

**EFFECT OF SOWING DATES, VARIETIES AND
GLYPHOSATE APPLICATION ON BROOMRAPE (*Orobanche*
crenata FORSK.) AND YIELD OF FABA BEAN (*Vicia faba* L.)**

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ABSTRACT

Two field experiments were conducted during 1999/2000 and 2000/01 winter seasons in naturally *Orobanche* infested soil at Sids Agricultural Research Station to study the effect of sowing dates (1st, 15th and 30th Nov.), faba bean varieties (Giza 429 and Yousef El-Sedeak) and different times of Roundup application on the number and dry weight of broomrape; growth, seed yield of faba bean and its components.

Sowing faba bean in 15th and 30th November decreased broomrape infestation by 31.3 and 88.0, and 58.3 and 96.0 percent as compared with the 1st of November in both seasons, corresponding to increases in seed yield of faba bean of 8.0 and 23.0, and 5.1 and 32.3 percent, respectively.

Giza 429 variety was less infested than Yousef El-Sedeak with by 47 and 70 percent (dry weight/m²) of with increases in seed yield/fed. by 23.1 and 28.6 % accompanied with improvement in yield components.

Application of Roundup (glyphosate) at the rate of 75 cm³/fed. at two or three sprays gave 98.3 and 96.4 % and 99.8 and 99.2 % reduction of broomrape and increased seed yield by 166 and 153 %, respectively.

and 133 and 130 % as compared with untreated check in two seasons, respectively.

The interaction effects between sowing dates and varieties were statistically significant on the number and dry weight of broomrape in the second season and seed yield in both seasons. The highest seed yield was obtained from sowing at 30th Nov. and Giza 429 variety in both seasons.

The interaction between sowing dates and Roundup application was very effective on decreasing the number and dry weight of broomrape and increased seed yield in both seasons. The lowest number and dry weight of broomrape were obtained from the first sowing date (1st Nov.) and application of Roundup three times, but the highest seed weight (g/plant) and seed yield resulted from the second sowing date (15th Nov.) and Roundup application three times.

Giza 429 variety and the application of Roundup three times gave the lowest number and dry weight of broomrape highest seed weight/plant and seed yield/fed. The lowest number and dry weight of broomrape resulted from the interaction between sowing date (15th Nov.), Giza429 variety and the application of Roundup three times. The highest seed weight/plant and seed yield/fed. Were obtained from the interaction between sowing date (15th Nov.), Giza 429 variety and the application of Roundup three times in the first season. The lowest seeds weight/plant and seed yield was obtained from the interaction between the sowing of Yousef El-Sedeak variety on the 1st of Nov. without Roundup in both seasons.

Key words: *faba bean , sowing dates, varieties, weed control.*

1. INTRODUCTION

Broomrape (*Orobanche crenata* Forsk.) is one of the most important biotic stresses facing faba bean production in Egypt. Severe yield losses in faba bean due to broomrape parasitism had been mentioned by many investigators (Parker 1991). Several cultural methods were suggested for controlling this parasitic weed, but every method was not sufficient by itself. These methods include the delay of sowing date (Mesa-Garcia and Garcia-Torres 1986, Van

Hezewijk *et al.*, 1987; Garcia-Torres and Lopez-Granados 1991) and using resistant varieties (Ibrahim *et al.*, 1997) ; Saber *et al.*, (1999). Chemical control by glyphosate is another approach, (Zahran *et al.*, 1981 ; Hassanein *et al.*, 1990 and 1998 ; Hassanein and Salem 1999). The study of the integration between sowing dates, new resistant varieties and glyphosate herbicide is needed. Thus the present study aimed to estimate the role of sowing date, faba bean varieties, the times of Roundup application and their integration in control of *Orobanche crenata* Forsk. and faba bean productivity under Beni Suef Governorate condition.

2. MATERIALS AND METHODS

Two field experiments were conducted during 1999/2000 and 2000/01 winter seasons at Sids Agricultural Research Station, Ministry of Agriculture in soil naturally infested with broomrape. The treatments were arranged in a split-split plot design in four replications as follows:-

2.1. Main plots (Sowing dates)

2.1.1. 1st November.

2.1.2. 15th November.

2.1.3. 30th November.

2.2. Sub plots (Faba bean varieties)

2.2.1. Giza 429. as *Orobanche* resistant variety.

2.2.2. Yousef El-Sedeak as *Orobanche* susceptible variety.

2.3. Sub- sub plots (Times of Roundup application)

2.3.1. Spraying Roundup (glyphosate 48 % WSC) 3 times at 3 weeks intervals, starting at the beginning of flowering at the rate of 75 cm³/fed. for each spray .

2.3.2. Spraying Roundup twice at 3 weeks intervals, starting at the beginning of fowering at the rate of 75 cm³/ fed. for each spray.

2.3.3. Untreated (check plots).

The soil texture of the experimental plots in both seasons was clay. Phosphorus fertilizer was applied pre-planting at the rate of

150 kg/fed. as calcium superphosphate (15.5% P₂O₅). The sub-sub plot area of 10.5 m² consisted of five ridges 3.5 m long and 60 cm apart. Faba bean seeds were hand planted on both sides of the ridge in double-seed hills spaced 20cm.apart.

Harvest was carried out after 165 days from sowing. All cultural practices of growing faba bean were conducted according to recommendations. The temperature of the soil and air during growing seasons, 1999/2000 and 2000/01 under Beni Souf conditions are as shown in Table 1.

2.4. Data recorded

2.4. 1. On broomrape.

2.4. 1. 1. Number of broomrape/m².

2.4. 1. 2. Dry weight of broomrape/m².

2.4.2. Growth characters, yield and some yield components of faba bean.

2.4.2.1. Pigment content determination in leaves.

Chlorophylls and carotenoids were determined in leaves at 100 days of age, 0.2 g of leaves was mixed with 10 ml. acetone 85 % and ground in mortar in the presence of pure sand and calcium carbonate till the exhaust of the green colour by washing several times and repeating the extraction if required. The total extraction was made up to 100 ml. in a volumetric flask. The absorbance of the previously obtained extraction was read in Shimadza spectrophotometer UV120 – 0.02 at 633 nm., 644 nm. and 452 nm. for the estimation of chlorophyll a, b and carotenoids, respectively. The pigment concentration was calculated from the following formula:-

Chlorophyll (a) mg./l. = 10.3 (O. D.) 633 – 0.918 (O. D.) 644

Chlorophyll (b) mg./l. = 19.7 (O. D.) 644 – 3.87 (O. D.) 663

Carotenoids mg./l. = 4.75 (O. D.) 452 – total chlorophyll x 0.226

The calculated concentration as mg /l. was converted to mg./g. fresh weight of leaves according to Wettstein (1957) as follows:

Concentration of any pigment content as mg/mg. = $c. v / w. 1000$ where
C = Concentration of any pigment content as mg./l.

V = The volume of extraction.

W = The fresh weight of used leaf sample.

Table (1): The temperature of the soil and air during growing seasons,1999/2000 and 2000/01 under Beni Souf conditions.

Months	Degree of temperature °C							
	1999/2000 season				2000/01 season			
	Soil at 20cm		Air		Soil at 20cm		Air	
	Maximum	Minimum	Mean	Mean	Maximum	Minimum	Mean	Mean
November	27.1	25.8	26.5	19.2	25.8	24.6	25.2	20.0
December	22.2	20.2	21.2	16.9	20.6	19.0	19.8	16.9
January	19.5	18.2	18.9	15.0	19.4	17.8	18.6	15.9
February	20.1	18.6	19.4	15.7	20.4	18.7	19.6	15.5
March	22.7	21.0	21.9	18.1	30.9	25.3	28.1	22.2
April	28.2	25.7	27.2	25.2	28.5	26.6	27.5	23.9

Data of Meteorological Station (14), Beni-Suef Governorate.

At harvest, samples of ten plants were collected at random from the central rows of each plot to study the following traits:-

- 2.4.2.2. Plant height (cm).
- 2.4. 2. 3. Plant weight (g/ plant).
- 2.4.2.4. Number of branches / plant.
- 2.4. 2.5. Number of pods/ plant.
- 2.4.2. 6. Weight of pods / plant (g / plant).
- 2.4.2.7. Seed weight / plant (g / plant).

Seed yield (ardab/fed.) was calculated from the weight of seeds obtained from each plot.

2.5. Statistical analysis

All data were statistically analyzed according to the procedures outlined by Steel and Torrie, 1980 and the treatment means were compared by least significant differences (L.S.D.). The fresh weight of broomrape was transformed to logarithmic values to obtain their normal distribution (Erwin *et al.*, 1966).

3.RESULTS AND DISCUSSION

3.1. Effect of main factors

3.1.1. Effect of sowing date

3.1.1.1. On broomrape

Results in Table (2) indicate that the number and dry weight of broomrape spikes were affected significantly by owing dates. The

late sowing date in the 30th of November reduced both the number and dry weight of broomrape as compared with the first and second dates (1st and 15th of November). The decreasing percentage in dry weight of broomrape by sowing dates (15th and 30th Nov.) were 31.3 and 88 % and 58.3 and 96 % as compared with early sowing date (1st November in 1999/2000 and 2000/01 seasons, respectively. These results might be due to the increase in temperature, which encourages earlier broomrape germination at the beginning of flowering at early sowing date than late sowing date (Table 1). The obtained data are in agreement with the results obtained previously by Mesa-Garcia and Garcia-Torres (1986), Van-Hezewijk *et al.*, (1987) and Garcia-Torres and Lopez-Granados (1991).

Table (2): Effect of sowing dates on the number and dry weight of broomrape in 1999/ 2000 and 2000/2001 seasons.

Sowing dates	Number of spikes/m ²				Weight of spikes g/m ²			
	1999/2000		2000/01		1999/2000		2000/01	
	O	T	O	T	O	T	O	T
1 st November	7.5	0.515	5.3	0.348	38.8	0.925	16.4	0.516
15 th November	4.9	0.423	1.5	0.245	24.4	0.786	4.6	0.410
30 th November	0.5	0.161	0.1	0.051	4.2	0.483	0.4	0.124
LSD at 5 % level	3.2	0.14	0.6	0.03	15.4	0.27	6.2	0.054

O. Original data.

T. Transformed data

3.1.1. 2. On faba bean growth, yield and yield components

Data in Table (3) indicate that sowing dates had highly significant effect on pigment contents in faba bean leaves *i.e.* (chlorophyll a, b and carotenoides) at 100 days age in both seasons, except carotenoid content in the second season which did not reach the level of significance. The highest value of pigment contents in faba bean leaves was obtained at sowing in 1st November in both seasons. These results might be due to suitable environmental condition to germination of faba bean seeds and long growing season at the sowing of 1st November.

Data in Table (3) show that the sowing dates gave significant effect on plant height in both seasons, plant weight in the first season and number of branches in the second season. The sowing date of 1st November gave the highest plant height, but the highest

Table (3): Effect of sowing dates of faba bean on growth characters, yield and its components in 1999/2000 and 2000/01 winter seasons.

Sowing dates	Chlorophyll		Caroteniodes	Plant height (cm)	Plant weight g / pl.	Number of branches	Number of pods/plant	Weight of pods (g / plant)	Weight of seed (g / plant)	Seed yield ardad / fed.
	A	B								
1999 / 2000 season										
1 st November	1.09	0.41	0.27	92.1	39.6	3.0	7.7	29.6	18.5	4.7
15 th November	1.05	0.36	0.22	90.2	56.7	2.7	8.0	29.5	19.8	5.1
30 th November	1.00	0.32	0.18	87.0	73.5	2.8	9.4	36.3	22.7	5.9
LSD at 5% level	0.06	0.01	0.01	2.2	2.95	N S	0.2	0.9	0.7	0.3
2000 / 2001 season										
1 st November	1.41	0.38	0.34	134.6	58.4	2.1	6.9	31.4	17.1	5.1
15 th November	1.31	0.28	0.33	125.1	63.2	2.5	7.1	34.9	18.0	5.4
30 th November	1.30	0.24	0.33	112.7	67.9	2.4	7.9	36.5	19.0	5.8
LSD at 5% level	0.09	0.01	N S	2.8	N.S	0.2	0.3	3.2	0.8	N.S

plant weight was obtained from the sowing date in 30th November. The lowest value of plant height resulted from the sowing on the 30th of November in both seasons. These results might be due to suitable environmental conditions to germination of faba bean seeds and long growing season at the sowing date in 1st November, but sowing on 30th November increased plant weight that might be due to increased number and weight of pods and weight of seeds/plant.

Also, faba beans in 30th November were planted significantly superior in number, weight of pods, weight of seeds/plant and seed yield/fed. as compared with sowing in 1st November and the sowing in 15th November in both seasons. The lowest number, weight of pods, seed weight and seed yield/fed. resulted from sowing in the 1st of November. The increasing percentages of seed yield /fed. were (8 and 23% and 5 and 32 %) in 1999/2000 and 2000/01 seasons, respectively by sowing dates (15th and 30th Nov.) as compared with those of early sowing dates. Such increases are attributed to the reduction in broomrape number in the third sowing date which increased assimilate accumulation in faba bean pods and consequently improved faba bean yield. Similar results were obtained by Mesa-Garcia and Garcia-Torres 1986, Van-Hezewijk *et al.*, (1987) and Garcia-Torres and Lopez-Granados (1991).

3.1.2. Effect of faba bean varieties

3.1.2.1. On broomrape

Table (4) shows that the number and dry weight of broomrape were significantly lower in Giza 429 variety than Yousef El-Sedeak in both seasons. The reduction percentage in dry weight of broomrape in Giza 429 was 47.0 and 69.6 % compared with Yousef El-Sedeak variety in 1999/2000 and 2000/01 seasons, respectively. Similar performance was obtained by Saber *et al.*, (1999) when evaluating the resistant variety Giza 843.

3.1.2.2. On faba bean growth, yield and yield components.

Results in Table (5) indicate that Giza 429 was significantly superior in carotenoids in both seasons and chlorophyll b in the second season. These results are attributed to the reduction in the number and dry weight of broomrape spikes.

Table (4) : Effect of faba bean varieties on the number and dry weight of broomrape in 1999/2000 and 2000/01 seasons.

Varieties	Number of spikes/m ²				Weight of spike g/m ²			
	1999/2000		2000/01		1999/2000		2000/01	
	O	T	O	T	O	T	O	T
Giza 429	2.8	0.285	0.7	0.145	14.8	0.586	2.5	0.274
Youse El – Sedeak	5.8	0.447	3.9	0.284	30.1	0.877	11.8	0.426
LSD at 5 % level	2.1	0.10	0.5	0.04	11.5	0.22	4.8	0.04

O. Original data.

T. Transformed data

Results in Table (5) show that Giza 429 was significantly superior in the number of branches in the first season, chlorophyll b in the second season, plant height and plant weight in both seasons.

Table (5) shows that Giza 429 was superior significantly superior in the number, weight of pods, seeds yield / plant and seed yield/ fed. than Yousef El–Sedeak in both seasons. Giza 429 had impressive yield performance with an average seed yield increase of 14.3 and 9.6 % over Yousef El–Sedeak in 1999/2000 and 2000/01 seasons, respectively. These results are due to the decreased number and dry weight of broomrape. These results agree with these obtained by Saber *et al.*, (1999).

3.1.3. Effect of Roundup application times

3.1.3.1. On broomrape

Table (6) indicates that Roundup spray at 75 cm³/fed. two or three times was very effective in controlling broomrape spikes. The decreases in the number and dry weight of broomrape spikes were highly significant. The differences between Roundup application of two or three times in the number and dry weight of broomrape spikes were not statistically significant in both seasons. The reduction percentage of broomrape dry weight by Roundup application at 75 cm³ /fed. (three and two times) were 98.3 and 96.4 % and 99.8 and 99.2 % in 1999/2000 and 2000/01 seasons, respectively.

These findings are in agreement with those obtained by several researchers, *i.e.*, Zahran *et al.*,(1981), El-Shandidy *et al.*, (1984), Hassanein *et al.*,(1990), (1998) and Hassanein and Salem(1999) and Ibrahim *et al.*, (1997).

Table (5): Effect of faba bean varieties on growth characters, yield and its components in 1999/2000 and 2000/01 winter seasons.

Variety	Chlorophyll		Carotenoids	Plant height (cm)	Plant weight g/pl.	Number of branches	Number of pods/plant	Weight of. pods (g / plant)	Weight of seed (g / plant)	Seed yield ardab / fed.
	a	b								
1999/2000 season										
Giza 429	1.04	0.36	0.23	98.9	61.0	3.0	8.8	34.4	21.6	5.6
Yousef El-Sedeak	1.06	0.37	0.21	80.6	52.1	2.7	7.9	29.2	19.1	4.9
LSD at 5% level	N. S	N. S	0.01	3.0	1.9	0.2	0.2	0.5	0.6	0.5
2000/01 season										
Giza 429	1.33	0.31	0.34	126.9	66.4	2.3	7.4	36.3	19.0	5.7
Yousef El-Sedeak	1.35	0.29	0.33	121.3	59.9	2.3	7.2	32.3	17.1	5.2
LSD at 5% level	N. S	0.02	0.01	2.4	1.5	N.S	N.S.	2.2	N.S.	N.S

Table (6): Effect of different times of Roundup application on the number and dry weight of broomrape spikes in 1999/2000 and 2000/01 seasons.

Times of Roundup application	Number of spikes / m ²				Weight of spikes g/ m ²					
	1999/2000		2000/01		1999/2000			2000/01		
	Original data.	Transformed data	Original data.	Transformed data	Original data.	Transformed data	% reduction	Original data.	Transformed data	% reduction
Roundup 3x75 cm ³ / fed.	0.21	0.071	0.017	0.006	1.087	0.240	98.3	0.042	0.015	998
Roundup 2x75 cm ³ / fed.	0.43	0.139	0.063	0.024	2.321	0.418	964	0.159	0.052	992
Untreated	12.25	0.887	6.796	0.614	63.929	1.536	0.0	21.196	0.983	0.0
LSD at 5 % level	2.62	0.08	0.60	0.04	13.1	0.14	-	5.5	0.06	-

3.1.3.2. On faba bean growth, yield and yield components.

Table (7) shows that the application of Roundup at the rate of 75 cm³/fed. two or three times significantly reduced chlorophyll A and carotenoides, in both seasons. The lowest chlorophyll A and carotenoides contents in faba bean leaves were obtained from the application of Roundup three times. These results mean that some phytotoxicity of faba bean plant had happened from Roundup applications.

Table (7) shows that the application of Roundup at the rate of 75 cm³/fed. (two or three times) significantly increased plant height, plant weight and the number of branches/plant. The highest plant weight and number of branches/plant were obtained from the application of Roundup three times. These results are due to the reduction in the number and dry weight of *Orobanche* spikes.

Table (7) shows that Roundup application had a significant effect on the number, weight of pods, seeds weight and seed yield/fed. in both seasons. The greatest number, weight of pods, seed weight/ plant and seed yield/fed. resulted from the application of Roundup three times but, the lowest number, weight of pods/plant, seed weight/plant and seed yield/fed. were obtained from untreated control. Increasing percentages of seed yield/fed by Roundup application at 75 cm³/fed. (three and two times) were (166 and 152.5%) and (133 and 130 %) in 1999/2000 and 2000/01 seasons, respectively. These results are due to a decrease in the number and dry weight of broomrape. The obtained data in this study are in agreement with results obtained previously by Zahran *et al.*, (1981) and Hassanein *et al.*, (1990, 1998).

3. 2. Effect of the interactions

3.2.1.Effect of interaction between sowing date and faba bean varieties

3.2.1.1.On broomrape control, yield and its components of faba bean

Data presented in Table (8) show that the interaction between sowing date and faba bean varieties was statistically significant on the number and dry weight of broomrape spikes in 2000/01 season.

Table (7): Effect of Roundup applications on growth characters, yield and its components of faba bean in 1999/2000 and 2000/01 seasons.

Roundup rate / fed	Chlorophyll		Carotenoides	Plant height (cm)	Plant weight gm / pl.	Number of branches / plant	Number of pods / plant	Weight of. pods (g / plant)	Weight of seed (g / plant)	Seed yield ardad / fed.
	A	b								
1999 / 2000 season										
3 x 75 cm ³ / fed	1.01	0.36	0.20	92.0	61.5	3.00	9.7	37.2	24.4	6.2
2 x 75 cm ³ / fed	1.05	0.36	0.23	95.1	60.4	3.0	9.4	35.6	22.4	5.7
Untreated	1.08	0.37	0.22	82.2	47.8	2.7	6.0	22.6	14.2	3.8
LSD at 5% level	0.04	N. S	0.01	2.3	1.6	0.3	0.3	0.9	0.7	0.3
2000 / 2001 season										
3 x 75 cm ³ / fed	1.24	0.29	0.33	128.3	69.1	2.6	8.1	38.2	20.0	6.0
2 x 75 cm ³ / fed	1.34	0.31	0.32	130.9	67.1	2.5	7.9	35.4	19.3	5.9
Untreated	1.44	0.30	0.35	113.2	53.3	1.9	5.9	29.3	14.8	4.5
LSD at 5% level	0.07	N. S	0.02	2.4	1.7	0.2	0.2	2.2	0.7	0.3

The highest reductions of dry weight of broomrape spikes (96 and 98 %) were obtained at the sowing in 30th November by Giza 429 variety in 1999/2000 and 2000/01 seasons, respectively, whereas, the lowest reductions in the number and dry weight of broomrape spikes were obtained from sowing in 1st November by Yousef El – Sedeak variety in both seasons.

The effect of interaction between sowing dates and faba bean varieties was statistically significant on yield and some yield components (Table 8). Sowing on 30th November by Giza 429 gave the highest value of seed weight/plant and seed yield/fed. In both seasons. The lowest values of pod weight/plant, seed yield/plant and seed yield/fed. were obtained from sowing Yousef El–Sedeak variety in 1st November.

4.2.2. Effect of interaction between sowing date and Roundup applications

4. 2.2.1. On broomrape control, yield and its components

Data in Table (9) show that the interaction between sowing dates and different rates of Roundup application was statistically significant the on number and dry weight of broomrape spikes. The highest reductions in dry weight of broomrape spikes (99.3 and 100%) were obtained by sowing faba bean in 30th November and spraying Roundup three times in 1999/2000 and 2000/01 seasons, respectively.

Table (9) shows that the interaction between sowing date and different times of Roundup application was significant on the number, weight of pods/plant, seed weight/plant and seed yield/fed. in both seasons. The highest values of weight of pods/plant, seeds weight/plant and seed yield/fed. resulted from sowing faba bean in 30th November and the application of Roundup three times in the first season and the sowing faba bean in 15th November and Round up applied three time. Meanwhile, the lowest values of number, weight of pods/plant, seed weight/plant and seed yield/fed. were obtained from sowing on 15th November and untreated plants in 1999/2000 season, but was obtained from the sowing in 1st November and untreated check.

Table (8): Effect of the interaction between sowing dates and varieties on the number and dry weight of broomrape, yield and yield components of faba bean in 1999/2000 and 2000/2001 seasons.

Sowing date	Faba bean varieties	1999 / 2000 season							2000 / 2001 season						
		Number of broomrape / m ²		Weight of broomrape g / m ²		Number of pods / plant	Weight of Seeds (g / plant)	Seed yield (ardab / fed.)	Number of broomrape / m ²		Weight of broomrape g / m ²		Number of pods / plant	Weight of Seeds (g / plant)	Seed yield (ardab / fed.)
		O	T	O	T				O	T	O	T			
1 st Nov.	Giza 429 Yousef El – Sedeak	5.3	0.384	25.4	0.728	8.5	19.1	4.9	0.8	0.181	3.0	0.356	7.1	18.3	5.5
		9.7	0.645	52.1	1.123	6.9	17.8	4.5	9.7	0.514	29.7	0.687	6.7	15.9	4.8
15 th Nov.	Giza 429 Yousef El – Sedeak	2.8	0.347	17.4	0.705	8.4	20.8	5.5	1.1	0.214	4.1	0.383	7.1	18.6	5.6
		7.0	0.499	31.3	0.867	7.5	18.7	4.8	1.8	0.276	5.1	0.437	7.1	17.4	5.2
30 th Nov.	Giza 429 Yousef El – Sedeak	0.4	0.124	1.6	0.326	9.6	24.8	6.5	0.1	0.041	0.3	0.093	8.0	20.2	6.1
		0.6	0.197	6.8	0.641	9.2	20.6	5.3	0.2	0.062	0.6	0.155	7.8	17.8	5.6
LSD at 5 % level		3.6	0.18	19.9	0.38	0.4	1.1	0.9	0.9	0.07	8.3	0.07	N.S	0.9	0.6

O. Original data.

T. Transformed data

Table (9): Effect of interaction between sowing dates and times of Roundup application on the number and dry weight of broomrape, yield and it's components of faba bean in 1999/2000 and 2000/01 seasons.

Sowing date.	Times of Roundup application.	1999 / 2000 season						2000 / 2001 season					
		Number of broomrape / m ²		Weight of broomrape g / m ²		Weight of Seed g / plant	Seed yield ardeb / fed.	Number of broomrape / m ²		Weight of broomrape g / m ²		Weight of Seed g / plant	Seed yield ardeb / fed.
		O	T	O	T			O	T	O	T		
1 st Nov.	3 x 0.075 L / fed.	0.4	0.125	1.8	0.316	24.0	6.1	0.013	0.005	0.1	0.019	19.1	5.7
	2 x 0.075 L / fed.	0.6	0.183	3.0	0.553	20.1	5.2	0.100	0.039	0.2	0.070	18.5	5.7
	Untreated	21.4	1.235	111.5	1.907	11.4	2.9	15.713	1.000	48.8	1.460	13.8	4.0
15 th Nov.	3 x 0.075 L / fed.	0.1	0.034	0.7	0.174	24.8	6.3	0.038	0.014	0.1	0.025	20.8	6.2
	2 x 0.075 L / fed.	0.3	0.108	2.5	0.378	23.4	6.1	0.075	0.028	0.2	0.066	19.6	5.9
	Untreated	14.3	1.127	69.9	1.806	11.2	3.0	4.263	0.693	13.5	1.138	13.7	4.1
30 th Nov.	3 x 0.075 L / fed.	0.1	0.055	0.7	0.229	24.5	6.3	0.000	0.000	0.0	0.000	20.2	6.1
	2 x 0.075 L / fed.	0.4	0.127	1.5	0.324	23.7	5.9	0.013	0.005	0.1	0.021	19.8	5.9
	Untreated	1.0	0.300	10.4	0.896	20.1	5.4	0.413	0.149	1.3	0.350	16.9	5.5
LSD at 5 % level		4.5	0.14	22.6	0.24	1.3	0.6	1.05	0.06	9.5	0.10	1.2	0.6

O. Original data.

T. Transformed data

3.2.3. Effect of the interaction between faba bean varieties and times of Roundup application.

3.2.3.1. On broomrape (*Orobanche*) control, yield and its components.

The interaction between faba bean varieties and different times of Roundup applications was significant on the number and dry weight of *Orobanche* spikes, Table (10). The highest reductions in dry weight of *Orobanche* spikes were obtained by sowing Giza 429 and applying Roundup three times in both seasons.

The interaction between faba bean varieties and different times of Roundup application was significant on seed yield/plant and seed yield/fed. in both seasons. Data in Table (10) indicate that the greatest values of seed yield/plant and seed yield/fed. resulted from sowing Giza 429 and applied Roundup three times, but, the lowest values of these traits were obtained from the interaction between Yousef El-Sedeak and untreated by Roundup in both seasons.

3.2.4. Effect of interaction between sowing dates, faba bean varieties and times of Roundup application.

Data in Table (11) show that the interaction between sowing dates, faba bean varieties and Roundup application was statistically significant on the number and dry weight of broomrape as well as seed yield ardeb/fed. in both 1999/2000 and 2000/01 seasons, except with the number of broomrape/m² in the first season.

Sowing Giza 429 in November the 30th with the three sprays of Roundup decreased the number and weight of broomrape spikes/m² by 99.5 and 100 % in 1999/2000 and 2000/01 seasons and increased seed yield by 161.9 and 86.0 % as compared with sowing Yousef El-Sedeak with early sowing in the 1st of November in untreated check. This explains the integrated role of both delayed sowing of faba bean and the use of semi tolerant varieties to broomrape and Roundup spray in broomrape control. Thus, the pervious integrations can be recommended for faba bean growers in infested areas. The integrated approach for broomrape control of faba bean was mentioned by many researchers as Zahran *et al.* ,(1981) and Hassanein *et al.*, (1990).

Table (10): Effect of interaction between faba bean varieties and times of Roundup application on the number and dry weight of *Orobanche*, spikes yield and its components in 1999/2000 and 2000/01 seasons.

Faba bean varieties.	Times of Roundup application	1999 / 2000 season						2000 / 01 season					
		Number of <i>Orobanche</i> / m ²		Weight of <i>Orobanche</i> / m ²		Weight of Seeds /pl.	Seed yield /fed	Number of <i>Orobanche</i> / m ²		Weight of <i>Orobanche</i> / m ²		Weight of Seeds / pl.	Seed yield /fed
		O	T	O	T			O	T	O	T		
Giza429	3x75cm ³ /fed.	0.1	0.040	0.6	0.156	26.1	6.7	0.00	0.000	0.0	0.000	20.9	6.4
	2x75cm ³ /fed.	0.2	0.074	1.4	0.309	23.6	6.1	0.03	0.013	0.1	0.030	19.7	6.0
	Untreated	8.2	0.740	42.4	1.294	15.1	4.1	2.08	0.423	7.4	0.791	16.5	4.8
Youseaf El-Sedeak	3x75cm ³ /fed.	0.3	0.103	1.6	0.324	22.7	5.8	0.03	0.013	0.1	0.029	19.2	5.7
	2x75cm ³ /fed.	0.7	0.205	3.2	0.527	21.2	5.4	0.09	0.034	0.2	0.074	18.8	5.7
	Untreated	16.4	1.035	85.5	1.779	13.3	3.4	11.58	0.805	35.0	1.174	13.1	4.2
LSD at 5 % level		3.7	0.11	18.5	0.19	1.0	0.5	0.85	0.05	7.7	0.08	0.9	0.5

O. Original data.

T. Transformed data

Table (11): Effect of interaction between sowing dates, faba bean varieties and Roundup applications on the number and dry weight of broomrape, yield and it's components of faba bean in both seasons.

Sowing date	Faba bean varieties	Times of Roundup application	1999/2000 season					2000/01 season				
			Number of broomrape / m ²		Weight of broomrape/m ²		Seed yield ardab /fed.	Number of broomrape / m ²		Weight of broomrape/m ²		Seed yield ardab /fed.
			O	T	O	T		O	T	O	T	
1 st Nov.	Giza 429	3 x 75 cm ³ /fed.	0.2	0.051	0.714	0.147	6.4	0.00	0.000	0.0	0.000	6.0
		2 x 75 cm ³ /fed.	0.2	0.076	1.667	0.381	5.2	0.05	0.020	0.1	0.042	5.9
		Untreated	15.4	1.024	73.690	1.657	3.2	2.40	0.524	9.0	0.995	4.5
	Yousef El- Sedeake	3 x 75 cm ³ /fed.	0.7	0.199	2.905	0.486	5.8	0.025	0.010	0.1	0.039	5.5
		2 x 75 cm ³ /fed.	1.0	0.291	4.405	0.724	5.2	0.105	0.056	0.3	0.098	5.4
		Untreated	27.4	1.446	149.238	2.157	2.6	29.025	1.476	88.6	1.924	3.5
15 th Nov.	Giza 429	3 x 75 cm ³ /fed.	0.1	0.020	0.476	0.116	6.9	0.000	0.000	0.0	0.000	5.9
		2 x 75 cm ³ /fed.	0.2	0.065	1.643	0.321	6.6	0.050	0.020	0.1	0.049	6.6
		Untreated	8.2	0.955	50.190	1.683	2.9	3.300	0.624	12.2	1.099	4.2
	Yousef El- Sedeake	3 x 75 cm ³ /fed.	0.1	0.048	0.952	0.232	5.8	0.075	0.028	0.1	0.049	6.0
		2 x 75 cm ³ /fed.	0.5	0.151	3.310	0.441	5.6	0.100	0.037	0.3	0.083	5.8
		Untreated	20.4	1.299	89.667	1.930	3.0	5.225	0.763	14.7	1.179	4.0
30 th Nov.	Giza 429	3 x 75 cm ³ /fed.	0.1	0.050	0.667	0.204	6.8	0.00	0.000	0.0	0.000	6.5
		2 x 75 cm ³ /fed.	0.2	0.081	0.952	0.231	6.5	0.00	0.000	0.0	0.000	6.0
		Untreated	0.8	0.241	3.214	0.541	6.0	0.325	0.122	0.9	0.278	5.7
	Yousef El- Sedeake	3 x 75 cm ³ /fed.	0.2	0.060	0.810	0.254	5.7	0.00	0.000	0.0	0.000	5.7
		2 x 75 cm ³ /fed.	0.5	0.172	1.952	0.417	5.3	0.025	0.010	0.1	0.042	5.8
		Untreated	1.2	0.359	17.571	1.250	4.7	0.500	0.176	1.7	0.422	5.3
LSD at 5 % level			6.41	0.198	31.9	0.34	0.8	1.48	0.09	13.4	0.14	0.8

O. Original data.

T. Transformed data

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تأثير مواعيد الزراعة وصنفين من الفول البلدي وإضافة الجليفوسيت على الهالوك و محصول الفول البلدي

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ملخص

أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بسدس خلال موسمي ٢٠٠٠/١٩٩٩ ، ٢٠٠٠/٢٠٠١ في حقل مصاب بالهالوك لدراسة تأثير كل من مواعيد الزراعة وصنفى الفول البلدي والمعاملة بمبيد الراونداب وكذلك دراسة التأثير المشترك لهذه العوامل على مكافحة الهالوك وإنتاجية محصول البذور في الفول البلدي. تشير النتائج إلي أن مواعيد الزراعة كان لها تأثير معنوي على عدد ووزن نباتات الهالوك حيث أدى التأخير في ميعاد الزراعة من ١١/١ إلى ١١/١٥ إلى ١١/٣٠ إلى نقص في الوزن الجاف للهالوك بنسبة ٣١,٣% ، ٨٨% وذلك مقارنة بالزراعة في الميعاد ١١/١ في الموسم الأول وبنسبة ٥٨.٣ ، ٩٦% في الموسم الثاني، كما وأدى تأخير ميعاد الزراعة إلي زيادة معنوية في الصفات المحصولية (عدد ووزن القرون/نبات ووزن محصول البذور للنبات ومحصول البذور للفدان وكانت نسبة الزيادة في المحصول ١٠٠ ، ١٠٨ ، ١٢٣% في الموسم الأول ، ١٠٠ ، ١٠٥ ، ١٣٢% في الموسم الثاني ويعود ذلك إلي خفض عدد ووزن الهالوك. ويتضح من الدراسة أيضا وجود اختلافات معنوية بين صنفى الفول حيث إنخفض عدد ووزن نباتات الهالوك بصنف جيزة ٤٢٩ بنسبة ٤٧% في الموسم الأول ، وبنسبة ٧٠% في الموسم الثاني عن صنف يوسف الصديق. وكذلك تفوق صنف جيزة ٤٢٩ في صفات المحصول ومحصول البذور للفدان علي صنف يوسف الصديق بنسبة زيادة في محصول البذور (أردب/ ف) ١٦% في الموسم الأول ، ٩% في الموسم الثاني. كما وبلغت نسبة النقص في محصول البذور لصنفى جيزة ٤٢٩ ، يوسف الصديق ٦٥% ، ٦٨% في الموسم الأول ، ٣٣% ، ٣٥% في الموسم الثاني على التوالي نتيجة لتأثير الهالوك. وأدت المعاملة بمبيد الراونداب بمعدل ٧٥ سم^٣ ثلاث مرات أو مرتين إلي نقص معنوي في عدد ووزن الهالوك وكانت نسبة النقص في الوزن الجاف للهالوك ٩٨ ، ٩٦% في الموسم الأول ، ٩٩,٧ ، ١٠٠% في الموسم الثاني. كما وزاد محصول الفول البلدي بنسبة ١٦٦ ، ١٥٢% في الموسم الأول ، ١٣٣ ، ١٣٠% في الموسم الثاني على التوالي وذلك

نتيجة الزيادة في صفات المحصول (وزن النبات، عدد الأفرع الثمرية/نبات، عدد ووزن القرون والبذور/نبات) وذلك بالمقارنة بمعاملة الكنترول. تشير النتائج التي تم التوصل إليها إلي أن التفاعل بين العوامل تحت الدراسة كان لها تأثير معنوي علي عدد ووزن نباتات الهالوك وكذلك صفات المحصول ومحصول البذور حيث أدت الزراعة في ٣٠ نوفمبر بصنف جيزة٤٢٩ إلي تقليل الوزن الجاف للهالوك بنسبة ٩٦% ، ٩٨% في الموسمين علي الترتيب وذلك مقارنة بالزراعة في أول نوفمبر بصنف يوسف الصديق والذي أعطت أقل نسبة زيادة. كما وكان للتفاعل بين مواعيد الزراعة والرش بمبيد الراونداب تأثير معنوي علي وزن وعدد نباتات الهالوك حيث أعطى أعلى نقص في عدد ووزن نباتات الهالوك من الزراعة في أول نوفمبر والرش بمبيد الراونداب ثلاث مرات بنسبة زيادة ٩٩,٧% في الموسم الأول ، والزراعة في ٣٠ نوفمبر والرش بمبيد الراونداب ثلاث مرات بنسبة زيادة ١٠٠%. وأدي الرش بمبيد الراونداب ثلاث مرات والزراعة بصنف جيزة٤٢٩ تحت مواعيد الزراعة الثلاثة إلي أعلى نسبة نقص في الوزن الجاف للهالوك حيث تراوحت نسبة الإيادة من ٩٩% إلي ١٠٠% في الموسمين. وكان أعلى زيادة في محصول بذور الفدان ناتج من الزراعة في ١٥ نوفمبر بصنف جيزة٤٢٩ والرش بمبيد الراونداب ثلاث مرات حيث كان ٦,٨٧ أردب/ف في الموسم الأول، ٦,٦٣ أردب/ف في الموسم الثاني. من ذلك يتبين أنه يمكن النصح في الأراضي الموبوءة بالهالوك بتأخير الزراعة إلي النصف الأخير من نوفمبر والزراعة بصنف الفول جيزة٤٢٩ الذي يتحمل نسبيًا الهالوك والرش مرتين بالراونداب بمعدل ٧٥ سم^٣ للفدان لمكافحة الهالوك في الأراضي الموبوءة تحت ظروف بني سويف للمحافظة علي إنتاجية الفول البلدي بها.