

Effect of Sowing Date and Broomrape Control on Yield and Yield Related Traits of Some Faba Bean Cultivars

El-Degwy, I.S.; A.A. Glelah;¹ A. El-Galaly² and Marwa K. Mohamed¹

ABSTRACT

Two field experiments were conducted under naturally infested orobanche fields at Sakha Agricultural Research Station, Kafrelsheikh, Egypt during 2006/2007 and 2007/2008 seasons. The aim of this investigation was to study the effect of sowing date and broomrape control on seed yield and yield related traits of three faba bean cultivars; Misr 1, Giza 843 and Sakha 2.

Three sowing dates; first Nov., mid Nov. and first Dec. beside three doses of glyphosate application; control, 75 cm³/fed. and 75 cm³/fed. twice were involved in this study. A split-split plot design with three replications was used. Sowing date were allocated to the main plots and glyphosate application treatments were allocated in the sub plots while, faba bean cultivars were occupied the sub sub plot.

The most important findings could be summarized as follows:

The differences among sowing dates were significant or highly significant for all the studied traits in both seasons except for number of pods/plant and biological yield (ton/fed) in the second season.

Sowing date on mid-Nov. exhibited the highest values for all the studied traits, but, the differences between the second and the third sowing date were not significant for number of pods/plant and number of seeds/plant (in the first season) also the differences between the first and the second sowing date were not significant for seed yield (ard./fed.) and biological yield (ton/fed) in the first season.

Increasing glyphosate doses from zero up to 75 cm³/fed twice were associated with significant increase in number of pods/plant, number of seeds/plant and seed yield/plant, seed yield (ard./fed.). However, the differences between application of 75 cm³ glyphosate once or twice were not significant for seed yield (ard./fed.) and biological yield in the first season.

Large variations among the three faba bean cultivars were recorded for all the studied characters. Misr 1 cultivar detected the highest values for all the studied characters however, the differences between Misr 1 and Giza 843 were not significant for seed yield (ard./fed) in the second season and for biological yield in both seasons.

INTRODUCTION

Broomrape is a major constraint for faba bean production in the Mediterranean countries. Broomrapes are among the most aggressive parasitic weeds, especially in the developing world. The parasite attacks its specialized sucking apparatus to the faba bean root

system and exhausts plant nutrients. Each parasite produces dozens of capsules each containing thousands of seeds that can survive in the soil for more than 10 years. Many attempts have been made to devise control methods against broomrape, no single measure has been proven effective and practicable. Late sowing of faba bean gave excellent results for broomrape control under its heavy infestation (Linke *et al.*, 1991). Delaying sowing date up to 15th November decreased significantly fresh and dry weights of broomrape spikes and produced the highest dry weight of pods and seed yield (Zein *et al.*, 2004).

Glyphosate application decreased broomrape growth, which in turn increased faba bean productivity (Assaad *et al.*, 1982). Garcia and Torres (1982) reported glyphosate application at the rate of 0.12 kg/ha to *Vicia faba* infested with *Orobanche cernata* delayed weed emergence and increased the crop yield. Glyphosate application significantly reduced weed population and dry weight but increased pod weight, seed weight and seed yield (Mekky *et al.*, 2003).

This investigation aims to study the effect of sowing date and broom rape control on seed yield and yield related characters of three faba bean cultivars.

MATERIALS AND METHODS

Two field experiments were carried out under naturally infested orobanche field, Sakha Agricultural Research Station (ARC), Egypt during 2006/2007 and 2007/2008 growing seasons. Three sowing date i.e. first November, mid-November and first December beside three doses of glyphosate application namely; control, 75 cm³/fed. once and 75 cm³/fed. twice were involved in this study.

The first spray was applied at 25% of onset flowering date and the second was conducted after 3 weeks from the first one.

Split-split-plot design with three replications was used. Sowing date were allocated in main plots, glyphosate treatments were arranged in the sup-plots, while faba bean cultivars misr 1, Giza 843 and Sakha 2 were occupied in the sub-sub-plots. Each plot consisted of three ridges each 3 m long and 60 cm apart. The seed were sown in two sides of the ridge in 2-seeds/hill 20 cm apart in three sowing dates; first November, mid-November and first

¹Crop Sci. Dept., Fac. Agric., Kafrelsheikh Univ., Egypt

²Food Legumes Section, Field Crop Res. Inst., Agric. Res. Center.

Received August 10, 2010, Accepted August 25, 2010

December. All the recommended agricultural practices for faba bean production were adopted at the proper time. Calcium superphosphate fertilizer was used at the rate of 15.0 kg P₂O₅/Fed. during land preparation. Hoeing was applied before the first and second irrigation. Irrigation was done monthly. Insects were controlled chemically when needed according to recommendations.

At harvest five plants were randomly taken from each sub-sub plot to determine the following characters; number of pods/plant, number of seeds/plant and seed yield (g/plant). While, seed and biological yields were recorded from the two inner rows and converted to get seed yield (ard./fed.) and the biological yield (ton/fed.).

All collected data were statistically analyzed according to Cochran and Cox (1957). Duncan's multiple range test was used to make comparison among the treatments means (Duncan, 1955).

RESULTS AND DISCUSSION

Number of pods/ plant:

Data presented in (Table 1) showed significant effects of sowing date on number of pods/ plant in the first season. Sowing date (Nov. 15th) possessed the highest value (8.54 and 7.09 in 2006/2007 and 2007/2008 seasons, respectively). On the contrary, sowing date (Nov 1st) exhibited the lowest one (6.95 and 6.02). In this concern, Zein *et al.*, (2004) found that sowing faba bean on mid-November produced the highest dry weigh of pods. Also, Grenz *et al.*, (2005) found that delayed sowing date improved the relative competitive ability of pod and the

parasitism mainly decreased host yield by reducing pods number.

Number of pods/plant was significantly increased by increasing the dose of glyphosate application. Where, using 75 cm³/ fed from glyphosate twice recorded the highest value of this trait (9.56 and 7.81 in both seasons, respectively). On the other hand, control treatment possessed the lowest one (6.35 and 4.94). These results indicated that glyphosate greatly affected the performance of this trait. Mekkey *et al.*, (2003) evaluated two faba bean cultivar, Giza 429 and Youssef El-Sedeak under three sowing date (1 , 15 or 30 November). They found that sowing on 30 November resulted in the highest number of pods/plant. They also found that glyphosate application increased number of pods/plant.

Concerning to cultivar, data in (Table 1) emphasized that Misr 1 possessed the maximum number of pods/plant as it recorded 9.97 and 7.78 pods in the two seasons, respectively. Such result may be interpreted that Misr 1 cultivar was bred for orobanche tolerance. On the other hand, Sakha 2 recorded the lowest number of pods; 6.08 and 4.78; in two seasons of 2006/2007 and 2007/2008. This result may be due to Sakha 2 is a susceptible variety which is more affected by orobanche infestation. In this respect, Zaitoun *et al.*, (1991) indicated that broomrape infection had no significant effect on pod and seed production in Giza 402 but it only affected seed production in Giza 3 and significantly decreased both pods and seed production in Roumy, Renia blanca and Sevilla giant.

Table 1. Number of pods/plant of some faba bean cultivars as affected by sowing date, herbicide dose and their interaction in 2006/07 and 2007/08 seasons

Variable	Number of pods/ plant		
	2006/2007	2007/2008	
Sowing date (S)	Nov. 1 st	6.95b	6.02
	Nov. 15 th	8.54a	7.09
	Dec. 1 st	8.35a	6.02
	F. test	*	N.S
Herbicide dose (H)	Control	6.35c	4.94c
	75 cm ³ /fed once	7.93b	6.38b
	75 cm ³ /fed twice	9.56a	7.81a
	F. test	**	**
Cultivars (C)	Misr 1	9.97a	7.78a
	Giza 843	7.79b	6.57b
	Sakha 2	6.08c	4.78c
	F. test	**	**
Interaction	S x H	N.S	*
	S x C	N.S	N.S
	H x C	N.S	N.S
	S x H x C	N.S	N.S

*, **, NS indicate P<0.05, P<0.01 and not significant, respectively. Means designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.

The interaction between sowing date and glyphosate application was significant for number of pods/ plant only in the second season. Each increment of glyphosate application from zero to 75 cm³/fed. twice was paralleled with increasing in number of pods/plant under each sowing date (Table 2). Sowing date of (Nov. 15th) and the herbicide rate of 75 cm³/fed. twice possessed the highest value (8.06 pods/plant) without significant differences with the combination of sowing date of Nov. 1st and the herbicide rate of 75 cm³/fed. twice.

Number of seeds/ plant:

Data in Table (3) showed that, number of seeds/ plant was significantly affected by sowing date. The second sowing date (Nov 15th) produced the highest value of 26.02 and 19.14 in the two seasons of 2006/2007 and 2007/2008, respectively, but the differences between the second and the third sowing dates or between the first and the third sowing date were not significant in the first and

the second seasons. On the other hand, sowing date (Nov 1st) exhibited the lowest one; 19.43 and 15.56 seeds; in two seasons.

Glyphosate application significantly affected number of seed/ plant (Table 3). Increasing the herbicide rate from 75 cm³/fed once to 75 cm³/twice was significantly associated with increasing in number of seeds/plant. The recommended dose (75 cm³/ fed twice) recorded the highest seeds number/plant (28.11 and 21.12). While, such values were minimized in case of the control treatments which exhibited the lowest one (18.04 and 12.75 seeds) in the two seasons, respectively. Concerning to genotypes, data in (Table 3) showed that Misr 1, possessed the highest value of number of seeds/ plant (28.20) in the first season as well as (20.77) in the second season. Such results may be interpreted that the genotypes Misr 1 was bred for orobanche tolerance. On the other hand Sakha 2 recorded the lowest value

Table 2. Number of pods/ plant as affected by the interaction between sowing date and herbicide dose in 2007/2008 season

Sowing date	Herbicide dose		
	2007-2008		
	Control	75 cm ³ /fed once	75 cm ³ /fed twice
Nov. 1 st	3.33e	6.34cd	8.00ab
Nov. 15 th	6.38cd	6.68bc	8.06a
Dec. 1 st	5.11d	6.07cd	6.87bc

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 3. Number of seeds/plant of some faba bean cultivars as affected by sowing date, herbicide dose and their interaction in 2006/07 and 2007/08 seasons

Variable	Number of seeds/ plant		
	2006/2007	2007/2008	
Sowing date (S)	Nov. 1 st	19.43c	15.56b
	Nov. 15 th	26.02a	19.14a
	Dec. 1 st	23.81a	15.63b
	F. test	**	**
Herbicide dose (H)	Control	18.04c	12.75c
	75 cm ³ /fed. once	23.11b	16.53b
	75 cm ³ /fed. twice	28.11a	21.12a
	F. test	**	**
cultivars (C)	Misr 1	28.20a	20.77a
	Giza 843	22.52b	16.65b
	Sakha 2	18.54c	12.98c
	F. test	**	**
Interaction	S x H	*	N.S
	S x C	N.S	N.S
	H x C	*	N.S
	S x H x C	N.S	N.S

*, **, NS indicate P<0.05, P<0.01 and not significant, respectively. Means designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.

(18.54 and 12.98 seeds) in two seasons may be due to its susceptibility and being more affected by orobanche. Hassanein *et al.*, (1998) found that Giza 843 faba bean cultivar was partially tolerant under artificial and natural in fields at Giza

Concerning sowing date x glyphosate application interaction data presented in (Table 4) showed that number of seeds/ plant was significantly affected by the interaction between sowing date and herbicide dose. This result indicated that the rank of sowing date differed with increasing the dose of glyphosate treatments. Sowing date in (Nov 15th) at the rate of 75 cm³/fed twice possessed the highest value 31.98 in the first season. On the other hand, the first sowing date (Nov 1st) with zero glyphosate recorded the lowest value (11.81 seeds) in the first season.

Significant interaction effects between herbicide dose and cultivars were detected for number of seeds/plant in the first season (Table 5). This result indicated that the rank of genotypes differed with increasing the dose of glyphosate treatments. Misr 1 at the rate of 75 cm³/ fed twice possessed the highest value (31 seeds). On the other hand, untreated Sakha 2 with zero glyphosate recorded the lowest value (12.07 seeds).

Seed yield/ plant (g):

Data presented in (Table 6) showed that sowing date significantly differed in their effect on seed yield/ plant. Sowing date (Nov 15th) produced the maximum seed yield/plant (18.97 and 15g) in the two seasons 2006/2007 and 2007/2008. But, early sowing date (Nov 1st) exhibited the lowest one (14.57 and 11.24g) in the two seasons, respectively. These results are, in general, agreed with those of Zahran *et al.*, (1982) who reported that late sowing of faba bean to the month December has been found to be more favourable, than the early sowing on November, particularly in the heavy infested fields with broomrape. Also, Hezewijk *et al.*, (1987) studied the effect on sowing date (ranging from mid October to mid December) on broomrape infestation and yield of faba bean under Syrian condition. They found that delayed sowing date increased seed yield of the crop.

Table 4. Number of seeds/plant as affected by the interaction between sowing date and herbicide dose in 2007/2008 season

Sowing date	Herbicide dose		
	2006-2007		
	Control	75 cm ³ /fed once	75 cm ³ /fed twice
Nov. 1 st	11.81d	21.94c	24.54bc
Nov. 15 th	22.64C	24.1bc	31.98a
Dec. 1 st	20.34c	23.28bc	27.82ab

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Faba bean yield was higher after sowing at mid November and the beginning of December. Also, Mekkey *et al.*, (2003) found that sowing faba bean on 30 November resulted in the highest seed yield.

Glyphosate application significantly affected seed yield/ plant (Table 6) the dose 75 cm³/fed twice recorded the highest value (20.67 and 15.24g). While, such values were inferior in case of the control (11.54 and 9.29 g) in two seasons 2006/2007 and 2007/2008, respectively. In this respect, Zahran *et al.*, (1980) reported that glyphosate application at 240cm³/ha applied in 4 sequential sprays at 3-week intervals beginning at onset of crop flowering increased seed yield by 14-37.5%. Also, Assaad *et al.*, (1982) reported that glyphosate application increased faba bean productivity, moreover, Ghalwash (2003) indicated that glyphosate increased the yield of both infected and healthy plants, without apparent crop injury. Glyphosate at 75 cm³/fed gave the best results.

Concerning to cultivars data illustrated in (Table 6) showed that Misr 1 and Giza 843 possessed the highest values of seed yield/plant; 19.34 and 14.66; as well as; 16.17 and 12.50g; in the two seasons, respectively. This result illustrated that the breeding of orobanche tolerance cultivars contributed for higher seed yield per plant. On the other hand, Sakha 2 recorded the lowest seed yield/ plant (13.33 and 9.88g) in the two seasons, respectively. This results may be due to the Sakha 2 is more affected by orobanche infestation. These results are in general agreement with those obtained by Attia (1998).

Concerning sowing date x glyphosate application data in (Table 7) showed significant effects on seed yield/ plant. This result indicated that the sowing date differed with increasing the dose of glyphosate treatments. Sowing date in (Nov 15th) and using 75 cm³/fed twice detected the highest value (23.89 and 18.59g) in seasons 2006/2007 and 2007/2008. On the other hand untreated control with sowing date in (Nov 1st) showed the lowest one (7.63 and 5.87 g) in seasons 2006/2007 and 2007/2008, respectively.

Table 5. Number of seeds/plant as affected by the interaction between herbicide dose and cultivar in 2006/2007 season

Herbicide dose	Cultivars		
	2006-2007		
	Misr 1	Giza 843	Sakha 2
Control	23.6dce	19.13f	12.07g
75 cm ³ /fed. once	30.01ab	20.7def	18.61ef
75 cm ³ /fed. once	31.00a	28.39abc	24.96bcd

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 6. Seed yield/ plant (g) of some faba bean cultivars as affected by sowing date, herbicide dose and their interaction in 2006/07 and 2007/08 seasons

Variable	Seed yield/ plant (g)		
	2006/2007	2007/2008	
Sowing date (S)	Nov. 1 st	14.57b	11.24b
	Nov. 15 th	18.97a	15.00a
	Dec. 1 st	15.29b	10.80b
	F. test	*	**
Herbicide dose (H)	Control	11.54c	9.29c
	75 cm ³ /fed once	16.61b	12.51b
	75 cm ³ /fed twice	20.67a	15.24a
	F. test	**	**
Cultivars (C)	Misr 1	19.34a	14.66a
	Giza 843	16.17b	12.50b
	Sakha 2	13.33c	9.88c
	F. test	**	**
Interaction	S x H	*	**
	S x C	*	N.S
	H x C	*	NS
	S x H x C	NS	NS

*, **, NS indicate P<0.05, P<0.01 and not significant, respectively. Means designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.

Table 7. Seed yield/ plant (g) as affected by the interaction between sowing date and herbicide dose in 2007/2008 season

Sowing date	Herbicide dose					
	2006-2007			2007-2008		
	Control	75 cm ³ /fed once	75 cm ³ /fed twice	Control	75 cm ³ /fed once	75 cm ³ /fed twice
Nov. 1 st	7.63e	17.42bc	18.66bc	5.87e	12.9bc	14.94ab
Nov. 15 th	15.54c	17.49bc	23.89a	12.57bcd	13.86bc	18.59a
Dec. 1 st	11.44d	14.93c	19.48b	9.42d	10.77cd	12.2bcd

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Seed yield/ plant was significantly affected by the interaction between sowing date and cultivars in the first season (Table 8). The maximum seed yield was obtained by Misr 1 at the second sowing date; 22.27g but, the differences between the first and the intermediate sowing date were not significant.

Also, the interaction between herbicide dose and cultivars was significant for seed yield/ plant in the first season. Seed yield/plant was maximized in case of Giza 843 when it treated with 75 cm³ herbicide/ fed twice but, the differences between Giza 843 and Misr 1 under such dose or under 75 cm³/fed once were not significant (Table 9). On the other hand, seed yield/plant estimates were inferior in case of Saka 2 faba bean cultivar(8g

under zero dose of herbicide. Results also showed that seed yield/plant was not significantly affected by the interaction among sowing date, herbicide dose and cultivars.

Seed yield (ard./fed.):

Significant differences among sowing dates were detected for the seed yield in the two seasons (Table 10). The second sowing date gave the maximum seed yield; 8.73 and 7.76 ard./ fed. in the two seasons, respectively compared with the other sowing dates. These results are harmony with those of Hezewijk *et al.*, (1991) who reported that delaying sowing of faba bean increased crop seed yield. Zein *et al.*, (2004) indicated that sowing faba bean on mid-November produced the highest seed yield.

Also, seed yield/fed was significantly affected by glyphosate application. The minimum value was recorded under the control while, the highest seed yield was detected under application of 75 cm³/fed. glyphosate once or twice in both season. This results reflecting the role of herbicide in maximization the seed yield through reduction number and dry weight of orobanche/plot. These results are in agreement with those obtained by Ghalwash (2003).

The differences among faba bean cultivars was significant for seed yield/ fed. in both seasons. Misr 1 cultivar detected the highest seed yield; 9.24 and 7.33; followed by Giza 843; 7.98 and 6.98; while Sakha 2 detected the lowest seed yield, 6.62 and 5.7 ard./ fed.; for both seasons, respectively. These results may be due to the tolerance ability of Misr 1 and Giza 843 for orobanche infestation. In this respect, Ahmed *et al.*,

(2001) reported that faba bean genotypes were significantly differed in their performance against broomrape infection.

Significant interaction effects between sowing dates and glyphosate application was detected for seed yield ard./fed. in the first season. Application of 75 cm³ glyphosate once or twice at the second sowing date recorded the maximum seed yield 9.42 ard./fed. While, such values were minimized in case of the first sowing date without glyphosate application; 4.74 ard./ fed.; respectively. These results may be interpreted as the severity of orobanche infestation under the control and first sowing date (Table 11). In field experiments conducted in Syria, Egypt and Spain, Pieterse *et al.*, (1994) reported that delaying sowing date of faba bean and low concentrations of herbicides such as glyphosate gave a promising results.

The interaction between sowing date and cultivars was significant in the first season. Under the second sowing date, Misr 1 detected the highest seed yield; 10.17 ard./ fed.; (Table 12) while, such estimates were inferior in case of Sakha 2 at the first sowing date; 4.71 ard./ fed.

The interaction between glyphosate dose and cultivars was presented in (Table 13). Results showed that in the first season, the orobanche tolerant faba bean cultivar (Misr 1) recorded the maximum seed yield when it sprayed with 75 cm³/fed. glyphosate and yielded about 9.54 ard./fed. But, in the second season the differences between Misr 1 and Giza 843 were not significant under the aforementioned dose.

Table 8. Seed yield/ plant (g) as affected by the interaction between sowing date and cultivars in 2007/2008 season

Sowing date	Cultivars		
	2006-2007		
	Misr 1	Giza 843	Sakha 2
Nov. 1 st	18.39ab	16.37bc	8.96d
Nov. 15 th	22.27a	17.41bc	17.24bc
Dec. 1 st	17.36bc	14.72bc	13.78c

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 9. Seed yield/ plant (g) as affected by the interaction between herbicide dose and cultivars in 2007/2008 season

Herbicide dose	Cultivars		
	2006-2007		
	Misr 1	Giza 843	Sakha 2
Control	15.27c	11.36d	8.00e
75 cm ³ /fed. once	20.98ab	14.54d	14.32cd
75 cm ³ /fed. Twice	21.77ab	22.6a	17.66bc

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 10. Seed yield (ard./fed.) of some faba bean cultivars as affected by sowing date, herbicide dose and their interaction in 2006/07 and 2007/08 seasons

Variable	Seed yield(ard./fed.)		
	2006/2007	2007/2008	
Sowing date (S)	Nov 1 st	7.82ab	5.86c
	Nov 15 th	8.73a	7.76a
	Dec. 1 st	7.29b	6.39b
	F. test	**	**
Herbicide dose (H)	Control	6.64b	5.81b
	75 cm ³ /fed once	8.39a	7.05a
	75 cm ³ /fed twice	8.81a	7.15a
	F. test	**	**
Cultivars (C)	Misr 1	9.24a	7.33a
	Giza 843	7.98b	6.98a
	Sakha 2	6.62c	5.70b
	F. test	**	**
Interaction	S x H	**	N.S
	S x C	**	N.S
	H x C	**	**
	S x H x C	*	N.S

*, **, NS indicate P<0.05, P<0.01 and not significant, respectively.

Means designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.

Table 11. Seed yield (ard./fed.) as affected by the interaction between sowing date and herbicide dose in 2006/2007 season.

Sowing date	Herbicide dose		
	2006-2007		
	Control	75 cm ³ /fed once	75 cm ³ /fed twice
Nov. 1 st	4.74e	8.02ab	9.13ab
Nov. 15 th	8.16bc	8.76ab	9.42a
Dec. 1 st	7.01d	7.31cd	7.53cd

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 12. Seed yield (ard./fed.) as affected by the interaction between sowing date and cultivars in 2006/2007 season.

Sowing date	Cultivars		
	2006-2007		
	Misr 1	Giza 843	Sakha 2
Nov. 1 st	9.72a	8.53b	4.71e
Nov. 15 th	10.17a	8.23bc	7.80bcd
Dec. 1 st	7.64bcd	6.86d	7.36cd

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 13. Seed yield (ard./fed.) as affected by the interaction between herbicide dose and cultivars in 2006/07 and 2007/08 seasons.

Herbicide dose	Cultivars					
	2006-2007			2007-2008		
	Misr 1	Giza 843	Sakha 2	Misr 1	Giza 843	Sakha 2
Control	8.44bc	6.95e	4.51f	6.62b	6.63b	4.18c
75 cm ³ /fed once	9.54a	8.14cd	7.18de	7.70a	7.16ab	6.29b
75 cm ³ /fed twice	9.38ab	8.52bc	8.18cd	7.66a	7.16ab	6.64b

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Seed yield/fed was significantly affected by the interaction among sowing date, herbicide dose and faba bean cultivars in the first season. Misr 1 cultivar recorded the highest seed yield ard./fed. When it sown on first sowing date (Nov.1st) and treated with 75cm³/fed. from glyphosate once or twice without significant differences with Misr 1 cultivar under the second sowing date and all glyphosate treatments (Table 14).

Biological yield (ton/fed.)

Data presented in (Table 15) showed that sowing date significantly differed in their effect on biological yield (ton/fed.). The second sowing date had the maximum value (2.04 ton) in the first season 2006/2007.

Table 14. Seed yield (ard./fed.) as affected by the interaction among sowing date, herbicide dose and cultivars in 2006/2007 season.

Sowing date	Herbicide dose	Cultivars		
		2006-2007		
		Misr 1	Giza 843	Sakha 2
Nov. 1 st	Control	7.83 f-i	6.40 kl	- m
	75 cm ³ /fed once	11.00 a	9.30 b-e	6.10 L
	75 cm ³ /fed twice	10.33 ab	9.90 abc	8.03 e-h
Nov. 15 th	Control	9.73 a-d	7.93 f-i	6.80 h-L
	75 cm ³ /fed once	10.30 ab	8.30 efg	7.67 f-k
	75 cm ³ /fed twice	10.00 abc	8.47 d-g	8.93 c-f
Dec. 1 st	Control	7.77 f-j	6.53 jkl	6.73 i-L
	75 cm ³ /fed once	7.33 g-L	6.83 h-l	7.77 f-j
	75 cm ³ /fed twice	7.83 f-i	7.20 f-l	7.57 c-L

Means designed by the same letter are not significantly different at 5% level, using Duncan's multiple range test.

Table 15. Biological yield (ton/fed) of some faba bean cultivars as affected by sowing date, herbicide dose and their interaction in 2006/07 and 2007/08 seasons.

Variable	Biological yield (ton/fed.)		
	2006/2007	2007/2008	
Sowing date (S)	Nov 1 st	2.01ab	2.36
	Nov 15 th	2.04a	2.43
	Dec. 1 st	1.58c	2.18
	F. test	**	N.S
Herbicide dose (H)	Control	1.79b	2.33
	75 cm ³ /fed. once	2.07a	2.21
	75 cm ³ /fed. twice	2.17a	2.43
	F. test	**	N.S
Cultivars (C)	Misr 1	2.12a	2.46a
	Giza 843	2.24a	2.58a
	Sakha 2	1.67b	1.93b
	F. test	**	*
Interaction	S x H	N.S	N.S
	S x C	**	**
	H x C	N.S	N.S
	S x H x C	N.S	N.S

*, **, NS indicate P<0.05, P<0.01 and not significant, respectively. Means designed by the same letter are not significantly different at 5% level according to Duncan's multiple range test.

On the other hand, sowing date (Dec 1st) exhibited the lowest one (1.58 ton). While, such differences were not significant in the second season. Mekkey *et al.*, (2003) studied the effect of three sowing date (1, 15 or 30 November) on faba bean cultivars Giza 429 and Yossef El-Sedeak. They found that sowing on 30 November resulted in the lowest weed dry weight and the highest faba bean weight

Biological yield/fed. was significantly affected by glyphosate application (Table 15) application of 75 cm³/fed. twice recorded the highest value (2.17 ton/fed.) with insignificant differences with the dose of 75 cm³/fed. (2.07 ton/fed.) in the first

season. On the other hand, control treatment exhibited the lowest one (1.79 ton/fed.) in the first season. But, in the second season the differences among herbicide treatments were not significant. These results are in harmony with those of Nassib *et al.*, (1990) as they reported that application of glyphosate at twice period at 60 and 75 days after sowing increased seed and straw yields compared with control. Glyphosate application significantly reduced weed population and dry weight.

From these results, it could be concluded that sowing date on mid-November gave the most favourable results for seed yield and yield related characters also application of 75 cm³/fed. glyphosate once recorded the highest seed yield under the environmental conditions of this experiment at Kafr El-Sheikh but caution has to be taken considering generalization of glyphosate doses to cover all faba bean cultivars.

REFERENCES

- Ahmed, M.A., M.M.A. Abdalla, M.F. Mohamed and E.A. Waly (2001). Performance of some faba bean (*Vicia faba*) genotypes in *Orobanche* infested soil. Assuit. J. Agric. Sci. 32 (1): 263-290.
- Assaad, M.; F.H. Farag and E.E. Hassanein (1982). Effect of pronamide and glyphosate on growth and mineral content of *Vicia faba* and *Orobanche crenata*. Proc Egypt Bot. Vol. 3 Mansoura conference pp: 626-643.
- Attia, Sabah M. (1998). Response of some faba bean (*Vicia faba* L.) varieties to broomrape (*Orobanche crenata* Forsk). M.Sc. Thesis, Fac. Agric. Cairo Univ., Egypt.
- Duncan, B.D. (1955) Multiple range and multiple F. Test. Biometrics, 11:1-42
- Cochran, W.G. and G.M. Cox (1957). Experimental Designs: 403-415. John Wiley, New York.
- Garcia, M.J. and G. Torres (1982). Broomrape (*Orobanche crenata* Forsk) control in bean (*Vicia faba* L.) with glyphosate as affected by infection. Proceedings British Crop Protection Conference. Weeds (2): 765-770.
- Ghalwash, A.M. (2003). Studies on broomrape weed in Egypt ph. D. Thesis, Fac. of Agric. Minufiya University, 140 pp.
- Grenz, J.H.; A.M. Manschadi; F.N. Uygur and J. Sauerborn (2005). Effects of environment and sowing date on the competition between faba bean (*Vicia faba*) and the parasitic weed *Orobanche crenata* field crops Research 93 (2/3): 300-313.
- Hassanein, E.E.; H.T. Almarafy; A.S. Kkolosy and H.M. Ibrahim (1998). Variation in faba bean cultivars to *Orobanche* infection as measured by different reaction scales. Annals of Agricultural Science Cairo, 43 (1): 189-200.
- Hezewijk, M.J., A.H. Pieterse, M.C. Saxena and S.J. Borg (1987). Relationship between sowing date and the development of *Orobanche crenata* on faba bean and lentil in Syria. 4th International Parasitic, Marburg, 377-390.
- Hezewijk, M.J.V.; K.H. Linke; J.A.C. Verkleij and A.H. Pieters (1991). The effect of ammonium fertilizer in combination with nitrification inhibitors on *Orobanche crenata* infestation in faba bean. Proceeding of the 5th International Symposium of Parasitic Wee, Nairobi, Kenya: 470-483.
- Linke, K.H.; S. Weigand and M.C. Saxena (1991). Biological control of *Orobanche* ICARDA, legume program annual report pp. 231-233.
- Mekky; M.S.; Z.R. Yehia and A.N.M. Nassar (2003). Effect of sowing dates varieties and glyphosate application on broomrape (*Orobanche crenata* forsk.) and yield of faba bean (*Vicia faba*, L.). Bulletin of faculty of Agriculture, Cairo University 54 (4): 55-76.
- Nassib, A.M., E.E. Hassanein and A.H.A. Hussein (1990). Broomrape control in faba (*Vicia faba*, L.) with reduced rates of glyphosate mixed with three adjuvants. Ann. Agric, Sci., Moshtohor 28 (1): 17-25.
- Pieterse, A.H., L. Garcia; O.A. Al-Menoufi, K.H. Linke and S.J. ter Borg (1994). Integrated control of the parasitic angiosperm *Orobanche* (Broomrape). In: F.J. Muehlbauer and W.J. Kaiser (eds.). expanding the production and use of cool-season food legumes. Kluwer Academic Publishers 695-702.
- Zahran, M.K.; Ibrahim, -T-S-El-N; Farag, -F-H; Korollos, -M-A (1980). Chemical control of *Orobanche crenata* in *Vicia faba*. FABIS Newsletter, (2): 47-49.
- Zahran, M.K; F.H. Farag and T.S. Ibrahim (1982). Control of parasitic plants (broomrape and dodder) in different crops in Egypt. Final Tech. Report Agric. Res. Program, Public Law 480, Grant No. FG-EG-130, Project No. FG-ARS-15.
- Zaitoun, F.M.F; O.A. Al-Menoufi and H.C. Weber (1991). Mechanisms of tolerance and susceptibility of three *Vicia faba* varieties to the infection with *Orobanche crenata*. Proceedings of the 5th international symposium of parasitic weeds, Nairobi, -Kenya, 24-30 June p.195-207 .
- Zein, A.A., M.M. Abd El-Hamid, M.F. Shady and M.E. Kenapar (2004). Effect of sowing date broomrape (*Orobanche crenata* forsk) control and releasing *Phytomyza orobanchia*, Kalt, on faba bean (*Vicia faba* L.) growth and productivity J. Agric. Res. Tanta Univ., 30 (2): 465-486.

الملخص العربي

تأثير مواعيد الزراعة ومقاومة الهالوك على المحصول والصفات المرتبطة به في بعض أصناف الفول البلدى

إبراهيم سعد الدجوى، عبدالحمد أحمد جليله، علا أحمد الجلالى، مروة خليل مجدى

بين ميعاد الزراعة الثانى والثالث لم تكن معنوية لصفة عدد القرون/نبات وعدد البذور/نبات (فى الموسم الأول) وكذلك بين ميعاد الزراعة الأول والثانى لصفى محصول البذور (أردب/فدان) والمحصول البيولوجى (طن/فدان) فى الموسم الأول.

أظهرت النتائج أنه بزيادة عدد مرات الرش من مبيد الحشائش (جليفوسيت) حتى 75 سم³/فدان مرتين حدثت زيادة معنوية فى كل الصفات تحت الدراسة فى حين لم تسجل اختلافات معنوية بين الرش بالمبيد مرة واحدة ومرتين لصفة محصول البذور (أردب/فدان) والمحصول البيولوجى (طن/فدان) وذلك فى الموسم الأول.

أظهرت النتائج وجود اختلافات واسعة بين أصناف الفول البلدى الثلاثة فى جميع الصفات المدروسة وقد سجل الصنف مصر 1 أعلى القيم لكل الصفات موضع الدراسة ولكن الاختلافات بينه وبين الصنف جيزه 843 لم تصل إلى مستوى المعنوية بالنسبة لصفة محصول البذور (أردب/فدان) فى الموسم الثانى وكذلك بالنسبة لصفة المحصول البيولوجى (طن/فدان) فى الموسمين.

وعلى ذلك يتضح من هذه الدراسة أن الزراعة فى منتصف نوفمبر أدت إلى أفضل النتائج بالنسبة لصفة محصول البذور والصفات المرتبطة بها وأن الرش بمعدل 75 سم³/فدان من مبيد الحشائش مرة واحدة أدى إلى أعلى محصول من البذور (أردب/فدان) بدون وجود أية اختلافات معنوية مع الرش بنفس التركيز مرتين متتاليتين بالنسبة لهذه الأصناف موضع الدراسة، ولكن هناك حذر من التعميم باستخدام تركيزات محددة لتغطى كل التراكيب الوراثية لتوقع حدوث تفاعل بين الأصناف وتركيزات المبيد كما أتضح من دراسات سابقة.

أقيمت هذه الدراسة بالمزرعة التجريبية بمحطة البحوث الزراعية بسخا- كفرالشيخ خلال موسمى الزراعة 2006/2007م، 2007/2008م فى أرض موبؤة بالهالوك وذلك بهدف دراسة تأثير مواعيد الزراعة والمقاومة الكيماوية للهالوك على محصول البذور والصفات المرتبطة به. وإشتملت هذه الدراسة على ثلاثة أصناف من الفول البلدى هى: مصر 1 (مقاوم للهالوك)، جيزه 843 (مقاوم) والصنف سخا 2 (حساس) وزرعت هذه الأصناف فى ثلاثة مواعيد للزراعة هى: الأول من نوفمبر، منتصف نوفمبر والأول من ديسمبر. وأجريت عملية الرش بمبيد الجليفوسيت بثلاثة معاملات هى: صفر، 75 سم³/فدان مرة واحدة، 75 سم³/فدان مرتين متتاليتين وصممت التجربة بنظام القطع المنشقة مرتين فى ثلاث مكررات حيث وضعت مواعيد الزراعة فى القطع الرئيسية، ومعاملات الرش فى القطع الشقية أما الأصناف فقد خصصت لها القطع تحت الشقية.

وأخذت البيانات على أساس الصفات الأتية: عدد القرون/نبات، عدد البذور/نبات، محصول البذور/نبات، محصول البذور (أردب/فدان) والمحصول البيولوجى (طن/فدان).

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

كانت الاختلافات بين مواعيد الزراعة معنوية أو عالية المعنوية لجميع الصفات المدروسة فى كلا الموسمين فيما عدا صفة عدد القرون/نبات والمحصول البيولوجى فى الموسم الثانى.

أدت الزراعة فى الميعاد الثانى - منتصف نوفمبر - إلى الحصول على أعلى القيم لجميع الصفات موضع الدراسة ولكن الاختلافات