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MANAGEMENT OF ASCOCHYTA BLIGHT OF CHICKPEA THROUGH INTEGRATION OF HOST PLANT TOLERANCE AND FOLIAR SPRAYING OF CHLOROTHALONIL

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ABSTRACT

A field trial was conducted for three seasons (1982/83, 1983/84, and 1985/86) at Tel Hadya, Syria, to evaluate effect of foliar spraying of chlorothalonil (Bravo 500) on Ascochyta blight severity and yield in a blight tolerant Kabuli chickpea cultivar ILC 482. One spray during the vegetative stage (VS) significantly reduced blight severity on leaves and stems in some seasons as compared to nonsprayed plots. Two sprays, one each during the VS and reproductive stage (RS) or both in RS significantly reduced blight severity on leaves, stems and pods and also increased yield in some seasons. Two sprays of chlorothalonil, one each during the seedling and early podding stages on an average of two seasons gave the highest cost-benefit ratio of 1:5 for controlling Ascochyta blight.

INTRODUCTION

Ascochyta blight (*Ascochyta rabiei* (Pass.) Lab.) (AB) is the major disease of chickpea in North-western India, northern Pakistan, West Asia, North Africa, and southern Europe. During the past 50 years, several efforts were made to control AB through the use of resistant cultivars (Singh *et al.*, 1981, 1984), but only a limited progress could be made mainly due to lack of high levels of resistance in the cultivated *Cicer* germplasm and frequent appearence of new races (Reddy and Siham, 1984; Vir and Grewal, 1974). The resistant lines identified so far, have reasonable resistance in the vegetative stage (VS) but are susceptible during the reproductive stage (RS) (Reddy and Singh, 1984). Though several foliar fungicides effective against AB have been identified their application under farmers' field conditions in susceptible cultivars is impracticable because even six sprays were found insufficient (Reddy and Singh, 1983). In the absence of cultivars having resistance both in VS and RS, and other practical control measures, AB continues to cause heavy losses in major chickpea producing areas (Nene and Reddy, 1987). Control of AB in tolerant varieties using fungicides is feasible (Reddy and Singh, 1983) and attempts were made to generate information on these lines using ILC 482, a blight tolerant and high yielding cultivar released for general cultivation in West Asia and North Africa region.

MATERIALS AND METHODS

The trial was conducted in field for three crop seasons (1982/83, 1983-84, and 1985/86) at Tel Hadya, principal experiment station of ICARDA, Syria. A high yielding Kabuli cultivar, ILC 482 which shows tolerance to AB during VS but is susceptible during RS was selected (Reddy and Singh, 1984). Trial was sown during

Joint contribution from ICARDA and ICRISAT.

TABLE 1. Effect of foliar spray of chlorothalonil (Bravo 500) on Ascochyta blight severity and yield in blight tolerant chickpea cultivar ILC 482, Tel Hadya, Syria, 1982 83 to 1985/86.

Spray treatments		Blight severity on vegetative parts on 1–9 scale[1]			% pod infection				Yield (kg/ha)			
No	Timing	1983/84	1985/86	Mean	1982/83	1983/84	1985/86	Mean	1982/83	1983/84	1985/86	Mean
1	SS	4 7	NT	4 7	25	17*	NT	28	2329	1873	NT	2101
1	MVS	4 0*	3 7	3 9	22	13	8	14	2390	1713	1021	1708
1	FS	3 7*	3 7	3 7	27	2	8	12	2567	2081	1289	1979
1	EPS	4 7	2 0*	3 4	26	2	5*	11	2306	1894	1314	1148
1	LPS	5 0	4 7	4 9	32	10	7	17	2452	1602	990	1681
2	SS+EPS	3 0*	NT	3 0	18	1	NT	10	2438	2602*	NT	2520
2	SS+LPS	4 3*	NT	4 3	34	20*	NT	27	2248	2259*	NT	2254
2	MVS+EPS	3 3*	2 0*	2 7	24	1	4*	10	2565	2223	1524*	2104
2	MVS+LPS	4 3*	NT	4 3	19	9	NT	14	1962	1786	NT	1874
2	FS+EPS	NT	2 0*	2 0	NT	NT	3*	3	NT	NT	1493*	1493
2	EPS+LPS	4 7	3 0*	3 9	29	0	5*	11	1854	2063	1433	1783
4	SS+MVS/EPS+LPS	3 0*	2 0*	2 5	25	0	3*	9	2070	2329*	1452	1950
	No Spray (Control)	5 3	4 3	4 8	33	8	7	16	2181	1665	1084	1643
	Average	4 2	3 0		26	6 9	5 6		2280	2008	1289	
CV%		13 21	22 89		50 69	65 86	18 31		18 3	16 9	17 1	
LSD (0 05)		0 93	1 20		18 2	7 7	1 7		615 0	572 0	379 0	

1 – 1=Killed, 9=Free
SS=Seedling stage, MVS=Mid vegetative stage, FS=Flowering stage, EPS=Early podding stage,
LPS=Late podding stage
NT = Not tested * Significant P=05

autumn season (second fortnight of November) During the 1982/83 and 1983/84 seasons, a total of 11 treatment combinations and during the 1985/86 season, 9 treatment combinations were tested Number of chlorothalonil sprays given during a season varied from 1 to 4 The frequency and timing of sprays is given in Table 1 There was an unsprayed plot as a control Randomised block design with three replications was used Each plot had 8 rows of 5 m length with an inter-and intra-row spacings of 30 and 10 cm, respectively

The crop was inoculated with AB, by scattering the diseased chickpea debris collected from the previous season, when the seedlings were one month old (Reddy *et al*, 1980) Fungicide was sprayed at the rate of three litres Bravo 500 in 600 L of water per hectare using a knap sack sprayer Observations on AB severity on vegetative parts were recorded, using a 1-9 point scale (Reddy and Singh, 1984) Pod infection was recorded on five randomly sampled plants from each plot Other observations recorded were yield, plant height, and time for 50% flowering Cost-benefit ratio was worked out for the three highest yielding treatments on the average of 2-3 seasons

RESULTS AND DISCUSSION

Of the total 12 treatment combinations, 7 were tested for three seasons, 4 for 2 seasons, and one for one season (Table 1) Blight severity during VS was not recorded during the 1982/83 season as it was negligible Pod infection was high during the 1982/83 seasons as compared to the other two seasons (1983/84 and 1985/86) The treatment effects in terms of reducing blight severity in VS and RS varied from season to season One spray in VS or RS significantly reduced blight severity on vegetative parts in some seasons but not in others Sprays in VS had no effect on pod infection or yield Some of the two spray treatments (one each in VS and RS) significantly reduced blight severity and also increased yield in certain seasons

The variable response of the blight tolerant cultivar ILC 482 to foliar sprays in this study in terms of blight severity in VS and RS, and yield could be due to variation in the time of blight occurrence and severity across the seasons Also correlation matrix between blight severity on vegetative parts, per cent pod infection, and yield on the average of the three seasons indicated that blight severity on vegetative parts had strong positive correction (r—0 8) with only pod infection The correlations between blight severity on vegetative parts and yield (r—0 003), and pod infection and yield (r—0 3) were however, very weak The lack of correlation between blight severity on vegetaive parts and yield may be due to sufficient level of blight tolerance in ILC 482 in VS The lack of correlation between pod infection and yield could be due to late or superficial infection of pods and/or compensation of the blighted pods by the later developed pods This compensation very much depends on the availability of moisture in the soil and temperatures at later stages of crop growth At Tel Hadya, conditions favourable for AB development prevail between 15 March and end of May After May, if there is enough moisture in the soil due to late rains the crop can considerably compensate for the damaged pods by producing new pods The temperatures late in the season are higher (> 30C) and unfavourable for blight development but podding can occur in chickpea

Though the pod infection, in general, was high during the 1982/83 season, the yield levels were also higher indicating same environmental conditions being favourable both for the disease and crop. During the 1983/84 season, in the treatments (1 spray in SS and 2 sprays one each in SS and EPS where the pod infection was significantly higher than in the unsprayed plots, the flowering and podding had occurred slightly earlier (one week), when the conditions for AB development were more congenial thus resulting in higher pod infection.

The cost benefit ratio of three highest-yielding treatments on the average of 2-3 seasons is given in table 2. One spray each in the SS and EPS, on an average of 2 seasons gave the highest cost-benefit ratio of 1:5. Two sprays, one each in MVS and EPS, based on 3 seasons average gave the second best cost-benefit ratio of 1:4. The third best treatment was one spray each in SS and LPS with a cost-benefit ratio of 1:3. The favourable cost-benefit ratios obtained in this study clearly indicate the scope for use of foliar fungicides in the management of AB. However, the lack of consistency in response to foliar sprays applied in this experiment at fixed phenological stages, suggest the need for further refinement in time of application of foliar spray based on blight occurrence and epidemiological aspects of the disease.

TABLE 2. Cost-benefit ratio of two foliar applications of chlorothalonil (Bravo 500) for control of Ascochyta blight in tolerant chickpea cultivar ILC 482, Tel Hadya, Syria, 1982/83 to 1985/86.

Stages of the crop sprayed with Chlorothalonil	Yield (kg/ha)	Value of additional produce ($)	³Cost benefit ratio ⁴
Seedling and early podding	2520[1]	209.0	1:5.5
Mid vegetative and early podding	2104[2]	159.5	1:4
Seedling and late podding	2254[1]	115.9	1:3
No spray (Control)	1923	—	—

1 = Average of two seasons

2 = Average of three seasons

3 = At the rate of $ 0.35 per kg of chickpea seed

4 = Cost of two sprays of chlorothalonil ± $ 38.5 per ha.

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