GRASS SUPPRESSION IN CLOVER SEED CROPS

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Summary

Competition from ryegrass (*Lolium* spp.) restricts the flowering of white clover (*Trifolium repens*) seed crops and limits seed yields. This can be only partially overcome by grazing management and manipulation of closing dates. Results from the use of dichloropropionic acid and paraquat on white clover seed crops are presented and an attempt is made to relate these to some of the many environmental factors which operate.

The increased seed yields arising from grass suppression on heavier soils are considerable and paraquat is the most suitable material. More work is needed to determine the optimum and rate of herbicide required for development of an interesting and potentially rewarding technique.

INTRODUCTION

CAREFULLY-MANAGED GRAZING and manipulation of the closing date have been the traditional means of reducing ryegrass (*Lolium* spp.) competition in white clover (*Trifolium repens*) seed crops. This is only partially successful and the limited use of dichloropropionic acid has demonstrated the value of a herbicide for grass control. However, the margin of safety to clover is slender, and a number of stands suffered damage when a period of dry weather followed treatment. In pastures used for white clover seed production, ryegrass is the usual companion species. The susceptibility of ryegrass to paraquat reported by Thompson (1962) and Leonard (1962), coupled with the quick recovery of white clover after paraquat application (Bramley, 1962; Thompson, 1962), prompted investigation of this material for grass suppression. Three trials involving rates of herbicide and one time-of-application trial (No. 4) were, therefore, laid down in spring, 1963.

EXPERIMENTS

Paraquat is said to be very sensitive to environmental conditions at the time of application (Cronshey, pers. comm.) and these are set out for each trial in Table 1. Soils were adequately moist on all occasions.

In trial 4 each set of plots was fenced off as it was treated, the aim being to have all plots at about the same stage of growth when sprayed. Non-ionic surfactant at the rate of 0.1% was added to all paraquat treatments.

Trials 1, 2 and 3 were replicated three times in a randomized block design, while Trial 4 was duplicated in a regular layout. Rates of herbicide are expressed in terms of active ingredient per acre, while seed yields represent pounds of dressed seed per acre.

The strain of ryegrass was short-rotation in Trials 1, 2 and 4 and perennial in Trial 3.

TABLE 1: CONDITIONS DURING TRIALS

	Temp.	*Light*	*Grass-growth*	*Humidity*
Trial 1	Mild	Bright	2 in. to 3 in.	Moderate
Trial 2	Cool	Hazy sun	2 in.	Moderate
Trial 3	Cool	Bright	1½ in.	Moderate
Trial 4:				
(a) Oct. 8	Cool	Overcast	2 in. to 3 in.	Moderate to high
(b) Oct. 18	Warm	Bright	3 in to 4 in.	Moderate
(c) Oct. 31	Cool	Overcast	2 in. to 3 in.	Moderate
(d) Nov. 12	Hot	Bright	3 in.	Moderate

TABLE 2: RESULTS FROM TRIAL 1

Treatment	*Yield (lb/acre)*	*% Increase over Control*
Paraquat 2 oz	115	60
Paraquat 3 oz	119	65
Paraquat 4 oz	133	85
Dichloropropionic acid 1.5 lb	72	0
Control	72	—

TABLE 3: RESULTS FROM TRIAL 2

Treatment	*Yield (lb/acre)*	*% Difference from Control*
Paraquat 2 oz	294	+ 4
Paraquat 3 oz	287	+ 2
Paraquat 4 oz	315	+12
Dichloropropionic acid 1.5 lb	251	—11
Control	282	—

TABLE 4: RESULTS FROM TRIAL 4

Date of Treatment	*Paraquat 3 oz Yield (lb/acre)*	*Control Yield (lb/acre)*
October 8	77	38
October 18	164	24
October 31	130	48
November 12	65	21

RESULTS

Yields from Trials 1, 2 and 4 are set out in Tables 2, 3 and 4 respectively, the herbicide application in Trial 4 being paraquat at 3 oz per acre.

Trial 3 was sited on a soil which dries out quickly. Ryegrass suppression, measured by the density of seed-heads, was satisfactory

but the white clover failed to grow tall enough to allow harvesting. The estimated suppression of ryegrass was 50 to 60% from 2 oz paraquat per acre, 80% from 3 oz and 95 to 100% from the 4 oz rate. The density of white clover seed-heads appeared to be increased in proportion to the grass control.

DISCUSSION

Seed yield from Trial 1 was not high but marked increases resulted from treatment with paraquat. This trial was laid down on the same day as Trial 2 which, although higher yielding, gave relatively small responses to treatments. This contrast was paralleled by the differences in ryegrass suppression achieved in the two trials. The most likely reason for the widely-differing result is that Trial 1 was established on a sward with adequate, though short, green leaf, whereas grazing of the Trial 2 site ceased just before treatment. These trials were laid down on September 24.

Trial 3 was established on September 29, on a short, growing pasture and gave satisfactory grass suppression. On a drought-prone soil type, however, the clover crop was too short-stemmed for harvest but the pasture renovation which resulted was quite acceptable as a substitute.

In the time-of-application trial, the earliest treatment (October 8) gave poor ryegrass suppression and a low seed yield. The second application gave the best grass suppression and the highest seed yield. Ryegrass suppression from the two later treatments was fairly complete and the low seed yield from the November treatment could not be attributed to grass competition. In view of the check caused to white clover by paraquat, it seems likely that plants treated on November 12 were unable to complete their development before dry summer conditions were felt.

The date of the most successful treatment, October 18, was between two and three weeks earlier than the customary closing date for the locality. This date, of course, varies from place to place.

Trials 1, 2 and 3 were all laid down before the end of September. Spring growth was slow to commence in 1963 and all three trials could well have been established too early to gain maximum efficiency from the herbicide applied.

INTERIM CONCLUSIONS

Suppression of grass in white clover seed crops certainly induces more prolific flowering and results in increased seed yields. Paraquat is the most suitable material available for this purpose and it appears that the required rate of application will be about 3 to 4 oz per acre. Several factors are known to influence the activity of paraquat and more work is required to determine their relative importance in this field.

Meanwhile, it is suggested that grass suppression for white clover seed production is best practised on moisture-retentive or irrigated soils. However, some farmers on lighter land might be prepared to gamble on the possibility of a seed crop with pasture renovation as an attractive secondary objective.

In any case, pastures should be grazed closely and then allowed to produce 2 to 4 in. of spring growth before treatment. A suitable time for application seems to be two to three weeks before normal closing time. Of the factors which are said to govern the activity of paraquat — growth stage, soil moisture, light intensity, humidity — growth stage is the one most readily manipulated. However, some

striking contrasts in effect have been observed in farmers' applications of paraquat under different light intensities. Spraying in the evening or overcast weather could therefore be expected to increase translocation of paraquat and give a more lasting effect in the sprayed grasses.

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REFERENCES

Bramley, P., 1962: *Proc. 15th N.Z. Weed Control Conf.*, p. 97.
Leonard, W. F., 1962: *Proc. 15th N.Z. Weed Control Conf.*, p. 39.
Thompson, F. B., 1962: *Proc. 15th N.Z. Weed Control Conf.*, pp. 92, 190.