CHEMICAL CONTROL OF SPECKLED LEAF BLOTCH AND STRIPE RUST IN KOPARA WHEAT

S. WOODS, K.C. CHAN and R.E. GAUNT

Department of Agricultural Microbiology, Lincoln College, Canterbury

SUMMARY

Trials in 1981 and 1982 showed that three triazole fungicides, propiconazole, diclobutrazol and triadimefon effectively reduced disease severity when applied as foliar sprays to wheat, cv Kopara. The reduction was due mostly to reduced flecking by stripe rust (*Puccinia striiformis*). Yield was not affected by treatments in 1981, possibly due to the drought experienced in that season. In 1982 significant and economic yield losses due to disease were prevented by treatment with these fungicides. Fenpropimorph also showed some promise for the control of leaf diseases.

INTRODUCTION

Speckled leaf blotch (*Mycosphaerella graminicola*, imperfect state *Septoria tritici*) was controlled by a number of different fungicides in a field trial on Kopara wheat at Lincoln College in 1979/80 (Thomson *et al* 1981). The major response to treatment was attributed to those components determined early in the crop growth cycle, i.e. ear number per unit area and grain number per ear. It was recommended that this disease be controlled by one or two sprays applied in August. Since that trial, several new fungicides have become or will soon be available commercially. Also a new disease for New Zealand, stripe rust, has been shown to be potentially damaging to wheat crops. The situation has therefore changed markedly for disease control strategies. Recent dry years and the increased crop area of the resistant cultivar Rongotea, have reduced the development of speckled leaf blotch. However, this disease should still be regarded as a hazard to wheat production. This paper reports on the relative efficacies of a range of fungicides, applied as foliar sprays, for the control of both speckled leaf blotch and stripe rust. Kopara was selected for these trials as an example of a cultivar susceptible to speckled leaf blotch and stripe rust.

METHODS

Blocks of wheat, cv Kopara, were sown on 28 May 1981 and 20 May 1982 at Lincoln College, on Templeton silt loam soil. After crop emergence, treatment plots (12 x 10 m) were marked out in four replicate blocks, each block containing twelve (1981) or eight (1982) randomised treatment plots. The plots were separated by 6 m buffer zones and the replicate blocks by 10 m buffer zones. All buffer zones were untreated to provide an adjacent inoculum source, designed to be a more severe test of treatments than in commercial situations. Sprays were applied for all treatments using a hand carried 6 m boom with hollow-cone nozzles (D2 - 25) operating at 450 kPa and applying 300 litres/ha. Spraying oil (1%) was included with treatments where appropriate.

Disease was assessed at intervals from 1 week after the first spray application till there was no green leaf area on the plants. Severity of infection was assessed on each fully expanded leaf as the mean non-green area (speckled leaf blotch and stripe rust lesions, disease induced senescence and natural senescence) on those leaves still bearing some green area in the most effective treatment. A disease index was calculated as the mean of the non-green area on selected leaves at each growth stage sampled. This disease index was selected as an indicator of the relative amount of disease in different treatments at each time of sampling (Lim and Gaunt 1981).

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At harvest, ten 0.1 m² quadrat samples were removed from the central zone of each plot for detailed analysis of yield components. A central 3 m strip was harvested mechanically and the header yields and individual grain weights recorded.

RESULTS AND DISCUSSION

The first symptoms of both speckled leaf blotch and stripe rust were observed on the main stem leaves at early tillering (G.S. 23-30, Zadoks *et al* 1974). In both years, disease severity was reduced by the three triazole fungicides, with the greatest effect 2-3 weeks after the second spray was applied (Tables 1 and 2), though effects were observed before and after this time. There was a period of 2-3 weeks after spray application before the effect of treatment became statistically significant. By anthesis (30 November and 7 December in 1981 and 1982 respectively), there were no significant differences between these treatments and the water or water and oil treated plots. There was little difference between the efficacy of the three triazole fungicides, all of which reduced the amount of flecking due to stripe rust and the level of speckled leaf blotch.

The four MBC-type fungicides had little effect in 1981 on disease severity, even at the early growth stages. Speckled leaf blotch did not develop markedly in the trial possibly because of a combination of the dry seasons and a low level of inoculum from the previous season. Thus the known efficacy of this type of chemical against speckled leaf blotch was not observed. In 1982, when speckled leaf blotch levels were higher, thiabendazole reduced overall disease severity at growth stage 44 only. Fenpropimorph reduced disease severity in 1982 at growth stages 44 and 56, mostly by reducing the incidence and severity of stripe rust. The effect was less than with the triazole fungicides. There were no effects on disease severity by the remaining treatments, though in 1981 some phytotoxicity (Thomson *et al* 1981) was observed in plots treated with captafol, especially after the first application.

TABLE 1: Effect of fungicides on disease severity in wheat (1981).

Treatment*	Rate g ai/ha	Date G.S.	Disease Severity**				
			5/10 31	15/10 32	27/10 34	9/11 33	18/11 52
diclobutrazol	125		33 c	42 e	40 b	44 bc	30.9 d
propiconazole	125		38 c	50 cde	41 b	34 c	35.0 cd
triadimefon	125		39 c	46 de	46 b	46 b	41.7 bcd
benomyl	250		51 ab	55 abcd	62 a	61 a	53.5 ab
cardendazim	250		60 a	59 abc	53 ab	50 ab	48.8 abc
thiabendazole	250		58 a	60 abc	58 a	50 ab	59.1 a
thiophanate methyl	250		44 bc	52 bcde	61 a	59 a	52.7 ab
chlorothalonil and oil	1660		56 ab	59 abcd	59 a	55 ab	52.8 ab
mancozeb and oil	1600		59 a	66 a	52 ab	52 ab	47.0 abcd
prochloraz and oil	400		55 ab	55 abcd	58 a	59 a	50.7 abc
captafol and oil	1500		53 ab	50 cde	58 a	60 a	50.0 abc
water and oil	—		56 ab	63 ab	61 a	54 ab	52.5 ab
LSD 5%			11.5	11.3	14.2	10.1	14.8

* - Treatments were applied on 31 August and 26 September.

** - Mean of percent non-green leaf area.

Treatments also were assessed on 7.9, 14.9, 21.9, 30.11 and 14.12, when there were no significant differences between treatments, and water-treated plots.

TABLE 2: Effect of fungicides on disease severity in wheat (1982).

Treatment*	Rate g ai/ha	Date G.S.	Disease Severity**			
			26/10 32	5/11 44	15/11 56	26/11 68
diclobutrazol	125		54 cde	49 bcd	23 cd	68 ab
propiconazole	125		50 e	48 bcd	27 bcd	65 bc
triadimefon	125		51 de	34 d	23 cd	63 bc
thiabendazole	250		61 abc	58 bc	30 ab	64 bc
fenpropimorph	750		57 bcde	42 cd	24 cd	74 a
prochloraz	400		60 abcd	62 ab	30 ab	71 ab
captafol	1500		66a	64 ab	34 a	72 ab
water	-		64 ab	79 a	32 ab	71 ab
LSD 5%			7.3	17.8	5.5	8.3
cv %			8.9	25.2	14.3	8.6

* - Treatments were applied on 13 September and 24 September.

** - Mean of percent non-green leaf area on the leaf positions being assessed.

Treatments were assessed also on 7, 14, 21 and 28 September on 15 October, and 22 December, when there were no significant differences between treatments.

In both years the crop was subject to drought and in 1981 to a late epidemic of stripe rust which was not controlled by the treatments. Yields were constrained by these factors which probably reduced the effect of treatments on yield (Table 3). None of the treatments affected yield in 1981. In 1982 header yields were significantly greater in plots treated with propiconazole than in the water-treated plots. All other treatments yielded higher than the non-treated plots, though these were not significant. The yield from quadrat samples showed similar effects, being attributable to increased numbers of ears per unit area and lesser effects on individual grain weight and grain number per ear.

TABLE 3: Effect of fungicide treatment on yield of wheat.

Treatment	Header Yield 1981/82 (t/ha)	Header Yield 1982/83 (t/ha)	Quadrat Sample 1982-83			
			Ears/m ²	Grain/ear	Individual Grain Wt (mg)	Yield (t/ha)
diclobutrazol	4.2 a	4.8 abc	515 ab	27.6 a	36.0 bcd	5.1 ab
propiconazole	4.4 a	5.3 a	526 a	28.7 a	38 ab	5.6 a
triadimefon	4.5 a	5.0 ab	534 a	25.6 a	37.2 abc	5.1 ab
benomyl	4.0 a	—	—	—	—	—
cardendazim	4.1 a	—	—	—	—	—
thiabendazole	4.4 a	4.5 bc	512 ab	26.9 a	35.8 bcd	4.9 b
thiophanate methyl	4.1 a	—	—	—	—	—
fenpropimorph	—	4.8 abc	529 a	25.8 a	37.4 ab	5.1 ab
chlorothalonil	4.2 a	—	—	—	—	—
mancozeb	4.0 a	—	—	—	—	—
prochloraz	3.9 a	4.8 abc	534 a	26.0 a	36.3 bcd	5.1 ab
captafol	3.8 a	4.8 abc	453 b	28.7 a	35.6 cd	4.6 b
water	3.8 a	4.3 bc	482 ab	27.2 a	35.0 d	4.6 b
LSD 5%	0.6	0.5	61.3	3.0	1.5	0.6
CV %	—	7.3	8.2	7.6	2.8	8.2

In the 1981 and 1982 seasons, the triazole fungicides were the most promising for the control of speckled leaf blotch and stripe rust in Kopara wheat. It is likely that these chemicals would be the most effective on cultivars such as Rongotea, Hilgendorf, Takahe and Tiritea, which are very susceptible to stripe rust as demonstrated by McCullough (1982 a and b).

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APPENDIX

Common and trade names of fungicides used.

Common	Trade	Common	Trade
benomyl	Benlate 50WP	mancozeb	Dithane M45
captafol	Difolatan 80W	prochloraz	Sportak 40EC
carbendazim	Bavistin 50W	propiconazole	Tilt 250EC
chlorothalonil	Bravo 72F	thiabendazole	Tecto 45 F
diclobutrazol	Vigil	thiophanate-methyl	Topsin M
fenpropimorph	Mistral 75EC	triadimefon	Bayleton 25EC