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INTEGRATED CONTROL OF ROOT-ROT/WILT DISEASES IN FABA BEAN, LENTIL AND CHICKPEA

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Abstract

An experiment for controlling root-rot/wilt diseases in faba bean, lentil and chickpea has been carried out in pots at Giza Res. Station. Two cultivars from each crop, two fungicides and two pathogeric fungi plus mixture were used to study the interaction between all of them.

Results showed that, the interaction between fungicides, fungi, and cultivars were significant in faba bean and lentil crops, and not significant in chickpea crop. Also, it indicated that fungicides were effective in controlling these diseases in the three crops especially in the seedling stage. The effect of cultivars on the incidence of the diseases were varied from crop to another.

INTRODUCTION

Damping-off, root-rot and wilt diseases are still the most important diseases affecting faba bean. Lentil and chickpea crops in Egypt, causing considerable damage and losses in the annual seed yield. *R.solani* and *F.oxysporum* are the main pathogens of these diseases (Mohamed 1982, Abou-Zeid *et al.* 1990, El-Awadi 1993 and El-Garhy 1994).

In order to increase the productivity, the legume crops should be protected from root-rot/wilt disease complex, and other diseases as well. Intergrated control programs of plant diseases are the most successful and economical means in controlling diseases, especially when all availale pertinent information regarding the crops, its pathogens, the environmental condition expected to prevail, locality,

availability of materials and costs are taken account in developing the control program (Agrios 1988). In these programs, different methods are applied together to reach such target. Healthy seed, host resistance, pesticide application, biological control and cultural practices can be manipulated to reach an economic disease management system that keeps the disease damage below economic threshold (Agrios 1988).

This work is an attempt to study the effect of certain fungicides and cultivars on controlling root-rot and wilt diseases caused by *R.solani* and *F.oxysporum* in faba bean, lentil and chickpea to reach the best ways for controlling these diseases.

MATERIALS AND METHODS

This experiment was carried out in the greenhouse at Giza Res. Station during 1995/1996 season. Field soil and clay pots (25 cm diameter) were sterilized using 5% formalin solution. Fungal inocula were prepared by growing the tested cultures on sand-sorgum medium (1:3 w/w) for 3 weeks at 25+2°C. Sterilized soil was divided to several parts. Each part of sterilized soil was infested with one tested fungal culture or mixture of cultures at the rate of 3% (w/w). Sterilized pots were potted with the infested soil, three pots for each treatment. Pots were watered and left for one week in moist state to enhance the fungal growth before planting. Seeds of two cultivars from each crop were divided into three groups; one treated with the fungicide Rizolex-T at the rate of 3g/1 kg seed, the second treated with Quinolate-pro at 3g/1kg seed and the third was left without treatment to serve as control. Negative controls were included in each treatment for comparison.

Treated and untreated seeds were planted at the rate of 10 seeds/pot. The pots were arranged in a randomized complete block design. The two cultivars of faba bean used in this experiment were Giza 3 and Giza 402 and the tested fungi were *R.solani, F.oxysporum* f.sp fabae and mixture of both . In lentil, the two cultivars used were Giza 9 and Giza 370 and the tested fungi were *R.solani, F.oxysporum* f.sp *lentis* and mixture of both. In the case of chickpea, the two used cultivars were Giza 88 and Giza 831 and the tested fungi were *R.solani, F.oxysporum f.sp.ciceri* and mixture of both.

Seeds of all tested cultivars were obtained from Food Legume Res. Dept., FCRI, ARC, Giza and the fungal cultures were obtained from (the culture collection of

the Food Legume Diseases Dept., PPRI, ARC. Giza, Egypt.

Data were recorded after 3,5 and 12 weeks from planting for pre-emergence damping-off, post emergence damping-off and survival plants, respectively.

RESULTS AND DISCUSSION

Faba bean :

Data in Table (1) show the effects of both fungi and fungicides on the percentage of pre-emergance damping-off which were significant, while the effect of cultivars on the disease incidence was not significant. Also, the effect of fungicides on fungi was significant, while the effects of both fungi and fungicides on the cultivars were not significant. Moreover, the interaction between fungicides, fungi and cultivars was significant. It means that percentages of damping-off caused by *R.solani* were 100% in both cultivars, and in the case of mixed fungi were 80 and 100% in the cultivars Giza 3 and Giza 402, respectively, while in *F.oxysporum*, percentages of damping-off were 20 and 13.3% only in the cultivars Giza 3 and Giza 402, respectively.

Table 1. Effect of faba bean cultivars and seed treatment with fungicides on controlling root rot/wilt diseases .

Fungicides	Cultivars	% of pre-emergence damping-off			% of pre-emergence damping-off			% of survival plants		
		Rs	Fo	Rs+Fo	Rs	Fo	Rs+Fo	Rs	Fo	Rs+Fo
Rizolex-T	Giza 3	13.3	10.0	23.3	0.0	0.0	0.0	86.7	90.0	76.7
	Giza 402	3.3	13.0	16.7	3.3	0.0	0.0	93.4	86.7	83.3
Quinolate	Giza 3	86.7	0.0	63.3	3.3	0.0	0.0	10.0	100.0	36.7
pro	Giza 402	80.0	13.3	40.0	0.0	0.0	3.3	20.0	86.7	56.7
Untreated	Giza 3	100.0	20.0	80.0	0.0	0.0	0.0	0.0	80.0	20.0
seeds	Giza 402	100.0	13.3	100.0	0.0	0.0	0.0	0.0	86.7	0.0

Rs = R.solani Fo = F.oxysporum

L.S.D. at 5 % for Fungi	(F) = 11.41	= N.S.	= 12.59
Fungicides	(D) = 10.33	= N.S.	= 9.83
Cultivars	(C) = N.S.	= N.S.	= N.S.
F X D	= 17.9	= N.S.	= 17.02
F X C	= N.S.	= N.S.	= N.S.
D X C	= N.S.	= N.S.	= N.S.
F X C	= 19.95	= N.S.	= 1915.

Data clearly show that, Rizolex-T was highly effective in controlling pre-emergence damping-off caused by both *R.solani* and the mixture of fungi (*R.solani* and *F.oxysporum*) in faba bean cultivars, while it was less effective in the case of *F.oxysporum*. On the other hand, Quinolate-pro was less effective in controlling pre-emergence damping-off caused by *R.solani* in both faba bean cultivars, and moderately effective with the fungal mixture (*R.solani* and *F.oxysporum*). Effect of Quinolate-pro on pre-emergence damping-off caused by *F. oxysporum* was varied depending on the cultivar. It was highly effective in controlling pre-emergence damping-off with Giza 3 cultivar (0.0%), while it was not effective with Giza 402 cultivar (13.3%).

Data also show that, all treatments on the post-emergence damping-off were not significant and percentage of infected plants was very low. In addition, treatments with fungicides increased the percentage of survival plants compared with the control. Also, the correlation between the percentages of pre-emergence damping-off and the percentages of survival plants could be noticed.

Generally, it could be concluded that, the effect of fungicides were varied with respect to different species of fungi and also varieties of faba bean. In this connection, it should be mentioned that Gruzdyev *et al.* (1988) stated that some fungicides display toxicity only with respect to separate species of pathogens, whereas others have a broad spectrum of action and are effective against many pathogens. Also, Barakat *et al.* (1976) added that the variable response of different varieties to a particular fungicide, may indicate importance of further testing the promising fungicides on different varieties before any recommendation are put forward. Besides, Mohamed (1982) mentioned that, under field condition Giza 402 cultivar of faba bean was the least infected seedlings with root-rot/wilt diseases and produced the highest yield, while Giza 2 cultivar was the most susceptable one. He also added, *R.solani* caused severe losses in early, but not in late, plantings in Egypt.

Lentil :

Data in Table (2) indicate that, *R.solani* alone or when mixed with *F.oxysporum* increased the percentages of pre-and post-emergence damping-off and decreased the percentage of survival plants than *F.oxysporum* alone with significant difference between the two tested lentil cultivars; Giza 9 and Giza 370. Rizolex-T was more effective in controlling pre-emergence damping-off caused by *F.oxysporum* than that caused by both *R.solani* and mixture of both fungi. On the contrary, Quinolate-pro

was more effective in controlling pre-emergence damping-off caused by *F.oxysporum* than that caused by both *R.solani* and the mixture.

The effect of seed treatment with fungicides on the percentage of post-emergence damping-off generally was not significant, while the percentage of survival plants increased significantly compared with the control. Data also showed that, cultivar Giza 9 was more susceptttble to *R.solani* and *F.oxysporum* than Giza 370. Also, the interaction between fungi, fungicides and cultivars was significant.

These results are in agreement with several investigators. Kamaiyan and Nene (1975) reported that some cultivars of lentil are more resistance in the seedling stage, while others are more resistance in the mature plant stage. Also, Mehrotra and Claudius (1973) found that pre-soaking lentil seeds in an 80 ppm concentration of Zn and Mn salts reduced Fusarium wilt. They also added, late-sown (November-December) cultivars wilted less than earlier-sown cultivars due to soil temperature differences.

Table 2. Effect of lentil cultivars and seed treatment with fungicides on controlling root rot/wilt diseases .

Fungicides	Cultivars	% of pre-emergence damping-off			% of pre-emergence damping-off			% of survival plants		
		Rs	Fo	Rs+Fo	Rs	Fo	Rs+Fo	Rs	Fo	Rs+Fo
Rizolex-T	Giza 9	20.0	13.3	18.3	0.0	0.0	3.3	80.0	86.7	78.4
	Giza 370	25.0	13.3	20.0	0.0	0.0	3.3	75.0	86.7	76.7
Quinolate	Giza 9	95.0	25.0	90.0	0.0	1.7	0.0	5.00	73.3	10.0
pro	Giza 370	55.0	26.7	83.3	0.0	1.7	0.0	45.0	71.6	16.7
Untreated	Giza 9	100.0	31.7	100.0	0.0	8.3	0.0	0.0	60.0	0.0
seeds	Giza 370	88.3	25.0	83.3	0.0	11.7	0.0	11.7	63.3	16.7

Rs = R.solani Fo = F.oxysporum

L.S.D. at 5 % for Fungi (F) = 4.02 = N.S. = 4.31
Fungicides (D) = 2.78 = N.S. = 2.74
Cultivars (C) = 2.42. = N.S. = 2.64
F = 4.28 = N.S. = 4.74
D = 4.29 = N.S. = 4.58
F X = 4.29. = N.S. = 4.58
= 7.43. = N.S. = 7.93

Chickpea :

Data presented in Table (3) show that, *R.solani* alone and the mixture of the two fungi killed all chickpea seedlings in the pre-emergence stage in both cultivars, while *F.oxysporum* killed most of the chickpea seedlings in both cultivars in the same stage also, without significance between different fungal treatments. Both fungicides were generally effective in controlling pre-emergence damping-off in all fungal treatments in both cultivars. Rizolex-T was more effective in controlling pre-emergence damping-off in all fungi treatments than Quinolate-pro especially with Giza 88 cultivar. Data also show that, percentages of post-emergence damping-off in all treatments were very low, while percentages of survival plants were high in the treated seed compared with untreated seed in both cultivars.

Table 3. Effect of chichpea cultivars and seed treatment with fungicides on controlling root rot/wilt diseases .

Fungicides	Cultivars	% of pre-emergence damping-off			% of pre-emergence damping-off			% of survival plants		
		Rs	Fo	Rs+Fo	Rs	Fo	Rs+Fo	Rs	Fo	Rs+Fo
Rizolex-T	Giza 88	0.0	30.0	36.7	0.0	3.3	0.0	100.0	66.7	63.7
	Giza 531	20.0	33.3	0.0	0.0	3.3	13.3	80.0	63.4	86.7
Quinolate	Giza 88	26.7	60.0	70.0	0.0	0.0	0.0	73.3	40.0	30.0
pro	Giza 531	46.7	56.0	46.0	3.3	0.0	0.0	50.0	43.3	53.3
Untreated	Giza 88	100.0	56.7	100.0	0.0	0.0	0.0	0.0	6.7	0.0
seeds	Giza 531	100.0	93.3	100.0	0.0	0.0	0.0	0.0	16.7	0.0

Rs = R.solani Fo = F.oxysporum 83.3

L.S.D. at 5 % for Fungi			
Fungicides	(F) = N.S.	= N.S.	= N.S.
Cultivars	(D) = 9.78	= N.S.	= 9.87
F X D	(C) = N.S..	= N.S.	= N.S.
F X C	= N.S.	= N.S.	= N.S.
D X C	= 13.21	= N.S.	= N.S.
F X B X C	= N.S..	= N.S.	= N.S.
	= N.S..	= N.S.	= N.S.

In general, both cultivars showed similar reaction towards fungi and fungicides without significance, while both fungicides were effective in controlling pre-emergence damping-off (in the seedling stage) with significant difference between each other. In this connection, Reddy (1983) mentioned that, soft, root-rot (*R.solani*) mostly occurs in the seedling stage when soil moisture content is high. It occurs within a temperature range of 18 to 30°C in a soil moisture range of 30 to

80% and at high nitrogen levels. On the other hand, *F.oxysporum* is a soil-and seed-borne pathogen and can transmitted through seeds and survive in the soil for a long time. Haware *et al.* (1978) demonstrated that Benlate T (a mixture of 30 % benomyl and 30% thiram) can completely eradicate seed-borne *F.oxysporum*.

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المكافحة المتكاملة لامراض اعفان الجذور والذبول فى الفول البلدى والحمص والعدس

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اجريت هذه التجربة فى محطة البحوث الزراعية بالجيزة فى قصارى لمقاومة امراض اعفان الجذور والذبول فى محاصيل الفول البلدى والحمص والعدس. تم استخدام صنفين من كل محصول وعدد ٢ مطهر فطرى مع نوعين من الفطريات فى كل محصول ذلك لدراسة التفاعل بينهم وتأثير ذلك على درجة الاصابة بهذه الامراض.

اوضحت النتائج ان التفاعل بين المطهرات الفطرية والفطريات المستخدمة والاصناف كان معنويا بالنسبة لشدة الاصابة فى كل من الفول البلدى والعدس وغير معنوى بالنسبة لمحصول الحمص. ايضا اوضحت النتائج ان استخدام المطهرات الفطرية قد عمل على انخفاض نسبة الاصابة بالذبول واعفان الجذور بدرجة معنوية فى المحاصيل الثلاثة خاصة فى مرحلة البادرات. اوضحت النتائج ايضا تفاوت نسبة الاصابة بالمرض باخلاف الصنف فى المحاصيل الثلاثة.