

EFFECT OF PLANTING DATES AND SEED SIZE ON PRODUCTIVITY AND QUALITY OF SOME FABA BEAN CULTIVARS

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ABSTRACT

Two field experiments were conducted at Tag AL-Ezz, Agricultural Research Station Farm, Dakahlia Governorate, Agricultural Research Center, Egypt, during 2007/2008 and 2008/2009 seasons to study the effect of planting dates (20th October, 10th November and 1st December) and size of sown seeds (small, medium and large) of some faba bean cultivars (Sakha 1, Masr 1 and Giza 843), as well as, their interaction on yield and its components and seed quality. In addition, a laboratory experiment was carried out at Seed Technology Research Unit in Mansoura, Dakahlia Governorate, Field Crops Research Institute, Agricultural Research Center, Egypt, to some physiological and seed quality of seed resulted from the field experiments.

The main results could be summarized as follows:

- 1-Planting faba bean in the intermediate date (10th November) produced the highest values of seed yield and its components and also high seed quality traits ranked by early (20th October) then late planting dates (1st December).
- 2-Sakha 1 cultivar ranked first whereas Giza 843 and Masr 1 were ranked second and third, respectively in all studied characters.
- 3-The effect of seed size on seed yield and its components and seed quality characters was significant, except for the number of seeds/plant, pod weight, number of seeds/pod and dry weight of seedlings in the second season only. Large size of sown seeds recorded the highest values of all studied characters, followed by medium then small size. There were insignificant differences between large or medium size of seed in some yield component and seed quality as well as seed yield/fed.
- 4-it can be recommended that planting faba bean Sakha 1 cultivar on 10th November with large or medium size of seeds might improve faba bean productivity and seed quality.

Keywords: Faba bean, *Vicia faba* L., planting dates, sowing dates, seed size, cultivars, varieties, yield, quality.

INTRODUCTION

Faba bean (*Vicia faba* L.) is a common staple food in the Egyptian diet, eaten by rich and poor alike. It can be used as a vegetable, either green or dried, fresh or canned. It also used as fodder and forage crop for animals and for increasing available nitrogen in the biosphere.

It is well know that high productivity with good quality of any crop is the final goal of many factors and operations. Thus, this research have been conducted on various agronomic problems such as planting dates, most promising cultivars and seed grading in term of seed size as major factors determining faba bean yield and its components as well as seed quality.

Planting dates refer to the effect of all environmental conditions on large scale on growth and yield of faba bean crop, which differ widely from region to another as reported by many scientists. Moreover, planting dates is an important factor which significantly affects the timing and duration of the vegetative and reproductive stages as well as yield and its components and seed quality (Refay, 2001 and Turk and Tawaha, 2002), since, environmental factors such as temperature and light differ with varying planting dates. Whereas, early date of planting (late October and early November) resulted significant increase in vegetative growth and production more pods per plant, consequently increased yield and quality of seed (Hussein *et al.*, 2002 ; Mohamed, 2003 and Oweis *et al.*, 2005). However, each delay in planting date over mid November resulted in steadily reduction in growth and yield (Abuldahab *et al.*, 2002 ; Mohamed, 2003 and Grenz *et al.*, 2005). So, it is very important to determinate date of planting for faba bean that achieving the optimum limits for these factors in order to get best yield and quality.

No doubt that chosen the high yielding cultivars is very important to raise crop productivity and quality. Whereas, faba bean cultivars were significantly different in number of pods and seeds/plant, seed yield per plant and per unit area as well as seed quality (Hussein *et al.*, 1995 ; Metwally *et al.*, 2000 ; Abou-Taleb, 2002 and Annicchiarico, 2005). Therefore, this study is aiming to evaluate the faba bean cultivars for focusing light on the most promising cultivars that can be used on a large scale at studying area.

The simplest argument for relation between seed yield and seed size suggest that seed size should have a positive, neutral, or negative influence on seed yield. So, if seed size influence yield, it would be advantageous to plant the seeds that give the highest yield (Reddy *et al.*, 1989 ; El-Emery, 1993 and Metwally, 2003). Plant ecologists generally concur that larger seed size leads to larger initial plant vigor. So, greater seed weight resulted in greater growth and greater yield. In this concern, Tomaszewski *et al.* (1978) and Salih (1997) indicated that faba bean plants developed from large seeds had greater fresh matter and seed yields. In contrast, Salih and Salih (1980), Salih (1983), Pocsai (1986), Turk and Tawaha (2002) and Idris (2008) revealed that seed size had no significant effect upon seed yield, although the highest yields were obtained from planting medium –sized seeds.

Thus, the aim of this work was to study the effect of planting dates, performance of faba bean cultivars and seed size on seed yield and its components as well as seed quality characters of faba bean under the environmental conditions of Tag El-Ezz district, Dakahlia Governorate.

MATERIALS AND METHODS

Two field experiments were carried out at Tag AL-Ezz, Agricultural Research Station Farm, Dakahlia Governorate, Agricultural Research Center, Egypt, during 2007/2008 and 2008/2009 seasons to study the effect of planting dates and size of sown seeds on the performance of some faba bean cultivars, as well as, their interaction on seed yield and its components and seed quality. Beside, a laboratory experiment was carried out at Seed

Technology Research Unit in Mansoura, Dakahlia Governorate, Field Crops Research Institute, Agricultural Research Center, Egypt, to determine the germination percentage and seedling vigor (seed quality) of the resulting seed from the field experiments.

A- Field studies:

The field studies experiments were performed in six experiments during the two growing seasons of 2007/2008 and 2008/2009 seasons. The treatments included three planting dates which were 20th October, 10th November and 1st December. The studied faba bean cultivars were Sakha 1, Masr 1 and Giza 843, which were obtained from the Agricultural Research Center, Ministry of Agriculture and Land Reclamations, Egypt. While, seed size were small, medium and large. Grading of seeds was carried out by using the riddles which performed at Sherbeen Seed Foundation. The small size of seeds was obtained by using riddle with holes more than 6 ml and less than 8 ml in diameter. The medium size of seeds was obtained by using riddle with holes more than 8 ml and less than 10 ml in diameter. However, the large size of seeds was obtained by using riddle with holes more than 10 ml in diameter.

Three experiments for planting dates were performed. Every experiment of planting date was carried out in split plot design with four replications. The main plots were occupied with faba bean cultivars. Whereas, the sub plots were assigned to size of sown seeds. Each experimental basic unit (sub – plot) included five ridges, each of 60 cm width and 3.5 m long, resulted an area of 10.5 m² (1/400 fed). The preceding summer crop was rice (*Oryza sativa* L.) in both seasons. Before planting, soil samples for both physical and chemical analyses for the experimental soil were undertaken and the corresponding data were shown in Table 1.

Table 1: Physical and chemical soil characteristics of the experimental site during 2007/2008 and 2008/2009 seasons.

Physical characteristics								
Properties	Coarse sand (%)	Fine sand (%)	Silt (%)	Clay (%)	Soil texture	CaCO ₃ (%)	Field capacity (%)	Real density (g/cm ³)
Seasons								
2007/2008	5.7	33.9	25.1	35.3	Clay loam	2.48	35.0	2.65
2008/2009	6.0	32.9	25.6	35.5	Clay loam	2.51	34.8	2.63
Chemical characteristics								
Properties	pH soil paste	EC dSm ⁻¹	Organic matter (%)	Available nutrients (ppm)				
				N	P	K		
Seasons								
2007/2008	7.7	2.4	1.83	32.4	7.3	228		
2008/2009	7.4	2.2	1.96	36.1	7.8	236		

Calcium superphosphate (15.5 % P₂O₅) was applied during soil preparation at the rate of 100 kg/fed. Planting time was carried out at three dates as mentioned before on both sides of ridges at 25 cm between hills and 60 cm between ridges, which expressed 112 000 plants/fed. After full germination plant densities were adjusted by replanting the missing hills or thinning the over plants at 21 days from planting leaving healthy plant per hill.

Hand hoeing was achieved twice every 21 days to control weeds (before time of irrigations).

Nitrogen in the form of ammonium nitrate (33.0 % N) at the rate of 15 kg N/fed as starter dose was added before the first irrigation. Potassium sulphate (48 % K₂O) at the rate of 50 kg/fed was applied to soil in two equal portions, before the first and second irrigations. However, other agricultural practices were performed as commonly followed in the district.

Studied characteristics:

At harvest time, ten guarded plants were taken from each sub-plot to estimate the following characters.

- | | |
|-----------------------------|------------------------------|
| 1- Plant height (cm). | 2- Number of branches/plant. |
| 3- Number of pods/plant. | 4- Pods weight/plant (g). |
| 5- Number of seeds/plant. | 6- Seed yield/plant (g). |
| 7- Pod length (cm); | 8- Pod weight (g). |
| 9- Number of seeds per pod. | 10- 100 – seed weight (g). |
- 11- Seed yield (ardab/fad); whole plants in each sub plot were harvested and left for air drying, then they were threshed and the seeds (which were at 12 % moisture) were weighted (kg), then converted to ardab per feddan (one ardab = 155 kg).
- 12- Protein percentage (%). Crude protein percentage in the dry seeds was estimated according to the improved Kjeldahl method of A.O.A.C. (1990).

All data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split – plot design to each experiment (planting date), then the combined analysis was achieved between planting dates as outlined by Gomez and Gomez (1984) using means of "MSTAT-C" computer software package. Least Significant Difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

B- Laboratory studies:

Random sample of 400 seeds resulted from each treatment were sown on top filter paper which moistened with adequate distilled water in sterilized Petri-dishes (14-cm diameter). Each Petri-dish contained 25 seeds, and four Petri-dishes kept close together and incubated at 25° C and 100 % relative humidity, then four replications were used for every seed test. Standard germination tests was done according to A.O.S.A. (1993).

Germination percentage was expressed by the percentage of seed germinated normally after twelve days. The four replications of germination test were used to evaluate speed of germination according to Agrawal (1986). Shoot and root length (cm) were determined from 10 normal seedlings taken by random per each replicate at the end of standard germination test, then dried in a forced air oven at 105 °C for 24 hours to obtain seedling dry weight and expressed as grams (Agrawal, 1986).

The accelerated ageing test was carried out to define the vigor index and was used to predict the storage potential of seed. Each sample of 400 seeds resulted from each treatment were placed in an accelerate ageing chamber at 40° C and 100 % relative humidity for 48 hour. After this exposure period, the seed sample was submitted to the standard germination test and

the vigor index was calculated by dividing the number of germinated seeds from the outlet by that from the inlet samples (Pollock and Ross, 1972).

Collected data were subjected to the statistical analysis according to the technique of analysis of variance (ANOVA) for the completely randomized design as published by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1- Yield and its components:

1.1- Planting dates effect:

Planting dates caused significant effects on faba bean seed yield and its components in both seasons (Tables 2 and 3). Intermediate planting date (10th November) markedly resulted in the highest values of plant height, number of branches/plant, number of pods/plant, pods weight/plant, number of seeds/plant, seed yield/plant, pod length, pod weight, number of seeds/pod and 100 – seed weight as well as seed yield/fed as compared with other studied planting dates in both seasons. Early planting date (20th October) was ranked secondly rank after intermediate planting date. Late planting date (1st December) registered the lowest values of seed yield and its components in both seasons. The increases in faba bean seed yield and its component characters due to planting faba bean in early November might be attributed to the seasonable environmental conditions during this period such as temperature, day length and light intensity which allow rapid germination, establishment, vegetative growth, development and ripening, consequently increasing dry matter accumulation, yield components as well as seed yield per unit area. Abuldahab *et al.* (2002), Mohamed (2003) and Grenz *et al.* (2005) obtained similar results.

1.2- Cultivars performance:

Data presented in Tables 2 and 3 show significant differences among the three tested cultivars of faba bean for plant height, number of branches/plant, number of pods/plant, pods weight/plant, number of seeds/plant, seeds weight/plant, pod length, pod weight, number of seeds/pod and 100 – seed weight as well as seed yield/fed in both seasons. Sakha 1 cultivar significantly surpassed other studied cultivars (Giza 843 and Masr 1) in all yield component characters and also seed yield/fed, which recorded the highest values of all characters in the two growing seasons. Whereas, the last rank values were obtained from Masr 1 cultivar in both seasons. It is worthy to mention that the differences among all studied cultivars were significant in all seed yield and its components in both seasons, except pod weight (in the first season) and number of seeds/pod (in the second season). These findings might be attributed to the differences in their genetical constitution and genetic factors makeup. Similar results were stated by Metwally *et al.* (2000), Abou-Taleb (2002) and Annicchiarico (2005). The performance of Sakha 1 cultivar out yielded the other two cultivars and might be recommended.

Table 2: Plant height, number of branches, number of pods/plant, pods weight/plant, number of seeds/plant and seed yield/plant of faba bean as affected by planting dates, cultivars and seed size as well as their interactions during 2007/2008 and 2008/2009 seasons.

Characters	Plant height (cm)		Number of branches/plant		Number of pods/plant		Pods weight/plant (g)		Number of seeds/plant		Seed yield/plant (g)	
	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009
A- Planting dates:												
20 th Oct.	82.8	94.8	2.61	2.64	13.07	13.90	27.50	29.13	26.36	29.09	20.75	22.95
10 th Nov.	99.0	109.6	3.29	3.36	13.92	15.27	27.92	32.74	29.01	31.36	21.88	24.46
1 st Dec.	78.8	88.0	2.39	2.35	11.88	13.17	25.82	25.56	25.12	28.51	19.51	22.60
F. test	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.4	0.7	0.14	0.13	0.04	0.07	0.09	0.12	0.50	0.57	0.03	0.05
B- Cultivars:												
Sakha 1	93.9	106.5	3.06	3.22	13.48	14.66	27.80	31.64	28.66	31.62	21.81	23.74
Masr 1	81.2	87.6	2.49	2.46	12.41	13.64	26.11	26.79	25.41	28.18	19.84	22.93
Ciza 843	85.4	98.5	2.74	2.66	12.97	14.03	27.32	29.00	26.41	29.15	20.49	23.35
F. test	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.4	0.7	0.14	0.13	0.04	0.07	0.09	0.12	0.50	0.57	0.03	0.05
C- Seed size:												
Small	86.1	93.1	2.66	2.63	12.84	13.99	24.75	28.36	26.71	29.65	20.56	23.21
Medium	86.9	97.6	2.73	2.80	12.95	14.11	27.89	29.14	26.86	29.82	20.71	23.34
Large	87.6	101.9	2.90	2.91	13.07	14.23	28.60	29.93	28.92	29.49	20.86	23.47
F. test	*	*	*	*	*	*	*	*	NS	NS	*	*
LSD at 5 %	0.2	0.5	0.12	0.12	0.02	0.05	0.08	0.07	-	-	0.02	0.03
D- Interactions:												
A X B	*	*	NS	NS	*	*	NS	NS	*	*	*	*
A X C	*	*	NS	NS	*	*	NS	NS	NS	NS	*	NS
B X C	*	*	NS	NS	NS	NS	NS	NS	NS	NS	*	NS
A X B X C	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	*	NS

Table 3: Pod length, pod weight, number of seeds/pod, 100 – seed weight and seed yield/fed of faba bean as affected by planting dates, cultivars and seed size as well as their interactions during 2007/2008 and 2008/2009 seasons.

Characters	Pod length (cm)		Pod weight (g)		Number of seeds/pod		100 - seed weight (g)		Seed yield (ardab/fed)	
	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009
A- Planting dates:										
20 th Oct.	7.66	8.27	2.53	2.78	2.57	2.68	62.20	62.43	9.24	10.02
10 th Nov.	8.73	9.41	2.83	2.81	2.67	2.84	64.28	66.66	10.47	11.03
1 st Dec.	6.95	7.63	2.39	2.19	2.50	2.59	58.08	59.90	8.61	9.26
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.05	0.04	0.10	0.14	0.02	0.05	0.23	0.29	0.10	0.12
B- Cultivars:										
Sakha 1	8.24	8.75	2.64	2.79	2.65	2.77	63.12	64.88	9.93	10.66
Masr 1	7.20	8.15	2.50	2.44	2.50	2.63	60.29	60.85	9.04	9.57
Ciza 843	7.90	8.41	2.61	2.55	2.60	2.71	61.16	63.26	9.36	10.08
F. test	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.05	0.04	0.10	0.14	0.02	0.05	0.23	0.29	0.10	0.12
C- Seed size:										
Small	7.64	8.34	2.53	2.50	2.54	2.69	61.38	61.06	9.25	9.86
Medium	7.78	8.45	2.58	2.70	2.58	2.70	61.49	63.34	9.50	10.18
Large	7.92	8.52	2.64	2.59	2.62	2.71	61.69	64.58	9.58	10.27
F. test	*	*	*	NS	*	NS	*	*	*	*
LSD at 5 %	0.03	0.02	0.09	-	0.01	-	0.20	0.26	0.09	0.11
D- Interactions:										
A X B	*	*	NS	NS	NS	NS	*	*	*	*
A X C	*	*	NS	NS	NS	NS	NS	NS	*	NS
B X C	NS	NS	NS	NS	NS	NS	NS	NS	*	NS
A X B X C	NS	NS	NS	NS	NS	NS	NS	NS	*	NS

1.3- Seed size effect:

The results in Tables 2 and 3 clarified that size of sown seeds had significant effects on plant height, number of branches/plant, number of pods/plant, pods weight/plant, seed yield/plant, pod length, pod weight, number of seeds/pod and 100 – seed weight as well as seed yield/fed in both seasons, except pod weight and number of seeds/pod in the second season only. Large size of sown seeds markedly recorded the highest seed yield and its components compared with medium and small seed size in both seasons. Conversely, the lowest values of these characters were obtained from small size of sown seeds in both seasons. However, there were insignificant differences between sown faba bean by large or medium seed size with respect of pod weigh and 100–seed weight (in the first season), number of branches/plant and number of seeds/pod (in the second season) as well as seed yield/fed (in both seasons). These results may be due to sowing larger seeds of bean could improve early plant growth, which might be advantageous for crop establishment in unfavourable environments. However, some compensatory effect associated with delay leaf senescence, higher net assimilation rate, or greater number of seeds per pod, allows plants originating from medium seed to achieve similar seed yield. Lack of consistent effect of the seed size on seed yield indicated that the extra costs of sowing only the largest seed would not be profitable, but larger seeds at harvest usually attain better market prices. Salih (1997), Metwally (2003) and Idris (2008) reported similar conclusions.

1.4- Interactions effect:

There are many significant effect of the interactions among studied factors on all characters as shown in Tables 2, 3 and 4. But, the significant interaction on seed yield/fed only were reported. The significant effect of the interactions on seed yield/fed were the interaction between planting dates X cultivars (in both season), planting dates X seed size, cultivars X seed size and planting dates X cultivars X seed size (in the first season) as presented in Table 3. As shown from data graphically illustrated in Fig. 1, the highest seed yield/fed of faba bean was produced from planting Sakha 1 cultivar on 10th November. Data graphically illustrated in Fig. 2, show that the highest seed yield/fed was resulted from planting faba bean on 10th November with large size of seeds. Planting large size of Sakha 1 cultivar seeds resulted in the maximum means of seed yield/fed as cleared from data graphically illustrated in Fig. 3. The highest values of faba bean seed yield/fed were obtained from intermediate planting date (10th November) with large size of Sakha 1 cultivar seeds, followed by the same planting date by using medium size of Sakha 1 cultivar seeds without remarkable differences (Fig. 4).

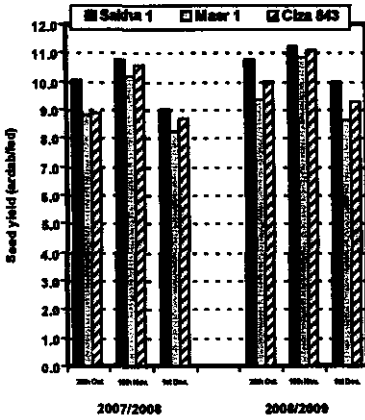


Fig. 1: Seed yield (ardab/fed) as affected by the interaction between planting dates and faba bean cultivars during 2007/2008 and 2008/2009 seasons.

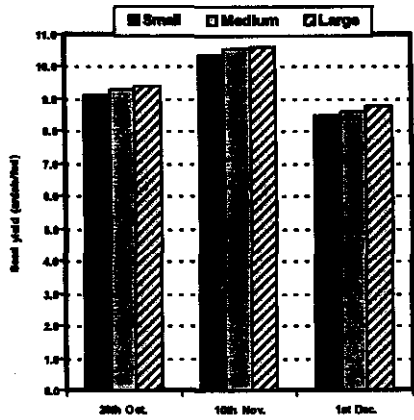


Fig. 2: Seed yield (ardab/fed) as affected by the interaction between planting dates and seed size during 2007/2008 season.

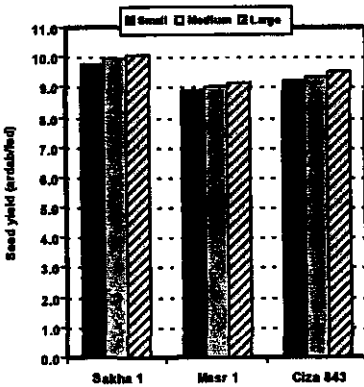


Fig. 3: Seed yield (ardab/fed) as affected by the interaction between faba bean cultivars and seed size during 2007/2008 season.

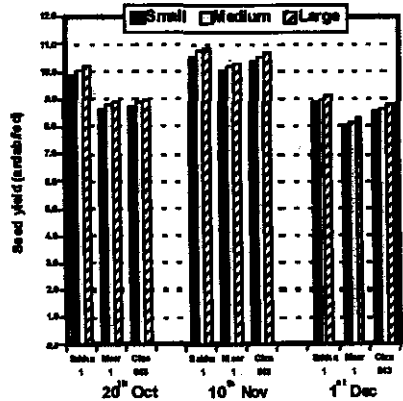


Fig. 4: Seed yield (ardab/fed) as affected by the interaction among planting dates, faba bean cultivars and seed size during 2007/2008 season.

Table 4: Protein %, germination %, speed of germination, root and shoot length, seedling dry weight and germination after ageing of faba bean as affected by planting dates, cultivars and seed size as well as their interactions during 2007/2008 and 2008/2009 seasons.

Characters	Protein %		Germination %		Speed of germination		Root length (cm)		Shoot length (cm)		Seedling dry weight (g)		Germination after ageing (%)	
	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009
A- Planting dates:														
20 th Oct.	24.34	25.00	85.9	87.3	8.14	8.90	10.27	12.47	13.57	16.55	0.255	0.295	56.4	62.1
10 th Nov.	24.85	25.73	93.6	94.5	9.42	9.87	11.61	14.57	16.07	19.08	0.374	0.368	58.7	67.1
1 st Dec.	23.84	24.63	83.8	85.8	7.42	8.36	9.45	11.40	11.01	13.56	0.239	0.283	54.2	58.6
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.20	0.18	0.9	1.0	0.09	0.05	0.11	0.06	0.18	0.25	0.080	0.064	0.1	0.2
B- Cultivars:														
Sakha 1	24.91	25.94	89.6	92.1	8.64	9.35	11.93	14.05	17.52	20.28	0.311	0.347	57.6	65.0
Maar 1	23.78	24.33	85.0	86.8	8.06	8.75	9.26	11.54	10.93	13.65	0.265	0.291	55.4	60.7
Ciza 843	24.34	25.09	88.8	88.6	8.29	9.03	10.13	12.86	12.19	15.25	0.293	0.307	56.3	62.2
F. test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
LSD at 5 %	0.20	0.18	0.9	1.0	0.09	0.05	0.11	0.06	0.18	0.25	0.080	0.064	0.1	0.2
C- Seed size:														
Small	24.22	24.77	83.6	85.0	8.23	8.76	9.65	12.39	12.73	14.19	0.282	0.312	55.5	61.7
Medium	24.34	25.18	89.3	90.2	8.36	9.09	10.49	12.90	13.77	16.95	0.289	0.315	56.4	62.7
Large	24.47	25.41	90.4	92.4	8.40	9.27	11.18	13.15	14.15	18.05	0.297	0.318	57.4	63.5
F. test	*	*	*	*	*	*	*	*	*	*	*	NS	*	*
LSD at 5 %	0.18	0.17	0.8	0.9	0.08	0.04	0.10	0.05	0.17	0.20	0.077	-	0.1	0.1
D- Interactions:														
A X B	*	*	*	*	NS	NS	NS	NS	NS	NS	NS	NS	*	*
A X C	NS	NS	*	*	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
B X C	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
A X B X C	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

2- Seed quality :

2.1- Planting dates effect:

Data in the Tables 4 reveal that there were significant differences among the three planting dates on faba bean seed quality in both seasons. The most marked and maximum values of seed quality characters such as protein, germination percentages, speed of germination, shoot and root length, seedling dry weight and germination after ageing were resulted from the intermediate planting date in November^{10th} followed by early and then late planting dates. Seed quality characters were probably near maximum values at the intermediate planting date might due to more suitable environmental conditions during this period to form more photosynthates products, which translocated and accumulated in seeds. Hussein *et al.* (2002), Mohamed (2003) and Oweis *et al.* (2005) came out to similar results.

1.2- Cultivars performance:

The results in Tables 4 exhibit significant differences among the three tested cultivars in seed quality characters *i.e.* protein, germination percentages, speed of germination, shoot and root length, seedling dry weight and germination after ageing in both seasons. From the data, Sakha 1 cultivar significantly surpassed all cultivars and produced the highest values of previously mentioned traits. Varieties could be descendingly arranged according to seed quality traits as follows: Sakha 1, Giza 843 and Masr 1. The differences among the three cultivars may be due to the genetical make up factors and environmental conditions to which the mother plants were subjected in the field. These results are partially in accordance with those stated by Hussein *et al.* (1995), Metwally *et al.* (2000) and Abou-Taleb (2002).

1.3- Seed size effect:

The results in Tables 4 show that the effect of seed size on seed quality characters was significant, except for seedling dry weight in the second season only. Planting faba bean with large seed size significantly produced the highest values of all quality characters *i.e.* protein and germination percentages, speed of germination, shoot and root length, seedlings dry weight as well as germination after ageing in both seasons. Whereas, planting faba bean by using medium seed size gave the best values of all quality characters followed large seed size in the two growing seasons, and without significant differences respecting speed of germination (in the first season) and dry weight seedlings (in the second season). On the other hand, planting small seed size resulted in the lowest values of these characters in both seasons. Seedling vigor appears to be enhanced as a result of planting with large or medium seeds and thus may be due to the increase in seed protein and carbohydrate contents, where the high protein content of seeds resulted in larger seedlings than low protein seeds. Confirming results reported by Bulisani and Warner (1980). The differences may be attributed to the efficiency of metabolic activity and substrate transfer to seedling axis in the high protein seeds, an increase in soluble protein content in the seedling axis which consists mainly of enzymes and protein factors for various metabolic processes of growth and development of the

seedling axis (Ching, 1972). These results are in agreement with those stated by Pocsai (1986), El-Emery (1993) and Turk and Tawaha (2002).

Conclusion

According to the obtained results from this study, it can be concluded that, planting faba bean Sakha 1 cultivar on 10th November with large or medium size seeds could be recommend to raise faba bean productivity and seed quality under the environmental conditions of Tag El-Ezz district, Dakahlia Governorate.

REFERENCES

- A.O.A.C. (1990). Official Methods of Analysis Association of Official Analytical Chemists. 15th Ed. Inc. Wash. D.C. Nutrient Cycling in Agro ecosystems, 56 (3): 263-275.
- A.O.S.A. (1993). "Association of Official Seed Analysts" Rules for testing seeds. J. Seed Tech., 16: 1-113.
- Abou-Taleb, S.M. (2002). Morphological variation and dry matter distribution in some faba bean cultivars under different sowing dates. Proc of Recent Technologies in Agriculture, Fac. Agric. Cairo Univ., 28-30 Oct. 2002, Bull. Fac. Agric. Cairo Univ., Egypt, Vol. (IV): 846-874.
- Abuldahab, A.A. ; W.A. EL-Murshedy and G.O. Mahmoud (2002). Phenological response of faba bean to climatological effects under different sowing dates and plant distributions. J. Agric. Sci. Mansoura Univ., 27(4): 1989-2003.
- Agrawal, P.K. (1986). Seed vigor: Concepts and Measurements. In: Seed Production Technology (Ed. J.P. Srivastava and L.T. Simarsk), ICARDA, Aleppo, Syria pp: 190-198.
- Annicchiarico, P. (2005). Pea, faba bean and lupin for autumn and late winter sowing. *Informatore Agrario*, 61(39): 61-65 (C.F. Computer Search).
- Bulisani, E.A. and R.L. Warner (1980). Seed protein and nitrogen effects upon seedling vigor in wheat. *Agron. J.*, 72: 657-662.
- Ching, T.M. (1972). Metabolism of germination seeds. In TT Kozlowski, ed, *Seed biology*, Vol. II- Academic Press, New York, pp. 109-213.
- El-Emery, M.I. (1993). Effects of seed weight and planting date on seedling vigor and agronomic characters of faba bean (*Vicia faba* L.). *Ann. of Agric. Sci., Cairo*, 38(1): 193-201.
- Gomez, K.N. and A.A. Gomez (1984). *Statistical procedures for agricultural research*. John Wiley and Sons, New York, 2nd ed., 68 P.
- Grenz J, Manschadi AM, Uygur FN, Sauerborn J (2005): Effects of environment and sowing date on assimilate competition between faba bean (*Vicia faba*) and the parasitic weed *Orobancha crenata*. *Field Crops Res.*, 93: 300-313.
- Hussein, A.H.A. ; M.A. El-Deeb and K.H. El-Yamani (2002). Response of new faba bean genotypes to different sowing dates and plant densities in the newly reclaimed land in upper Egypt. National Ann. Coordination Meeting, ICARDA/EC, Cairo, 22-23 September I: 70-74.

- Hussein, A.H.A. ; S.A. Saleh K.H.A. El-Assily and M.M. El-Morsy (1995). Response of some released faba bean cultivars and promising lines to plant densities at newly reclaimed soil in middle Egypt. *Ann. Agric. Sci. Ain Shams Univ.*, 40(2): 539-545.
- Idris, A.L.Y. (2008). Effect of seed size and plant spacing on yield and yield components of faba bean (*Vicia faba* L.). *Res. J. of Agric. and Biol. Sci.*, 4(2): 146-148.
- Metwally, A.A. ; M.M. shafik ; M.A. Hassanin and D.S. Darwish (2000). Influence of sowing dates and population densities on performance of some faba bean varieties growing in newly reclaimed land. *J. Agric. Sci. Mansura Univ.*, 25(9): 5587-5599.
- Metwally, A.K. (2003). Effect of seed type and seed size on some growth parameters, yield and yield components in some new broad bean (*Vicia faba* L.) lines. *Assiut J. of Agric. Sci.*, 34(4): 53-71.
- Mohamed, A.A. (2003). Effect of planting date on growth and yield of some faba bean varieties. M. Sc. Thesis, in Agron. Fac. of Agric. Cairo Univ.
- Oweis, T. ; A. Hachum and M. Pala (2005). Faba bean productivity under rainfed and supplemental irrigation in northern Syria. *Agric. Water Management*, 73: 57-72.
- Pocsai, K. (1986) Ways of reducing the seed rate of *Vicia faba* L. *Novenytermeles*, 35(1): 39-44.
- Pollock, B.M. and E.E. Ross. (1972). Seed and seedling vigor. In *Seed Biology*, Kozlowski, T.T. Ed., Academic Press, New York, pp. 313-387.
- Reddy, P.N. ; K.N. Reddy ; S.K. Rao and S.P. Singh (1989). Effect of seed size on qualitative and quantitative traits in soybean [*Glycine max* (L.) Merr.]. *Seed Sci. & Technol.*, 17: 289-95.
- Refay, Y.A. (2001). Effect of planting dates and plant density on two faba bean lines grown under the Central region conditions of Saudi Arabia. *Arab Univ. J. of Agric. Sci.*, 9(1): 79-93.
- Salih, F.A. (1983). Influence of sowing date, seed rate, and seed size on yield and yield components of faba beans. *Fabis Newsletter, Faba Bean Information Service, ICARDA*, 5: 32.
- Salih, F.A. (1997). Influence of seed size and population on seed yield and other yield characteristics of faba bean. *Fabis Newsletter*, 17: 18-22 (C.F. Computer Search).
- Salih, F.A. and S.H. Salih (1980). Influence of seed size on yield and yield components of broad bean (*Vicia faba* L.). *Seed Sci. and Technol.*, 8(2): 175-185.
- Snedecor, G.W. and W.G. Cochran (1980). "Statistical Methods" 7th Ed. The Iowa State Univ. Press, Iowa, USA.
- Tomaszewski, Z., M. Idzkowska and , I. Koczowska (1978). The effect of seed size of the sowing material on the fresh matter and seed yields of pulses. p: 15 (C.F. Computer Search).
- Turk, M.A. and A.R.M. Tawaha (2002). Effect of dates of sowing and seed size on yield and yield components of local faba bean under semi-arid conditions. *Legume Res.*, 25(4): 301-302.

تأثير مواعيد الزراعة وحجم البذور على إنتاجية وجودة بعض أصناف الفول البلدى

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أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بتاج العز - محافظة الدقهلية - مركز البحوث الزراعية خلال موسمي ٢٠٠٧/٢٠٠٨ و ٢٠٠٨/٢٠٠٩ لدراسة تأثير مواعيد الزراعة (٢٠ أكتوبر ، ١٠ نوفمبر و١ ديسمبر) وحجم البذور (صغير ، متوسط ، كبير) لبعض أصناف الفول البلدى (سحا ١ ، مصر ١ وجيزة ٨٤٣) وكذلك التفاعل بينهم على المحصول ومكوناته وصفات جودة البذور. كذلك أجريت تجارب معملية بوحدة بحوث تكنولوجيا البذور بالمنصورة بمعهد بحوث المحاصيل الحقلية ، مركز البحوث الزراعية لتقدير جودة التقاوى عن طريق إختبارات الإنبات وقوة البادرات للتقاوى الناتجة من التجربة الحقلية بالإضافة على نسبة البروتين فى البذور.

تشير النتائج المتحصل عليها أن مواعيد الزراعة كان لها تأثير معنوى على محصول البذور ومكوناته وكذلك صفات الجودة فى كلا الموسمين. أدت زراعة الفول البلدى فى الميعاد المتوسط (١٠ نوفمبر) إلى الحصول على أعلى القيم لجميع الصفات تحت الدراسة تلاه الزراعة فى الميعاد المبكر ثم المتأخر. كانت هناك فروقا معنوية بين أصناف الفول البلدى الثلاثة تحت الدراسة. حيث تفوق الصنف سحا ١ على الصنفين الآخرين (جيزة ٨٤٣ ومصر ١) حيث أعطى أعلى القيم لجميع الصفات تحت الدراسة فى كلا الموسمين. كان لحجم البذور المنزرعة تأثيراً معنوياً على جميع الصفات فى كلا الموسمين ما عدا عدد بذور النبات ، وزن القرن ، عدد بذور القرن والوزن الجاف لـ ١٠ بادرات فى الموسم الثانى فقط. أدت زراعة البذور ذات الحجم الكبير إلى الحصول على أعلى القيم لجميع الصفات تحت الدراسة تلاها الزراعة بالبذور ذات الحجم المتوسط ثم الصغير بدون فروق معنوية لبعض مكونات المحصول وصفات جودة التقاوى وأيضاً محصول بذور الفدان.

من النتائج المتحصل عليها فى هذه الدراسة يوصى بزراعة الفول البلدى صنف سحا ١ فى أوائل نوفمبر (١٠ نوفمبر) بالبذور ذات الحجم الكبير أو المتوسط للحصول على أعلى إنتاجية وجودة للبذور والتقاوى فى منطقة تاج العز بمحافظة الدقهلية.

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