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EFFECT OF SOME CULTURAL PRACTICES IN REDUCING THE INCIDENCE OF FABA BEAN NECROTIC YELLOWS VIRUS IN FABA BEAN FIELDS IN EGYPT

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ABSTRACT

Two trials were conducted for two seasons (1997/98 and 1998/99) at Sids research station (Middle Egypt). One trial with full protection against aphids and another without chemical control, both trials were subjected to roguing and non roguing of diseased plants. A split-plot design with three replications was used. The effect of three sowing dates (25 October, 15 November and 5 December) on percentage rate of infection by FBNYV in faba been cultivar Giza 429 was studied. Rate of infection increases with delayed sowing. Roguing of diseased plants out of the field was found to be efficient in reducing the rate of infection wither insecticides was used or not . Early sowing combined with roguing and chemical spray against aphids was superior to other treatments in reducing the rate of infection reaching only 2.04% compared to 44.55% without roguing, chemical control and delayed sowing over two season. Using the same cultural practices package in demonstration plots resulted in an increase in seed yield of 69% more than that of neighboring farmers' fields.

INTRODUCTION

Faba bean(*Vicia faba* L.) is an important food legume crop in Egypt and occupies around 140.00 hectares with an average seed yield of 3.00 t/ha during the last five years (1997/2001). About 40% of this area is planted in Middle and Upper Egypt during 1991/92 sowing season, faba been production in these two geographical zones was hardly hit by a faba bean virus diseases. Faba Been Necrotic Yellows Virus (FBNYV) was isolated for the first time in Egypt from naturally infected faba been plants during 1992/93 growing season, and this virus can cause 100% yield loss in infected faba been plants.

The abnormal situation called for intensive investigations to identify the causal pathogens to develop the appropriate control measures. Results of field survey (Makhouk *et al.*, 1992 and 1994) conducted under the Nile Valley Regional Program (NVRP) indicated that FBNYV was the virus with highest incidence (62.1%) of the 1166 samples tested followed by FBYMV (31.2%). In the following years, FBNYV continued to be an important constraints for faba bean production and losses in Middle and Upper Egypt due to this virus were estimated at 20-25% annually. Since host resistance is consider the most effective and environment friendly approach for control virus diseases in crops, effort continued to screen a large number of faba bean genotypes in Egypt for their resistance to FBNYV. So far no genotypes has been identified to have acceptable level of FBNYV resistance (Mahmoud *et al.*, 1998). Complete crop failure occurred when faba bean plants are inoculated with

FBNYV-carrying aphids at a very young stage, and infection by the virus at later growing stages are economically less important. Similarly in Middle and Upper Egypt, faba bean fields when planted very early in the season (early October) suffered high incidence of FBNYV, sometimes reaching 100%. Accordingly, FBNYV epidemic which result from movement of high populations of viruliferous aphids can be avoided by proper timing of sowing date. In Egypt, Food Legumes Section, ARC suggested that roguing FBNYV infected plants in the field early in the season has a positive effect in reducing virus spread in the field. Similar observations were made earlier in relation to other viruses effecting leguminous crops (A'Brook, J. 1964). Based on this available information, a number of cultural practices which has potential in reducing virus spread in the field was evaluated in this paper.

MATERIALS AND METHODS

Tow trials were conducted during 1997/98 and 1998/99 growing seasons, at Sids research station (Middle Egypt), to estimate infection percentage of faba bean plants with Necrotic yellow virus (FBNYV). One experiment was sprayed three times with Pirimor aphicide 50% (0.75 g/L), to keep it aphid free until harvest. The second experiment was not sprayed with any insecticide and left for natural infection with aphids. The recommended cultivar Giza 429 was used in this study. A spilt plot design with three replications was used in both trials. The main plot was assigned to sowing dates (October 25, November 15 and December 5), whereas sub-plot was devoted to (a- roguing of diseased plants and b- no roguing). Each plot consist of 6 ridges, four meters length with 60 cm between ridges apart. Plants took place on both side of ridges in single seeded hills (20 cm apart). Roguing of diseased plants has been done 3 times in each plot in both seasons and the total number of healthy and infected plants were counted then the infection percentage was calculated. The yield losses (t/ha) was estimated in 1998/99 season).

In 2000/2001 growing season, five demonstration plots in an area of 5 fed. involving five farmers (participant) were chosen at EL-Fashn district, Beni-Suef governorate. The recommended cultural practices as mentioned in the previous years included: Improved cultivar, sowing date, aphid control and roguing of diseased plants. Three random sample plots each of 42m^2 in participant and nonparticipant farmers were taken by technical staff to estimate seed yield.

RESULTS AND DISCUSSIONS

1-Percentage of infection :

Infection percentage of FBNYV with and without roguing of plants with chemical application is presented in Tables 1 and 2. Results indicated that rate of infection increases with delayed sowing dates. Roguing of diseased plants out of the field was found to be efficient in reducing the rate of infection either insecticide was used or not. Early sowing combined with

roguing and chemical spray against aphides was superior to other treatments in reducing the rate of infection reaching only 2.05% compared to 44.6% without roguing, chemical control and delayed sowing over two seasons. These results are in agreement with those finding obtained by A'Book, 1964 who reported that the incidence of virus disease and the vector *Aphis craccivora* increase with delayed sowing.

Table 1: Infection (%) of FBNYV with and without roguing of diseased plants and insecticide application during 1997/98, season

Sowing date	Roguing	Spray				Non Spray			
		Total number of plants	No. of healthy plants	No. of infected plants	Infection %	Total number of plants	No. of healthy plants	No. of infected plants	Infection %
October 25	a	300	293	7	2.3	297	260	37	12.5
	b	300	253	47	15.7	294	202	92	31.3
November 15	a	300	284	16	5.3	294	246	48	16.3
	b	294	224	70	23.8	291	190	101	34.7
December 5	a	297	251	50	15.5	294	237	57	19.4
	b	300	202	98	32.7	297	187	110	37.0

a= roguing (discarded all infected plants with virus diseases)
b= without roguing (all infected plants were left)

Table 2: Infection (%) of FBNYV with and without roguing of diseased plants and insecticide application during 1998/99, season.

Sowing date	Roguing	Spray				Non Spray			
		Total number of plants	No. of healthy plants	No. of infected plants	Infection %	Total number of plants	No. of healthy plants	No. of infected plants	Infection %
October 25	a	340	334	7	1.8	352	308	44	12.5
	b	360	306	54	15.0	340	256	84	24.7
November 15	a	336	304	32	9.5	348	264	84	21.4
	b	352	272	80	22.7	360	224	136	37.8
December 5	a	328	260	68	20.7	344	214	130	38.0
	b	354	220	134	37.9	360	172	188	52.2

a= roguing (discarded all infected plants with virus diseases)
b= without roguing (all infected plants were left)

II- Seed yield t/ha

a – Effect of sowing date :

Results in Table 3 indicated that seed yield (t/ha) gradually decreased by delayed sowing .Early and second sowing with chemical application increased seed yield by 266% and 165% compared with late sowing. On the other hand, early and second sowing without chemical application increased seed yield by 627 and 473% compared with late sowing. This result proved the important of early sowing in increasing seed yield.

Table3: Effect of 3 sowing dates, with and without roguing and insecticide application on seed yield (t/ha), 1998/99 season

Sowing date	Spray insecticide			Non spray insecticide		
	Roguing			Roguing		
	a	b	Mean	A	b	Mean
October 25	3.84	3.12	3.48	2.35	2.01	2.18
November 15	2.92	2.11	2.52	1.78	1.65	1.72
December 5	1.25	0.65	0.95	0.39	0.20	0.30
Mean	2.67	1.69		1.51	1.29	
LSD (P<0.05)						
Sowing date	0.81			0.32		
Roguing	0.48			0.34		
Interaction	0.84			0.59		
C.V%	17.75			17.62		

Table 4: Mean faba bean yield (t/ha) of the cultural practices package fields compared with neighboring farmers' fields at EL-Fashn district, Beni-Suef governorate, during 2000/2001 season.

	Location					Mean	S.D.
	1	2	3	4	5		
Participant farmer (PF)	4.98	4.75	3.87	3.87	4.98	4.49	0.57
Nonparticipant farmer (NF)	2.21	2.77	2.21	3.14	2.95	2.66	0.43
PF-NF (t/ha)	2.77	1.99	1.66	0.75	2.03	1.83	
PF-NF (%)	125.3	71.8	75.1	23.2	68.8	68.8	

b- Effect of roguing

Roguing of diseased plants with application of aphicide increased seed yield by 58% over non roguing. On the other hand, seed yield was increased by 17% with roguing without application of aphicide.

c- Interaction between sowing dates and roguing:

Results in Table 3 revealed that roguing of diseased plants was superior over non roguing in all sowing dates. Also, seed yield was decreased with delayed sowing dates either with and without application of aphicide. Early sowing (Oct. 25) with roguing and chemical spray gave the highest seed yield(3.84 t/ha) on the other hand, delayed sowing(Dec. 5) without roguing and without spray gave lowest seed yield (0.20 t/ha).

III- Demonstration of the cultural practices:

Demonstration of the cultural practices package data presented in Table 4 show the results of cultural practices package where the recommended variety Giza 429 and cultural practices were utilized. The average seed yield of participant farmers ranged from 3.87 to 4.98 t/ha with an average of 4.49 t/ha, while the average seed yield of nonparticipant farmers ranged from 2.21 to 3.14 t/ha. The percentage increase in seed yield was 68.8% more than that of nonparticipant farmers.

CONCLUSION

It can be concluded that early sowing combined with roguing and chemical spray against aphids was superior to other treatments in reducing the rate of infection (2.05%) and significantly increased seed yield. The cultural practices package was agronomically superior to farmers' traditional practices as resulted in higher yield at the hot spot in Beni-Suef governorate.

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تأثير بعض العمليات الزراعية في تقليل الإصابة بفيروس تقزم وموت البادرات في الفول البلدي بمصر

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يعتبر الفول البلدي من أهم المحاصيل البقولية الغذائية في مصر و متوسط المساحة المنزرعة من محصول الفول خلال الفترة من ١٩٩٧ حتي ٢٠٠١ حوالي ١٤٠ ألف هكتار ومتوسط المحصول ٣ طن/ هكتار ويعتبر فيروس تقزم وموت البادرات (FBNYV) من أخطر الفيروسات التي تصيب الفول البلدي حيث تم عزل الفيروس لأول مرة في موسم ١٩٩٢/٩٣. ويسبب هذا الفيروس نقص في المحصول يصل الي ١٠٠% في الحقول المصابة. وقد أجريت تجربتين في موسمي ١٩٩٧/٩٨و ١٩٩٨/٩٩ لدراسة بعض المعاملات الزراعية التي تقلل الإصابة بهذا الفيروس. التجربة الأولي تم فيها مقاومة المن كيميائيا والتجربة الأخرى تركت بدون مقاومة للمن. وكلا التجربتين شملت علي معاملتين الاولي إزالة النباتات المصابة والثانية عدم إزالة النباتات المصابة لنشر الفيروس وقد استخدم في كلا التجربتين تصميم القطع المنشقة في ثلاث مكررات لدراسة تأثير مواعيد الزراعة (٢٥ أكتوبر و١٥ نوفمبر و٥ ديسمبر) علي نسبة الإصابة بفيروس تقزم وموت البادرات علي صنف الفول البلدي جيزة ٤٢٩. وقد أظهرت النتائج أن نسبة الإصابة بالفيروس تزداد بالتأخير في الزراعة. كما إن معاملة إزالة النباتات المصابة من الحقل كان لها تأثير في تقليل نسبة الإصابة سواء تحت الرش لمقاومة المن من عدمه. أوضحت النتائج ان الزراعة المبكرة مع إزالة النباتات المصابة واستخدام المبيدات المقاومة للمن أدت الي تقليل الإصابة بالفيروس الي ٢,٠٤% مقارنة مع حالة التأخير في الزراعة وعدم إزالة النباتات المصابة بالإضافة الي عدم مقاومة المن حيث كان متوسط الإصابة في الموسمين ٤٤,٥٥% .

وجد أنه باستخدام حزمة التوصيات السابقة في حقول المزارعين أدت الي زيادة محصول البذور بحوالي ٦٩% مقارنة بالحقول المجاورة التي لم تطبق بها هذه التوصيات.