al.* (1999) and Farag and Helal (2004) who found significant differences among lines and genotypes in faba bean.

Highly significant differences among the evaluated faba bean genotypes in total green pod yield during the two experimental seasons were shown in Tables (1 and 2). The highest total green-pod yield was produced by the genotypes Reina Mora, Luz De Otono and Giza Blanca in the two seasons. While, the cv. Kobrosy gave the lowest value in both seasons. Compared with check cultivar, it is easily to conclude that, the genotypes Reina Mora, Luz De Otono and Giza Blanca outyield the check cultivar in both seasons in this trait. The increase percentage in these genotypes ranged from 19.21 to 51.85 % in the first season and from 14.70 to 71.60 % in the second one. These results are in accordance with those reported by Khare and Singh (1991), Salih *et al.* (1993), Mulat (1998), Adak *et al.* (1999) and Farag and Helal (2004) who found significant differences for this trait among faba bean genotypes.

Chemical composition of green seeds:

Data of green seeds crude protein % showed that the genotypes significantly differ for this trait (Table 3). The highest values were observed in Giza Blanca, Giza 957 and Sakha 1, while the lowest values were in Giza 717 and ILB 4726. It should be noted that the crude protein % in genotypes under study ranged from 21.6 to 32.1. Four genotypes, Mansoura 1, Giza 643, Giza 717 and ILB 4726 gave protein % lower than that of the check cultivar.

Significant differences among the evaluated faba bean genotypes in lipid % of green seeds were found and the results were given in Table (3). The results showed that, the lipid % ranged from 2.16 in Giza 716 to 1.27 in Kassasin 1. Comparison of the studied genotypes with the check cultivar could be noted that three cvs., i.e., Giza 716, Icarus and Sakha 1 contained higher lipid % than that in the check cultivar.

Table (3): Mean performance of the studied faba bean genotypes with regard to green seed compositions during 2002/2003 season*.

Characters / Genotypes	Crude protein %	Lipid %	Crude fiber %	Ash %	Carbohydrates %	KCal. / 100 g sample	Dry weight %	Total Phenoles (mg Tannic acid /100 g sample)
Giza Blanca	32.1 a	1.78 bc	10.5 m	5.45 de	60.63	343	18.1 i	149.26 j
Mansoura 1	24.5 j	1.75 cd	13.2 i	5.64 a	68.08	333	24.8 b	146.14 i
Kassasin 1	28.2 e	1.27 i	13.7 h	5.22 h	65.23	330	23.4 c	149.78 j
Kassasin 7	25.1 i	1.61 ef	12.0 k	4.89 i	68.36	336	23.5 c	180.93 g
Icarus	27.0 g	2.07 a	15.4 d	5.54 b	65.31	327	18. 5 h	173.95 h
Aquadolce	24.5 j	1.88 b	15.9 ab	5.44 e	68.10	323	25.7 a	147.37 k
Giza 643	23.4 k	1.70 cde	16.0 ab	5.39 f	69.44	321	19.3 fg	145.75 i
Giza 716	29.4 c	2.16 a	16.1 a	5.52 bc	62.84	321	18.6 h	251.74 c
Giza 717	21.6 l	1.37 hi	15.9 b	5.62 a	71.38	319	20.9 e	125.25 n
Giza 957	30.8 b	1.61 ef	12.6 j	5.38 f	62.17	334	21.9 d	185.71 f
Sakha 1	30.5 b	2.05 a	13.9 g	5.35 f	62.02	333	19.0 i	199.88 d
Giza 461	29.1 cd	1.65 de	15.6 c	4.93 i	64.23	327	17.5 j	190.00 e
ILB 4726	21.7 l	1.53 fg	15.4 d	5.64 a	71.04	321	19.2 g	257.36 b
Reina Mora	27.7 f	1.47 gh	15.0 e	5.28 g	65.45	324	19.6 f	143.72 m
Luz De Otono	26.4 h	1.60 ef	14.2 f	5.48 cd	66.46	328	21.2 e	171.16 i
Kobrosy	28.9 d	1.46 gh	11.2 l	5.20 h	64.34	341	16.0 k	283.19 a
Mean	26.9	1.686	14.2	5.37	65.94	328	20.497	181.32

Mean within a column followed by different letter are significantly different at $p \leqslant 0.5$ level according to LSR test.
* percentages were calculated on dry weight basis.

Concerning of crude fiber % in green seeds, the results were demonstrated in Table (3). The data showed that the highest values were recorded in Giza 716 and Giza 643, while the lowest values were in Giza Blanca and Kobrosy. It should be observed that the crude fiber % ranged between 16.1 and 10.5 with mean of 14.2. Only two genotypes, Giza 716 and Giza 643 were higher in crude fiber % than that in the check cultivar.

It should be observed that the faba been genotypes Mansoura 1, Giza 717 and ILB 4726 had the highest values of ash, while Kassasin 7 and Giza 461 had the lowest values. Carbohydrates percentage ranged between 60.6 in Giza Blanca and 71.3 in Giza 717. Giza Blanca and Kobrosy gave the highest values of energy, while the lowest value was recorded by Giza 717.

Total phenols of faba been genotypes under study listed also in Table (3). Most genotypes had higher values of total phenols than that in check cultivar.

The dry seeds weight % of the faba bean genotypes under study recorded also in Table (3). The results indicated that the check cultivar (Aquadulce) gave the highest value of dry weight % (25.7) followed by the genotype of Mansoura 1 while the lowest values were 16.0 and 17.5 in cvs., Kobrosy and Giza 461, respectively.

Chemical Composition of dry Seeds:

The chemical composition (crude protein %, lipid %, crude fiber %, ash %, carbohydrates, total phenol, dry weight % and energy values of dry seeds of the studied faba bean genotypes were determined only in 2003 season and the results were listed in Table (4). Significantly differences among the genotypes under study were observed. Crude protein % ranged from 28.63 to 22.72 with the mean of 25.53. The highest values (28.63 and 28.62) were obtained in Giza 461 and Mansoura 1, while the lowest values (22.72 and 22.83) were in Kobrosy and Giza 717, respectively. Four cvs., Giza 461, Mansoura 1, Sakha 1 and Kassasin 7 had higher protein % than that in the check cultivar. These results are in harmony with those reported by Khare and Singh (1991). They studied 25 genotypes of faba bean and found that the crude protein percentage ranged between 17.6 and 30.12.

Lipid percentage ranged between 0.67 in Aquadolce and 1.15 in Giza 643 as shows in Table (4). All studied genotypes gave values of lipid % higher than those of the check cultivar.

For the crude fiber %, Mansoura 1 and Aquadolce contained the highest values, but Giza 716 and Giza 641 had the lowest values. Crude fiber % ranged from 7.081 to 8.827 with mean of 7.811 as shows in Table (4). It should be also noted from the same table that only Mansoura 1 genotype had higher value of crude fiber % than that in the check cultivar.

It should be noted that the Giza 717 gave the highest value of carbohydrates % (72.1), but Giza Blanca gave the highest energy values. Total phenols of genotypes seeds ranged between 49.48 in Giza 957 and 77.46 in Luz De Otono.

The data of dry weight % in evaluated genotypes showed that all samples contained dry weight more than 90% and the values ranged between 90.18 % in Luz De Otono and 91.13 % in Icarus. It could be also observed that except four cvs.(Kassasin 1, Giza 717, Sakha 1, Giza 461 and Luz De Otono), the remain cvs., had dry weight higher than that in the check cv.

Regarding the cooking time of dry seeds, results in fig. (1) showed that the studied faba bean genotypes greatly differed. From this figure it could be noted that the cooking time ranged between 70 and 150 min. Giza 716 was the best genotype for this trait followed by Kobrosy genotype then Giza Blanca, but Giza 717 and Aquadulce genotypes needed long cooking time. This may be due to the effect of genotypes differences or due to the differences in chemical composition of tested faba bean lines. On the other hand, the present results were different from that obtained by Khare and Singh (1991). They studied 25 diverse genotypes of faba bean and found that the cooking time ranged between 34.25 and 66 min.

It may also noted that, the results indicated that the genotype Giza 716 which had high values of protein and lipid %, but it had low value of crude fiber % and better cooking time (Table 4 and fig. 1). Mahmoud *et al.* (1998) found that Giza 716 was the best for stewing and the lowest hull percentage.

Correlation coefficient:

Correlation coefficient between pair of studied characters were estimated and listed in Table (5). Correlation values showed that high green-pod yield associated with seed number per pod, large pod weight, long pod and high weight of 100-green seed. Also, long pod associated with high number of seed per pod and large pod weight. Morever, 100-green seed weight was associated with large pod weight, long pod and

high number of branches. Taller plant was associated with high number of pods per plant, light pod weight and short pod length.

The observed positive correlation between total yield and number of seed per pod in this study is in agreement with those of Naidn *et al.* (1985), Bakheit and Mahady (1988), Vandana and Dubey (1993) and Mulat (1998). The positive correlation between total yield and pod weight is in harmony with that obtained by Mulat (1998). Also, the positive correlation between high total yield and high 100-seed weight is in agreement with the findings of Katiyar and Singh (1990) and Bargale and Billore (1992).

Data also, showed that negative significant correlation between crude protein % and crude fiber % were found in the green seeds of faba bean genotypes. On the other side, positive significant correlation between dry weight of green seeds and protein % of dry seeds were observed.

Based on the correlation coefficient, number of seeds per pod, pod weight, pod length and 100-seed weight appeared to be the principal yield attributes for which selection can be effective.

Table (4): Mean performance of the studied faba bean genotypes with regard to dry seed compositions during 2002/2003 season *.

Characters / Genotypes	Crude protein %	Lipid %	Crude fiber %	Ash %	Carbohydrates %	KCal. /100 g sample	Dry weight %	Total Phenoles (mg Tannic acid /100 g sample)
Giza Blanca	25.3 ef	1.01 cdef	8.0 d	4.20 e	71.45	362	90.5 bcd	59.00 h
Mansoura 1	28.6 a	1.01 cdef	8.8 a	4-20 e	66.16	351	90.5 bcde	55.66 ij
Kassasin 1	25.3 e	0.73 hi	7.3 ij	4.06 f	69.79	356	90.4 fg	59.54 g
Kassasin 7	26.9 b	0.79 h	7.3 ij	3.57 k	68.73	359	90.6 bc	71.08 b
Icarus	25.0 f	0.94 efg	7.5 h	3.93 h	70.06	357	91.1 a	62.51 e
Aquadolce	26.5 c	0.67 i	8.6 b	3.85 i	68.94	352	90.4 cdef	63.22 d
Giza 643	23.2 j	1.15 a	7.4 hi	3.75 j	71.83	355	90.6 bc	55.46 j
Giza 716	26.0 d	1.12 ab	7.0 k	4.01 g	68.80	358	90.4 cdef	47.44 l
Giza 717	22.8 k	0.79 h	8.0 def	4.21 e	72.16	354	90.4 defg	55.99 i
Giza 957	24.5 g	0.95 defg	7.9 ef	4.40 c	70.13	355	91.0 a	49.48 k
Sakha 1	28.3 a	0.93 fg	7.7 g	4.40 c	66.28	354	90.3 g	47.47 l
Giza 461	28.6 a	0.98 cdef	7.1 k	4.06 f	66.29	359	90.4 efg	61.24 f
ILB 4726	26.2 d	1.03 cd	8.0 de	4.44 b	68.30	354	90.7 b	63.27 d
Reina Mora	23.7 i	1.04 bc	7.3 j	4.26 d	70.93	356	90.6 b	68.01 c
Luz De Otono	24.1 h	1.02 cde	8.4 c	4.42 bc	70.41	354	90.1 h	77.46 a
Kobrosy	22.7 k	0.88 g	7.9 f	4.58 a	71.72	351	90.6 b	71.42 b
Mean	25.5	0.941	7.8	4.14	69.49	355	90.5	60.52

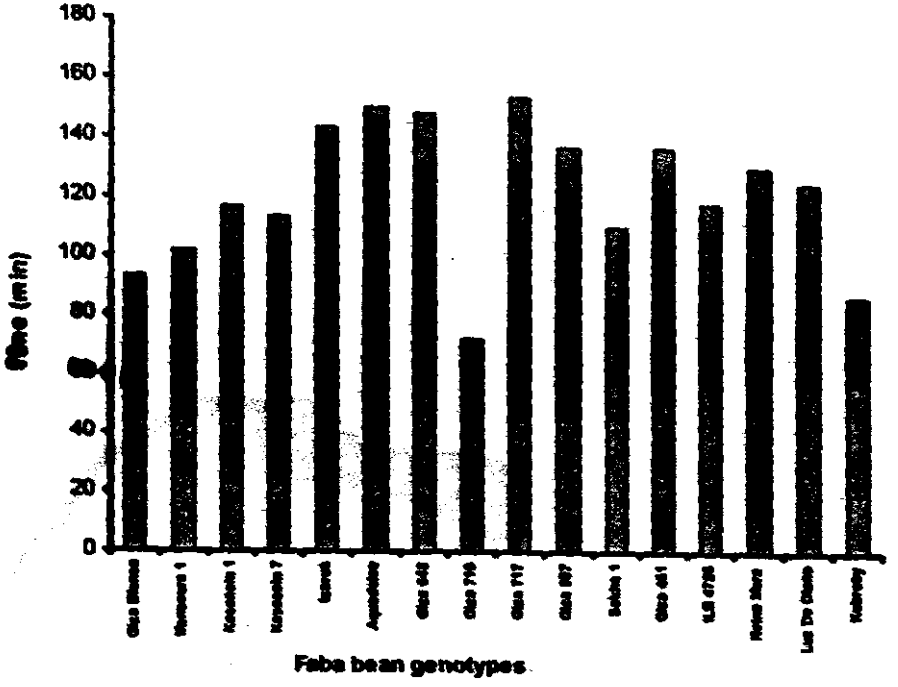
Mean within a column followed by different letter are significantly different at $p \leq 0.5$ level according to LSR test.
* percentages were calculated on dry weight basis.

Table (5): Correlation coefficients between some pair of characters studied in faba bean genotypes.

Characters / Genotypes	Plant height	No. of branches	No. of pods/pl	No. of seeds/plant	Pod weight	Pod length	100-green seeds weight	Total green pod yield	Protein % (green seeds)	Lipid % (green seeds)	Dry weight of green seeds	Fiber % of green seeds	Protein % of dry seeds	Lipid % of dry seeds
No. of branches	-0.232 Ns													
No. of pods/plant	0.498 *	-0.179 Ns												
No. of seeds/plant	-0.382 Ns	0.138 Ns	-0.390 Ns											
Pod weight	-0.543 *	0.389 Ns	-0.471 Ns	0.730 **										
Pod length	-0.537 *	0.364 Ns	-0.420 Ns	0.736 **	0.926 **									
100-green seeds weight	-0.399 Ns	0.499 *	-0.405 Ns	0.443 Ns	0.758 **	0.748 **								
Total green pod yield	-0.385 Ns	0.385 Ns	-0.109 Ns	0.709 **	0.915 **	0.898 **	0.710 **							
Protein % (green seeds)	-0.022 Ns	-0.281 Ns	0.208 Ns	0.022	0.017 Ns	0.173 Ns	-0.076 Ns	0.130 Ns						
Lipids % (green seeds)	0.092 Ns	-0.231 Ns	0.516 *	-0.147	-0.208 Ns	-0.187 Ns	-0.189 Ns	-0.080 Ns	0.280 Ns					
Dry weight (green seeds)	0.252 Ns	0.143 Ns	-0.346 Ns	0.491 *	0.192 Ns	0.099 Ns	0.263 Ns	0.102 Ns	-0.372 Ns	-0.120 Ns				
Fiber % (green seeds)	0.191 Ns	0.101 Ns	0.107 Ns	0.163 Ns	0.036 Ns	-0.066 Ns	-0.134 Ns	0.045 Ns	-0.494 *	0.257 Ns	0.207 Ns			
Protein % (dry seeds)	0.203 Ns	-0.222 Ns	0.296 Ns	0.029 Ns	-0.214 Ns	-0.282 Ns	-0.104 Ns	-0.127 Ns	0.138 Ns	0.436 Ns	0.266 *	0.064 Ns		
Lipid % (dry seeds)	-0.467 Ns	-0.176 Ns	0.166 Ns	-0.198	0.115 Ns	0.102 Ns	0.005 Ns	0.141 Ns	0.137 Ns	0.293 Ns	-0.529 Ns	-0.064 Ns	-0.049 Ns	
Dry weight (dry seeds)	0.452 Ns	0.197 Ns	0.268 Ns	-0.571 *	-0.326 Ns	-0.183 Ns	0.049 Ns	-0.216 Ns	0.093 Ns	0.112 Ns	-0.132 Ns	-0.153 Ns	-0.204 Ns	0.079 Ns

NS: not significant, * significant at p≤0.05 level and, ** highly significant at p≤ 0.01 level.

Fig (1): Cooking time of faba bean cultivars seeds.



REFERENCES

Adak, M. S; H. Ulukan and M. Güler (1999): Determination of some agronomic traits in Turkish faba bean (Vicia faba L.) lines. FABIS Newsletter, 24: 29-31..

AOAC (1990): Association of official and Agricultural chemists official and tentative methods of analysis 15th ed. Washington, D. C.

AOCS (1984): American Oil Chemist Society. Official and tentative methods of the Amer. Oil Chem. Soc.

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

Bargale, M. and S. D. Billore (1992). Genetic divergence and hybrid performance over environments in faba bean. J.of Maharashtra Agric. Univ., 17:428-430.

Bassiouny, M. A. (2001). Evaluation of aba bean genotypes under limited water supply. Ph.D. Thesis, Fac. Of Agric., Alexandria Univ.

Bora, G. C.; S. N. Gupta; Y. S. Tomer; S. Singh and L. Rai. (1997). Performance of faba bean genotypes over year in north India. FABIS Newsletter 40:7-9.

Della, A. (1988). Characteristics and variation of Cyprus faba bean germplasm. FABIS Newsletter 21: 9-12.

Duncan, B. D. (1955). Multiple range and multiple F test. Biometrics, 11: 1-42.

El-Murabaa, A. I.; A. M. Butt; S. A. Abdel-Aal and K. B. Salem. (1987). Effect of genotype and planting data on faba bean performance. Ass. J. Agric. Sci. 18: 187-201.

Farag, S. T. and F. A. Helal (2004). Heterosis and combining ability in broad bean (*Vicia faba L.*). Minufiya J. Agric. Res. Vol. 29: 707-722.

Katiyar, R. P. and A. Singh (1990). Path coefficient studies for yield and yield components in faba bean *(Vicia faba L.*). FABIS Newsletter 26: 3-5.

Kaul, D. K. and K. L. Vaid (1996): Combining ability in faba bean. FABIS Newsletter, 38/39:2-11.

Khare, D. and C. B. Singh (1991). Genetic behaviour of yield and quality traits of *Vicia faba L.*, FABIS Newsletter 34: 3-8.

Link, W.; D. Stelling and E. Ebmeyer (1994). Factors determining the performance of synthetics in *Vicia faba L.* , 1- Heterogeneity, Heterozygosity, and degree of cross fertilization. Euphytica, 75: 77-84.

Mahmoud, A. S., M. Farid and Hanaa A. D. (1998): Effect of location on physical and chemical characteristics of faba bean seeds. NVRSRP Newsletter, P. 315-324.

Mahmoud, A. S., A. E. Basyony, Amal H. Mahmoud, M. M. El-Hady and S. A. Hafez (1998): Cookability characteristics of faba bean and their relationship to prepared dishes. NVRSRP Newsletter No. 1, 17-18.

Multa, G. (1998). Variation among Ethiopian faba bean landraces for seed yield and Agro- morphological characters. FABIS Newsletter 41: 5-8.

Naidn, M. R.; A. Chhabra; B. Singh and V.P.Singh. (1985). Analysis of yield components in broad bean. Indian J. of Agric. Sci. 55 (4); 236-239.

Nanda, H. C.; M. Yasin; C. B. singh and S. K. Rao. (1988). Effect of water stress on dry matter production, harvest index, seed yield, and its components in faba bean (*Vicia faba L.*). FABIS Newsletter 21: 26-30.

Salih, F. A. and N.E. Khairi (1990). Variation in test a fraction with some other seed quality attribute of faba bean grown in the new production area in the Sudan. FABIS Newsletter 27: 30-31.

Salih, F. A.; A. Abu Sarra and S. H. Salih (1993). Performance of faba bean genotypes in the jebel marra area. FABIS Newsletter 33: 3-7.

Salih, S. H. and A. E. Aly (1989). A new faba bean genotype for the northern province of the Sudan. FABIS Newsletter 23: 8-10.

Sindhu, J. S.; O. P. Singh and K. P. Singh (1985). Components 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 (1982). Statistical Methods (7th Edit, 2nd printing). Iowa State Univ., Press, Ames, Iowa, USA, 507 pp.

Steel, R. G. and J. H. Torrie, (1960). Principles and procedures of statistics Mc. Grow Hill Book Company, Inc. New York 481 pp.

Swain, T. and W. E. Hills (1959): The quantitative analysis of phenolic constituents. J. Food Agric. 10:63.

Tewati, B. and A. S. Virk, (1996). Nutritional potential of faba bean for improved productivity in ruminants-A review. FABIS Newsletter 38/39: 2-11.

Vandana and D.K. Dubey (1993). Path analysis in faba bean. FABIS Newsletter 32: 23-24.

Wali, A. A. ;F. A. Taher; M. E. Youssef and A. Mandour, (1990). Evaluation of growth and productivity of three faba bean (*Vicia faba* L.) genotypes tested under sprinkler irrigation system. FABIS Newsletter 26: 27-29.

الملخص العربي

كفاءة بعض الطرز الوراثية من الفول البلدي فى منطقة الدلتا

سمير توفيق فرج[1]- محمد عوض سعد[2]- محمد فتحى النادي[3]
١- قسم بحوث الخضر- معهد بحوث البساتين- مركز البحوث الزراعية.
٢- قسم الصناعات الغذائية- كلية الزراعة بكفر الشيخ- جامعة طنطا.
٣- قسم النبات الزراعي- كلية الزراعة بكفر الشيخ- جامعة طنطا.

أجريت تجربتان حقليتان بمحطة البحوث الزراعية بالجميزة/محافظة الغربية والتابعة لمركز البحوث الزراعية خلال الموسمين الشتويين ٢٠٠١/٢٠٠٢ & ٢٠٠٢/٢٠٠٣ بهدف دراسة كفاءة ستة عشر طرازا وراثيا من الفول البلدي ، حيث زرعت هذه التراكيب الوراثية في تجربة مصممة بطريقة القطاعات العشوائية في ثلاث مكررات، وسجلت القياسات الخاصة بصفات نمو النبات والقرون ويمكن تلخيص أهم النتائج فيما يلي:-

وجود إختلافات معنوية بين التراكيب الوراثية تحت الدراسة فى جميع الصفات. بالنسبة لطول النبات اعطى الصنف إيكاروس أطول النباتات، بينما أعطت السلالة ILB ٤٧٢٦ نباتات ذات أكبر عدد من الأفرع. بالنسبة لعدد القرون لكل نبات أعطى الصنف جيزة ٤٦١ أكبر عدد قرون في الموسم الأول، أما في الموسم الثاني أعطي الصنف جيزة بلانكا أكبر عدد من القرون. وأعطي الصنف اكوادولس و الصنف رينا مور قرونا بها أكبر عدد من البذور، بينما أعطي الصنف إكاروس أقل عدد من البذور بكل قرن في موسمي التجربة. أما بالنسبة لصفات وزن و طول القرن و وزن ١٠٠ بذرة خضراء و المحصول الكلي من القرون الخضراء أعطي الصنف رينا مور أعلي قيمة لتلك الصفات في موسمي التجربة علي التوالي (٢٨،٥٣ إلي ٣١،٤٠جرام بالنسبة لمتوسط وزن القرن، ٢٣ إلي ٢٤،٤٣ سم بالنسبة لطول القرن، ١٨٦،٨٥إلي ١٨٤،٤٩جرام بالنسبة لوزن ١٠٠ بذرة، ٦٢٠،١٠ إلي ٧٥٠،٤٢ جرام بالنسبة للمحصول الكلي من القرون الخضراء).

قد أعطي الصنف جيزة بلانكا وجيزة ٧١٦ أعلى محتوي بروتين وليبيدات فى البذور الخضراء على التوالي بينما أعطت الأصناف جيزة ٦٤١ وجيزة ٦٤٣ أعلى مجتوي من البروتين والليبيدات فى البذور الجافة علي التوالي. وقد تم تقدير محتوي البذور من الألياف الخام وكذلك تم تقدير محتوى البذور من الكربوهيدرات والسعرات الحرارية و المواد الفينولية الكلية ومدة الطبخ.

عموما فلقد أعطت الأصناف رينا مور، ليوز دى أوتون، جيزة بلانكا أعلي محصول كلي من القرون الخضراء متفوقة علي الصنف الكنترول بقيم تراوحت من ١٩،٢١ إلي ١٥،٨٥% في الموسم الأول، ١٤،٧٠ إلي ٧١،٦٠% بالنسبة للموسم الثاني. وبناءا عليه يمكن إستخدام هذه الأصناف الثلاثة كآباء في برامج التربية المستقبلية بهدف إنتاج أصناف جديدة عالية الجودة و الإنتاجية.

بناءا علي قيم الإرتباط يتضح أن عدد البذور بالقرن، متوسط وزن و طول القرن،وزن ١٠٠ بذرة هي المكونات الرئسية للمحصول والتي يمكن أن يكون الإنتخاب لها فعالاً.