Control of ascochyta blight in chickpeas using resistant varieties and foliar fungicides

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Abstract

A field trial was established at Horsham to compare the grain yield of current commercial chickpea varieties and ascochyta resistant breeding lines, under three foliar fungicide spray regimes. Regular fungicide sprays (every 10-14 days) effectively controlled the disease in all varieties. The strategic application of four fungicide sprays (6 weeks after sowing, early flowering, mid flowering and late pod set) reduced yield losses in many varieties but did not prevent serious yield losses in the most susceptible varieties. The most resistant chickpea lines (Desis: ICCV 96836, FLIP 94-508C, Paidar-91; and Kabulis: S 95362, S 95342, FLIP 94-90C and FLIP 94-92C) yielded well without any fungicide sprays. Moderately resistant chickpea lines required at least four sprays to prevent significant yield losses and the most susceptible lines required fortnightly sprays to prevent complete crop loss. In the highly susceptible varieties (Lasseter and Bumper), fortnightly sprays did not completely control ascochyta blight.

Key Words

Chickpea, ascochyta blight, chemical control, disease resistance

Introduction

Ascochyta blight, caused by *Ascochyta rabiei* (Pass.) Labr., is a devastating foliar disease of chickpeas (*Cicer arietinum* L.) and most of the varieties currently grown in Australia are very susceptible to the disease. Some farmers have successfully controlled ascochyta blight by applying fungicide sprays every 2-3 weeks and have produced profitable chickpea crops. However, the risk of crop failure remains high. The use of resistant cultivars, as a major component of an integrated pest management strategy, appears to be the best long-term option for the control of this disease.

In 2001, a field trial was established at Horsham to compare the grain yield and ascochyta blight resistance of current commercial varieties and advanced breeding lines under three foliar fungicide spray regimes. The spray treatments allow the profitability of chickpea production to be explored for genotypes with differing resistances to ascochyta blight.

Materials and methods

Seven chickpea lines (from the International Center for Agricultural Research in Dry Areas, Syria and the International Crops Research Institute for the Semi Arid Tropics, India) and 8 Australian chickpea varieties were chosen for their differing ascochyta blight resistances. They were sown in experimental plots (5 m x 1.5 m) at Horsham on 22 June 2001. Seeding rates were adjusted according to seed size and percentage germination to obtain 50 plants/m?. Experimental design was a randomised split block with four replicates. Main plots were fungicide treatments and sub-plots were chickpea genotypes.

The three foliar spray regimes compared were: (1) Strategic - 4 sprays (23 Aug, 14 Sep, 12 Oct and 9 Nov), (2) Regular - 8 sprays at 14 day intervals (3 Aug, 17 Aug, 31 Aug, 14 Sep, 28 Sep, 12 Oct, 26 Oct and 9 Nov), and (3) Control - no fungicide applied. The fungicide used contained 500 g chlorothalonil per L of product, and was applied at a rate of 1.5 L/ha.

Plants from the unsprayed treatment (control) were assessed for ascochyta blight damage on 14 Dec, according to a 1-9 rating scale developed by Singh *et al.* (1). Plots were harvested at maturity on 9 Jan 2002 with a Hege plot harvester and grain yields were recorded.

Results

Table 2. Effect of foliar fungicides on the grain yield and gross margin of eight commercial chickpea varieties and seven chickpea lines grown at Horsham in 2001 in the presence of ascochyta blight

Name	Rating[A]	No fungicide			4 Sprays			8 Sprays	
	(1-9)	Yield (t/ha)	GM[B] ($/ha)	Loss (%)[C]	Yield (t/ha)	GM[B] ($/ha)	Loss (%)[C]	Yield (t/ha)	GM[B] ($/ha)
Desis									
FLIP 94-508C	4	1.99	537	10	2.06	501	6	2.20	530
ICCV 96836	4	2.01	544	25	2.60	690	3	2.67	695
Howzat	6	1.60	400	41	2.52	662	7	2.72	712
Sona-4028	6	1.29	292	41	2.03	491	6	2.17	520
Tyson	7	0.96	176	65	1.80	410	35	2.75	723
Jimbour	8	0.21	-87	92	1.78	403	28	2.48	628
Sona	8	0.17	-101	93	1.31	239	44	2.35	583
Amethyst	8	0.06	-139	98	1.41	274	43	2.47	625
Lasseter	9	0.00	-160	100	0.05	-203	98	2.56	656
Kabulis									
FLIP 94-92C	3	2.29	1363	-2	2.39	1373	-7	2.24	1208
FLIP 94-90C	3	2.76	1692	4	2.84	1688	1	2.88	1656

S95342	4	2.30	1370	12	2.41	1387	7	2.60	1460
S95362	4	2.17	1279	24	2.56	1492	11	2.87	1649
Kaniva	8	0.20	-100	92	0.63	141	75	2.56	1432
Bumper	9	0.08	-184	96	0.29	-97	85	1.90	970
LSD (5%)		0.27		11	0.27		11	0.27	

[A] Resistance to ascochyta blight: 1 = Very resistant; 9 = Very susceptible.
[B] Gross margin = [Grain yield (t/ha) x Grain Price ($/tonne) - Variable costs ($/ha)].
Based on a grain price of $350/t for desi and $700/t for kabuli lines. Desi costs of $160/ha + $15/ha/fungicide spray. Kabuli costs of $240/ha + $15/ha/fungicide spray.
[C] Comparison of yield with fortnightly sprayed treatment.

Discussion

Ascochyta blight significantly reduced the grain yield of all Australian chickpea varieties grown at Horsham in 2001. Applying fungicides every 14 days effectively controlled the disease in all but the most susceptible varieties, but added significantly to the cost of production. The strategic application of four fungicide sprays (8 weeks after sowing, first flowering, early pod and late pod set) reduced yield losses in moderately resistant and moderately susceptible varieties but did not prevent serious yield losses in susceptible or very susceptible varieties.

Three of the most resistant chickpea lines evaluated in this trial (desi: FLIP 94-508C and kabuli: FLIP 94-90C and FLIP 94-92C) yielded well without any fungicide sprays but may still require some fungicide sprays during podding in order to produce high quality grain. The best ascochyta blight resistant lines tested in this experiment were commercialised in June 2002 and should be widely available to chickpea growers from 2004. Howzat, a new variety with better resistance to ascochyta blight than current commercial varieties, will enable desi chickpeas to be grown profitably in most regions again. However, this variety will still require strategic sprays in order to prevent serious crop losses from the disease. In 2001, at Horsham the grain yield of Howzat was reduced by 41% where no fungicide was applied and by 7% following four strategic sprays.

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References

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