Interaction of flumetsulam with chlorothalonil and Uptake? oil applied to Ascochyta infected chickpeas

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Abstract

A glasshouse experiment was conducted in 2005 at Northam, Western Australia to investigate the impact of Ascochyta blight (*Ascochyta rabiei*) infection of chickpea on the crop tolerance of flumetsulam herbicide applied in mixes with chlorothalonil fungicide and/or Uptake? oil. Application of flumetsulam (20 g a.i./ha) in two and/or three way mixes with Uptake? oil (0.25 % v/v) and chlorothalonil (1080 g a.i./ha) to healthy chickpea plants (not inoculated with *A. rabiei* conidia) resulted in significantly lower plant height and dry weight compared to untreated control plants. Under moderate disease pressure, produced by inoculation with *A. rabiei* conidia, the infected plants had lower final plant height and dry weight compared with the same spray treatments in the un-inoculated set. Application of flumetsulam (20 g a.i./ ha) in mixture with Uptake? oil and /or chlorothalonil (1080 g a.i./ha), but not flumetsulam alone, further reduced the height and dry weight of disease inoculated plants when compared with the diseased plants only. Flumetsulam (20 g a.i./ha) and Uptake? oil in combination, with or without chlorothalonil also increased disease severity.

It is suggested not to apply flumetsulam in mixture with chlorothalonil and/or Uptake? oil on chickpeas affected by foliar diseases such as Ascochyta blight.

Key Words

Chickpea, Ascochyta blight, flumetsulam, Chlorothalonil, Uptake? oil, herbicide tolerance.

Introduction

Ascochyta blight is a damaging fungal disease of chickpea throughout the world. Best available chickpea varieties are only moderately resistant to this disease, therefore fungicide (eg chlorothalonil) sprays are still required to maximize yield. Broadleaf weeds are also a major problem in chickpea production. Post-emergent application of flumetsulam at 20 g a.i./ha is commonly used to control broadleaf weeds in Australia. Addition of Uptake? oil (petroleum spray oil concentrates with more than 15% emulsifiers) improves its weed control efficacy (Piper and Nicholson 1999). Little information is available on the crop safety of tank mixes of flumetsulam, chlorothalonil and Uptake? oil.

The aim of this experiment was to study the impact of Ascochyta blight infection of chickpea on the crop tolerance of flumetsulam applied in mixes with chlorothalonil and/or Uptake? oil.

Methods

Fifteen seeds of chickpea (cv. Sonali) were sown into 5-litre pots filled with premium potting mix and covered with a 5 cm layer of sandy loam soil at Northam, WA. At the 3-4 node stage of the plants, half of the pots (40) were selected randomly, inoculated with a conidiospore suspension of *Ascochyta rabiei* (10^5 spores/mL) and incubated at saturated humidity for 48 hrs. The remaining pots were also kept in the same growing conditions for the incubation period. After incubation, herbicide and fungicide treatments (Table 1) were applied using an overhead, compressed air, glasshouse boom sprayer calibrated to deliver 72 L/ha at 200kPa pressure. Pots were then returned to the glasshouse (inoculated and un-inoculated on separate tables), thinned to 10 uniform looking plants, 5 days after the treatments application. There were 4 replications of each treatment.

The data were recorded on disease reaction 1 and 4 weeks after herbicide sprays (WAS) using a 1-9 scale (Nene and Reddy 1979). Herbicide phytotoxicity was assessed 2 and 4 WAS on a 1-3 scale (where 1 = slight, 2 = moderate, 3 = severe yellowing) and the height of 5 randomly selected plants per pot was measured from ground level to the base of last fully opened leaf on the main stem. Four WAS, all plants (alive and dead) were cut at ground level and plant dry weight (g per pot) recorded. All, data were analysed (ANOVA) using nested design within Genstat programme.

Results and Discussion

Inoculation with *A. rabiei* conidiospores produced moderated disease levels in the inoculated plants and no Ascochyta symptoms were recorded in the uninoculated plants. Flumetsulam caused slight to moderate yellowing in both the inoculated and uninoculated plants. The intensity of symptoms increased with the increase in herbicide rate from 20 to 40 g/ha. Application of flumetsulam in two and/or three way mixes with Uptake? oil and chlorothalonil on uninoculated chickpea plants resulted in significantly lower plant height and dry weight compared to untreated control plants. Chlorothalonil + Uptake? oil caused similar negative effects. Flumetsulam + Uptake oil mixture effects are in line with the results of three field trials conducted during 2003 and 2004 where flumetsulam 20 g/ha applied at 4-6 node, with and without Uptake? oil, caused yellowing and biomass reduction (10-20%) in Sonali. Flumetsulam applied with Uptake? oil in those field trials caused more biomass reduction than when applied alone, but there was no significant reduction in seed yield (Dhammu et.at 2004; Dhammu 2005). In this glasshouse experiment, plants were only kept for 4 WAS, however these plant symptoms are transient and disappear over time in normal growing conditions, but may be evident up to the flowering stage of a crop.

Table 1. Effect of treatments on Ascochyta blight disease reaction, plant height and dry weight (Wt.) per pot in Chickpea cv Sonali.

Treatment description	Disease ratings		Plant Height		Dry Wt.
	(0 - 9 scale)		(% of untreated control)		
Pesticide or pesticide mixture *rate/ha*	1 WAS	4 WAS	2 WAS	4 WAS	4 WAS
Uninoculated (Disease – Absent)					
T1. Untreated control (no chemicals)	0	0	100 (18.7 cm)	100 (18.7 cm)	100 (7.29 g)
T2. Flumetsulam (Flume.) *20 g*	0	0	99	103	96
T3. Flume. *40 g*	0	0	**79**	89	80
T4. Uptake? Oil (U. Oil) *180 mL* (0.25%v/v)	0	0	98	104	105
T5. Chlorothalonil (Chloro.) *1080 g*	0	0	91	100	93
T6. Flume. *20 g* + U. Oil 0.25%	0	0	**74**	88	**75**

T7. Flume. *20 g* + Chloro.*1080 g*	0	0	**65**	**76**	**72**
T8. Flume. *40 g* + Chloro.*1080 g*	0	0	**49**	**63**	**56**
T9. Flume. *20 g* + U. Oil 0.25% + Chloro.*1080 g*	0	0	**38**	**71**	**63**
T10. Chloro. *1080 g* + U. Oil 0.25%	0	0	**72**	**73**	**77**
Inoculated (Disease – Present)					
T11. Disease only (no chemicals)	4.6	4.8	**69**	**76**	**61**
T12. Flume. *20 g*	4.7	6.0	**61**	**71**	**45**
T13. Flume. *40 g*	4.9	**6.6**	**53**	**64**	**41**
T14. U. Oil *180 mL* (0.25%v/v)	5.9	6.4	**61**	**75**	**53**
T15. Chloro. *1080 g*	4.4	5.4	**73**	**76**	**73**
T16. Flume. *20 g* + U. Oil 0.25%	5.9	**7.5**	**45**	**53**	**27**
T17. Flume. *20 g* + Chloro.*1080 g*	5.9	**7.3**	**46**	**56**	**34**
T18. Flume. *40 g* + Chloro.*1080 g*	4.9	**6.7**	**44**	**53**	**38**
T19. Flume. *20 g* + U. Oil 0.25% + Chloro.*1080 g*	6.1	**7.7**	**34**	**43**	**26**
T20. Chloro. *1080 g* + U. Oil 0.25%	5.3	6.3	**46**	**50**	**49**
LSD (0.05)	1.9	1.6	15	15	21

WAS - weeks after treatment spraying;
For disease rating 1-9 scale used; 1=no infection, 9 = plant dead
Figures in **bold** are significantly different from Disease only treatment (T11) for disease ratings.
Figures in **bold** are significantly different from untreated control (for plant height and dry wt.)
Figures in **bold** and **underlined** are significantly different from disease only treatment (T11)

Under the moderate disease pressure produced in the inoculated treatments, the infected plants had lower final plant height and dry weight compared to the same spray treatment in the uninoculated set

(except flumetsulam 40g + chlorothalonil treatment). Application of flumetsulam in mixture with Uptake? oil and /or chlorothalonil, further reduced the height and dry weight of inoculated treatments compared to the disease only treatment.

Chlorothalonil alone did not reduce Ascochyta severity at either assessment since germinating spores had penetrated leaves prior to chlorothalonil application and were therefore no longer vulnerable to the fungicide. As this was a glasshouse experiment, no secondary spread of Ascochyta occurred, hence the diseased plants were able to recover by producing healthy secondary branches. Two or three way mixtures of flumetsulam with chlorothalonil and Uptake? oil increased disease severity by the final assessment (4 WAS). The effects of herbicide mixtures on diseased plants could be more pronounced on final seed yield in a field situation than the effect demonstrated on plant growth in this glasshouse experiment. Further field experiments are required to confirm this hypothesis.

Application of flumetsulam plus Uptake? oil (with or without chlorothalonil) to a chickpea crop infected with Ascochyta may increase the disease severity. Consequently, it is suggested that farmers should not apply flumetsulam in mixture with chlorothalonil? and/or Uptake? oil on chickpeas affected by foliar diseases such as Aschochyta. Farmers should adhere to the label recommendations for these products.

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