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INVESTIGATIONS ON FABA BEANS, *Vicia faba* L. 22-REACTION OF SIX FABA BEAN GENOTYPES AND *Orobanche* TO THE HERBICIDE GLYPHOSATE

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ABSTRACT

The present investigation was carried out in naturally Orobanche infested fields, during 2002/2003 and 2003/2004 growing seasons to study the performance of six faba bean genotypes to foliar application of glyphosate with different doses for Orobanche characteristics, yield of faba bean and its attributes. Significant difference of environments (E) and treatments (T) were found for all studied traits. Data also showed that, genotypes and genotypes x environments had highly significant differences for all studied traits except for Orobanche numbers/plot and Orobanche dry weight/plot. The recommended dose (54 g/fed) recorded the desirable values for all studied traits followed by the 2/3 of the recommended dose (36 g/fed.). On the other hand, control (without glyphosate application) exhibited the higher number and dry weight of Orobanche and the lowest values of biological and seed yield/plot. Results of genotypes showed the variety Cairo 2 to possess the highest values of podded hosts, biological yield and seed yield/plot and recorded 91.4 %, 2.347 kg and 0.834 kg, respectively. On the contrary, Giza 2 exhibited the highest number of Orobanche/plot (12.5) and podless hosts (31.5 %), lowest biological and seed yields/plot (1.859 and 0.641 kg, respectively).

Key words: *Faba bean, Vicia faba, Environments, Genotypes, Foliar application, Glyphosate, G x T interaction.*

INTRODUCTION

Improving yield and its stability of faba bean genotypes with avoiding adversely effects of biotic and abiotic stresses is a major goal of plant breeding. This could be achieved using chemical control that may enhance the resistance of host genotypes. Faba bean (*Vicia faba* L.) is the most important food legume in Egypt. It is a valuable protein-rich food that provides a large sector of the human populations in some countries with a cheap source thus partly compensates for the large deficiency in animal protein sources. In addition, faba bean plays an important role in enhancing the soil fertility.

The parasitic weed *Orobanche crenata* Forsk. is an annual plant which is an obligate parasite on different legumes. It has been reported to be one of the most constraints in faba bean production in Egypt. It causes harmful losses to the host and in some cases may result in a crop failure. Losses of faba bean seed yield according to *Orobanche* infestation may be reach to 100 % (Darwish 1987 and Zaitoun 1990). Due to the extraordinary high number of seeds, their high viability in the soil for several years until germinated by secreted stimulant/s of proper host/s and long-lived seeds to

circulate by the wind control of broomrape is difficult (Kadry and Tewfic 1956, Hiron 1973, Whiteny 1978 and Wegmann *et al* 1991). Different methods were suggested to control broomrape and/or diminish its effects. These methods include chemical control (Khalaf *et al* 1994) and using tolerant host/s (Nassib *et al* 1979, 1982, Ibrahim *et al*, 1979, Abdalla 1982, Darwish 1982, 1987, Radwan *et al* 1988a and b, Darwish and Abdalla 1994, Khalil *et al* 1994, Abdalla and Darwish1994, 1996a & b and 1999 and Saber *et al* 1999). Herbicide application with legume crop seeds for broomrape control could be of interest since most broomrape infections normally occur in the crop root system near where the crop seeds are located (Garcia-Torres and Lopez-Granados 1991).

The objectives of this study were, therefore, to study the effect of foliar application of glyphosate with different doses on performance of six faba bean genotypes for *Orobanche* characteristics, yield of faba bean and its attributes.

MATERIALS AND METHODS

The present investigation was carried out under naturally *Orobanche* infested fields, of the Faculty of Agriculture, Cairo University, Giza, ARC-Giza and Farm field in Qualiub during 2002/2003 and 2003/2004 growing seasons. Table (1) shows seasons, locations and sowing dates of conducted trials.

Table 1. Season and location of trials

No.	Season	Location	Sowing date
1	2002/2003	Fac. Agric., Cairo Univ	Early
2	2002/2003	Fac. Agric., Cairo Univ	Normal
3	2002/2003	ARC, Giza	Normal
4	2003/2004	Fac. Agric., Cairo Univ	Normal
5	2003/2004	Qualuib	Normal

The code, origin and pedigree of studied genotypes and lines are presented in Table (2).

Table 2. Code, source and pedigree of studied varieties and lines

Code	Source	Pedigree
24 Hyto	Fac. Agric., Cairo Univ	Individual selection
Cairo 2	Fac. Agric., Cairo Univ	Synthetic from selected LR
Giza 429	FCRI, ARC	Selected from Giza 402
Line 396	FCRI, ARC	Individual selection from Yousef El-Sedeek
Giza 2	FCRI, ARC	Individual selection from LR
Misr 2	FCRI, ARC	Individual selection from Yousef El-Sedeek

Treatments were 3 herbicide (glyphostae) applications with three doses; 1) control (without herbicide), 2) 50 cm^3 (36 g. a.i.) and 75 cm^3 /Fed. (54 g. a.i.) of glyphosate. Foliar treatments was applied twice, the first was at 25 % of onset of flowering date and second was after 3 weeks from the first one. A split-plot arrangement in a randomized complete block design with three replications was used in all trials. Treatments were allocated to the main plots, while faba bean genotypes were randomized in the sub-plots. Each plot consisted of two ridges, each 3 m long and 60 cm apart. The seeds were sown in one side of the ridge in 2-seed hills distanced 20 cm. The normal sowing date was at Mid-November, while the early one was at the beginning of November. All the recommended agricultural practices for faba bean production were adopted at the proper time.

At harvest, five guarded plants were taken for collecting data based on plot means. The harvested plants were classified into podless and pod-bearing (two categories) and the number of plants/each class was determined. The number and the weights of *Orobanche* spikes/host, biological and seed yield/plot (kg) were determined.

Statistical manipulation

For statistical analysis, number and weight of *Orobanche* spikes/plant and percentage of podded plants were transformed to log (x+1), and arc sin, respectively (Darwish 1991b). The data of each trial as an environment was analyzed according to (Cochran and Cox 1957). The homogeneity tests of error variances indicated that error terms were homogeneous then the combined analysis over environments was performed.

RESULTS AND DISCUSSION

Significance of mean squares

Significance of mean squares due to various sources of variation for studied traits over environments is presented in Table (3). Highly significant variances were detected of environments for all studied traits. This indicates that environmental differences affected the performance of studied traits. Such effects may be attributed to the environmental changes and/or the geographic *Orobanche* population's capabilities that differed from environment to another. The effects of environmental differences on faba bean genotypes under *Orobanche* infestation were explored by Abdalla *et al* (2006) and El-Marsafawy (2006). The variation of *Orobanche* postulations were obtained by (Fischbeck *et al*, 1986, Darwish 1987 and Radwan *et al* 1988b).

Foliar application of glyphosate exhibited significant differences for all studied traits. This result indicates that glyphostae applications greatly influenced the performance of studied traits. On the other hand, genotypes

and G x E recorded highly significant variances for all studied traits except for *Orobanche* numbers and dry weight per plot.

Table 3. Significance of variance from combined analysis over environments

S.O.V	df	*Orobanche* number/plot [Log (x+1)]	*Orobanche* dry weight/plot, g [Log (x+1)]	Podded hosts % (arc sin)	Podless hosts % (arc sin)	Biological yield/plot, kg	Seed yield/plot, kg
Environments (E)	4	2.112**	4.279**	5798.828**	6208.169**	87.187**	13.930**
Treatments (T)	2	14.312**	24.375**	845.47*	2889.28**	5.074**	0.649**
E x T	8	0.410ns	0.675ns	150.656ns	415.362*	1.573ns	0.154ns
Genotypes (G)	5	0.319ns	0.543ns	639.195**	2272.887**	1.639**	0.246**
E x G	20	0.256ns	0.466ns	172.063**	1072.49**	1.183**	0.190**
T x G	10	0.203ns	0.428ns	87.204ns	136.71ns	0.461ns	0.123*
E x T x G	40	0.136ns	0.228ns	81.544*	142.338ns	0.269ns	0.057

ns, * and ** indicate insignificant and significant at 0.05 and 0.01 level of probability, respectively.

This result indicating that the performance of genotypes significantly differed from environment to another. Interaction between T x G and E x T x G exhibited insignificant differences for all studied traits except of T x G for seed yield/plot and E x T x G for podded hosts.

Mean performance

Mean performance of studied factor and traits over environments are given in Table (4). Concerning podded hosts %, biological and seed yield/plot (kg), Qualiub data (5) recorded higher means 94.7, 3.977 and 1.568 kg, respectively than those in other environments. On the other hand, the ARC-Giza trial 3 was infested with higher number and dry weights of *Orobanche* which recorded 19.8 and 78.79 (g), respectively.

Regarding to glyphostae foliar application, data revealed that the recommended dose (54 g/fed) recorded the desirable values for all studied traits followed by the 2/3 of the recommended dose (36 g/fed.). On the other hand, control (without glyphosate application) exhibited the highest numbers and dry weight of *Orobanche* and the lowest values of biological and seed yield/plot (kg). These results indicated that the glyphostae treatments are greatly influencing the infestation of *Orobanche* parasite. The low doses of herbicidal treatments were not satisfactory for controlling the parasite, which reflected in higher infestation and lower yields than recommended dose. On the other hands, the higher doses had harmful effects as toxic symptoms that reduced yield attributes in spite of reliable control of *Orobanche* (Darwish 1982). However, such effects varied greatly among different genotypes, which referred to the genotypic capabilities to tolerate over doses of herbicides. It's worth to mention that some herbicide-

sensitive faba bean genotypes may be negatively affected by recommended or low doses of glyphostae (Nassib *et al* 1990, Khalaf 1991, Hussein *et al* 1993 and Saber *et al* 1994). Found a host-close interaction when glyphosate was tested on 42 genotypes of faba beans.

Table 4. Mean of studied factors and traits in combined data

	Orobanche[1] number/plot Log (x+1)	*Orobanche*[1] dry weight/plot, g Log (x+1)	Podded hosts (arc sin)	Podles hosts (arc sin)	Biological yield/plot, kg	Seed yield/plot, kg
Environments						
1	3.6 e	7.67 e	85.1 b	14.9 b	1.265 c	0.460 c
2	12.4 b	39.32 b	90.7 ab	9.3 c	1.555 c	0.564 bc
3	19.8 a	78.79 a	91.9 a	8.1 c	2.666 cd	0.796 c
4	9.3 c	26.65 c	62.2 c	37.8 a	0.824 b	0.257 b
5	5.0 d	13.82 d	94.7 a	5.4 c	3.977 a	1.568 a
Foliar application						
Control	19.4 a	67.01 a	80.0 c	20.0 a	1.784 b	0.634 b
36 g /fed (a.i.g	9.0 b	27.74 b	84.5 b	15.5 b	2.178 a	0.758 a
54 g /fed (a.i.g	1.6 c	4.99 c	90.2 a	9.8 c	2.210 a	0.796 a
Genotypes						
Hyto 24	11.4 a	37.58 a	90.8 a	9.2c	2.205 ab	0.798 ab
Cairo 2	10.2 a	43.64 a	91.4 a	8.6c	2.347 a	0.834 a
Giza 429	9.9 a	29.06 a	80.7 b	19.3b	1.893 cd	0.692 c
Line 396	8.7 a	28.96 a	89.7 a	10.3c	2.080 bc	0.731 bc
Giza 2	12.5 a	34.73 a	68.5 c	31.5 a	1.859 d	0.641 c
Misr 2	7.3 a	25.53 a	88.3 a	11.7c	1.960 cd	0.679 c

Means followed by the same letters are not statistically different at 5 % level of probability.
[1] Actual data are tabulated and differences estimated from transformed ones.

Concerning the performance of genotypes over environments and doses results (Table 5) revealed that Cairo 2 possessed the highest values of podded hosts (91.4 %), biological yield (2.347 kg) and seed yield/plot (0.834 kg). Such result reflected the history of Cairo 2, being bred for tolerance to *Orobanche*. These results are in agreement with those obtained by Abdalla and Darwish (1996a&b). On the contrary, Giza 2 exhibited the highest number of *Orobanche*/plot (12.5) and podless hosts (31.5%), lowest biological and seed yields/plot (1.859 and 0.641 kg, respectively). This result may be due to the susceptibility of this cultivar and is harmony with those obtained by Attia (1998).

According to combined analysis of variance, G x T interaction exhibited insignificant differences for all studied traits except seed yield/plot (kg). This result indicates that the behaviour of genotypes under different doses of glyphosate is similar.

Table 5. Interaction effects between glyphostae treatments and faba bean genotypes over environments.

	No. of *Orobanche*/plot				Seed yield/plot (kg)			
	Control	36 a.i.g	54 a.i.g	Mean	Control	36 a.i.g	54 a.i.g	Mean
Hyto 24	20.7	10.6	2.9	11.4	0.637	0.823	0.933	0.798
Cairo 2	21.8	7.8	1.1	10.2	0.800	0.836	0.866	0.834
Giza 429	14.5	13.5	1.6	9.9	0.614	0.668	0.793	0.692
Line 396	16.4	9.5	0.2	8.7	0.606	0.775	0.810	0.731
Giza 2	27.4	8.2	1.9	12.5	0.483	0.841	0.600	0.641
Misr 2	15.4	4.6	1.9	7.3	0.661	0.604	0.773	0.679
Mean	19.4	9.0	1.6		0.634	0.758	0.796	
LSD 0.05 for								
Treatment (T)			0.2				0.090	
Genotypes (G)			NS				0.100	
T x G			NS				0.172	

Finally it is observed that glyphosate application had improved reaction of hosts to Orobanche and also improved seed yield per plot. This occurred in both tolerant and susceptible faba bean genotypes.

REFERENCES

Abdalla, M.M.F. (1982). Characteristics of a local faba bean collection and its reaction to *Orobanche*. G. Hawtin and C. Webb (Eds.) Faba Bean Improvement: 207-212. Martinus Nijhoff, Netherlands

Abdalla, M.M.F. and D.S. Darwish (1994). Breeding faba beans for *Orobanche* tolerance at Cairo University. In Pieterse, A.H., J.A.C. Verkleij and S.J. Ter Borg (Eds.). Biology and Management of *Orobanche* and related *Striga* research. Proc. 3rd Inter. Work. Amsterdam, Netherlands. Royal Tropical Institute: 450-454.

Abdalla, M.M.F. and D.S. Darwish (1996a). Investigations on faba beans, *Vicia faba* L. 5. Improving faba bean yield aecompanying selection to *Orobanche* tolerance. Proc. 7th Egypt. Agron. Conf. Mansoura: 171-178.

Abdalla, M.M.F. and D.S. Darwish (1996b). Investigations on faba beans, *Vicia faba* L. 7. Cairo 2 and Cairo 241, two new *Orobanche* tolerant varieties. Proc. 7th Egypt. Agron. Conf. Mansoura: 187-201.

Abdalla, M.M.F. and D.S. Darwish (1999). Breeding faba beans for *Orobanche* tolerance using the concept of breeding for uniform resistance. In: Kroschal, J., M. Abderabihi, H. Betz (eds.). Advances in parasite weed control at on-farm level. Vol. 2. Joint action to control *Orobanche* in the WANA region. Margraf Verlag. Weikershein, Germany: 205-213.

Attia, Sabah M. (1998). Performance of some faba bean genotypes and hybrids and reaction to *Orobanche*. Ph.D. Thesis, Fac. Agric. Cairo University, Egypt.

Cochran, W.G. and G.M. Cox (1957). Experimental Designs: 403-415. John Wiley, New York.

Darwish, D.S. (1982). Reaction of a faba bean collection to *Orobanche* and the effects of glyphosate on the host and the parasite. M.Sc. Thesis, Fac. Agric., Cairo Univ., Egypt.

Darwish, D.S. (1987). Studies on selection for broomrape tolerance in faba bean and host-parasite interrelationship. Ph.D. Thesis, Fac. Agric., Cairo Univ., Egypt.

Darwish, D.S. (1991b). Resource allocation in screening for broomrape tolerance in faba beans. In: Ransom, J.K., L.J. Musselman, A.D. Worsham and C. Parker (eds.). Proc. 5th Inter. Symp. Parasitic Weeds, Nairobi: CYMMYT, 346-351.

Darwish, D.S. and M.M.F. Abdalla (1994). Investigations on faba beans, *Vicia faba* L. 4. Cairo 1 and Cairo 375, two newly developed varieties. Proc. 6th Conf. Agron. Al-Azhar Univ., Cairo, Egypt, Sept, Vol II: 633-650.

Fischbeck, G., M.M.F. Abdalla, A.A. Metwally and D.S. Darwish (1986). Variation of *Vicia faba* L. genotypes and populations of *Orobanche crenata* Forsk. Proc. 2nd Conf. Agron. Alex. Egypt. Vol. 2: 499-514

Garcia-Torres, L. and F. Lopez-Granados (1991). Broomrape (*Orobanche crenata* Forsk.) control in broad beans (*Vicia faba* L.) with imidazolines and other herbicides. Weed Res. 31: 227-236.

Hiron, R.W.P. (1973). An investigation into the processes involved in germination of *Orobanche crenata* using a new bio-assay technique. In: Symposium on parasitic weeds. Proceedings of the 1st EWRC, Parasitic Weeds Research Group. Wageningen, 76-88.

Hussein, A.H.A., S.A. Saleh, E.E. Hassanein and M.A. El-Deeb (1993). Effect of glyphosate application and rhizobium inoculation on *Orobanche* control, symbiotic nitrogen fixation and yield of faba bean. Ann. Agric. Sci. 38 (2): 411-422.

Ibrahim, A.A., M.K. Zahran, A.M. Nassib, F.H. Farag and H.M. Farag (1979). The resistance of broad bean (*Vicia faba*) varieties to *Orobanche crenata* Forsk and their response to chemical control. In: FABIS Newsletter (1): 28.

Kadry, A.R. and H. Tewfik (1956). Seed germination in *Orobanche crenata* Forsk. Svensk Botanisk Tidskrift 50: 270-286.

Khalaf, K.A. (1991). Herbicidal activity of glyphosate on *Vicia faba* stimulants and germination of *Orobanche crenata* seeds *in vitro*. In: Weymann, K. and L.J. Musselman (eds.). Progress in *Orobanche* Research. Proceedings of the International Workshop on *Orobanche* research, Obermarchtal, Germany 209-214.

Khalaf, K.A., R.R. El-Masry and Nadia Mesiha (1994). Effect of soil treatment with dazomet (Basamid) on *Orobanche crenata* and *Cuscuta planiflora*. In: A.H. Pieterse, J.A.C. Verkleij and S.J. ter Borg (eds.). biology Management of *Orobanche*. Proceedings of the Third International Workshop on *Orobanche* and related *Striga* research, RTI, Amsterdam, The Netherlands, 576-579.

Khalil, S.A.M., H.A. Saber, M.H. El-Sherbeeny, M.M. El-Hady and S.R. Saleeb (1994). Present state of *Orobanche* resistance breeding in Egypt. In: Pieterse, A.H., J.A.C. Verkleij and S.J. ter Borg (eds.). biology and Management of *Orobanche*, Proc. 3rd Inter. Workshop on *Orobanche* and related *Striga* Research, Amsterdam, Netherlands, RTI: 455-462.

Nassib, A.M., A.A. Ibrahim and H.A. Saber (1979). Broomrape (*Orobanche crenata*) resistance in broad beans: Breeding work in Egypt. In: Hawtin, G.C. and G.C.

Chancellor (eds.). Proceeding a workshop held at the University of Allepo, Syria, 2-7 May, 1978. 133-135.

Nassib, A.M., A.A. Ibrahim and S.A. Khalil (1982). Breeding for resistance to *Orobanche*. In: Hawtin, G.C. and C. Webb (eds.): Faba Bean Improvement: ICARDA, Aleppo, Syria, 199-206. Martinus Nijhoff, Netherlands.

Nassib, A.M., E.E. Hassanein and A.H.A. Hussein (1990). Broomrape control in faba (*Vicia faba* L.) with reduced rates of glyphostae mixed with three adjuvants. Ann. Agric. Sci. Moshtohor 28 (1): 17-25.

Radwan, M.S., M.M.F. Abdalla, G. Fischbeck, A.A. Metwally and D.S. Darwish (1988a). Selection of faba bean for tolerance to broomrape, *Orobanche crenata* Forsk. Plant Breeding 100: 289-298.

Radwan, M.S., M.M.F. Abdalla, G. Fischbeck, A.A. Metwally and D.S. Darwish (1988b). Variation in reaction of faba bean lines to different accessions of *Orobanche crenata* Forsk. Plant Breeding 101: 208-216.

Saber, H.A., M.M. El-Hady, S.A. Khalil, M.H. El-Sherbeeny and M.W. Hassan (1994). New herbicides for *Orobanche* control in faba bean in Egypt. In: Pieterse, A.H., J.A.C. Verkleij and S.J. ter Borg (eds.). Biology Management of *Orobanche*. Proceedings of the Third International Workshop on *Orobanche* and related *Striga* research, RTI, Amsterdam, The Netherlands, 572-575.

Saber, H.A., M.A. Omar, M.M. El-Hady, Samia A. Mahmoud, N.M. Abou-Zeid and M.M. Radi (1999). Performance of newly bred faba bean line (X-843) resistant to *Orobanche* in Egypt. In: Kroschel, J., M. Abderabihi and H. Betz (eds.). Advances in parasitic weed control at on-farm level. Vol. 2. Joint action to control *Orobanche* in the WANA Region. Margraf Verlag, Weikersheim, Germany 227-237.

Wegmann, K., E. von Elert, H.J. Harloff and M. Stadler (1991). Tolerance and resistance to *Orobanche*. In: K. Wegmann and L.J. Musselman (Eds.) Progress in *Orobanche* research. Eberhard-Karls. Universtat FRG 318-321.

Whiteny, P.J. (1978). Broomrape (*Orobanche*) seed germination inhibitors from plant root. Ann. Appl. Bio. 89: 475-478.

Zaitoun, F.M.F. (1990). Studies on the resistance and susceptibility of broad bean (*Vicia faba* L.) to broomrape (*Orobanche crenata* Forsk.). Ph. D. Thesis, Fac. Agric., Alexandria Univ., Egypt.

دراسات علي الفول البلدي

٢٢ - تأثر ستة أصناف من الفول البلدى والهالوك بمبيد الحشائش الجليفوسات

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أجريت هذه الدراسة تحت ظروف العدوى الطبيعية للهالوك فى كلية الزراعة-جامعة القاهرة خلال الموسمين 2003/2002، 2004/2003 وكذلك فى مركز البحوث الزراعية وفى محافظة القليوبية. وتهدف الى دراسة سلوك بعض التراكيب الوراثية للفول البلدى (24 هايتو، قاهره 2، جيزه 429، سلاله 396، جيزه 2 و مصر 2) نتيجة الرش بجرعات مختلفة من مبيد الجليفوسات (صفر، 50 و75 سم^3)على صفات الهالوك والمحصول البيولوجى ومحصول البذور للقطعة التجريبية. أظهرت النتائج اختلافات عالية المعنوية للبيئات ومعاملات الرش

بالجليفوسات لكل الصفات المدروسة. كما أظهرت النتائج ان التراكيب الوراثية وتفاعل التراكيب الوراثية مع البيئات كانت عالية المعنوية لكل الصفات المدروسة فيما عدا عدد ووزن الهالوك للقطعة. كما عكست النتائج ان معاملة الرش الموصى بها (54 جم/فدان) سجلت افضل القيم لكل الصفات المدروسة تلتها 3/2 الكمية الموصى بها (36 جم/فدان). بينما حلت فى المرتبة الأخيرة معاملة الكنترول حيث سجلت أعلى عدد ووزن لهالوك القطعة واقل قيم للحاصل البيولوجى ومحصول البذور للقطعة.

كما أظهرت النتائج ان الصنف قاهرة 2 سجل أعلى القيم للنباتات الحاملة للقرون والمحصول البيولوجى ومحصول البذور حيث سجل 91.4، 2.347 كجم، 0.834 كجم على التوالى. على الجانب الأخر فقد سجل الصنف جيزة 2 أعلى قيم لعدد ووزن الهالوك واقل قيم للمحصول البيولوجى ومحصول البذور وهذا يرجع لحساسية هذا الصنف.