CONTROL OF LEAF SCALD AND EYESPOT IN BARLEY BY FOLIAR APPLICATION OF PROCHLORAZ

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SUMMARY

In trials throughout NZ, prochloraz foliar sprays applied to winter and spring sown barley crops provided good control of leaf scald *(Rhynchosporium secalis)* and eyespot *(Pseudocercosporella herpotrichoides)* at rates of 225g ai/ha to 450g ai/ha. Significant yield increases over untreated were obtained at rates of 338 and 450g ai/ha when used for leaf scald control, and 450g ai/ha when used for eyespot control.

INTRODUCTION

Until recently barley growers in New Zealand did not consider the severity of diseases present in their crops justified control by foliar application of a fungicide. Growers began to reconsider this situation 2 years ago when net blotch *(Drechslera teres)* became prevalent in North Island barley crops. Reasons for the increase in net blotch included the increase in barley area sown and the planting of new susceptible cultivars which had been inadequately seed treated (Sheridan *et al* 1983).

Leaf scald was found to be widely distributed in the cereal growing areas of NZ where barley is continuously cropped (Grbavac 1984). A high incidence of the disease was recorded in the Wairarapa district but until last year, leaf scald was not considered a major problem since barley was mainly spring sown and climatic conditions were not conducive to disease development.

In 1983, recognised winter barley cultivars were commercially grown for the first time with the greatest area being in Canterbury. In the same season, a national survey of barley crops revealed that leaf scald had become prevalent (Sheridan and Grbavac 1984). Commercial barley crops were treated with foliar fungicides last season to control leaf scald.

Eyespot was recently found to be severe in barley crops of South Otago and Southland (Plant Health Station, MAF, Lincoln - pers comm). Little is known about the effect of this disease on barley in N.Z. In the UK barley is considered as susceptible as wheat to eyespot. The disease prevails under cool, wet growth conditions and yield losses associated with eyespot only occurred in areas of Britain where these conditions prevailed (Gair *et al* 1976). In previous N.Z. trials (Ballard and McLaughlan 1982) good control of eyespot of wheat was demonstrated with prochloraz.

The trials, now reported, evaluated the control of eyespot and leaf scald with prochloraz foliar sprays and assessed the effect of them on barley yields.

METHODS

In the three trials, treatments were applied using a pressurised precision plot sprayer with hand held boom. Nozzles were Teejet fan type 730154, operated at 210 and 300kPa. Plots measuring 2-5 m x 8-10 m were randomised in blocks and replicated four times.

Trial I: Leaf scald control in winter-sown barley.

On 5 August 1983 foliar sprays of prochloraz (Sportak 45EC), propiconazole (Tilt 25EC) and triadimefon (Bayleton 25WP) were applied to winter sown barley, (Feekes GS 6) cv Hassan in Nelson. The crop had become naturally infected from debris from a previous barley crop.

Assessments of leaf infection were carried out at 20 and 26 days after treatment when the top two leaves of 20 tillers per plot were assessed for percent leaf area diseased (% severity). The incidence (% of leaves infected per tiller) was then calculated. At 72 days after treatment (16 Oct) at full flag leaf emergence (Feekes GS 10.5) the plots were assessed for percent green leaf area on 25 flag leaves per plot, and the disease incidence (% of leaves infected per tiller) was assessed. Birds destroyed the crop before the trial could be harvested.

Trial II: Leaf scald control in spring-sown barley.

On 10 November 1983, a trial at Halcombe, Manawatu on spring-sown barley, cv Triumph, was sprayed to assess the efficacy of treatments applied at Feekes GS 4 in tank mix with a broadleaf herbicide. Inadequate seedbed preparation and destruction of previous barley crops had led to a high inoculum pressure at the time of application. Fungicide treatments were tank mixed with a proprietary brand of herbicide, applied at 4.5 litres/ha.

Disease incidence was assessed at 12 days after treatment on a sample of 150 tillers per plot. At 56 days after treatment (9 January 1984) the top three leaves of twenty tillers per plot were assessed for disease severity, and the mean leaf area diseased per tiller was calculated. On 28 February 1984, the plots were harvested using a Hegge 125 plot harvester.

Trial III: Eyespot control in spring-sown barley.

On 9 December 1983, foliar sprays of prochloraz, propiconazole and benomyl (Benlate 50 WP) were applied to barley, cv Goldmarker, at Feekes GS 7, at Thornbury, Southland. On 3 March 1984, 65 tillers per plot were randomly sampled and the first three internodes were scored for eyespot infection using a 0-5 scale, where 0 = clean and 5 = severely infected. The three scores per tiller were summed to give a disease score per tiller. On 20 March 1984, 5 m^2 per plot was hand harvested and threshed on a Kurt Peltz.

RESULTS AND DISCUSSION

Trial I: At the time of application most of the lower leaves were diseased on every plant, and only the top leaves were not infected. In the following cold, wet conditions, the barley grew slowly and the leaf scald spread quickly upwards, infecting new leaves soon after they unrolled.

TABLE 1: Control of leaf scald at GS 6 in winter sown barley (cv. Hassan).

		Disease incidence			Disease severity		%Green leaf area
DAT		20	26	72	20	26	72
GS (Feekes)		7	7-8	10.5	7	7-8	10.5
Treatments (5.8.83)	(g ai/ha)						
untreated	-	44 a	23 a	97 a	9.0 a	4.3 a	51 b
prochloraz	338	6 b	9 bc	86 abc	0.4 b	1.4 b	64 a
prochloraz	450	4 b	6 bc	86 abc	0.2 b	0.5 b	73 a
prochloraz	675	1 b	1 c	70 c	0.1 b	0.1 b	74 a
triadimefon	125	9 b	16 ab	78 bc	0.6 b	2.0 ab	74 a
propiconazole	125	10 b	11 abc	75 bc	0.3 b	2.4 ab	73 a
CV%		50.7	71.4	12.9	54.9	86.1	12.1

Disease incidence = % of tillers infected
Disease severity = Mean % leaf area diseased

Table 1 shows that up to 20 days after application, all fungicide treatments gave good control of leaf scald under heavy inoculum pressure. At 26 days after application, only the prochloraz treated plots significantly differed in severity and incidence from the untreated plots.

By 72 days after treatment (GS 10.5) 97% of the flag leaves on untreated plots were heavily infected. All fungicide treatments reduced the incidence of disease, but levels of disease control at this later stage were less than expected from the earlier results obtained. Inoculum pressure from untreated plots in the trial may have contributed to disease incidence on flag leaves in fungicide-treated plots. However, a single foliar application of fungicide (at GS 6) to a susceptible winter sown barley cultivar growing under heavy inoculum pressure may not be sufficient to protect the grain filling leaves later in the season.

Trial II: At application, 30% of the plants in the trial were diseased. During the following cold, wet weather, all fungicide treatments effectively controlled leaf scald up to 56 days after treatment.

TABLE 2: Control of leaf scald at GS 4 in spring sown barley (cv. Triumph).

		Disease incidence	Disease severity	Crop yield	
DAT		12	56		%
GS (Feekes)		5	11.2	t/ha	of untreated
Treatments (10.11.83)	(g ai/ha)				
untreated	-	86	28.2	4.4 b	100
prochloraz	225	5	0.6	4.5 b	102
prochloraz	293	7	0.9	4.5 b	102
prochloraz	338	4	1.5	4.8 a	109
prochloraz	450	9	1.4	4.9 a	111
propiconazole	125	8	0.6	4.3 b	98
C V %				32	

Negligible differences in diseased leaf area (Table 2) were recorded for all fungicide treatments. It is therefore difficult to explain why prochloraz at 338 g ai/ha and 450 g ai/ha recorded significantly higher yields than other treatments. An intermediate assessment between 12 and 56 days after treatment may have revealed differences in green leaf area. UK trials have shown that fungicide treatments which increased green leaf area prior to anthesis are likely to enhance yield (Griffiths 1981, Priestley 1981). Propiconazole and prochloraz have shown possible phytotonic effects in earlier N.Z. trials (Sheridan *et al* 1983).

Trial III: Table 3 shows 11.9 level of eyespot in untreated plots, out of a possible score of 15. All fungicide treatments significantly reduced the disease score. The level of eyespot control with prochloraz improved with increasing rate (from 225 to 450 g ai/ha). The highest rate of prochloraz provided the best disease control and was the only treatment to record a yield significantly higher than untreated. Eyespot control from benomyl applied alone or with propiconazole was not as good as from the two higher rates of prochloraz.

Barley samples from the trial were examined for MBC resistance. Unfortunately only one eyespot isolate was obtained from benomyl treated plots, and tolerance to benomyl (2 ppm) was found. This may have had a bearing on the efficiency of the benomyl treatments. It is not known at this stage whether the incidence of MBC resistance in Southland is likely to result in failure to control eyespot.

TABLE 3: Eyespot control in spring sown barley (cv. Goldmarker).

Treatments (9.12.83)	(g ai/ha)	Mean disease score per tiller (3.3.84)	Crop yield t/ha	% of untreated
untreated	-	11.9 a	3.54	100 b
prochloraz	225	6.2 bc	3.81	108 ab
prochloraz	338	4.9 cd	3.80	107 ab
prochloraz	450	3.6 d	4.10	116 a
propiconazole	125 +			
benomyl	125	6.8 b	3.80	107 ab
benomyl	250	7.3 b	3.64	103 ab
CV%		17.8		6

CONCLUSION

In these trials prochloraz applied as a foliar spray at 225-450 g ai/ha effectively controlled leaf scald of barley and provided significant yield increases at 338 and 450 g ai/ha. The fungicide may be tank mixed with herbicide provided that the application technique (spray volume, droplet size and distribution pattern) and timing are suitable for both products.

Prochloraz at 450 g ai/ha provided the best eyespot control in barley and was the only treatment to significantly increase yields over untreated in this trial.

Where barley is intensively cropped, more than one disease may be present at a time. The broad spectrum disease control and significant yield increases provided by prochloraz have been shown in results reported in this paper and elsewhere (Ballard and McLaughlan 1982; Sheridan and Grbavac 1984). In many situations prochloraz may be slotted into the crop management programme to provide cost effective disease control.

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