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Research Note

THE TOLERANCE OF BARLEY CULTIVARS TO WILD OAT HERBICIDES

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SUMMARY

The barley cultivars Zephyr, Mata and Manapou were sprayed with 1.0, 1.5 and 2.25 kg/ha of difenzoquat or diclofop-methyl at two spraying times. In a trial in 1977 phytotoxicity from both herbicides, particularly difenzoquat, was noted but no significant yield differences were detected. In a repeat trial in 1979 where more severe phytotoxicity resulted, treatment with herbicide depressed yields of Zephyr. Difenzoquat caused more phytotoxicity than diclofop-methyl. At recommended rates of 1.0 kg/ha the yield tolerance of the three cultivars appeared satisfactory though some phytotoxicity occurred.

INTRODUCTION

Previous trials (Allen and Butler 1980; Butler *et al* 1980) using post-emergence wild oat herbicides in barley were conducted on the then standard malting cultivar Zephyr and were concerned principally with the control of wild oats in the crop. They indicated the potential of difenzoquat and diclofop-methyl at 1.0 kg/ha for a high level of kill and seed suppression of wild oats. Some visual effects on the crop were noted but no adverse effect on yield. However differences in tolerance to these chemicals between barley cultivars are known to occur overseas and tolerant cultivars are specified (MAFF 1979). With the imminent release of two new cultivars of barley, Manapou and Mata, bred by the Crop Research Division, DSIR, we laid down a trial in 1977 to examine their tolerance to diclofop-methyl and difenzoquat and to compare their tolerance to that of Zephyr. We repeated the trial in 1979.

METHOD

Trials were sown with a precision hoe coulter drill on 14.10.77 and 28.11.79 on Templeton silt loam soils. Cultivars were sown at rates of 100 and 150 kg/ha of seed for the 2 years respectively. A four replicate split-plot design was used with the barley cultivars as main plot treatments and the herbicide treatments arranged as sub-plots. Two untreated plots were included in each main plot (Tables 1 and 2). Plot size was 15 x 1.5 m and herbicide treatments were applied in 200 litres/ha with a modified pressure sprayer operated at 210 kPa using Tee Jet 730231 (1977) or 8002 (1979) nozzles. Wetting agent (Agral LN) was added to difenzoquat treatments. The crops were sprinkler irrigated at the first node stage. Whole plots were harvested with a self propelled plot harvester. Assessments of crop injury were made 1 and 2 weeks after spraying treatments.

RESULTS

The 1977 trial site varied from a shallow to a heavy Templeton silt loam. This factor, accentuated by moisture stress before spraying, was the major cause of the high variability in the trial. There were no yield differences between cultivars (Table 1) or between treatments (Table 2). Early treatment plots yielded less than later treated plots

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TABLE 1: Cultivar yields.

Barley cultivar	Yield t/ha	
	1977	1979
Zephyr	5.28	3.75
Mata	4.52	3.63
Manapou	4.55	3.76
se (mean)	0.374	0.115
CV%	27.0	6.6

TABLE 2: Subplot treatment effects on barley yield.

Herbicide	Date applied Barley growth stage Rate kg/ha	Yields as % of untreated			
		15.11.77	27.11.77	19.12.79	26.12.79
		3½ lf	6 lf	4 lf	6 lf
diclofop-methyl	1.0	93	96	104	98
diclofop-methyl	1.5	92	91	103	97
diclofop-methyl	2.25	83	99	99	100
difenzoquat	1.0	92	105	102	103
difenzoquat	1.5	91	98	106	104
difenzoquat	2.25	89	97	101	99
untreated		100 (5.05 t/ha)		100 (3.68 t/ha)	
se (mean)		4.95		1.93	
CV%		18.1		6.6	
<i>Comparisons</i>					
treated vs untreated		ns		ns	
diclofop-methyl vs difenzoquat		ns		*	
time 1 vs time 2		**		*	

in spite of more phytotoxicity in difenzoquat treated plots. There was no cultivar by herbicide treatment interactions.

The 1979 trial was on a more even trial site but the crop was late sown. Barley growth was extremely rapid only 7 days separated the two growth stages in 1979 (12 days in 1977) (Table 2). However, as in 1977, the time of application in 1979 was important though in contrast earlier treated plots yielded more than later treated plots. There was a significant ($P < 0.01$) treated vs untreated cultivar interaction. Yields for this interaction were Zephyr, 3.71 vs 3.91; Mata, 3.71 vs 3.65 and Manapou, 3.81 vs 3.47 t/ha. The interaction was due to Zephyr showing an opposite effect to treatment than Mata or Manapou. The cause of this interaction is unknown.

Visual scores for the two trials gave similar results. Difenzoquat gave severe and unacceptable damage at the higher rates with yellow mottling and burning of most of the leaves. These symptoms appeared 3 to 4 days after treatment and were evident for up to 3 weeks after application. Eventually the badly affected leaves dried up and were lost. Diclofop-methyl also damaged the leaves causing brown-grey mottling. The effect increased with higher rates and persisted as for difenzoquat with premature loss of lower leaves. The height of the mature barley crop was also reduced slightly (2-3 cm) with diclofop-methyl treatments.

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CONCLUSION

These two trials showed that Zephyr, Mata and Manapou cultivars appeared relatively tolerant to higher than normal rates of diclofop-methyl and difenzoquat. Little effect was found on yield, but the phytotoxicity observed is an indication of potential yield intolerance. These trials were carried out under relatively good growing conditions after treatment. Where the crop is stressed, the yield tolerance may not be as satisfactory. Testing of other cultivars as well as testing the herbicides where growth conditions are not as good is essential if these herbicides are to be used on barley.

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REFERENCES

- Allen, F.C. and Butler, J.H.B., 1980. Comparison of some post-emergence chemicals for wild oat control in cereals. *Proc. 33rd N.Z. Weed and Pest Control Conf.*: 237-240.
- Butler, J.H.B., Allen, F.C. and Lister, A.J., 1980. Comparison of some wild oat herbicides for use in barley. *Proc. 33rd N.Z. Weed and Pest Control Conf.*: 241-244.
- MAFF, 1979. *Weed control in cereals*. ADAS leaflet CG21: Ministry of Agriculture, Fisheries and Food, London.