ESTABLISHMENT OF OIL SEED RAPE BY DIRECT DRILLING

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Summary

In two trials a split treatment of paraquat 0.4 kg/ha + dicamba 0.44 kg/ha early and paraquat 0.8 kg/ha late was the most successful treatment for the establishment of direct-drilled oil seed rape (*Brassica napus* var 'Tower'). The early application of dicamba increased the suppression of clover (*Trifolium* spp) and reduced the toxicity towards the crop. Increased grass and clover suppression allowed the crop to establish more quickly and hence suppress further vegetation growth, probably by shading. Oil seed rape yield increased following applications of nitrogen up to 40 kg/ha.

INTRODUCTION

The United Kingdom direct-drills some 25,000 ha of oil seed rape annually, which is a considerable proportion of the total oil seed rape crop (Allen 1977). Information on direct-drilled oil seed rape in New Zealand is limited, but information on direct-drilled forage brassicas (*Brassica* spp) is more readily available (Taylor 1967). Taylor observed that the early growth rate of direct-drilled brassicas, which was slower than those in cultivated ground, was an important factor in complementing the herbicide treatment for the continued suppression of grasses and clovers. As direct-drilling of brassicas evolved in the Southland region it became apparent in some situations that the early growth of the crop was insufficient to provide adequate suppression of the remaining vegetation.

The recovered clover was shown to compete with the brassica crop for nitrogen (Simpson 1965). This effect was well illustrated in earlier New Zealand trials with paraquat by the severe symptoms of nitrogen deficiency exhibited by direct-drilled crops establishing in competition with recovering white clover (Taylor 1967). To overcome these deficiencies a series of trials was initiated to improve the pre-drilling vegetation suppression and to determine the effect of adding nitrogen to direct-drilled brasicas. Oil seed rape was chosen as the crop, due to its increased popularity over recent years. From these trials a technique emerged which gave superior vegetation suppression to that of the standard treatment. This was termed "split application" and two trials including such treatments are described. One trial on the effect of added nitrogen to direct-drilled oil seed rape is also described.

METHOD

The standard chemical recommendation for direct-drilled brassicas in Southland is paraquat 1.2 kg/ha + dicamba 0.44 kg/ha applied 1-6 days before drilling the seed with 400 kg/ha serpentine or reverted superphosphate. Sulphate of ammonia is then broadcast at 200 kg/ha (40 kg N/ha) before crop emergence. Treatments for Trials I and II consisted of taking the standard herbicide recommendation and splitting it into a series of ratios with a 14 day interval between applications. Drilling followed as soon as possible after the 14 day period. Treatments are listed in Table 1.

Trial III was treated with a split application of paraquat 0.4 kg/ha + dicamba 0.44 kg/ha followed by paraquat 0.8 kg/ha. Before emergence of the crop (sown 10.12.77), nitrogen, in the form of sulphate of ammonia, was broadcast at rates of 30, 40, 60, 80 kg/ha.

Pastures were grazed to a height of 3-4 cm prior to the first herbicide treatment. Herbicides were applied in 290-318 litres/ha at a pressure of 210 kPa to plots measuring a minimum of 4.0 x 17.4 m. Treatments were arranged in randomised blocks with four replicates. The trials were drilled with a Duncan 730 Multiseeder, fitted with the "triple disc" system. Oil seed rape at 4.0 kg/ha was drilled with 400 kg/ha of serpentine or reverted superphosphate. In Trial I a portion of each plot (4 x 5 m) was left undrilled to observe suppression in the absence of the crop. No nitrogen was applied to Trials I and II as this may have masked some of the responses.

Visual assessments were carried out for both grass and clover suppression at frequent intervals in both cropped and non-cropped areas. Crop vigour was also recorded. Plant numbers were recorded in Trial III. Green weights were obtained from all trials by taking a $2m^2$ quadrat from each plot.

TABLE 1: Percent suppression of pasture species and effect of treatment on oil seed rape yield.

Trial 1 at Edendale, sown 7/12/76, harvested 20/4/77

Treatment kg/ha paraquat (p) dicamba (d)		Assessed 16/12/77		Assessed 20/4/77		Yield
		Grass	Clover	Grass	Clover	Green Weight t/ha
Application dates 20/11/76	6/12/76	0 = no suppression 100 = complete suppression				
p 1.2 + d 0.44	-	14 c	9 e	0 d	10 d	4.0 d
p 0.8 + d 0.44	p 0.4	65 a	64 b	30 ab	40 c	35.5 ab
p 0.6 + d 0.44	p 0.6	68 a	68 b	35 ab	40 c	33.7 ab
p 0.4 + d 0.44	p 0.8	71 a	74 b	55 a	62 b	43.2 a
d 0.4	p 1.2	66 a	96 a	40 a	90 a	15.5 cd
p 1.2	d 0.44	16 c	91 a	0 d	85 a	12.5 cd
p 0.8	p 0.4 + d 0.44	66 a	75 b	30 ab	60 b	26.5 bc
p 0.6	p 0.6 + d 0.44	68 a	54 c	30 ab	40 c	36.3 ab
p 0.4	p 0.8 + d 0.44	66 a	51 c	20 bc	35 c	23.5 bc
-	p 1.2 + d 0.44	53 b	33 d	10 cd	10 d	14.3 cd
CV%		13.0	12.3	40.2	16.1	37.3

Trial II at Wyndham, sown 5/12/77, harvested 7/3/78

Treatment kg/ha paraquat (p) dicamba (d)		Assessed 9/1/78		Assessed 1/3/78		Yield
		Grass	Clover	Grass	Clover	Green Weight t/ha
Application dates 1/12/77	14/12/77	0 = no suppression 100 = complete suppression				
-	p 1.2 + d 0.44	90 b	100 a	75 b	75 b	30.2 a
p 0.4 + d 0.44	p 0.8	100 a	100 a	95 a	100 a	35.3 a
p 0.4 + d 0.44	p 0.6	100 a	100 a	100 a	100 a	32.9 a
p 0.3 + d 0.44	p 0.8	100 a	100 a	100 a	100 a	35.3 a
p 0.2 + d 0.44	p 0.8	100 a	100 a	95 a	100 a	39.4 a
CV%				3.2	6.2	12.3

RESULTS

Trials I and II

Table 1 shows grass and clover suppression ratings and crop green weight (GW) yields.

Both trials showed a split application of paraquat provided significantly better grass suppression than the standard single application of paraquat 1.2 kg/ha.

The most significant clover suppression in Trial I was recorded by those treatments where dicamba was applied by itself either preceding or following paraquat. Of the split applied paraquat treatments, paraquat 0.4 kg/ha + dicamba 0.44 kg/ha followed by paraquat 0.8 kg/ha and paraquat 0.8 kg/ha + dicamba 0.44 kg/ha followed by paraquat 0.4 kg/ha provided the best clover suppression. In Trial II the later assessment showed all split applied paraquat treatments to be significantly better than the standard treatment, paraquat 1.2 kg/ha + dicamba 0.44 kg/ha late.

Table 1 also shows the effect of split application on green weight at harvest. The highest yield of oil seed rape in Trial I resulted from the split applied treatment of paraquat 0.4 kg/ha + dicamba 0.44 kg/ha early and paraquat 0.8 kg/ha late, however the difference just failed to reach significance.

Yields tended to be lower in those treatments where dicamba was applied in the second application, one day prior to drilling.

Trial III

Table 2 shows the effect of nitrogen on oil seed rape plant number and green weight. There were no significant differences between treatments in plant number indicating no toxicity from excessive nitrogen. The application of nitrogen prior to crop emergence, at rates of 40 - 80 kg/ha resulted in a significant yield increase compared to 30 kg/ha and no nitrogen.

TABLE 2: Effect of nitrogen on oil seed rape plant numbers and green weight.

Trial III at Otama, sown 10/12/77, harvested 7/3/78		
Treatment nitrogen kg/ha	Plant No./m² 7/3/78	Yield 7/3/78 GW t/ha
0	35 a	50.5 b
30	34 a	53.9 b
40	36 a	62.0 a
60	35 a	67.6 a
80	35 a	62.4 a
CV%	11.2	8.2

DISCUSSION

The results clearly show the advantage of a split application of paraquat compared to a single application, this was expressed in an increased suppression of grass and clover and manifested in higher yields.

Trial II, laid down in the 1977/78 season was designed to test lower application rates of paraquat in an attempt to reduce the cost of establishment. Thus either 0.1 or 0.2 kg/ha paraquat was left out of the total application by reducing the rate in either the first or second application. The results indicate that a reduction in the total paraquat rate by up to 0.2 kg/ha did not affect yield. However, this finding requires further substantiation.

Clover control was significantly superior on those treatments where no paraquat was applied with the dicamba. As the addition of paraquat resulted in a more rapid desiccation of the clover, it was likely that the foliar absorption of dicamba was reduced in combined treatments, and thus expressed as poorer clover suppression.

The late application of dicamba, immediately prior to drilling, resulted in reduced crop vigour and yield. This could have been due to residual toxicity from dicamba to oil seed rape, and/or a delayed release of nitrogen, resulting from the later clover breakdown. Whilst the latter effect was no doubt present, such large differences as found in Trial I were more likely to be due to dicamba toxicity.

The best overall treatment when considered in terms of grass and clover suppression and in yield was the split treatment of paraquat 0.4 kg/ha + dicamba 0.44 kg/ha early and paraquat 0.8 kg/ha late, which allowed the crop to establish more quickly and hence suppress other vegetation, probably by shading. Efforts to lower the total herbicide rate showed promise but have yet to be proved over a wide range of environmental conditions. Increased nitrogen rates in Trial III increased the green weight of oil seed rape. The minimum nitrogen rate needed to obtain a significant advantage in yield was 40 kg/ha which is the standard recommendation for direct-drilled brassicas. There was no significant difference between green weight yields given by nitrogen at 40, 60 or 80 kg. Under a "split application" regime, in which dicamba was applied 14 days before drilling, nitrogen would have been released earlier from the decaying clover. This release was likely to coincide with the onset of growth from the emerging plants. The released nitrogen, plus the added 40 kg/ha broadcast prior to emergence proved to be adequate for rapid establishment of oil seed rape.

Other practical advantages may also favour the split application of herbicides, such as the conservation of soil moisture and an earlier breakdown of pasture roots to facilitate easier drilling. Progress to date with such trials as illustrated above has shown that oil seed rape can be successfully established by direct-drilling using a "split application" technique.

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