CDA OF FUNGICIDES FOR CONTROL OF CROWN RUST OF OATS

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SUMMARY

Propiconazole and triadimefon gave excellent control of crown rust of oats caused by *Puccinia coronata* with yield increases in excess of 20% in replicated trials in the Wairarapa. Significantly better control was obtained with CDA than a conventional spray technique in 1980-81 but not in 1981-82.

INTRODUCTION

There is considerable interest in controlled droplet application (CDA) of fungicides because of the savings in costs of fuel, chemicals and labour (British Crop Protection Council 1978, Bals 1978, Maas 1971). Although a range of new machines are available in New Zealand, and some farmers have recently applied fungicides to their cereal crops by this method (Leech 1981), there is a lack of published information comparing CDA with conventional techniques. In the trials reported CDA was compared with a knapsack application technique using two fungicides for control of crown rust of oats.

MATERIALS AND METHODS

The oat seed line cv Mapua was drilled at Ahiauruhe in the Wairarapa on 24 October 1980 and 2 November 1981 to land previously in ryegrass. Following emergence 30 plots each 20 x 2 m, separated by 1 m gaps, were marked out and the gaps rotaryhoed. The two fungicides triadimefon (250 EC) and propiconazole (100 EC in 1980-81, 250 EC in 1981-82) were applied by the hand-held Micron Ulva 8 (CDA) held 15 cm above the crop and a knapsack sprayer (conventional) fitted with a Norgren R06 pressure regulator and operated at 100 kPa. While spraying the trials the speed of the operator was regulated with the aid of a pace-meter: wind speeds ranged from 0 to 5 km/h. Further information is given in Table 1. Two sprays were applied in each season: on 5 and 13 January 1981 at Feekes G.S. 10.2 and 10.5 respectively, and on 30 December 1981 and 12 January 1982 at Feekes G.S. 10.1 and 11.1 respectively. In the CDA untreated plots water + 25% antievaporant oil ("Ulvapron" BP N.Z. Ltd.) was applied without fungicide in 1981-82: in the previous season the untreated plots were not sprayed. Disease incidence and severity was assessed on 10 tillers taken at random along a diagonal in each plot. Plots were harvested with a Massey-Ferguson combine harvester with a swath width of 1.6 m.

TABLE 1: Data relating to spray application techniques.

	Delivery rate*	Spray volume	Nozzle	Speed	Droplet size**	Diluent
	ml/min	litres/ha	type	paces/sec	microns	
CDA 1980-81	87.5	20	-	1	80	water + 25%
1981-82	87.5	20	-	1	80	anti-
Conventional						evaporant
1980-81	633	300	fan jet	1	-	
1981-82	563	300	cone jet	1	-	water

* Actual with water only: nominal for Micron Ulva 8 (CDA) is 60 ml/min.

** Volume average diameter i.e. the diameter of the drop of average volume.

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RESULTS

Both triadimefon and propiconazole gave excellent control of crown rust in both seasons by both techniques (Table 2 and 3). In 1980-81 significantly better control was obtained by CDA. Application of the diluent without fungicide by CDA gave some control of crown rust. All fungicide treatments gave yield increases of 20% or greater: the diluent without fungicide gave an 11% yield increase.

TABLE 2: Comparison of CDA and conventional application of foliar sprays in control of crown rust of oats 1980-81.

Method	Fungicide and rate/ha	Incidence (%) at first spray* G.S.10.2	Mean severity of crown rust on top 3 leaves				% control at G.S.11.1 11.2
			G.S. 10.2	G.S. 10.5	G.S. 11.1	G.S. 11.1-11.2	
CDA	triadimefon 125 g	16	0	0.2	1.5	1.1 C	97
	propiconazole 125 g	14	0	0.6	1.5	1.2 C	97
Conventional	triadimefon 125 g	12	0	0.6	1.3	2.9 B	93
	propiconazole 125 g	6	0	0.3	1.3	2.5 B	94
	untreated	8	0	0.5	10.1	44.0 A	0

* Second spray applied 13 January 1981 at G.S. 10.5.

TABLE 3: Comparison of CDA and conventional application of foliar sprays in control of crown rust of oats 1981-82.

Method	Fungicide and rate/ha	Incidence (%) at first spray* G.S.10.1	Mean severity of crown rust on top 3 leaves				% control at G.S. 11.2	Yield kg/ha
			G.S. 10.5	G.S. 11.1	G.S.11.1 (late)	G.S. 11.2		
CDA	triadimefon 125 g	64	0.2	1.7	2.9	6.9 b	87	4300 a
	propiconazole 125 g	46	0.3	0.9	1.4	6.9 b	86	4530 a
	25% "Ulvapron"	48	0.7	3.5	13.4	38.2 a	25	3990 b
Conventional	triadimefon 125 g	74	0.2	0.6	2.3	5.6 b	89	4570 a
	propiconazole 125 g	68	0.1	0.6	1.8	5.9 b	89	4480 a
	untreated	58	1.1	5.8	21.5	51.5 a	0	3590 c

* Second spray applied 12 January 1982 at G.S. 11.1.

DISCUSSION

Controlled droplet application of fungicides compared favourably with conventional application in control of crown rust of oats in the Wairarapa. Yield increases of 20% or greater were obtained. The slightly less effective control by both CDA and knapsack application in 1981-82 is probably due to the higher infection levels at first spray application although the longer interval between spray applications (13 days compared to 8 days) may also contribute. In the small plot trial work described here extreme care was necessary to ensure delivery of the correct amount of active ingredient to all plots. A small error in timing could lead to too high an application rate on CDA plots because of the more highly concentrated spray. Further, spraying in conditions where wind speeds of greater than 8 km/h occurred could lead to too low an application rate and confounding of treatments because of drift. Large scale trials are desirable. Tractor or helicopter-mounted "Micromax" units could be used, the former has been successfully used in New Zealand in non-replicated trials with triadimefon in

control of stripe rust of wheat (Leech 1981) and in replicated trials with insecticides (Trought 1981, Wrenn and Skinner 1981), but the latter although used to apply herbicides (Rennie 1981) has not been used for fungicides as far as we are aware. Application by helicopter would, of course, avoid crop damage although tramlining could be used with ground application. The advantages of CDA are recognised, particularly in the use of insecticides and herbicides. The work reported here promises well for the use of CDA in fungicide application particularly for control of foliar diseases of cereals.

ACKNOWLEDGEMENTS

We are grateful to Robert and Jan Baird of Waiwiri Farm, Gladstone, for the use of land and machinery and to Ciba Geigy (NZ) Ltd. and Bayer (NZ) Ltd. for supplying the fungicides.

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