

**RESPONSE OF TWO FABA BEAN (*Vicia faba* L.)
PROMISING LINES AND SAKHA 3 CULTIVAR TO
DIFFERENT SOWING DATES AND PLANT DENSITIES**

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ABSTRACT

Two field experiments were conducted at Sakha Agricultural Research Station, ARC, Egypt in 2005/06 and 2006/07 winter seasons to study the effect of three sowing dates (Oct. 1st, Oct. 15th and Nov. 1st) of two faba bean (*Vicia faba* L.) promising lines 81/35 and 83/27 for early sowing and Sakha 3 cultivar, as well as, three plant densities i.e. 27, 22 and 17 plants/m² on faba bean foliage diseases i.e. chocolate spot and rust caused by *Botrytis fabae* and *Uromyces fabae*, respectively, aphids (*Aphis* spp.) and seed yield and its components. Results showed that, number of days to maturity, foliage diseases infection and aphids infestation were increased under the early sowing date. However, early sowing date produced the highest faba bean seed yield in 2005/06 season, while, the medium sowing date, Oct. 15th, gave the highest seed yield in the second season (2006/07).

The new promising line 81/35, was earlier than Sakha 3 cultivar by three weeks and resistant to foliage diseases, similar to the resistant check cultivar, Sakha 3. Also, this line recorded the least number of aphids. At the same time, the new promising line 81/35, produced the highest seed yield in the two seasons. The sowing dates x varieties interaction showed that 81/35 line was early maturing under the three tested sowing dates, resistant to foliage diseases and recorded the least infestation with aphids under the different sowing dates. The 100-seed weight recorded the highest values with the two early sowing dates. Either planting at 27 or 22 plants/m² produced the highest seed yield in both seasons. A slight increase with foliage diseases were observed with high plant densities, while, the number of aphids deceased significantly under the high plant population.

INTRODUCTION

Faba bean (*Vicia faba* L.) is the most important legume crop in Egypt, due to its high nutritive value for human food and its role

as a break crop in cereal rotation system. The planted area was about 216,000 feddans in the last five seasons with an average seed yield of 9.0 ardab/feddan. In northern parts of Egypt the planted area represent about 85% of the total planted faba bean area, where the dominant summer crop is rice. After rice research program which released the short duration cultivars, some farmers intended to plant faba bean crop in September and October, while the optimum sowing date for the commercial cultivars is the first half of November. Under this early sowing, the seed yield significantly decreased due to the high level of infection with foliage diseases i.e. chocolate spot (*Botrytis fabae*), rust (*Uromyces fabae*), high infestation with insects and abnormal conditions.

The promising lines were selected from the early sowing breeding program at Sakha. They can be planted at early sowing date on October 1st with high yielding ability, resistance to foliage diseases and less infestation with aphids (*Aphis* spp.). The seed yield of resistant cultivars was significantly higher comparing with the recommended cultivars under natural infection with foliar diseases at Sakha (Amer *et al.*, 2002, 2003 and 2006). The results obtained by Khalil *et al.* (1996) clarified that six cultivars ; namely, Giza 461, Giza 643, Giza 714, Giza 716, Giza 717 and Giza Blanka significantly outyielded the recommended cultivar ,Giza 3, and were resistant to foliage diseases.

Sowing date, as it affects the timing and duration of the vegetative and reproductive stages, contributed largely to seed yield. On the other hand, the damage caused by foliar diseases and aphids in north parts of Egypt could be decreased if the proper genotype was selected and sown on the proper date. Amer *et al.*, 1992, Hussein *et al.*, 1994, El-Galaly, Ola *et al.*, (2002), El-Deeb *et al.*, (2006) and Hussein *et al.*, (2006) found that sowing on mid-October gave the highest seed yield. Mahmoud, Nagwa (1996), found that late sowing dates reduced the amount of diseases infection, while the highest seed yield was obtained from early sowing date. However, sowing date was one of the main agronomic practices that could directly affect the level of insect infestation (Dent, 1991) as it created a synchrony between phenology of both crop and the insect pest (Ferro, 1987).

Plant density plays a major role on yield improvement of faba bean. El-Galaly, Ola *et al.*, (2002) found that plant density of 22 plants/m² gave the highest seed yield, while plant density of 25-27 plants/m² was found suitable by Hussein *et al.*, (1994). Also, the plant density, where it changes in the micro environment and favored by the pest and its natural enemies (Coaker, 1987).

The objective of this work was to study the response of two early sowing promising lines to three sowing dates under three plant

MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station, Kafr El-Sheikh, Egypt, in the two winter seasons (2005/06 and 2006/07). A split-split-design, with four replications was used. The three sowing dates (Oct. 1st, Oct. 15th and Nov. 1st) occupied the main plots, Three varieties were placed in the sub-plots and three plant densities were plotted in the sub-sub plots. Varieties were two promising lines (line 81/35 and line 73/27) and local cultivar, Sakha 3. The three plant densities were distributed on ridges, 60 cm apart as follows: 1) 17 plants/m² in two seeded hills at 20 cm spacing one-side of ridges. 2) 22 plants/m² in two seeded hills at 30 cm spacing on two sides of ridges, and 3) 27 plants/m² in two seeded hills at 25 cm spacing on two sides of ridges. Each sub-sub-plot had six ridges, three meter long. The other cultural practices were done as recommended. No pesticidal treatments were applied. The foliar diseases (chocolate spot and rust) were recorded at April 1st according to ICDARDA (Bernier *et al.*, 1984) scale from 1-9 (1: highly resistant, 3: resistant, 5: moderate resistant, 7: susceptible, and 9: highly susceptible). To determine the aphids numbers, *Aphis spp.*, weekly sample of ten branches was randomly chosen from each plot and the number of all stages (adults and nymphs) were directly counted in the field, with the aid of hand lens. The inspection began six weeks after sowing and continued till the end of the season. The general mean number throughout the whole season for each treatment, was calculated.

At maturity, four middle ridges were harvested from each sub-sub plot to determine the seed yield in ardab/feddan, and five guarded plants were taken at random to estimate the different seed yield components. Maturity date was recorded for each sub-sub plot as a number of days from sowing to maturity.

All data collected were subjected to standard analysis of variance procedures (Snedecor and Cochran, 1982). The combined

analysis was done for the data of both seasons when the homogeneity test was not significant according to (Cohran and Cox, 1957). Treatment means were compared by Duncan's.

RESULTS AND DISCUSSION

I. Reaction to chocolate spot and rust diseases and aphids:

The incidence of faba bean foliar diseases, mainly, chocolate spot and rust, through 2005/06 and 2006/07 seasons and their combined analysis as affected by sowing dates, varieties and plant densities are shown in Table 1. Results indicated that the incidence of foliage diseases decreased by delaying sowing date for chocolate spot only, while increased in 2006/2007 and combined analysis for rust disease. El-Galaly, Ola *et al.*, (2002), found that the lowest values of foliage diseases were recorded with delaying sowing date to November. Also, the results showed that the new promising line, 81/35, and Sakha 3 recorded the high level of resistance. The low plant density 17 plants/m² recorded slightly lower infection rate with foliar diseases than the highest plant density. These findings were similar to those reported by El-Galaly, Ola *et al.*, (2002). The interaction effect of sowing dates and varieties as shown in Tables 4, 6 and 9, indicated that the lowest values of chocolate spot were obtained in the two seasons and combined data from the three different varieties under the late sowing date (Nov. 1st). These results are similar to those reported by Mahmoud Nagwa (1996). Also, the lowest values of rust disease were recorded in the second season (Table 6), while, the lowest values of this trait were obtained with the first sowing date (Oct 1st) for all varieties. Generally, such results indicated that line 81/35 and Sakha 3 cultivar were markedly resistant to chocolate spot and rust diseases (Table 9).

In general, the population of aphids was lower in the second season than in the first one (Table 1). This may be due to the differences in weather factors and/or the natural enemies. The aphid numbers were significantly lower in the late sowing date (Nov. 1st) in the two studied seasons, compared to the sowing date on October 1st. Also, the promising line, 81/35, received the least number of aphids in the two seasons. The plant density of 27 plants/m² recorded the lowest number of aphids in comparison with the rate of 22 and 17 plants/m².

The interaction effect of sowing dates and varieties, sowing dates and plant densities, as well as varieties and plant densities on aphid investment was insignificant. These results agreed with those of

Tukahirwa and Coaker (1982) who reported that an increase in plant density reduced the insect numbers. Also, El-Heneidy *et al.* (1998) reported that the aphid population was relatively greater in early sown faba bean than in the late sown one. In contrast, Slman (2002) revealed that the high density of faba bean plants significantly increased the population density of aphids in upper Egypt during 2000-2002. Also, Khalafalla and El-Galaly (1998) reported that faba bean, sown in November received the highest number of aphids, while, that sown in October harbored the lowest number.

Maturity date (number of days from sowing to maturity stage) recorded the lowest values under the late sowing date. The promising line, 81/35, was earlier than the local cultivar, Sakha 3, by about three weeks. On the other hand maturity date was not affected by plant density in the two seasons and combined analysis as shown in Table 1. The interaction was significantly between sowing dates and varieties in the two seasons and combined data. The data indicated that line,81/35, recorded the lowest values under the three sowing dates (Tables 4, 6 and 9)

II. Seed yield and its components:

The faba bean seed yield per plant and its components significantly differed among the three sowing dates in the second season, while 100-seed weight only was significantly differed in the first season as shown in Tables 2 and 3. Also, the seed yield and its components significantly differed among the three sowing dates except number of pods per plant and seed yield per plant from the combined data (Tables 2 and 3). The early sowing date (Oct. 1st) produced the tallest plants, number of seeds/pod and seed yield (ardab/feddan) compared with the two other sowing dates in the first season (Table 2 and 3). In the second season, plant height, number of branches, pods and seeds per plant and seed yield per plant recorded the highest values with the first sowing date (table 2 and 3), while 100-seed weight and seed yield (ardab/feddan) recorded the highest values with the second sowing date (Oct. 15th) (Table 3). From combined data, plant height, number of branches, number of seeds/plant, number of seeds/pod recorded the highest values Oct. 1st with sowing date, while 100-seed weight recorded the highest value with sowing date of Oct. 15th. The highest values of seed yield (ardab/fedan) was obtained from the sowing dates of Oct. 1st and Oct. 15th (Tables 2 and 3). Hussein *et al.*, (2006) found that sowing in mid of October recorded the highest seed yield.

The two faba bean promising lines and local check cultivar (Sakha 3) showed significant variations in seed yield and its components, as presented in Tables 2 and 3. In 2005/06 season, the data indicated insignificant differences in 100-seed weight and seed yield (ardab/feddan) among the tested varieties (Table 3). On the other hand, 81/35 line recorded the highest values for seed yield (ardab/feddan) and most traits of its components (Tables 2 and 3). These findings are in good agreement with those recorded by Khalil *et al.* (1996). Concerning the interaction effect of sowing dates and faba bean varieties on number of pods per plant (Table 4), Sakha 3 and Line 73/27 gave the highest number of pods/plant under the early sowing date, while, the data from line 81/35 indicated that no significant differences under the different sowing dates in the first season. In the second season, Sakha 3 gave the highest values of number of pods and seeds/plant in the third sowing date, while, the promising line, 81/35, gave the highest values of number pods/plant under the early sowing date (Table 6). In the combined data, line 81/35 recorded the highest values of number of pods and seeds/plant with the early sowing date (Table 2), and seed yield per plant, 100-seed weight and seed yield (ardab/fed.)

With regard to the different plant densities, sowing at 27 plants/m² produced the highest seed yield (ardab/fed.) in both seasons, and combined data followed by sowing at 22 plants/m² (Tables 2 and 3). The number of branches, pods and seeds per plant, as well as the seed yield per plant were significantly higher under the low plant density (17 plants/m²), while, plant height and 100-seed weight were significantly higher with the high plant density. Similar results were obtained by Amer *et al.*, (1992). The interaction effect between sowing dates and plant density as shown in Table 7 indicated that the highest values for number of pods/plant were recorded with the low plant density under all sowing dates in the second season. The faba bean varieties x plant densities interaction, as presented in Table 8, showed that the highest number of seeds/plant and seed yield/plant were obtained under all varieties with the low plant density. The 100-seed weight gave the highest values for Sakha 3 with the high plant density. Also, the same result was found from the combined data (Table 10). Line 81/35 recorded the highest seed yield (ardab/feddan) with the high plant densities of 27 and 22 plants/m² (Table 8).

Table (1): The effect of sowing dates, varieties and plant densities on maturity, chocolate spot, rust and aphids in the two growing winter seasons 2005/06 and 2006/07 and their combination

Variables	Characters studied											
	Number of days to maturity			Chocolate spot*			Rust*			Mean No. of aphids/10 branches		
	2005/06	2006/07	combined	2005/06	2006/07	combined	2005/06	2006/07	combined	2005/06	2006/07	combined
Sowing dates (A):												
Oct. 1 st	181 a	183 a	182.0 a	4.2 a	3.8 a	4.0 a	4.4 a	2.5 c	3.4 c	61.9 a	3.6 b	32.8 b
Oct. 15 th	175 b	175 b	175.0 b	3.2 b	3.9 a	3.5 b	4.8 a	3.6 b	4.1 a	69.8 a	7.7 a	38.8 a
Nov. 1 st	167 c	166 c	166.5 c	1.5 c	2.8 b	2.2 c	3.6 b	4.2 a	3.8 b	7.7 b	2.9 b	2.1 c
Varieties (B):												
Sakha 3	185 a	185 a	185.0 a	2.8 b	3.2 b	3.0 b	3.8 c	3.6 a	3.7 b	47.3 b	6.1 a	26.7 a
Line 81/35	166 c	164 c	165.0 c	3.2 a	3.2 b	3.2 b	4.2 b	3.2 b	3.7 b	41.6 c	3.2 c	22.4 b
Line 73/27	172 b	175 b	173.0 b	2.8 b	4.2 a	3.5 a	4.8 a	3.5 a	4.2 a	50.5 a	4.9 b	27.7 a
Plant densities (C):												
27 plants/m ²	177	177	177.0	3.1 a	3.8 a	3.4 a	4.4 a	3.7 a	4.0 a	43.7 b	3.6 b	23.6 b
22 plants/m ²	174	174	174.0	2.9 ab	3.5 ab	3.2 b	4.3 ab	3.4 ab	3.4 ab	49.2 a	6.8 a	28.0 a
17 plants/m ²	172	173	172.5	2.8 b	3.3 b	3.0 b	4.1 b	3.2 b	3.7 b	45.5 a	3.9 b	24.7ab
Interactions:												
A x B	*	*	**	**	**	*	**	**	**	N.S	N.S.	N.S.
A x C	N.S	N.S	N.S.	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
B x C	N.S	N.S	N.S.	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S
A x B x C	N.S	N.S	N.S.	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

(1) Column entries with the same letters do not significantly differ (P = 0.05).

(2)* Chocolate spot and Rust Scales: 1-9, 1 highly resistant and 9 highly susceptible.

(3)*, ** and NS = significant, highly significant and not significant, respectively.

Table (2): Effect of sowing dates, varieties and plant densities on plant height, number of brances, number of pods and seeds/plant in the two growing seasons and their combination.

Variables	Characters studied											
	Plant height (cm)			No. of branches/plant			No. of pods/plant			No. of seeds/plant		
	2005/06	2006/07	combined	2005/06	2006/07	combined	2005/06	2006/07	combined	2005/06	2006/07	combined
Sowing dates (A):												
Oct. 1 st	136.1 a	171.4 a	153.7 a	1.4	2.08 a	1.7 a	9.10	14.1 a	11.60	25.75	41.9 a	33.80 a
Oct. 15 th	118.0 b	160.5 b	136.7 b	1.3	1.89 a	1.6 ab	8.58	12.4 b	10.49	24.06	36.6 b	30.30 b
Nov. 1 st	102.3 b	153.3 b	127.8 c	1.4	1.60 b	1.5 b	8.22	13.2 ab	10.70	26.78	37.9 b	32.44 a
Varieties (B):												
Sakha 3	115.0	160.5 ab	137.7 b	1.5 a	1.94	1.7 a	8.14 b	12.1 b	10.12 b	26.16 a	39.6 a	32.9 a
Line 81/35	120.8	157.1 b	138.7 b	1.0 b	1.85	1.4 b	8.5 b	14.1 a	11.29 a	26.22 a	39.8 a	33.1 a
Line 73/27	121.6	167.7 a	144.6 a	1.5 a	1.78	1.6 a	9.29 a	13.6 a	11.40 a	24.21 b	37.1 b	30.6 b
Plant densities (C):												
27 plants/m ²	122.8 a	171.9 a	147.3 a	1.1 b	1.66 b	1.3 c	7.43 c	11.1 c	9.30 c	22.59 c	33.1 c	27.9 c
22 plants/m ²	118.4 ab	162.7 ab	140.5 b	1.3 b	1.86 ab	1.5 b	8.67 b	12.7 b	10.70 b	25.97 b	38.6 b	32.0 b
17 plants/m ²	116.2 b	150.7 b	133.4 c	1.6 a	2.05 a	1.8 a	9.79 a	15.9 a	12.80 a	28.53 a	44.7 a	36.6 a
Interactions:												
A x B	N.S	N.S	N.S	*	N.S	N.S	*	*	*	N.S.	**	*
A x C	N.S	N.S	N.S	N.S	N.S	N.S	N.S	*	N.S	N.S	N.S	N.S
B x C	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	*	N.S
A x B x C	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

(1) Column entries with the same letters do not significantly differ ($P = 0.05$).

(2) *, ** and Ns = significant, highly significant and not significant, respectively.

Table (3): Effect of sowing dates, varieties and plant densities on number of seeds/pod, seed yield/plant, 100-seed weight and seed yield in the two growing seasons and their combination.

Variables	Characters studied											
	No. of seeds/pod			Seed yield/plant (g)			100-seed weight (g)			Seed yield (ardab/fed)		
	2005/06	2006/07	combined	2005/06	2006/07	combined	2005/06	2006/07	combined	2005/06	2006/07	combined
Sowing dates (A):												
Oct. 1 st	3.3 a	3.0	3.2 a	21.40	33.9 a	27.7	83.53	81.25 b	82.89 b	11.68 a	12.99 b	12.33 a
Oct. 15 th	2.9 b	2.9	2.9 b	20.44	32.2 b	26.3	85.92	87.83 a	86.90 a	10.23 b	14.69 a	12.46 a
Nov. 1 st	2.9 b	3.1	3.0 b	22.71	30.7 b	26.7	85.17	81.86 b	83.50 b	9.98 b	12.41 b	11.19 b
Varieties (B):												
Sakha 3	3.2 a	3.4 a	3.3 a	22.43 a	32.5 a	27.5 a	85.89	83.33	84.6 a	10.76 ab	13.30	12.03 ab
Line 81/35	3.2 a	3.0 b	3.1 b	22.30 a	33.7 a	28.0 a	85.72	85.14	85.4 a	10.99 a	13.40	12.19 a
Line 73/27	2.6 b	2.7 b	2.7 c	19.83 b	30.6 b	25.2 b	83.00	82.47	82.7 b	10.13 b	13.39	11.76 b
Plant densities (C):												
27 plants/m ²	3.1	3.0	3.1	19.78 b	28.2 c	24.0 c	87.58 a	85.14 a	86.4 a	11.05 a	14.19 a	12.62 a
22 plants/m ²	3.1	3.1	3.1	21.34 ab	32.3 b	26.8 b	84.17 b	84.06 a	84.1 b	10.59 ab	12.93 b	11.76 b
17 plants/m ²	2.9	2.9	2.9	23.43 a	36.3 a	29.8 a	82.86 b	81.75 b	82.3 c	10.24 b	12.98 b	11.61 b
Interactions:												
A x B	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	**	N.S.	N.S.	N.S.	N.S.
A x C	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	*	N.S.
B x C	N.S.	N.S.	N.S.	N.S.	*	N.S.	*	**	*	N.S.	N.S.	N.S.
A x B x C	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

(1) Column entries with the same letters do not significantly differ (P = 0.05).

(2) *, ** and Ns = significant, highly significant and not significant, respectively.

Table (4): Effect of sowing dates x varieties interaction on maturity, diseases infection and faba bean seed yield and its components in 2005/06 season.

Sowing dates	Varieties		
	Sakha 3	Line 81/35	Line 73/27
	Maturity date (days)		
Oct. 1 st	190.0 a	173.9 d	178.4 c
Oct. 15 th	185.5 b	162.5 e	174.0 d
Nov. 1 st	177.4c	157.5 g	164.4 f
	Chocolate spot		
Oct. 1 st	3.50 b	4.50 a	4.50 a
Oct. 15 th	3.50 b	3.50 b	2.50 c
Nov. 1 st	1.30 d	1.50 d	1.50 d
	Rust		
Oct. 1 st	3.50 c	4.42 b	5.42 a
Oct. 15 th	4.50 b	4.50 b	5.50 a
Nov. 1 st	3.50 c	3.67 c	3.67 c
	No. of branches/plant		
Oct. 1 st	1.47 abc	1.18 cde	1.42 abc
Oct. 15 th	1.55 ab	1.06 de	1.28 bcd
Nov. 1 st	1.45 abc	0.85 e	1.74 a
	No. of pods/plant		
Oct. 1 st	9.43 a	8.30 bcde	9.57 a
Oct. 15 th	7.82 de	8.98 abcd	8.93 abcd
Nov. 1 st	7.18 d	8.24 cde	9.24 abc

Values in each character with the same letters do not significantly differ ($P = 0.05$).

Table (5): Effect of varieties and plant densities interaction on 100-seed weight in 2005/06 season.

Varieties	Plant densities		
	27 plants/m ²	22 plants/m ²	17 plants/m ²
Sakha 3	88.00 a	81.92 c	87.75 ab
Line 81/35	89.33 a	85.67 b	82.17 c
Line 73/27	85.42 b	84.92 bc	78.67 d

Values in each character with the same letters do not significantly differ ($P = 0.05$).

Table (6): Effect of sowing dates x varieties interaction on maturity, diseases infection and faba bean seed yield and its components in 2006/07 season.

Sowing dates	Varieties		
	Sakha 3	Line 81/35	Line 73/27
	Maturity date (days)		
Oct. 1 st	194.6 a	172.8 d	184.2 b
Oct. 15 th	184.0 b	164.3 e	177.3 c
Nov. 1 st	176.6 c	157.3 f	164.3 e
	Chocolate spot		
Oct. 1 st	3.5 c	2.5 d	5.5 a
Oct. 15 th	3.7 c	4.5 b	3.5 c
Nov. 1 st	2.5 d	2.5 d	3.5 c
	Rust		
Oct. 1 st	2.5 c	2.5 c	2.5 c
Oct. 15 th	3.7 b	3.5 b	3.5 b
Nov. 1 st	4.5 a	3.5 b	4.5 a
	No. of pods/plant		
Oct. 1 st	11.14 d	16.14 a	14.97 ab
Oct. 15 th	11.28 d	12.76 bcd	13.25 bcd
Nov. 1 st	13.90 abc	13.28 bcd	12.44 cd
	No. of seeds/plant		
Oct. 1 st	39.20 bcd	44.60 a	41.93 abc
Oct. 15 th	36.17 de	37.50 cde	36.25 de
Nov. 1 st	43.38 ab	37.33 cde	33.15 e
	100- seed weight (gm)		
Oct. 1 st	86.58 b	77.50 cd	79.67 c
Oct. 15 th	86.33 b	90.92 a	86.25 b
Nov. 1 st	77.08 cd	87.00 ab	81.50 c

Values in each character with the same letters do not significantly differ (P = 0.05).

Table (7): Effect of sowing dates and plant densities interaction on number of pods/plant 2006/07 season.

Sowing dates	Plant densities		
	27 plants/m ²	22 plants/m ²	17 plants/m ²
Oct. 1 st	12.26 bcd	13.43 bc	16.57 a
Oct. 15 th	11.17 cd	12.18 bcd	13.94 b
Nov. 1 st	9.82 d	12.61 bc	17.15 a

Values in each character with the same letters do not significantly differ (P = 0.05).

Table (8): Effect of varieties and plant densities interaction on seed yield and its components in 2006/07 season.

Varieties	Plant densities		
	27 plants/m ²	22 plants/m ²	17 plants/m ²
	No. of seeds/plant (gm)		
Sakha 3	34.20 d	38.00 cd	46.55 a
Line 81/35	35.93 d	40.55 bc	42.95 ab
Line 73/27	29.28 e	37.32 cd	44.73 ab
	Seed yield/plant (gm)		
Sakha 3	30.08 d	32.13 bcd	35.29 ab
Line 81/35	30.73 cd	34.04 abc	36.41 a
Line 73/27	23.93 e	30.67 cd	37.18 a
	100-seed weight (gm)		
Sakha 3	88.00 a	85.25 b	76.75 d
Line 81/35	85.67 b	84.50 bc	85.25 b
Line 73/27	81.75 c	82.42 c	83.25 c
	Seed yield ardab/feddan		
Sakha 3	14.59 b	12.26 d	10.37 e
Line 81/35	15.85 a	14.60 b	13.64 bc
Line 73/27	12.62 cd	12.43 d	14.92 ab

Values in each character with the same letters do not significantly differ (P = 0.05).

Table (9): Effect of sowing dates x varieties interaction on maturity, diseases infection, No. of pods/plant and No. of seeds/plant from combined data.

Sowing dates	Varieties		
	Sakha 3	Line 81/35	Line 73/27
	Maturity date (days)		
Oct. 1 st	193.8 a	173.2 e	181.2 c
Oct. 15 th	184.7 b	165.9 f	175.7 d
Nov. 1 st	177.0 c	158.4 g	164.5 f
	Chocolate spot		
Oct. 1 st	3.5 c	3.5 c	5.0 a
Oct. 15 th	3.5 c	4.0 b	3.0 d
Nov. 1 st	2.0 f	2.0 f	2.5 e
	Rust		
Oct. 1 st	3.0 d	3.5 c	3.9 b
Oct. 15 th	4.0 b	4.0 b	4.5 a
Nov. 1 st	4.0 b	3.6 c	4.0 b
	No. of pods/plant		
Oct. 1 st	10.28 bc	12.22 a	10.27 b
Oct. 15 th	9.55 c	10.87 b	11.09 b
Nov. 1 st	10.54 bc	10.76 b	10.84 b
	No. of seeds/plant		
Oct. 1 st	33.39 ab	34.57 ab	33.44 ab
Oct. 15 th	30.42 b	31.71 b	28.77 c
Nov. 1 st	34.89 a	33.02 ab	29.59 bc

Values in each character with the same letters do not significantly differ (P = 0.05).

Table (10): Effect of varieties x plant densities interaction on 100-seed weight from combined data.

Varieties	Plant densities		
	27 plants/m ²	22 plants/m ²	17 plants/m ²
Sakha 3	88.00 a	83.58 cd	82.25 cd
Line 81/35	77.75 e	85.08 bc	83.71 cd
Line 73/27	73.58 cd	83.67 cd	80.96 d

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الملخص العربى

استجابة سلالتين مبشرتين من الفول البلدى والصنف "سحا ٣" لثلاثة مواعيد زراعة تحت ثلاث كثافات نباتية مختلفة

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أقيمت تجربتان حقليتان فى محطة البحوث الزراعية بسحا - مركز البحوث الزراعية - مصر فى موسمين شتويين (٢٠٠٥/٢٠٠٦م و ٢٠٠٦/٢٠٠٧م) لدراسة تأثير ثلاثة مواعيد للزراعة (أول أكتوبر، ١٥ أكتوبر، أول نوفمبر) على سلالتين مبشرتين (٢٧/٣٥، ٧٣/٨١) من الفول البلدى للزراعة المبكرة خلال شهر أكتوبر مقارنة بصنف المنطقة "سحا ٣" تحت ثلاث كثافات نباتية مختلفة وهى: ٢٧، ٢٢، ١٧ نبات/م^٢.

وأظهرت النتائج أن عدد الأيام من الزراعة حتى النضج وكذلك مرضى المجموع الخضرى المتمثلة فى التبقع البنى والصدأ وكذلك الإصابة بحشرة المن تزيد مع التبكير فى الزراعة. وقد أعطى الميعاد المبكر للزراعة فى أول شهر أكتوبر أعلى محصول للبذور فى الموسم الأول (٢٠٠٥/٢٠٠٦م) فى حين أعطى ميعاد الزراعة فى النصف الثانى من أكتوبر أعلى محصول للبذور فى موسم الزراعة الثانى (٢٠٠٦/٢٠٠٧م). كما تميزت السلالة الجديدة (٣٥/٨١) بالتبكير فى النضج بحوالى ثلاثة أسابيع عن صنف المقارنة "سحا ٣" وكذلك تميزت بالمقاومة لمرضى التبقع البنى والصدأ وانخفاض الإصابة بحشرة المن، كما أعطت هذه السلالة أعلى محصول من بذور الفول البلدى (أردب/فدان) فى موسمى الزراعة (٢٠٠٥/٢٠٠٦م، ٢٠٠٦/٢٠٠٧م). وقد أظهر التفاعل بين مواعيد الزراعة والسلالات الجديدة تفوق السلالة (٣٥/٨١) فى التبكير للنضج والمقاومة لمرضى التبقع البنى والصدأ والإصابة المنخفضة بحشرة المن تحت مواعيد الزراعة الثلاثة المختبرة، كما أظهرت صفة وزن الـ المائه بذرة أعلى قيم لها تحت ميعادى الزراعة الأول والثانى خلال شهر أكتوبر. وقد أوضحت النتائج أن أعلى محصول من البذور كان تحت الكثافة النباتية ٢٧ أو ٢٢ نبات/م^٢ فى كلا موسمى الزراعة. كما أوضحت النتائج نقص أعداد حشرة المن مع الكثافة النباتية العالية وزيادة غير ملموسة فى الإصابة بمرضى التبقع البنى والصدأ.