CONTROL OF SEED-BORNE AND FOLIAR DISEASES OF BARLEY WITH NEW SYSTEMIC FUNGICIDES TRIADIMENOL AND TRIADIMEFON

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Summary

In trials over the 1977-78 and 1978-79 seasons, triadimenol (KWG 0519) applied as a seed treatment to barley controlled seed-borne net blotch (*Pyrenophora teres*) and protected plants against powdery mildew (*Erysiphe graminis*) and leaf rust (*Puccinia hordei*) for a number of weeks after sowing. Triadimefon (MEB 6447) applied as a foliar spray controlled the main foliar diseases of barley in two seasons of replicated and block trials resulting in significantly higher yields being obtained when compared to untreated.

INTRODUCTION

Triadimenol and triadimefon are both systemic fungicides exhibiting protective and eradivative effects against a range of barley diseases. Overseas information has suggested that triadimenol applied as a seed treatment to barley could control the following seed-borne diseases recorded in New Zealand :- covered smut (*Ustilago hordei*), loose smut (*U. nuda*), net blotch, leaf stripe (*Pyrenophora graminea*) and scald (*Rhynchosporium secalis*). It can be translocated within the plant to give protection from stem and foliar diseases such as a powdery mildew, stem rust (*Puccinia graminis*) and leaf rust and early secondary infection of scald and net blotch.

The length of protection from stem and foliar diseases varies depending on seasonal conditions and infection pressure with effectiveness on the following in decreasing order, powdery mildew, leaf rust, stem rust, scald, net blotch. It has also been reported from overseas that triadimefon applied as a foliar spray controls net blotch, scald, powdery mildew, stem rust and leaf rust.

METHODS

There were a total of five triadimenol and eight triadimefon trials conducted in Canterbury on the barley cultivar 'Zephyr'. The trials were either of small randomised block design of 4-5 replicates varying in area from 22.5m² - 120m² or larger 3 replicated blocks of 3600m².

Triadimenol was applied to the seed either as a dust or as a slurry ensuring accurate covering over the seed coat. Triadimefon was applied as a foliar spray either using a precision back-pack sprayer with a hand held boom fitted with Tee Jet or Hollow cone nozzles applying 250-380 litres/ha at 200 kPa, or by commercial land vehicle. Trials were harvested either by harvesting the whole plot, or in the case of the block trials 12 cuts were taken from each of the replicates.

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RESULTS

Seed treatment trials - 1977-78 season.

There are two similar trials reported. Table 1 presents the main results from one trial at Lincoln sown on 8th Nov. 1977 in which the seed treatments did not adversely affect emergence, and triadimenol provided effective control of seed-borne (primary) net blotch. The triadimenol was absorbed into the developing plant and provided good protection against powdery mildew for at least 37 days after sowing and leaf rust for 51 days. By the end of the season leaf rust had become severe on all treatments, causing overall yield reductions, which did not allow the effects of early disease control to show in the yield figures.

Table 1. Effects of barley seed treatments on emergence, primary net blotch, powdery mildew and leaf rust in 1977-78 season.

Treatments	Dusts applied g/100 kg seed	No. plants/ 30cm row	No. plants/ plot 1 net blotch	% Control relative to untreated days after sowing			
				powdery mildew 37c	Leaf rust		
1 untreated		13.1	33.8	0	0	0	0
2 captan	98	12.5	29.0	30.5	16.8	29.4	2.3
3 carboxin + thiram	50+50	13.1	14.0*	17.7	25.7	15.5	0.4
4 triadimenol ^a	15	14.0	7.5**	96.1	73.7	71.7	15.0
5 triadimenol ^b	15	14.8	5.5**	95.0	81.2	71.2	19.2
6 triadimenol	22.5	13.8	3.8**	97.9	51.1	68.4	13.3
7 triadimenol	30	14.2	5.5**	98.2	80.2	63.1	19.3
untreated % leaf area infected				14.1	5.1	19.5	33.1

Yield - In treatment 5, there were significantly ($P=0.01$) more tillers/row, treatments 4, 5 and 7 had significantly more grains/ear, but although treatments 4, 5 and 6 had yields 115%, 109% and 108% of untreated, these were not significant increases.

a = Using 10% dust

b = Using 15% dust

c, d = Mean % control based on disease assessments on 3 leaves on tiller 1 plus 3 leaves on tiller 2, or (d) 3 leaves on tiller 1.

* = Significant ($P=0.05$) or ** ($P=0.01$)

There was a second trial sown on 9th Nov. 1977 at Timaru which again showed that triadimenol did not adversely affect emergence and gave significant control of primary net blotch and powdery mildew at 49 days after sowing. There were no yield differences.

1978-79 Season.

There were three similar trials one at Lincoln and two at Prebbleton. Table 2 provides data from the Lincoln trial and shows that primary net blotch was controlled by treatments 4 to 9, and that triadimenol gave excellent control of powdery mildew for up to 58 days after sowing. In the trial the yields from treatments 5, 6 and 9 were significantly greater ($P=0.05$) than treatment 1, 2, 3 and 4 whereas treatments 6 and 9 showed highly significant ($P=0.01$) increase.

At Prebbleton both trials showed again that triadimenol at all rates reduced the amount of primary net blotch in the plots, and at 40 days after sowing was providing effective control of powdery mildew (70% leaf area infected in treatments 1 to 5, and 2.5% in treatments 6 to 9, in one

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Table 2. Effects of barley seed treatments on primary net blotch, powdery mildew and yield in 1978-79 season.

Treatment	Rate g/100 kg seed	No. plants 1 net blotch /plot	Powdery mildew % leaf area infected at		Mean yield/ plot at 15% moisture
			40 ^a	58 ^a	
1 untreated		13.3	32.5	6.3	5.6 cB
2 captan slurry	97.5	11.3	29.4	4.8	5.8 cB
3 mancozeb dust	75	9.3	30.3	4.1	5.8 cB
4 carboxin + thiram slurry	50 50	5.8	33.7	5.9	5.8 cB
5 mancozeb + carbendazim slurry	120 30	3.8	32.1	5.6	6.2 aAB
6 triadimenol dust	15	3.8	2.1	0.1	6.8 aA
7 triadimenol slurry	15	3.3	1.9	0.1	6.3 abAB
8 triadimenol dust	22.5	3.0	1.6	<0.1	6.5 abAB
9 triadimenol slurry	22.5	3.0	1.7	<0.1	6.8 aA
CV%					8.0

a = days after sowing on 8 Nov. 1978.

trial, and 30% and 8% in the second trial. It became apparent that secondary net blotch infection was taking place soon after emergence of the crop, thus making the timing of the primary net blotch assessment critical.

Table 3. Effects of a single spray application of triadimefon (125g/ha) applied for leaf rust control in barley in the 1977-78 season.

Date sown	TRIAL A 11th Nov. 1977		TRIAL B 14th Nov. 1977	
	Untreated	Treated	Untreated	Treated
leaf 2 ^a on				
18 Jan. 1978	0.6		1.3	
23 Jan. 1978	3.9	25 Jan. 78		23 Jan. 78
2 Feb. 1978			28.5	2.2*
7 Feb. 1978	24.8	5.2*		
16 Feb. 1978	42.8	8.7*		
Yield t/ha	5.3	6.3*	4.8	5.8*
	CV=10.8%		CV= 10.7%	
1000 grain weight (g)	42.2	44.6*	43.7	46.3*
	CV=2.2%		CV=12.0%	

* Differences are significant (P=0.05)

a = Mean % rust is based on at least 30 leaves per plot, leaf 2 is second from top of plant.

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In the second trial, triadimefon 125g/ha was applied to treatments 6 and 8 at 26 days after sowing. At 27 days after spraying the amount of leaf rust in the sprayed treatments was 0.4 and 0.2% respectively and 26% of leaf area infected in the other treatments. The combined seed and spray treatment yielded 6.9 and 7.0 kg/plot as compared with 5.2 kg in the untreated plots.

Spray trials with triadimefon 1977-78 Season.

There were four trials in the Lincoln area. Table 3 shows that in trials A and B leaf rust was effectively controlled by one application of triadimefon 125g/ha and that yield differences of 1 t/ha were achieved through control of this disease.

The grain weight data show that leaf rust attack reduced grain size. There was also a block trial on the same property as Trial A, in which the untreated block yielded 4.9 t and the treated 5.9 t/ha.

In addition in the same crop as Trial B, the 25% WP formulation was compared with a 25% EC both were equally effective in controlling rust.

1978-79 season.

There were three trials in the Lincoln area, and in this season all were sprayed with the 25% EC formulation. Table 4 summarizes the results, and shows again that powdery mildew and leaf rust can be effectively controlled for 3 - 4 weeks after one application of triadimefon.

There were significant yield differences because the plants were protected from the yield reducing effects of the two foliar diseases.

Table 4. Effects of a single spray application of triadimefon (125g/ha) applied 23.12.78 for leaf rust control in barley in the 1978-79 season.

Sown	TRIAL A 7th Nov. 1978		TRIAL B 17th Nov. 1978		TRIAL C 27th Nov. 1978	
	Untreated	Treated	Untreated	Treated	Untreated	Treated
Disease assessed days after spraying						
4 days						
% powdery mildew	23.5	4.8	71.0	5.4	71.3	2.0
% leaf rust	0	0	0.6	0.01	0.5	0
19 days						
% powdery mildew	3.8	0	43.0	0	20.5	0
% leaf rust	1.8	0	14.0	2.3	2.0	0
27 days						
% leaf rust	8.5	1.3			27.8	15.0
Yield kg/plot	6.5	8.0* (124%)b	3.7	4.1 (111%)b	5.7	6.8* (120%)b
	CV = 8.7%		CV = 5.2%		CV = 4.3%	

At time of spraying, Trial A was at Feekes growth stage 9, Trial B at growth stage 7 and Trial C at growth stage 5-6.

b = Yield relative to untreated = 100%

* = Differences significant at 5% level.

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DISCUSSION AND CONCLUSION

Triadimenol as a systemic fungicide applied as a seed treatment provided good protection against the foliar pathogens, powdery mildew and leaf rust. At the rates tested triadimenol had no adverse affect on emergence, and provided a high level of control of the seed-borne phase of net blotch disease.

The spray treatments with triadimefon were also shown to control powdery mildew and leaf rust effectively and give protection against reinfection. The trials in 1977-78 were on a large scale (plots 24 x 150 m) and the results confirm those obtained by Teng and Close (1977) using 6 x 20m plots.

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