CONTROL OF CROWN RUST IN OATS IN THE MANAWATU

P.A. BURNETT and W.J.P. MITCHEL

Crop Research Division, DSIR, Private Bag, Palmerston North

SUMMARY

In Manawatu a field trial with three oat (*Avena sativa*) cultivars was used to assess the effectiveness of triadimefon for the control of oat crown rust caused by *Puccinia coronata* f. sp. *avenae*. The cultivars Makuru and Omihi both gave significant economic yield responses from one spraying at the first sign of rust infection. However, the more resistant cultivar Caravelle did not respond to any treatment.

INTRODUCTION

Oat crown rust occurs throughout New Zealand wherever oats are grown. Crop Research Division of DSIR has a small oat selection and evaluation programme in the Manawatu. One of its aims is to select a crown rust resistant oat, because the crown rust resistance of South Island oat cultivars is not adequate in this environment. High levels of crown rust are common on all commercially available oat cultivars grown for green feed, chaff or grain in the Manawatu.

Simons (1970) stated that damaging outbreaks of crown rust have been reported from most areas of the world and that grain losses range from 10 to 40%. Martens *et al* (1972) recorded yield losses of up to 30% in Canada, but stressed that the level of crown rust, and so the level of yield losses, may vary greatly from year to year.

Eagles and Taylor (1976) documented winter forage losses in New Zealand due to crown rust. In a winter trial during 1981 we observed total sterility caused by crown rust on the cultivar Taiko and near total sterility in Makuru. Sheridan and Grbavac (1982) have recorded yield increases on the cultivar Mapua (Makuru?) of up to 26% due to controlling crown rust by spraying.

This paper reports preliminary results from using triadimefon for the control of crown rust on commercially available oat cultivars in the Manawatu in the 1981-82 season.

MATERIALS AND METHODS

Replicated plots of the oat cultivars Makuru, Omihi and Caravelle were untreated, or given one or two sprays with triadimefon at the rate of 125 g/ha. The trial was seeded within a commercial crop of Caravelle oats, at Kairanga near Palmerston North. Before sowing all seed was treated with the combination product triadimenol + fuberidazole (15 g + 2 g/100 kg seed). The trial design was a three-replicate split plot with sprays on main plots and cultivars on sub-plots.

Seed was drilled with a cone seeder on 15 October 1981. Plots were of seven rows at 15 cm spacing and 22 m long. The seeding rate aimed at establishing 300 plants/m², which equated approximately to a seeding rate of 160 kg/ha. Bromoxynil plus MCPA (0.4 + 0.4 kg/ha) was applied post-emergence to control broadleaf weeds by the farmer.

A propane-operated sprayer was used for applying triadimefon. The first spray was applied on 22 December 1981 at the first sign of crown rust, just as the crop was heading. The second spray was applied on 14 January 1982. The overall rust severity was assessed on 21 January 1982. Plots were harvested with a small self-propelled combine. Grain yields were recorded and a sample was taken to determine kernel weight and percentage screenings.

Proc. 35th N.Z. Weed and Pest Control Conf.

RESULTS AND DISCUSSION

Average crown rust scores from the three replicates (Table 1) show that the three cultivars exhibit a range of response to this pathogen. All are susceptible to crown rust in the North Island, but they differ in the speed with which crown rust infection develops. Makuru is very susceptible, Omihi rusts more slowly, and rust infection and development are slowest on Caravelle. However, from our observations, in a season that favours crown rust development each of these cultivars will ultimately rust severely. This year the general severity of crown rust was low, and the trial was protected by being in a field of Caravelle, a slow-rusting cultivar.

Plots of Omihi and Makuru receiving one spray had significantly less rust than the untreated, and two sprays gave complete control of the rust (Table 1).

Yields of Makuru and Omihi were significantly increased by one spray. These increases represent an economic return from the treatment. However, a second spray did not provide any further advantage in yield, and with Omihi the yield was not significantly different from that of the unsprayed plots. This could mean that the double spray caused a slight depression of yield. The yield of Caravelle did not vary with spray application, and was significantly lower than from all treatments other than unsprayed Makuru.

TABLE 1: Effect of triadimefon spray on crown rust score and grain yields of three oat cultivars. Palmerston North 1982.

Treatment	Omihi		Makuru		Caravelle	
	Rust score* (1-9)	Grain yield t/ha	Rust score (1-9)	Grain yield t/ha	Rust score (1-9)	Grain yield t/ha
Not sprayed	5.3	4.9	9.0	3.4	2.7	4.0
One spray	2.7	5.5	4.7	5.3	2.0	4.0
Two sprays	1.0	5.3	1.0	5.2	1.0	4.0
Rust score			Grain yield			
LSD	5%	0.8	LSD	5%	0.5	
	1%	1.2		1%	0.7	

(Figures can be compared in any direction)

* Rust score, 1 = no rust, 9 = high level of rust.

TABLE 2: Effect of triadimefon spray on kernel weight and percentage screenings of three oat cultivars. Palmerston North 1982.

Treatment	Omihi		Makuru		Caravelle	
	kernel wt (mg)	% screenings	kernel wt (mg)	% screenings	kernel wt (mg)	% screenings
Not sprayed	39.3	5.8	34.6	10.6	33.5	11.5
One spray	42.2	5.8	37.0	4.9	33.0	9.0
Two sprays	41.5	5.4	37.7	4.6	33.5	10.7
Kernel weight			% screenings			
LSD	5%	1.6	LSD	5%	1.7	
	1%	2.5		1%	2.7	

(Figures can be compared in any direction)

Table 2 shows that the average kernel weight of both Omihi and Makuru was significantly increased by spraying, but the increase did not fully account for the yield response. There was no response in the kernel weight of Caravelle, which had the lightest kernels.

The percentage screenings loss was reduced significantly by one or two sprays in Makuru and by one spray in Caravelle.

CONCLUSION

Losses caused by crown rust in the Manawatu in the oat cultivars Makuru and Omihi can be reduced significantly by the application of a single spray of triadimefon when seed treated with triadimenol/fuberidazole is sown. Spraying would have given a profitable return on these two cultivars.

On the relatively resistant cultivar Caravelle the spray reduced infection but this did not result in a yield response.

ACKNOWLEDGEMENTS

Appreciation is expressed to Mr R. Coulson for the trial site, Bayer New Zealand Ltd for supplying the triadimefon and the staff of CRD substation, Palmerston North, for assistance with the trial.

REFERENCES

- Eagles, H.A. and Taylor, A.O., 1976. Forage oat varieties for the North Island with emphasis on disease resistance. *Proc. Agron. Soc. N.Z.* 6: 31-35.
- Martens, J.W., Fleischman, G. and McKenzie, R.I.H., 1972. Effects of natural infections of crown rust and stem rust on yield and quality of oats in Manitoba. *Can. Plant Dis. Surv.* 52: 119-125.
- Sheridan, J.E. and Grbavac, N., 1982. Cereal diseases 1981-1982. Disease survey, disease control and yields in the Wairarapa and Manawatu. Botany Department Victoria University of Wellington, Mycology and Plant Pathology Report 19. ISSN 0110-9340. 111 pp.
- Simons, M.D., 1970. Crown rust of oats and grasses. Monograph 5. The American Phytopathological Society, 47 pp.