PRE-SEASON AND PRE-SOWING TREATMENTS ON WEED AND DIRECT-DRILLED CROP PERFORMANCE

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Summary. Six pre-season treatments which aimed to reduce seed set were imposed during spring 1985. Five pre-sowing treatments (cultivation plus trifluralin; direct drill plus trifluralin, oryzalin plus trifluralin, chlorsulfuron, or no herbicide), were superimposed over the pre-season treatments around sowing time. Triticale was sown eight days after application of glyphosate in May 1986. Pre-season treatments involving herbicide application, especially cultivation plus trifluralin, were more effective in reducing grass seedling numbers. In terms of weed DM, direct-drilling plus chlorsulfuron, and cultivation plus trifluralin were the most effective treatments. Triticale DM was increased by all pre-season treatments compared to control and by cultivation plus trifluralin compared to the direct-drilled treatments. Direct-drilled triticale was more sensitive to weed competition than when sown into a cultivated seedbed. For both sowing methods, the effect of weed competition on triticale DM increased as the season progressed.

INTRODUCTION

There is a large potential for obtaining 7-10 t/ha wheat yields in tableland environments, with relatively cool and moist springs providing favourable conditions for grain filling (4). Occurrence of frosts at flowering is of concern but with appropriate planting times these can be avoided (1). The timing of the commencement of the season, however, is not as reliable, and sod-seeding or direct-drilling techniques with their greater flexibility are seen as being an integral component of the cropping package for these areas. The attainment of high yields regularly and reliably from direct-drilled crops however is most seriously limited by ineffective weed control (3). Where weed populations are high as in a degraded pasture, pre-sowing herbicides are unlikely to be of any use. It seems that weed populations need to be substantially reduced if pre-sowing procedures are to be successful (2). This experiment aimed to look at the effect of herbicide application and grazing in the preceding season and pre-sowing treatments, on weed seedling numbers, and weed and crop growth during the subsequent cropping phase.

METHODS

The experiment was conducted on an old pasture area that had been cropped in 1984. The main components of the pasture were *Bromus molliformis*, *B. cathartícus*, *V. bromoides* and *Lolium perenne*. Six pre-season treatments plus a control were imposed in spring 1985. These were: paraquat 0.5 and 1.0 L/ha, each rate plus 0.5 L/ha 2,4-D ester; glyphosate 0.5 and 1.5 L/ha, each rate plus 0.5 L/ha 2,4-D ester; intensive grazing with sheep and later application of paraquat 1.0 L/ha + 0.5 L/ha 2,4-D ester; intermittent grazing with sheep; ungrazed (control). The timing of these operations is listed in Table 1. Main plot size was 10x10 m.

Superimposed over each pre-season treatment were four pre-sowing herbicide treatments, plus a control. These were: trifluralin 1.0 L/ha (29 May) cultivation (13 May); chlorsulfuron 20 g/ha (28 May); oryzalin + trifluralin 2.3 L/ha (28 May). Triticale cv. Currency was direct-drilled at 90 kg/ha on 29 May with 150 kg/ha Starter 12 after application of 2 L/ha glyphosate (21

May). Subplot size was 10x2 m.

Table 1. Pre-season management treatments - timing and rates of herbicide application, and grazing with sheep

		Pre-season management						
		Herbicide (L/ha)[a]						
		Paraquat		Glyphosate		Grazed + paraquat	Grazed only	Control
Date	Procedure	0.5	1.0	0.5	1.5	1.0		
28 Aug.- 9 Sept.	Grazed 300/ha	x	x	x	x	x	x	x
23 Sept.	Herbicide applied	x	x	x	x			
26-30 Sept.	Grazed 462/ha					x	x	
1-16 Oct.	Grazed 500/ha av. 2 days/wk					x	x	
22 Oct.- 5 Mar.	Grazed 200/ha av. 2 days/wk	x	x	x	x		x	
29 Nov.	Herbicide applied					x		
5 Mar.- 10 Apr.	Grazed 30/ha	x	x	x	x	x	x	x

[a]All herbicide treatments include 0.5 L/ha 2,4-D ester.

Two soil samples (50x30x6 cm) were taken from the main plots for assessment of potential weed seedling numbers on 23 April 1986 (control plots) and 12 May 1986 (other treatments).

The soil was placed into trays and watered regularly. Grass weed seedlings were counted and then removed. Counts were conducted on 2-16 May, 5-19 June, 22 September-10 October and 27 November. Cumulation of the four counts represented potential seedling numbers.

Triticale and weed seedlings were counted in permanent quadrats in the field on 22 July and 11 August, respectively. Serial crop and weed harvests were taken on 19 August, 8 September, 23 September and 21 October, from two 60x30 cm samples per plot. The triticale was cut 5 cm above ground while weed growth was cut to ground level. Weed DM data includes both grass and broad-leaved weeds (harvests 1, 2, 3) or only grass weeds (harvest 4). Differences referred to are at the 5% level of significance.

RESULTS AND DISCUSSION

Seedling numbers. All pre-season managements imposed, decreased grass

seedling numbers as assessed 29 days before sowing (DBS) shown in Table 2. The decrease ranged from 94 to 98% for the herbicide treatments and 89 to 90% for the grazing treatments, indicating that while a grazing regime imposed over spring and summer is not as effective as herbicide application, it did significantly reduce potential grass seedling numbers (5).

Table 2. Effect of pre-season management options on grass weed densities (plants/m^2)

Pre-season management	Herbicide rate (kg/ha)	Grass weed density[a] Potential (29 DBS)	Actual (74 DAS)
Paraquat	0.10	1608 bc	171 b
	0.20	595 c	108 b
Glyphosate	0.18	1239 bc	121 b
	0.54	449 c	91 b
Grazed plus paraquat	0.20	2694 b	287 b
Grazed only		2450 b	150 b
Control		25536 a	1959 a

[a]Within each column, values followed by the same letter are not significantly different (P = 0.05).

The actual number emerging in the crop has been averaged over the pre-sowing herbicide treatments and provides an indication of the general effectiveness of the knockdown and pre-sowing herbicides, and time in decreasing viability of the grass weed seeds present initially. Actual numbers, counted 74 days

Table 3. Effect of pre-sowing treatments on grass weed and triticale plant densities 74 DAS[a]

Pre-sowing treatment	Herbicide rate (kg/ha)	Plant density[b] Triticale (plants/m^2)	Grass weeds (plants/m^2)	Grass weeds (% decrease)
Cultivated (CC) Trifluralin (1)	0.40	262 a	59 b	75
Directed drilled (DD) Trifluralin (1)	0.40	242 b	184 ab	22
Trifluralin + oryzalin (2)	0.41 + 0.41	235 b	129 ab	46
Chlorsulfuron (3)	0.015	241 b	163 ab	31
Control (4)		249 ab	237 a	

[a]Values are meaned over pre-season treatments excluding the pre-season control.
[b]Within each column, values followed by the same letter are not significantly different (P = 0.05).

fter sowing (DAS), represented 8 to 20% of the respective potential numbers. Pre-season management had no effect on triticale seedling numbers which contrasted with the effect of the pre-sowing treatments where direct-drilling resulted in an 8% reduction compared to where cultivated (Table 3).

All pre-sowing treatments reduced grass seedling numbers compared to the control, with the CC1 treatment being more effective than any DD treatment. Better weed control was expected, especially on the DD treatments. However in terms of weed DM, the pre-sowing herbicides did improve the level of weed control.

Dry matter. Differences in weed DM between pre-sowing treatments were: 82 DAS - non-significant; 102, 117 DAS - DD3, CC1, DD1 < DD2, DD4; 145 DAS - DD3, CC1 < DD2, DD1, DD4.

The pre-season management treatments decreased weed DM compared to the control at all harvests except the first (82 DAS). Triticale DM compared to the control was increased by the pre-season treatments at all harvests and apart from harvests 2 and 3, where the heavy rates of paraquat and glyphosate were respectively greater, the treatments were not different. At all harvests, triticale DM was greatest on the CC treatment compared to the DD treatments which exhibited minor differences.

The relationship between triticale and weed DM was significant and is described by:

Harvest	Cultivated	Direct-drilled
1	$y = 294.0 - 0.18x$	$y = 201.8 - 0.72x$
2	$y = 0.026x^2 - 8.81x + 1034.9$	$y = -0.031x^2 + 9.18x + 422.6$
3	$y = 1383.8 - 0.75x$	$y = 812.7 - 0.75x$
4	$y = 0.001x^2 - 4.02x + 5672$	$y = 0.001x^2 - 4.02x + 4147$

At all harvests, the relative rate of decline of triticale DM with increasing weed DM was greater on DD plots than on the CC plot, suggesting a greater sensitivity of triticale to weed infestation. In addition, the rate of decline of triticale DM with increasing weed DM, increased with succeeding harvests, reflecting more intense weed competition as the season progressed. Some form of pre-season management is essential for pre-sowing herbicides to be effective. Grazing, though not as effective as herbicide application, did enable satisfactory crop development to proceed even where no pre-sowing herbicide was applied. However, a grain yield penalty would be expected.

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