

EFFECT OF SOWING DATE, FERTILIZERS AND BROOMRAPE CONTROL TREATMENTS ON FABA BEAN (*VICIA FABA* L.) PRODUCTIVITY.

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By

A.A.O. Fakkar , H. E.A. Ibrahim* and M. A. Raslan**

*Weed Central Labratory, *Central Labratory For Design and Statistical analysis Reasearch*

***Field Crops Reseach Institute, Agriculture Research Center, Giza, Egypt*

ABSTRACT

Two field experiments were carried out during two successive seasons (2013/2014 and 2014/2015) in naturally *Orobanche* infested soil at Shandaweel Research Station, Agricultural Research Center, Sohag Governorate. Studies were carried out to investigate the effect of two sowing dates (middle of October and first of November), three fertilizations (mineral fertilization at a rate of 20 kg N/fed, Farm yard manure at a rate of 20 m³ /fed and no fertilization) and five broomrape control treatments (glyphosate at a rate 50 cm³/fed+hand pulling once (H.P), glyphosate at a rate 75 cm³/fed+hand pulling once, glyphosate twice at a rate of 75+50 cm³/fed, hand pulling twice and untreated) on broomrape control and faba bean productivity. The results showed that sowing date, first of November significantly reduced both the dry weight of broomrape as compared to the other sowing date (mid. of October). The decreasing percentage in weight of broomrape by sowing on the first of November was 23.54% as compared with the first sowing date (mid. of October). Sowing date mid. of October recorded the highest values of growth characters, yield and yield attributes. The mineral and organic fertilizers significantly reduced both the number and dry weights of broomrape compared with the control. Moreover, mineral fertilizer delayed shoot emergence above the soil. Also, the fertilizer recorded the highest values of growth characters, yield and yield attributes. Application of glyphosate once with a rate of 50 cm³ or (glyphosate one time with rate 75cm³ /fed) glyphosate two times with a rate of 50 cm³+ 75 cm³ significantly decreased the number, dry weight of proomrape and delayed its emergence compared with the untreated plots. Hand pulling twice was the most significant treatment in increasing yield and yield attributes . Moreover, hand pulling twice and glyphosate two times 50+75 caused faba bean seed yield increase of 75.8 and 72.2% respectively. Meanwhile applying glyphosate once at a rate of 50 cm³ and once at rate of 75 cm³resulted in an increase of 69.6 and 63.2%9 in faba bean seed yield; respectively, over the untreated control treatment. Maximum seed yield was obtained with sowing on mid. of October, adding mineral fertilization and the application of glyphosate two times 50+75. There was a strong negative correlation between faba bean seed yield and the number and weight of *Orobanche* infestation/m² ($r = -0.548^{**}, -0.528^{**}$ respectively). Also, it is clear that these treatments which had low *Orobanche* infestation had good growth patterns and hence showed high seed yield

Key words: *Orobanche crenata, faba bean, glyphosate, sowing dates.*

1.INTRODUCTION

Broomrape is considered one of the most serious agricultural problems in Egypt, Mediterranean countries and different parts of the world, causing severe damage to legume crops (Mauromicale *et al.*, 2000). Egyptian broomrape (*Orobanche aegyptiaca* pers.) is a parasite that attacks the roots of many dicotyledonous crops including legumes. It draws carbon, nutrients and water through

haustoria, which connect the parasite with the host's vascular system. Broomrape infestation causes reductions in crop yield, adversely affecting crop quality and results in a loss of cultivated land area (Nandula, 1998). Among the most affected crops are legumes. Management of broomrape is difficult because of its close association with the host. Broomrapes are obligate holophrastic weeds that cause severe damage to the most important vegetable and

field crops in the Mediterranean region and the Middle East. Control of these parasites is difficult because broomrape produces hundreds of thousands of minute seeds that are highly persistent to the soil conditions and can easily transferred to new areas. Methods of control include agricultural practices (such as hand weeding, tillage, crop rotation and sowing dates) and chemical control. Planting time is the major factor affecting development, source of sink relationship and assimilation in faba bean plants. Planting time is crucial in many farming systems to avoid frost, drought, pests or diseases, which may occur early or late in the growing season. Late sowing may result in severe insect and disease attack (Sahile *et al.*, 2008). Mekky *et al.* (2003) reported that sowing faba bean on the 15th and 30th of November decreased broomrape infestation by 44.8 and 92% , respectively, as compared with the 1st of November in both growing seasons, in association with increasing seed yield by 6.55 and 27.7%, respectively. Shad *et al.* (2011) reported that the sowing date up to the 4th of October produced higher yield, thereafter yield decreased as sowing was delayed and yield recorded for crop sown on the 27th of December. (El-Metwally *et al.*, 2013). Sowing seeds at 10th December with spraying glyphosate or imazapic (three times/each) reduced both the number and dry weights of broomrape.

Most success in controlling broomrape has been achieved with using glyphosate. Rates of 0.2 to 0.3 kg ha⁻¹ gave good selective control when sprayed 6 weeks after sowing. Glyphosate is thought to translocate through the host phloem to broomrape attachments on the host roots and then exert its toxic effect (Nandula, 1998). Nassar and Mekky (2002) reported that controlling broomrape by applying glyphosate three times (7, 10 and 13 weeks) after sowing decreased the number and dry weight of broomrape spikes by 98.8 and 99%, as compared with the untreated plots in both seasons, successively. Application of glyphosate two or three times at the rate of 75 cm³/fed gave 99.1 and 97.8% reduction of broomrape and increased seed yield by 149.5 and 141.5% as compared with the untreated plots in both seasons under investigation successively. Messiha *et al.* (2004) reported that the post-emergence application of the low rate of glyphosate (25 ppm) substantially controlled broomrape parasitism in peas, by reducing the number and fresh and dry weights as compared with infected control. Al-Marsafy *et al.* (2000 and 2001) studied the feasibility of

hand pulling as alternative or complement with glyphosate. This method can only be recommended for low *Orobanche* infestations to prevent further increases of the parasite populations and seed bank. Ismail (2013) stated that application of glyphosate alone or as complement with hand pulling gave higher reduction in the number and weight of broomrape by 97.1, 97.1, 97.0, and 97.3 %, respectively, as compared with untreated chick, and improved seed yield by 75.6 and 72.1 %, respectively.

El-Metwally *et al.*, (2013) reported that glyphosate application three times significantly increased seed yield over the unweeded check by 85.1%. While, the maximum seed yield was recorded with crop sown at the 25th of November and at 10th November with the application of glyphosate (at 90 g a.i./ha) or imazapic (at the rate of 50 g a.i./ha) three times. Eventually, it could be concluded that sowing dates on 25th November with application of glyphosate or imazapic three times was the best combination for enhancing yield and its attributes. El-Rokiek *et al* (2015) found that the maximum yield was obtained with the addition of ammonium sulfate to glyphosate at 37.5 ml/fed compared with the infected control

Ismail (2013) revealed that adding (10 and 20 kg N/fed) reduced *Orobanche* infestation by 22.3 and 43.9%, respectively. Meanwhile, obvious improved seed yield by 14.9 and 13.1 %, respectively, than unfertilized plots. Organic manure improved of seed yield by 1.5 and 4.2 %, respectively, than without manure.

Kasasian (1973) found that manure and N-fertilizers can play an important role in reducing the level of broomrape infestation. High nitrogen application reduced development of Egyptian broomrape and crenate broomrape. Low fertility is considered to be an important factor associated with severe infestation of fields by broomrape . Gharib(1973), Kukula and Masri (1984) reported that 40 kg/ha ammonium nitrate were able to reduce the number of emerged *Orobanche* shoots and increased the yield of faba bean. The effects of N from different sources had different inhibitory effect on broomrape seeds (Abu-Irmaileh, 1994 and Nandula *et al.*, 1996).

The present study aimed to estimate the magnitude of contribution of the use of sowing date, fertilizers and hand pulling and selective herbicides alone or in integration with each other

for controlling broomrape, and increasing yield and its components in faba bean.

2.MATERIALS AND METHODS

Two field experiments were conducted at Shandaweel Research Station, Sohag Governorate during 2013/14 and 2014/15 seasons in naturally infested soil with *Orobanche*. Soil texture of the experimental plots in both seasons was sandy loam (Table 1). Each experiment included thirty six treatments which were a combination of three N rates, three manure treatments and six *Orobanche* control treatments using a split split plot design in three replications as follows :-

2.1. Main plots: (sowing dates)

2.1.1. Mid of October

2.1.2. First of November

2.2. Sub plots: (fertilization):

2.2.1. Mineral fertilization was applied as ammonium sulphate (33.5 % N) at a rate of 20 kg N/fed before the first and the second irrigations of faba bean.

2.2.2. Farm yard manure (Table 2) at a rate of 20 m³ /fed was applied before sowing

2.2.3. Unfertilization

2.3. Sub sub plots: *Orobanche* control treatments

2.3.1. Glyphosate {N- (phosphonomethyl) glycine} known commercially as Roundup (48% WSC) at 50 cm³ /fed, applied once at the beginning of flowering of faba bean plant followed by one hand pulling.

2.3.2. Glyphosate used once with rate 75 cm³ /fed at the beginning of the flowering stage followed by one hand pulling.

2.3.3. Glyphosate used two times with equal rate of 50 cm³ /fed at the beginning of the flowering stage + 75 cm³ /fed at 21 days after the first application

2.3.4. Hand pulling twice.

2.3.5. Untreated (control).

Seeds of the faba bean (Misr1 cultivar) were used in both seasons with a rate of 35 kg/feddan. The recommended agricultural practices of faba bean production were adopted. Plot area was 10.5 m² included five ridges 3.5 m length and 60 cm apart. The herbicidal treatments were sprayed with a knapsack sprayer with one nozzle boom using , 200 liters/fed of water.

2.4. Data recorded

2.4.1. Broomrape

Before faba bean harvest, the number of broomrape spikes/m² directly was counted and

the dry weight of broomrape/m² was recorded.

2.4.2. Faba bean yield and its components

At harvest in mid April, samples of ten faba bean plants were collected randomly from the central rows of each plot to record the following traits: plant height (cm), number of branches/plant, number of pods/plant, weight of pods (g/plant), seed weight (g/plant), 100-seed weight (g) and seed yield (ard/fed) were recorded from the whole plot.

2.5. Statistical analysis

The data obtained were subjected to analysis of variance (ANOVA). Since the trend of the results was similar in both seasons, the combined analysis of the data was carried out (Gomez and Gomez, 1984). Bartlett test of homogeneity for error indicated that the variance of the data of both seasons was insignificant; Treatment means were compared using the least significant differences test (LSD) at the 0.05 level. Simple correlation coefficients among the studied traits were calculated according to Draper and Smith (1966).

3.RESULTS AND DISCUSSION

3.1.The effects on broomrape

3.1.1.Effect of sowing date

The results in Table (3) indicated that for the number of broomrape spikes no significant differences were observed between the two sowing dates but the dry weights of broomrape spikes were significantly affected by the different sowing dates. The second sowing date on first of November reduced the number, weight and dates of emersion of broomrape as compared with the first sowing date (mid.October). The decrease percentage in the weight of broomrape by sowing dates on the first of November was 23.54% as compared with the other sowing date (mid. October). These results might be due to the increase in temperature, which encourages the earlier germination of broomrape seeds than the second sowing date (Mekky *et al.*, 2003 and El- Metwally *et al.*, 2013).

2.1.2.Effect of fertilization

The results in Table (3) indicated that the number and weight of broomrape spikes were significantly affected by the different fertilizers. The mineral fertilizer reduced both the number and weight of broomrape spikes followed by organic fertilizer as compared with the unfertilized plots. This might be due to nitrogenous fertilizers, which reduced broomrape

Table (1): Chemical analysis of the soil 2013/14 and 2014/15 seasons.

Chemical Seasons	Soil texture	O.M	pH	CaCo3	N	P	K
2013/14 season	Sandy loam	0.6	7.9	7.50	14	18	12
2014/15 season		0.8	7.7	7.55	13	17	13

Table (2): Chemical analysis of farm yard manure (FYM) applied in the experiment.

Component	Organic matter %	pH	Total nitrogen %	Organic carbon %	C/N ratio	P %	K %
Fertilizer of (FYM)	20.02	7.7	0.49	11.61	23.69	0.24	1.10

Table(3): Effect of sowing dates, fertilization and weed control treatments on broomrape control and growth of faba bean plants (average of the two seasons).

Treatments Characters	Broomrape characters			Growth characters	
	❖ No. of spikes/m ²	Weight of Spikes (g/m ²)	Days of emergence	Plant height (cm)	Number of branches/plant
Sowing dates					
Middle of October	9.93	40.82	127.83	125.93	3.15
First of November	7.79	31.21	115.99	120.85	2.84
F test	NS	*	**	*	*
LSD at 0.05		3.44	0.104	3.39	0.11
Fertilization					
Mineral	6.55	26.83	123.48	120.74	2.73
Organic	8.85	36.65	116.47	121.08	2.67
Unfertilized	11.18	44.55	125.78	128.35	3.58
F test	**	**	**	*	*
LSD at 0.05	1.19	3.83	4.12	4.26	0.08
Orobanche control					
Glyphosate 50+H.P	4.44	18.74	121.28	126.42	3.18
Glyphosate 75+H.P	5.75	22.99	120.69	123.54	3.19
Glyphosate 50+75	11.03	44.85	120.64	126.93	3.10
Hand pulling twice.	6.42	26.75	121.58	127.12	3.04
Untreated (control).	16.67	66.74	125.36	112.94	2.47
F test	**	**	**	**	**
LSD at 0.05	1.12	4.64	1.54	2.44	0.070

transformed to log (x)

seed germination and radicle length of the germinated seedlings (Pieterse, 1991). Nitrogen from different sources had different inhibitory effects. The effect could be due to a direct interaction with the metabolism of broomrapes by altering the osmotic balance (Ernst, 1988), since high nitrogen supply would reduce the uptake of potassium for which the parasite has a high demand (Welte and Wemer, 1962 and Ernst, 1988). The present results are in line with

those reported by Pieterse (1991) and Demirkan and Nemli (1994).

3.1.3. Effect of broomrape control treatments

As shown in Table (3) glyphosate once at a rate of 50 cm³/fed +hand pulling once (H.P) or glyphosate once at a rate of 75 cm³ /fed +hand pulling once were very effective in controlling broomrape. A decrease in the number and dry weight of broomrape spikes was recorded as

compared with glyphosate two times at a rate of 50 cm³+ 75 cm³/fed, hand pulling twice and untreated (control).

The reductions in the dry weight of broomrape spikes were highly significant. The reduction percentage of broomrape dry weight by spraying glyphosate once at a rate of 50 cm³ /fed+H.P or glyphosate once at a rate of 75 cm³ /fed+H.P or glyphosate two times with equal rate of 50 cm³+ 75 cm³ and hand pulling twice were 71.9, 65.5, 32.8 and 59.5%, respectively as compared with the untreated check treatments. The current results indicated that no significant differences were observed between glyphosate one time with a rate of 50 cm³ +H.P and (glyphosate one time with a rate of 75cm³ +H.P on the dry weight of broomrape spikes ; they have similar effect.

The above results are in agreement with those of Mekky *et al.* (2003), Ghalwash *et al.* (2008), Ghannam *et al.* (2012) and El-Metwally *et al.*(2013) who reported that the action of glyphosate on broomrape is attributable to its selective accumulation in the young parasite plant up to a level four times as high as that in faba bean host root three days after spraying.

3.1.4. Effect of the interaction

The interaction among sowing dates, fertilization and broomrape control treatments significantly affected the number and dry weight of broomrape spikes (Fig. 1 and 2). Sowing date on the first of November, using mineral fertilizer and spraying glyphosate once at a rate of 50 cm³ reduced both the number and dry weight of broomrape as compared with the other treatments. Meanwhile, the highest value of weed infestation was recorded in the unfertilized check treatment when sowing was on the middle of October and untreated weed control.

This explains the integrated role of both delayed sowing date and glyphosate treatment in broomrape control which enables faba bean to tolerate weed parasitism. These results are in good harmony with those reported by Mekky *et al.* (2003), Khalil *et al.* (2010), Kawochar *et al.* (2011) and El-Metwally *et al.* (2013).

3.2. The effects on faba bean growth

3.2.1. Effect of sowing dates

Significant variations were observed between the different treatments regarding their influence on the growth characters of faba bean plants including plant height, the number of branches/plant after 110 days from sowing as well as on the plant height at harvesting stage (Table 3). The maximum values of the

previously mentioned characters were obtained at the sowing date on the middle of October. These results may be due to the favorable environmental conditions to germination of faba bean seeds and long growing season for the early sowing. Similar results were reported by Turk and Tawaha (2002), Khalil *et al.* (2011), Kawochar *et al.* (2011) and Shaban *et al.* (2013)

3.2.2.Effect of fertilization

Significant variations were observed between the different fertilization treatments regarding their influence on the growth characters of faba bean plants including plant height and the number of branches/plant after 110 days from sowing as well as on plant height at harvesting stage (Table 3). The maximum values of the previous mentioned characters were obtained for the unfertilized. However, the lowest values were recorded by the mineral fertilizer. The results also indicated that there are no significant differences between mineral and organic fertilizer. Similar results were reported by Shaban *et al.* (2013).

3.2.3.Effect of broomrape control treatments

Table (3) shows that the application of hand pulling twice, glyphosate two times and glyphosate one time+ hand pulling significantly increased plant height. The untreated check produced the lowest values of growth characters of faba bean plants. These results coincide with those reported by Mekky *et al.* (2003), Ghalwash *et al.* (2008) and El- Metwally *et al.* (2013)

3.3. The effect on yield and its attributes

3.3.1. Effect of sowing dates

Faba bean yield and its attributes were significantly affected by the different dates of sowing (Table 4). The best results recorded for the different characters (including the No. of pods/ plant, pod weight / plant , Seed weight seed, 100 seed weight, yield ardab/fed) were for sowing on the middle of October. The high yield yield from the early planting might be due to the fact that the plants had sufficient longer vegetative period and better utilization of water and nutrients. The reduction in yield in the second sowing date may be due to poor growth, shorter seed filling duration and maturity period, less number of fruiting nodes and pods/ plant and minimum seeds/ pod (Sahile *et al.* 2008).

Effect of fertilization:

Significant variations were observed between the different fertilization treatments regarding their influence on the yield and its attributes of faba bean plants (Table 4). The maximum yield values of the previous

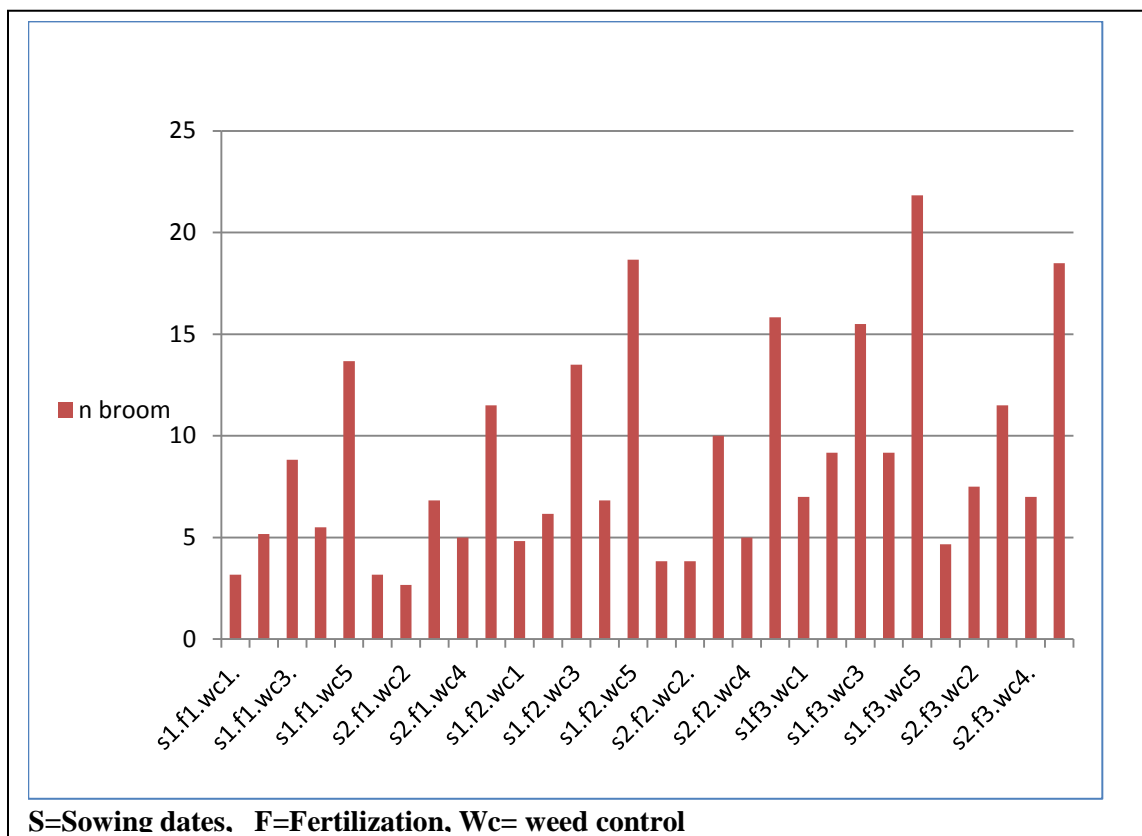


Fig. (1): Number of broomrape spikes at harvest/m² as influenced by the interaction between sowing dates and weed control treatments (combined data across 2013 /2014 and 2014/2015 seasons).

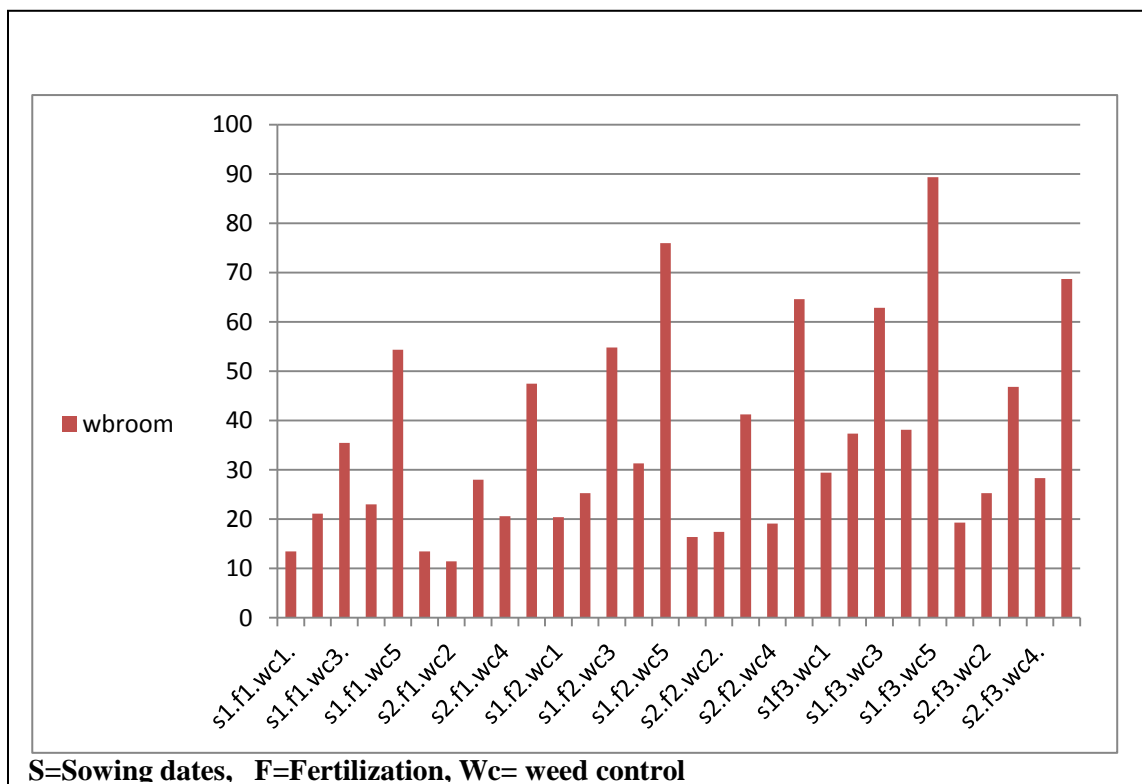


Fig. (2): Weight of broomrape spikes at harvest/m² as influenced by the interaction between sowing dates, fertilization and weed control treatments (combined data across 2013 /2014 and 2014/2015 seasons).

Table (4): Effect of sowing date, fertilization and weed control treatment on yield and yield attributes of faba bean plants (average of the two seasons).

Treatments Characters	No. of pods/ plant	Pod weight / plant (g)	Seed weight	100 seed weight	Yield ardab/fed
Sowing dates					
Middle of October	26.43	68.68	59.20	71.89	5.75
First of November	24.41	57.68	47.24	64.86	4.87
F test	*	*	*	*	*
LSD at 0.05	0.66	4.90	4.13	5.19	0.20
Fertilization					
Mineral	25.47	60.42	48.75	65.77	5.45
Organic	23.74	61.49	52.87	68.53	5.48
Unfertilized	27.06	67.64	58.03	70.82	5.02
F test	**	*	**	**	**
LSD at 0.05	1.18	3.80	1.57	0.98	0.19
Orobanche control					
glyphosate 50+H.P	27.22	66.98	57.52	72.75	5.77
glyphosate 75+H.P	26.62	66.89	58.11	72.55	5.55
glyphosate 50+75	25.27	62.92	51.50	69.98	5.86
Hand pulling twice.	26.86	68.00	58.23	73.03	5.98
Untreated (control).	21.14	51.11	40.72	53.57	3.40
F test	**	**	**	**	**
LSD at 0.05	1.01	2.48	2.24	1.95	0.21

mentioned characters (5.48 ard/fed) were obtained by using the organic fertilizer followed by mineral fertilizer (5.45 ard/fed). Similar results were obtained by Ismail (2013).

3.3.2. Effect of broomrape control treatments

According to the results in Table (4), yield and yield components of faba bean were significantly affected by broomrape control treatment. Hand pulling twice was the most significant treatment in increasing No. of pods/plant, pod weight/plant, seed weight, 100-seed weight and seed yield ardab/fed. Moreover hand pulling twice and glyphosate two times 50+75 cm³/fed caused seed yield increase by 75.8 and 72.2%, respectively, Meanwhile applying glyphosate once at 50 cm³/fed+H.P and glyphosate once at 75 cm³ +H.P has achieved an increasing estimate by 69.6 and 63.2%, respectively, over the untreated control. These results are due to the decrease in the number and dry weight of broomrape (Table 3). In this respect, Fayed *et al.* (2002) reported that there is a strong negative correlation between faba bean seed yield and the number and weight of *Orobanche* spikes/m² ($r = -0.548^{**}$, -0.528^{**})

(Table 5). The present study revealed that the chemical control of broomrape on faba bean can be achieved by using the herbicide glyphosate (48% WSC) at two times at 50+75 cm³/fed which adequately enough to govern the number of broomrape emerging spikes in faba bean in addition hand pulling twice. Similar findings were reported by Shaban *et al.*(1986), Mekky *et al.* (2003), Ghalwash *et al.* (2008) and Bellido *et al.* (2009) and Al-Marsafy *et al.* (2000 and 2001).

3.3.3.Effect of the interaction

Analysis of the data revealed that sowing date, fertilization and broomrape control treatment interaction significantly affected seed yield ard/fed (Fig.3). Maximum seed yield was obtained with sowing on the middle of October, mineral fertilization with the application of glyphosate twice (50+75). Meanwhile, the lowest seed yield was reported with sowing on the first of November, no fertilization with the untreated treatment. This explains the integrated role of both delayed sowing of faba bean and glyphosate herbicides in broomrape control.

Table (5): Simple correlation coefficients among the number and weight of broomrape spikes and faba bean traits across two seasons.

Traits	Plant height (cm) (PH)	Number of branches/plant (N.br)	Number of pods/Plant (N.pod)	Weight of pods (g/plant) (W.pod)	Seed weight (g/plant) (W.seed)	100 Seed weight (g) (Seed)	Seed yield ard/fed (Yard)	Number of broomrape (spike/m ²) (Nbroom)	Weight of broomrape /m ² (w.broom)
PH	1								
N.br	0.52**	1							
N.pod	0.58**	0.451**	1						
W.pod	0.59**	0.53**	0.48**	1					
W.seed	0.59**	0.53**	0.51**	0.81**	1				
Seed	0.58**	0.44**	0.53**	0.74**	0.78**	1			
Yard	0.53**	0.29**	0.50**	0.59**	0.62**	0.72**	1		
Nbroom	-0.18*	-0.06	-0.30**	-0.31**	-0.27**	-0.37**	-0.55**	1	
w.broom	-0.19*	-0.08	-0.31**	-0.29**	-0.26**	-0.38	-0.53**	0.98**	1

*and**: Significant at 0.05 and 0.01 probability level, respectively

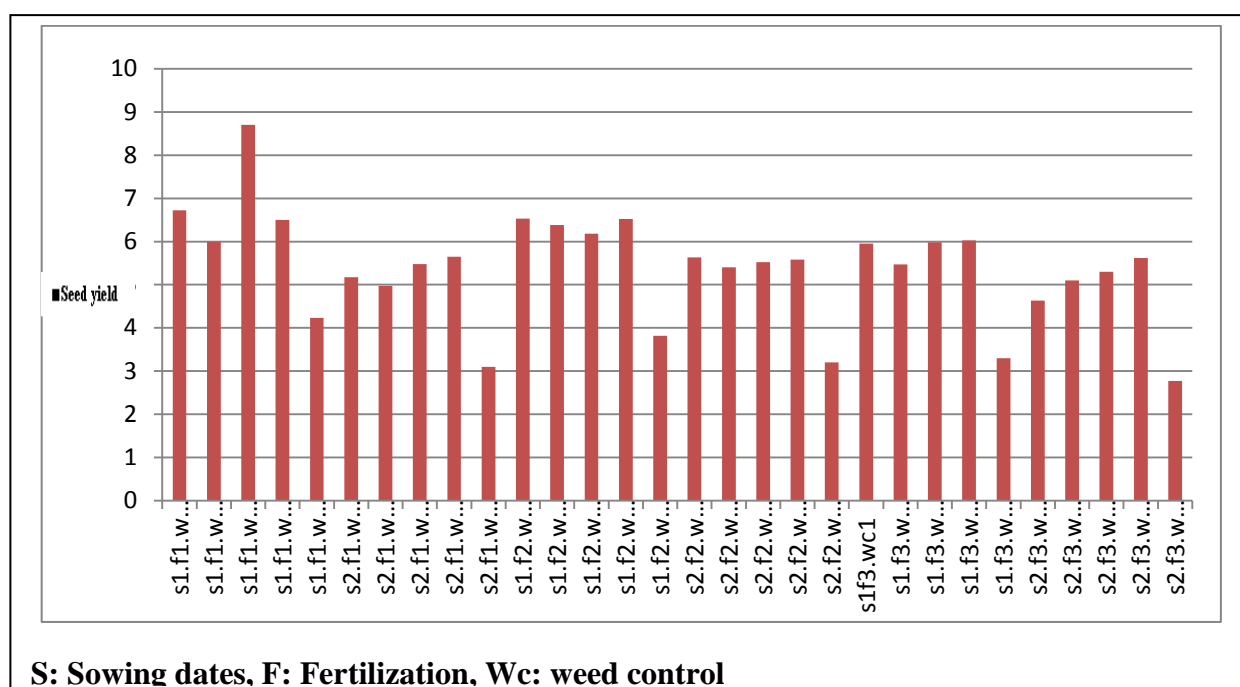


Fig. (3): Seed yield (ard/fed) as influenced by the interaction between sowing dates, fertilization and weed control treatments (Combined data across 2013 /2014 and 2014/2015 seasons)

Such, integration could be forwarded to faba bean growers in infested areas by broomrape. The integration approach for broomrape control of faba bean was mentioned by Mekky *et al.* (2003) and Ghalwash *et al.* (2008).

3.4. Correlation matrix

The simple correlation coefficients among number and weight of broomrape spikes and faba bean traits are presented in Table (5). Results showed that there is a strong negative correlation between faba bean seed yield and the number and weight of *Orobanche* spikes/m² (r = -0.548**, -0.528**).

Conclusion

It can be concluded from this study that sowing date, fertilization and broomrape control treatment interaction significantly affected faba bean seed yield (ard/fed) Maximum seed yield was obtained with sowing on the med of October and Mineral fertilization with the application of glyphosate two times (50+75). Meanwhile, the lowest seed yield was reported with sowing on the first of November, no fertilization with the no broomrape control treatment. This explains the integrated role of both delayed sowing of faba bean and glyphosate herbicides in

broomrape control. Such, integration could be forwarded to faba bean growers in infested areas by broomrape.

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تأثير ميعاد الزراعة والتسميد ومعاملات مكافحة الهالوك علي انتاجية الفول البلدي

عادل احمد عمران فكار - هدي السيد العربي إبراهيم* - محمود احمد رسلان**

المعمل المركزي لبحوث الحشائش - *المعمل المركزي لبحوث التصميم والتحليل الإحصائي-
** قسم بحوث البقوليات، معهد بحوث المحاصيل الحقلية- مركز البحوث الزراعية - الجيزة - مصر

ملخص

أجريت تجربتين حقليتين بمحطة البحوث الزراعية بشندويل- محافظة سوهاج - مركز البحوث الزراعية في موسمين متتاليين (2014/2013 و 2015/2014) في أرض مصابة بالهالوك لدراسة تأثير اثنين من ميعاد الزراعة (منتصف أكتوبر- والاول من نوفمبر) وثلاثة معاملات من التسميد (تسميد معدني بمعدل 20كجم/ف - تسميد عضوي بمعدل 20م³/ف - وبدون تسميد) وخمسة معاملات لمكافحة الهالوك (مبيد جليفوسيت بمعدل 50سم³/ف + نقاوة يدوية للهالوك - جليفوسيت بمعدل 75 سم³/ف متبوعا بنقاوة يدوية للهالوك - جليفوسيت مرتين بمعدل 75+50 سم³/ف - نقاوة يدوية للهالوك مرتين- بدون معاملة) علي مكافحة الهالوك وانتاجية الفول البلدي. أظهرت النتائج أن الزراعة في اوائل شهر نوفمبر خفضت بشكل ملحوظ ومعنوي الوزن الجاف للهالوك مقارنة بالزراعة في منتصف شهر أكتوبر حيث سجلت نسبة انخفاض في وزن الهالوك 23.54%. و أدى استخدام جليفوسيت بمعدل 50 سم³ أو 75 سم³ أو 50 سم³ + 75 سم³ إلى انخفاض الوزن الجاف للهالوك بنسبة 71.9%، 65.5%، 32.8% على التوالي مقارنة بالمعاملات الأخرى. سجل ميعاد الزراعة في منتصف شهر أكتوبر أعلى القيم من صفات النمو وأعلى قيم المحصول ومكوناته. وكان للنقاوة اليدوية أهمية في زيادة عدد القرون / نبات الوزن قرن / نبات الوزن البذور ووزن 100 بذرة، ومحصول البذور اربدب / فدان. اثر التسميد معنويا علي صفات الهالوك حيث قل عدد ووزن الهالوك باستخدام السماد المعدني ثم العضوي مقارنة بمعاملة الكنترول (بدون تسميد) حيث انخفض عدد ووزن الهالوك بنسبة 41.4 ، 39.8 ، 20.8 و 17.7% باستخدام السماد المعدني والعضوي علي التوالي. كما اخذ التسميد المعدني عدد ايام ظهور الهالوك فوق سطح التربة كان لاستخدام التسميد مردود معنوي علي المحصول ومكوناته حيث زاد طول النبات وعدد ووزن بذور النبات ووزن ال100بذرة ومحصول البذور(اربدب/ف).

اثرت معاملات مكافحة الهالوك معنويا علي عدد ووزن شماريخ الهالوك علاوة علي عدد الايام اللازمة لظهور الهالوك فوق سطح التربة حيث قل(عدد ووزن شماريخ الهالوك باستخدام باستخدام الجليفوسيت بمعدل 50سم³/ف متبوعا بنقاوة يدوية للهالوك او جليفوسيت بمعدل 75 سم³/ف متبوعا بنقاوة يدوية للهالوك كما زاد طول النبات ووزن قرون وبذور النبات ووزن ال100 بذرة ومحصول البذور (اربدب/ف) باستخدام تلك المعاملات بالمقارنة بمعاملة الكنترول.النقاوة اليدوية وجليفوسيت مرتين 50سم³ + 75 سم³ ادى لزيادة محصول البذور بنسبة 75.8 و 72.2% على التوالي. كما أن ميعاد الزراعة في منتصف أكتوبر، والتسميد المعدني مع استخدام جليفوسيت مرتين 50سم³ + 75 سم³ أعطى أفضل توليفة لزيادة المحصول وصفاته. وسجل أدنى محصول للبذور مع الزراعة في أول نوفمبر مع عدم التسميد وعدم استخدام مبيد الحشائش جايفوسيت. وهذا يفسر الدور المتكامل لميعاد الزراعة والتسميد ومبيدات مكافحة الحشائش في السيطرة على الهالوك. كذلك اظهرت النتائج وجود ارتباط عكسي قوى بين عدد ووزن الهالوك والصفات المدروسة حيث يقل عدد ووزن الهالوك ويزيد المحصول ومكوناته وذلك نتيجة استخدام مبيدات الحشائش .

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