CONTROL OF SCALD AND NET BLOTCH OF BARLEY WITH DMI FUNGICIDES

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SUMMARY

C¹⁴ demethylation inhibiting (DMI) fungicides were evaluated for the control of scald and net blotch of barley in the Wairarapa, North Island, New Zealand in 1988-89. Cyproconazole at 15 g/100 kg seed, alone or in combination with carboxin + thiram, gave the best control of both scald and net blotch. In foliar spray trials two applications of propiconazole at 125 g/ha and terbuconazole at 250 g/ha gave good control of net blotch. Strains of *Drechslera teres* with reduced sensitivity to triadimenol, flutriafol, cyproconazole, terbuconazole and imazalil, and strains of *Rhynchosporium secalis* with reduced sensitivity to triadimenol, were isolated from the pathogen population.

INTRODUCTION

Control of primary scald and net blotch infection in New Zealand barley crops is based on the use of seed treatments containing triadimenol or flutriafol (for scald control) and imazalil (for net blotch control). Strains of *Drechslera teres* resistant to triadimenol and flutriafol are widespread in the net blotch pathogen population (Sheridan *et al* 1987) and there is concern that imazalil insensitivity could also occur. In recent field trials triadimenol and flutriafol seed treatments gave less control of scald than previously found (Sheridan and Nendick 1988a) and the possibility of insensitive strains of *Rhynchosporium secalis* being present in the pathogen population must be considered. In commercial crops in England there has been a five to ten fold decline in mean sensitivity of *R. secalis* to triadimenol (Hollomon 1984, pers. comm.). Cross resistance to DMI fungicides used as foliar sprays must also be considered.

Our research has evaluated currently registered and new DMI's as seed treatments and foliar sprays for control of these two diseases and has screened local populations for insensitive strains.

MATERIALS AND METHODS

Treatments and rates of application for seed treatments and foliar applications are in Tables 1 and 2 respectively. The cultivar Zephyr was used because it carried a high level of natural seed borne infection with *D. teres* and is very susceptible to both scald and net blotch. Seed treatments and foliar sprays were applied as previously described. (Sheridan and Nendick 1988a). Seed treatment trials were sown by hand in 5 m rows, 35 g seed per row, on 14 May 1988. There were five replicates. The scald spray trial was sown on 14 May and the net blotch trial on 12 October 1988. There were three replicates. All trials were at Gladstone in the Wairarapa.

Disease assessment began at Feekes GS1 and continued at intervals up to GS11.1. Disease severity was assessed as the percent of leaf area infected on 10 tillers taken at random in each row (seed treatment trials) or plot (foliar spray trials).

DMI sensitivity was tested in poison plates using V-8 juice agar (*R. secalis*) or malt extract agar (*D. teres*) amended with various fungicides (Sheridan and Nendick 1988b,c).

RESULTS AND DISCUSSION

Scald control

Best control of *Rhynchosporium* scald was given by seed treatments containing cyproconazole at 15 g/100 kg seed or in a mixture with carboxin + thiram (Table 1).

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TABLE 1: The effect of seed treatments on the percent control of scald and net blotch on cv. Zephyr : Autumn 1988.

Treatment	Rate g ai/100 kg seed	% Control	
		Scald GS 10.5.1	Net blotch GS 1
triadimenol + fuberidazole ¹	15 + 2	24	64
triadimenol + imazalil ²	15 + 5	33	82
flutriafol + imazalil ³	5 + 5	11	92
cyproconazole	15	40	95
carboxin + thiram ⁴	50 + 50	0	54
carboxin + thiram + cyproconazole	50 + 50 + 15	49	98
terbuconazole + SAS 9244 + fuberidazole	3 + 4 + 4	0	71
disease in untreated		41%*	9.4%**

* mean diseased area of top three leaves (%)

** % of plants diseased

¹ Baytan F17² Baytan IM³ Vincit⁴ Vitaflo 200**TABLE 2: Effect of foliar sprays on percent control of of scald and net blotch on cv. Zephyr : Spring 1988.**

Treatment	Trade name and formulation	Rate g ai/100 kg seed	% Control	
			Scald* GS 11.1 7 DAT: 2nd spray	Net blotch** GS 10.5.3 7 DAT: 2nd spray
propiconazole	Tilt 250 EC	125	77 a	65
prochloraz	Sportak 45 EC	450	44 b	82
terbuconazole	Folicur 250 EC	250	—	69
triadimenol	Cereous 250 EC	125	44 b	31
flutriafol	Impact	125	34 b	33
Disease severity in unsprayed ***			43% c	20%

* Top two leaves assessed. First spray applied 8 October 1988. Second spray applied 24 October 1988.

** Top three leaves assessed. First spray applied 30 November 1988. Second spray applied 13 December 1988.

*** Mean % diseased leaf area.

A common letter denotes no significant difference ($P > 0.01$).

Triadimenol effectiveness continued to diminish (see Sheridan and Nendick 1988a). In the foliar spray trial propiconazole gave the best control (77%) at GS11.1 following two applications (Table 2). The mean inhibitory concentration (MIC) of triadimenol for New Zealand *R. secalis* isolates has increased from 0.5 to 3.2 over the past 10 years (Table 3). Hollomon (1984, pers. comm.) found an MIC of 8.8 for UK isolates in 1986. There is a need to examine isolates nationwide and to test sensitivity to other DMI's.

Net blotch control

The best control of net blotch ('net' type) in the autumn 1988 trials was given by seed treatments containing cyproconazole at 15 g/100 kg seed or in a mixture with carboxin + thiram (Table 1). Control with seed treatments containing imazalil was disappointing probably because the inoculum was from other sources in addition to

TABLE 3: Sensitivity of New Zealand isolates of *Rhynchosporium secalis* to DMI fungicides.

Year of isolation	No. of isolates	MIC* ($\mu\text{g/ml}$)			
		triadimenol		flutriafol	
		mean	range	mean	range
1976-1984	4	0.5	0.2-0.8	0.4	0.4
1988 Autumn regrowth	8	0.9	0.4-1.6	0.6	0.4-0.8
1988 Spring crops	11	3.2	1.9-7.5	—	—

* Minimum inhibitory concentration needed to give total inhibition of growth.

seed. In a further trial in the spring of 1988, where the seed was the only source of inoculum, imazalil in ethanol ('Fungazil') and triadimenol + imazalil ('Baytan IM') gave 100% and 97% control respectively. It is possible that cyproconazole gives some protection against secondary infection, which imazalil does not. In the foliar spray trial prochloraz, propiconazole and terbuconazole gave good control of net blotch (Table 2).

Forty two isolates of *D. teres* collected in the Wairarapa in 1987 and 1988, mostly from the trial site at Gladstone, were tested for sensitivity to DMI fungicides. All 'spot' type isolates (*D. teres* f. *maculata*) and 60% of net type isolates (*D. teres* f. *teres*) collected in the spring and autumn of 1987-88 were resistant to triadimenol and cyproconazole (Table 4). Sixty five per cent of isolates (all 'net' type) collected in November 1988 were resistant to triadimenol and flutriafol. Most 'net' type isolates were highly sensitive to propiconazole, prochloraz and terbuconazole. Sensitivity to imazalil sulphate appears to be decreasing.

TABLE 4: Growth of selected isolates of *Drechslera teres* on media amended with 10 $\mu\text{g/ml}$ DMI fungicides.

	Mean colony diam (mm)							
	'net' type				'spot' type			
	1977	1987-8			1986	1987-8		
		1	2	3*		1	2	3
cyproconazole	0	0	25	45	35	9	60	28
flutriafol	0	0	—	12	35	—	—	—
imazalil sulphate	0	8	10	36	15	3	15	25
prochloraz	0	0	10	4	5	0	10	15
propiconazole	0	0	0	8	3	0	17	10
terbuconazole	0	0	5	—	9	1	20	15
triadimenol	0	0	25	45	30	13	40	30
no fungicide	60	60	60	75	65	53	55	55

* 10 days . All the rest 7 days.

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