COMPARISON OF SOME POST-EMERGENT CHEMICALS FOR WILD OAT CONTROL IN CEREALS

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Summary

In wheat difenzoquat 0.83 kg/ha applied at the 4 to 5-leaf stage of wild oats (*Avena fatua*) and flamprop-methyl 0.75 kg/ha applied at early jointing gave equivalent control of wild oats to benzoilprop-ethyl 2.0 kg/ha at early jointing. In barley difenzoquat 0.83 kg/ha at the 2 to 4-leaf stage gave better control of wild oats than barban 0.35 kg/ha or flamprop-isopropyl 2.25 kg/ha. At the times and rates used in the trials both difenzoquat and flamprop-methyl reduced wild oat seed production below the level necessary to replace the initial population present at time of treatment. Grain yield response, when it occurred, was best from treatment at the 2 to 5-leaf stage of the wild oats with up to a 14% response in barley and a 49% response in wheat.

INTRODUCTION

Three herbicides with post-emergence activity against wild oats (*Avena* spp) became available in New Zealand in 1973. Two, flamprop-methyl (as WL 29761) and flamprop-isopropyl (WL 29762), are analogues of benzoilprop-ethyl. Flamprop-methyl being similar in range of tolerant crops to benzoilprop-ethyl occasioned less interest than flamprop-isopropyl which was reported to be suitable for use in barley. However, in 1974 the possibility that flamprop-methyl might replace benzoilprop-ethyl prompted a comparison of these chemicals in wheat and ryegrass seed crops.

The third chemical, difenzoquat (as AC 84777) offered the prospect of post-emergence wild oat control in both wheat and barley at a later stage of growth than barban but earlier than that recommended for either benzoilprop-ethyl or flamprop-isopropyl.

EXPERIMENTAL

The chemicals used and time of application with respect to stage of growth of the majority of the wild oats present are set out in Tables 1 and 2.

The application rates of the new chemicals were based on information supplied in proprietor's technical data sheets. Barban was used at the standard rate for the 12.5% formulation while benzoilprop-ethyl was applied at the rate considered optimum for seed suppression. Wetting agent (Citowett) at 0.5% V/V was used with difenzoquat treatments.

Treatments were in randomised complete blocks with from 4-6 replicates. Plots were 2 x 10 - 30 m, length and replication depending on the area of uniform wild oat infestation available.

Spraying was done with a bicycle wheel mounted boom with fan nozzles operated at 210 kPa and wheeled at uniform speed to give a volume of 200 litres/ha for chemicals other than barban. Pressure was increased to 350 kPa, nozzle orifice reduced and speed adjusted to give 100 litres/ha for barban application.

Wild oats were sampled by 0.1 m² quadrats either as fixed quadrats counted shortly after spraying and again before harvest or counted once only before harvest. Plant, panicle and spikelet counts were made. Crop yield was determined by direct heading whole plots.

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RESULTS

Barley

Wild oat control

Difenzoquat applied when the majority of the wild oats had 2-4 leaves and tillering was commencing (Feekes 2-3) gave a higher level of wild oat control than when applied at the 4 to 6-leaf stage (not significantly so at Halswell (1973-74) or at early jointing at Lakeside (1974-75) (Table 1). Control with flamprop-isopropyl, though disappointing, tended to be better at the 4 to 6-leaf stage (Fk 4-5) than at early jointing (Fk 6) in 1973-74 but, in 1974-75, was significantly better at the 2 to 4-leaf stage than at early jointing. There was a tendency towards better control with increasing rate for both chemicals but this was significant only with flamprop-isopropyl at Lakeside in 1973-74.

Difenzoquat at 2 to 4-leaf stage was superior to barban (included as a standard in 1973-74) and to flamprop-isopropyl, which tended to be less effective than barban.

TABLE 1: Wild oat control in barley cv Zephyr

Treatment	Rate kg/ha	Stage Wild oats leaf no.	Halswell 1973-74 Wild oat plants/m ²	Lakeside 1973-74 Wild oat panicles /m ²	Yield as % of untreated	Lakeside 1974-75 Wild oat panicles /m ²	Yield as % of untreated
barban	0.35	1-2½	31 bc				
barban	0.35	2-4	37 bc	84 c	102 bc		
difenzoquat	0.55	"				18 de	113 ab
difenzoquat	0.83	"	10 cd	0 d	112 a	3 e	116 a
difenzoquat	1.25	"	2 d	0 d	114 a	4 e	114 a
flamprop-isopropyl	1.0	"				54 d	98 cd
flamprop-isopropyl	1.5	"				46 d	101 cd
flamprop-isopropyl	2.25	"				41 d	95 d
difenzoquat	0.83	4-6	16 cd	72 c	100 bc		
difenzoquat	1.25	"	11 cd	69 c	102 bc		
flamprop-isopropyl	1.5	"	45 ab	146 b	106 ab		
flamprop-isopropyl	2.25	"	44 ab	102 c	101 bc		
difenzoquat	0.55	1-joint				108 abc	107 abc
difenzoquat	0.83	"				86 c	101 cd
difenzoquat	1.25	"				96 bc	108 ab
flamprop-isopropyl	1.0	"				125 ab	108 ab
flamprop-isopropyl	1.5	"	67 a	216 a	96 bc	90 c	103 bcd
flamprop-isopropyl	2.25	"	50 ab	144 b	95 c	100 bc	97 d
Untreated			52 ab	96 c	100 bc	142 a	100 cd
s.e. (mean)			7.95	12.0	2.8	13.0	3.3
Untreated yields			4160 kg/ha		4210 kg/ha		3420 kg/ha
CV%			47.9	25.8	5.5	37.0	6.2
Untreated: wild oat plants/m ²			52	89		125	

Crop yield

At Lakeside in 1973-74, plots treated with difenzoquat applied at the 2 to 4-leaf stage yielded significantly more than untreated plots. Yield differences at Halswell were not significant and results are not presented. At Lakeside in 1974-75 all the 2 to 4-leaf stage difenzoquat treatments and the early jointing stage difenzoquat 1.25 kg/ha and flamprop-isopropyl 1.0 kg/ha treatments were significantly higher yielding than untreated.

Cereals and Maize

Wheat

Wild oat control

Difenzoquat applied when the majority of wild oats had 4-5 leaves gave better control than flamprop-methyl applied at this stage, though the improvement was not significant in the Lincoln trial (Table 2). The 2 to 3-leaf time of application of difenzoquat at Darfield was less effective than the 4 to 5-leaf time of application.

Flamprop-methyl gave good control at early jointing stage in both trials and also at the 4 to 5-leaf stage at Lincoln. At Lincoln benzoylprop-ethyl was more effective at early jointing than at the 4 to 5-leaf stage. Difenzoquat and flamprop-methyl at the lower rates were less effective than at the medium rates. Thorough plot inspection indicated a slight improvement in control by increasing the dose rate by a further 50% to the high rate, but this was not detected by the sampling. At the middle and high rates difenzoquat at the 4 to 5-leaf stage and flamprop-methyl at early jointing gave similar good control of wild oats and were no different from benzoylprop-ethyl 2.0 kg/ha at early jointing.

TABLE 2: Wild oat control in wheat cv Kopara 1974-75 trials

Treatment	Rate kg/ha	Stage of wild oats	Darfield Wild oat panicles/m ²	Lincoln Wild oat panicles/m ²	Lincoln Yield as % of untreated
difenzoquat	0.55	2-3 lf	113 bc		
difenzoquat	0.83	"	32 de		
difenzoquat	1.25	"	21 de		
difenzoquat	0.55	4-5 lf	1 e	38 c	145 abc
difenzoquat	0.83	"	0 e	9 d	149 a
difenzoquat	1.25	"	2 e	1 d	146 abc
flamprop-methyl	0.5	"	150 ab	46 bc	142 bcd
flamprop-methyl	0.75	"	89 bc	17 d	148 ab
flamprop-methyl	1.125	"	71 cde	6 d	147 abc
flamprop-methyl	0.5	1-joint	54 cde	13 b	136 de
flamprop-methyl	0.75	"	14 e	3 d	134 de
flamprop-methyl	1.125	"	19 de	4 d	132 e
benzoylprop-ethyl	2.0	4-5 lf	4 e	66 b	141 cd
benzoylprop-ethyl	2.0	1-joint	45 cde	4 d	137 de
untreated			185 a	146 a	100 f
s.e. (mean)			19.5	8.0	3.0
untreated yield					3875 kg/ha
CV%			73	54.7	4.3
untreated: wild oat plants/m ²			137	86	

Crop yield

Crop yield differences were not significantly affected at Darfield and results are not presented.

At Lincoln all treatments yielded significantly more than untreated. The yields of difenzoquat and flamprop-methyl at the 4 to 5-leaf stage were similar, with the middle and high rates yielding significantly more than flamprop-methyl and benzoylprop-ethyl at the early jointing stage.

DISCUSSION

Difenzoquat and flamprop-methyl appear to be effective alternatives to the currently used benzoylprop-ethyl for post-emergence wild oat control in wheat, while difenzoquat offers the prospect of improved post-emergence control in barley. Similar conclusions have been reached overseas (Jordan 1977; Miller *et al* 1978).

Cereals and Maize

Wild oat populations show a variation of several leaf stages when sampled at spraying so that the population should be designated by the size range encompassing the majority of the plants. Difenzoquat gave good wild oat control when applied within the 2 to 5-leaf range with the modal stage at 3-leaf for spring sown crops and a ½ to 1-leaf later for winter-sown crops. This timing gave the best yield response in wheat at Lincoln and in barley at Lakeside. Flamprop-methyl has tended to be more effective applied later when the modal stage was early jointing. However, the better yield response with the earlier control could influence the decision as to time of spraying and points to the need to determine the reliability of control by early application with the chemical.

The yield results indicate that the low rates of difenzoquat (0.55 kg/ha) and flamprop-methyl (0.5 kg/ha) give sufficient control to achieve yield response with only marginal additional improvement likely following a 50% increase in dose rate. Estimating wild oat seed production on the basis of spikelet counts and allowing for two viable grains per spikelet, seed produced on the middle-rate optimum-time treatments with these chemicals would have been less than the number of plants recorded on the untreated plots and would have led to a net reduction in soil seed reserves. Thus at a dose rate of between 0.75 and 1.0 kg/ha both chemicals have promise for use in eradication programmes as well as prevention of yield losses from an infestation of wild oats.

The flamprop-isopropyl results were disappointing. The medium and high rate late-treated plots only appeared clean until harvest, since most of the retarded panicles and regrowth panicles remained below the level of the crop. Visual acceptability without yield response or adequate seed suppression is thus a possibility, while concealed panicles could present a problem at field inspection for certification.

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