SEED TREATMENTS FOR CONTROL OF NET BLOTCH OF BARLEY

J. EDMUND SHERIDAN and NICK GRBAVAC

*Botany Department, Victoria University of Wellington, Wellington.
Plant Protection Centre, MAF, Levin.*

SUMMARY

Seed treatments were evaluated for control of net blotch (*Pyrenophora teres* con. stat. *Drechslera teres*) on seed of barley cultivars carrying triadimenol resistant strains of the pathogen. Registered treatments containing imazalil gave best control in all trials in the autumn and spring of 1984.

INTRODUCTION

Outbreaks of net blotch, caused by the seed-borne fungus (*Pyrenophora teres* (con. stat. *Drechslera teres*), have occurred in New Zealand barley crops with consequent losses in yield. These outbreaks were generally due to the use of an ineffective seed treatment (Sheridan 1975) or inefficiency of coverage of seed (Hampton 1975). In 1982-83, in the Manawatu/Wanganui districts of the North Island, the seed treatment containing triadimenol + fuberidazole ('Baytan F17') failed to control the disease in the recently introduced cultivars Mata and Triumph (Sheridan and Grbavac 1983; Hampton and Liew 1984). Triadimenol resistant strains of *P. teres* were isolated and subsequently found in barley crops throughout the country (Sheridan and Grbavac 1985; Sheridan *et al* 1985a). New seed treatments containing imazalil ('Fungazil' and 'Baytan IM') were shown to be very effective in controlling net blotch where triadimenol had failed (Sheridan and Grbavac 1983; Sheridan *et al* 1984). Since both triadimenol and imazalil are ergosterol biosynthesis inhibitors there is the possibility of cross resistance occurring. It is essential to continue to test the effectiveness of imazalil in net blotch control and to search for new fungicides from different chemical groups. This paper reports on trials carried out in the autumn and spring of 1984 to investigate the effectiveness of registered and new experimental seed treatments on control of net blotch in some barley cultivars, and the results of screening commercially treated seed for effectiveness of control.

MATERIALS AND METHODS

Treatments with the rates of application and cultivars used are in the accompanying tables. A representative sample, 250 g of seed, was treated in the laboratory and sown in 5 m drills as previously described (Sheridan and Grbavac 1983). Net blotch was assessed by counting all diseased and emerged seedlings at Feekes G.S. 1 (Zadoks 10-12). The autumn 1984 trial was at Gladstone and the spring 1984 trial at Carterton (Nutt Farm) in ground which was not in barley in the previous year. This ensured that only seed-borne inoculum was present. In the spring trial an organo-mercury seed treatment was included for comparison. Samples of seed commercially treated by a Mist-O-Matic machine with imazalil (carried in ethanol) were tested in the laboratory for presence of *P. teres* by plating to malt extract agar containing 10 µg/ml benomyl and incubating for up to 10 days on the laboratory bench.

RESULTS

In the autumn trial the treatments containing imazalil alone and imazalil + triadimenol gave excellent control (96-100%) on all twelve cultivars. The triadimenol + fuberidazole treatment gave little or no control (Table 1). In the spring trial imazalil alone and imazalil + triadimenol gave control equal to that of organo-mercury on all three cultivars Triumph, Kaniere and Zephyr which carried triadimenol resistant *P. teres* (Table 2).

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TABLE 1: Infection and control of net blotch achieved in a hand-sown field trial in the Wairarapa in the autumn of 1984.

Cultivar and % seed-borne infection		No. of diseased seedlings and percent control							
		triadimenol + fuberidazole 15 g + 2 g†		triadimenol + imazalil 15 g + 5 g†		imazalil (in ethanol) 5 g†		untreated	
		D*	C**	D	C	D	C	D	E***
Aclaim	90	25	11	0	100	1	96	28	523
Georgie	96	53	34	1	98	1	99	77	557
Goldmarker	100	25	3	0	100	0	100	26	665
Grit	98	30	0	0	100	0	100	33	514
Hassan	52	52	0	1	97	0	100	34	469
Kaniere	97	47	0	0	100	0	100	41	529
Lada	100	49	31	1	99	0	100	77	544
Mata	92	68	0	1	98	0	100	64	607
Maxima	96	52	0	0	100	0	100	44	477
Porter	97	70	0	0	100	1	97	46	637
Triumph	90	63	12	1	98	0	100	67	566
Zephyr	96	81	15	0	100	0	100	104	607

† Rate of ai/100 kg seed

* Mean number of diseased seedlings averaged over 3 replicates.

** Control as % of untreated check adjusted for emergence.

*** Mean number of seedlings emerged averaged over 2 replicates.

TABLE 2: The effect of registered and experimental seed treatments on net blotch control in hand-sown field trials in the Wairarapa in the spring of 1984.

Treatment (g ai/100 kg seed)	Control as % of untreated			
	Zephyr (100) †	Triumph (100)	Kaniere (100)	Zephyr †† (75)
triadimenol + fuberidazole 15 g + 2 g (Baytan F17)	40 c†††	60 c	14 c	100 a
triadimenol + imazalil 15 g + 5 g (Baytan IM)	99 a	98 a	94 a	75 bc
imazalil (in ethanol) 5 g (Fungazil)	94 a	99 a	100 a	64 c
carboxin + thiram 50 g + 50 g (VitaFlo 200)	85 b	77 b	43 bc	30 de
carboxin + thiram + imazalil 50 g + 50 g + 5 g	90 ab	97 a	65 bc	80 bc
carboxin + imazalil + TBZ 60 g + 4 g + 5 g	74 b	59 c	71 b	85 bc
carboxin + imazalil + TBZ 75 g + 5 g + 6.75 g	67 b	62 c	77 b	15 e
carboxin 75 g	38 c	68 c	44 bc	32 de
iprodione 100 g	98 a	91 a	84 b	70 bc
carbendazim + mancozeb 30 g + 120 g (Granosan)	93 a	87 ab	98 a	73 bc
organo-mercury* 2.2 g	99 a	95 a	100 a	100 a
Untreated** Diseased	33 d	20 d	15 d	5 e
Emerged	624	602	607	616

Key to Table 2:

- * 1% mercury as phenyl mercury acetate + ethyl mercury chloride.
 ** Mean. no. of diseased and emerged seedlings per row at Feekes G.S. 1 (Zadoks 10-12) and 18 days after emergence. Diseased averaged over 4 replicates and emerged averaged over 5 replicates.
 † Percent seed-borne infection shown in brackets.
 †† Seed line carrying triadimenol sensitive *P. teres*.
 ††† Statistical analyses on incidence of infection. A common letter indicates no significant difference at the 5% level. Read down the columns.

Control was significantly poorer on the seed line of Zephyr carrying triadimenol sensitive *P. teres*. The addition of imazalil to the carboxin + thiram treatment improved its performance to an acceptable level on two of the four seed lines. The treatments containing carbendazim + mancozeb and iprodione gave good control also on only two of the four seed lines. The other treatments were less effective.

Seed lines of cv Triumph treated commercially with imazalil ('Fungazil') were tested for the presence of *P. teres* before and after treatment. The pathogen was detected in one out of 68, and three out of 11 treated seed lines, in 1983 and 1984 respectively. Infection in any treated seed line did not exceed 1% (Table 3).

TABLE 3: Incidence and levels of infection with *D. teres* detected before and after commercial treatment of seed lines of the barley cv Triumph with imazalil.

	SOUTH ISLAND				NORTH ISLAND			
	1983		1984		1983		1984	
	Untreat.	Treated*	U	T*	U	T*	U	T*
No. of seed samples	65	65	6	6	8	3	5	5
No. with <i>D. teres</i>	29	1	2	2	8	0	5	1
Range of infection**	1-6%	1%	1-22%	1%	3-47%	0%	1-3%	1%

* Commercially treated by the Mist-O-Matic machine using 'Fungazil'.

** The number of seeds infected in each sample.

DISCUSSION AND CONCLUSIONS

The currently available imazalil-containing seed treatments gave excellent control of net blotch on all cultivars tested in 1984 with the exception of a seed line of cv Zephyr carrying triadimenol sensitive *P. teres*. Since the triadimenol resistant strain of *P. teres* now predominates, these seed treatments should continue to be effective for some time to come.

However, because cross resistance to the related ergosterol biosynthesis inhibitor, nuarimol, occurs and a strain of imazalil resistant *P. teres* has been isolated from seed originating in Europe (Sheridan *et al* 1985 b) there is a need for continued vigilance and search for a new seed treatment which has a different mode of action.

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