DIFENZOQUAT FOR CONTROL OF WILD OATS IN PEAS

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Summary

Difenzoquat at rates of 0.5, 0.75, 1.0 and 2.0 kg/ha provided a high level of wild oat (*Avena* spp) control in two pea field trials. Difenzoquat was shown to be very dependent on the addition of high concentrations of wetting agent to provide satisfactory wild oat control. Peas (*Pisum sativum*) were shown to be tolerant to all rates of difenzoquat applied and significant yield responses were recorded from all rates of chemical application.

INTRODUCTION

Wild oats cause serious yield reductions in many crops. As wild oats emerge mainly in spring, autumn sown crops are less susceptible to infestation than spring sown crops. Barley is a more competitive crop than peas which are regarded as poor competitors (Jones 1976).

There is a need for more New Zealand information on the yield losses caused by wild oats in peas, and also for a more effective selective post-emergent wild oat herbicide. Difenzoquat has been widely tested throughout the world since 1971 and in New Zealand by Logan (1975) and Allen *et al* (1976). Yield increases and crop tolerance have been demonstrated in wheat (*Triticum aestivum*), barley (*Hordeum sativum*), and linseed (*Linum usitatissimum*). This paper reports on two trials carried out in the Mid Canterbury district to evaluate the use of difenzoquat for wild oat control in peas.

METHODS

Difficulty was experienced in the location of trial sites as a large proportion of the spring pea crops were sown in trifluralin treated soil thus restricting site selection to winter sown crops not pre-treated for wild oat control. Two trials were laid down in winter-sown field pea crops in which wild oats were present. This however, did not allow for comparison with a soil-incorporated trifluralin treatment.

Both trials were arranged in randomised blocks replicated three times and a plot size of 2 x 10 m. Plots were sprayed using a compressed air knapsack fitted with a hand held boom delivering 255 litres/ha, at 206 kPa. A non-ionic wetter was added at rates shown in Tables 1 and 2. No other herbicides were applied following the application of the trial treatments. Trial details have been summarised as follows:-

	Trial 1	Trial 2
Location	- Lowcliff	Westerfield
Soil type	- Southern grey	Southern yellow grey
Crop	- Peas var 'blue prussian'	Peas var 'maple'
Sowing date	- June 1976	May 1976
Application date	- 19 September 1976	20 September 1976
Wild oat stage	- 3-4 leaf	End of tillering
Crop stage	- 5 node	5-7 node

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Chemical effect on both crop and wild oats were recorded by visual observation and rating at regular intervals following treatment. Six weeks after treatment, pea populations in Trial 1 were established by counting plant numbers.

At harvest wild oat tillers were counted from 1 m²/plot in Trial 1 and in Trial 2 wild oat control was visually rated. In both trials 2 m² of peas were pulled from each plot to measure plant green weight yields. It was considered that this method would give a more reliable estimate of crop loss due to wild oats than shelled pea weights, as prolonged wet periods during spring/summer 1976 caused severe decay of lower pods.

RESULTS

Visual observations at 7 and 14 days after treatment showed a slight crop yellowing and occasional dark spotting on the leaves from all difenzoquat treatments. Difenzoquat 2.0 kg/ha caused the most severe yellowing but no differences were detected between remaining treatments. However, all symptoms of damage had disappeared by the third week following treatment. No height or maturity differences were detected throughout the duration of the trials.

Symptoms of herbicidal activity were not seen on wild oats for several days following treatment. Inhibition of the leaf and shoot development was seen after 14 days followed by yellowing, chlorosis and necrosis. Many plant deaths were seen to occur, however, regrowth did occur from the base of some plants in all treatments.

Table 1. Trial 1 — Visual assessments of wild oat control, plant numbers and pea yield data.

Treatment	Rate kg/ha	% wild oat control		Pea plants No/m ² 28.10.76	wild oat tillers/m ² 24.1.77	Pea green wgt(t/ha) 26.1.77
		1.10.76	28.10.76			
untreated	—	0c	0c	27b	87a	2.6 c
difenzoquat	0.5	30b	56b	34ab	56ab	39.5 ab
+ 0.52% v/v wetter						
difenzoquat	0.75	33b	64b	39a	33b	46.1 a
+ 0.52% v/v wetter						
difenzoquat	1.0	36ab	64b	35a	29b	29.4 b
+ 0.26% v/v wetter						
difenzoquat	1.0	40ab	79a	38a	13b	48.8 a
+ 0.52% v/v wetter						
difenzoquat	2.0	51a	89a	33ab	11b	45.5 a
+ 0.52% v/v wetter						
CV%		17	9	11	49	23
Stage of growth:						
		1-10-76 Wild oats 90% tillering; peas 10 node				
		28-10-76 Wild oats fully tillered; peas 5% flower				
		26-01-77 Wild oats 90% seed drop; peas green pod				

All treatments in Trial 1 significantly reduced wild oat infestation when compared with untreated (Table 1). However, difenzoquat 0.5 kg/ha plus 0.52% wetter and difenzoquat 1.0 kg/ha plus 0.26% v/v wetter failed to provide significant differences to untreated in Trial 2 (Table 2). In Trial 1 the treatment rating, for wild oat tiller numbers paralleled that of earlier percentage control assessments. An increase in either the difenzoquat rate or wetter rate consistently increased the level of wild oat control.

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Table 2. Trial 2 - Visual assessments of wild oat control and yield data.

Treatment 20.9.76	Rate kg/ha	Wild Oat Control* 28.10.76 26.1.77		Pea green wt t/ha
Untreated		0 b	0 b	2.7 c
difenzoquat + 0.52% v/v wetter	0.5	6 b	10 b	9.5 b
difenzoquat + 0.52% v/v wetter	0.75	9 b	38 a	12.4 b
difenzoquat + 0.26% v/v wetter	1.0	9 b	9 b	11.6 b
difenzoquat + 0.52% v/v wetter	1.0	23 a	52 a	15.1 a
difenzoquat + 0.52% v/v wetter	2.0	24.a	57 a	15.3 a
CV%	20	58	24	

Untreated wild oat population 26.1.77 = 130 plants /m²
 Stage of growth: 28.10.76 Wild oats panicles formed : Peas 5% flower
 26.1.77 Wild oats 100% seed drop : Peas green pod

In Trial 1 pea populations were significantly reduced by the heavy wild oat infestation in the untreated plots. This reduction in pea population reflected a severe competition from wild oats.

The yield figures (Tables 1 and 2) clearly show a significant advantage from treatment compared with untreated. In Trial 1 all difenzoquat treatments containing 0.52% v/v wetter were significantly better than the difenzoquat 1.0 kg/ha + 0.26% v/v wetter treatment. This indicated that within rates evaluated, wetter rate was more critical than difenzoquat rate. In Trial 2 at a constant wetter rate of 0.52% difenzoquat 1.0 and 2.0 kg/ha provided significantly better wild oat control than lower rates of difenzoquat. This result showed the advantage of higher rates of difenzoquat when applied to wild oats at a later stage of growth.

DISCUSSION AND CONCLUSION

The lower mean temperatures and the exceptional rainfall in the Mid Canterbury district over the reported growing season, had a marked effect on growth patterns. These conditions were favourable for the growth of wild oats and then subsequent re-tillering following difenzoquat treatment, especially in Trial 2 where difenzoquat was applied at the end of tillering. Shafer (1974) recommended for optimum results difenzoquat should be applied to wild oats between two and six leaves. Also lower temperatures are reported to adversely affect the performance of difenzoquat (Cyanamid International Corporation, Technical Information, 1975). Thus, the results on wild oat control obtained in Trial 2 were considered satisfactory when time of application and weather conditions were taken into consideration.

Concluding from both trials, difenzoquat 1.0 kg/ha + 0.52% v/v wetter produced the most economically satisfactory result for both crop tolerance and wild oat control. Lower rates of difenzoquat + 0.52% v/v wetter performed well when applied within the correct stage of wild oat growth (3-4 leaves) but failed to provide comparable control when applied at a later stage of growth. The difenzoquat rate of 1.0 kg/ha + 0.52% v/v wetter would be preferred for field use to allow for variability in stages of wild oat growth.

As a method of assessing pea losses from wild oat competition, there is always the possibility of introducing complicating factors with the use

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of herbicide. Chemical may have a deleterious affect upon the crop, or, alternatively, may have a beneficial one. However, from a practical and economic point of view, it was considered sufficient to measure competition as the difference between the yields from treated and untreated areas. These results clearly show that crop yield losses in field peas can occur from a severe infestation of wild oats. The results also support overseas data (Chesalin and Ramazanov 1963) which show peas to be weak competitors with wild oats, and provide evidence that wild oats have the capacity to suppress pea yields in the Mid Canterbury district.

Under more favourable weather conditions yield losses are not likely to be as exaggerated as reported in this paper, as it was considered that diseases were extremely active in the cooler and wetter conditions prevailing and may have damaged the peas, thus reducing their ability to compete with wild oats.

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