THE EFFECTS OF 2,4-DB ON RYEGRASS SEEDLINGS

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Summary

Following a report that the sodium salt of 2,4-DB had killed grass seedlings, two trials were laid down to assess the effect of this herbicide on ryegrass seedlings. No mortality was recorded on seedlings from the 1-leaf stage and ¼ in. high up to 5-leaf stage and 6 in. high when up to 8 lb a.i. per acre of 2,4-DB as the sodium salt was applied.

INTRODUCTION

IT HAS BEEN generally accepted in New Zealand that ryegrass seedlings are tolerant to the normal rates of 2,4-DB applied to pastures or undersown cereals. A tentative United Kingdom recommendation is that ryegrass seedlings should be 3 to 4 in. high and beginning to tiller before they can be safely sprayed with a maximum of 3 lb a.i. per acre of 2,4-DB (British Weed Control Council, 1960).

Users are always warned about the need for delaying spraying until the clover has reached the first trifoliate leaf stage. In that period grass seedlings normally develop to the three- or four-leaf stage, at which time they are tolerant. So it was with surprise that a report was received in January, 1961, of the death of ryegrass seedlings following the application of 1½ lb a.i. per acre of 2,4-DB as the sodium salt, to a crop of oats undersown with grass and clover. A thorough investigation ruled out the possibility of insects, fungi, frost, dryness, wind, or spray contamination being the cause of the damage.

It was decided that the tolerance of grass seedlings to butyric weedkillers would be worthy of investigation. This paper reports two trials in this study. The quantities of chemicals quoted are in terms of active ingredient per acre.

EXPERIMENTAL

TRIAL 1

Germinated ryegrass seedlings were space planted in 18 in. × 12 in. boxes. Three plantings were made in each box — 24 seeds per planting — giving three different stages of growth in each box at the time of spraying.

Treatments were:

(1) Control
(2) 1½ lb. 2,4-DB as the sodium salt in 22 gal water — soil covered.
(3) 1½ lb. 2,4-DB as the sodium salt in 22 gal water — soil uncovered.
(4) 1½ lb 2,4-DB as the sodium salt in 22 gal water — soil sterilized.

There were five replicates of each treatment.

The treatments were applied with a small motorized boom sprayer.

Just prior to spraying, the soil in the boxes for Treatment 2 was covered by strips of blotting paper laid between the spaced plants, thus preventing any of the herbicide reaching the soil. As overhead watering was not possible after spraying, because of the possibility of washing some material off the sprayed leaves and thus defeating the object of Treatment 2, the boxes were steeped in a trough of water when they required watering.

Assessment

The plants were harvested 12 days after treatment. A random sample of 8 plants was taken from each plot. Number of leaves, leaf length, number of tillers, and weight were recorded. The remaining plants in the plot were also harvested and weighed.

TRIAL 2

Ryegrass seeds, 12 per pot, were planted in 3½ in. pots containing John Innis Potting Mixture No. 1. Three plantings were made, 20 pots at each planting, so that there would be three different stages of growth at spraying time.

Treatments were: 0, 2, 4, 6, 8 lb of 2,4-DB as the sodium salt in 18 gal water.

There were four replicates of each treatment.

Application was made in a herbicide spraying cabinet normally used for screening of chemicals as herbicides. The pots were not watered for 24 hours after treatment and thereafter they received a light watering twice daily.

Assessment

Ten plants from each pot were harvested 11 days after spraying and dry weights recorded.

RESULTS

None of the treated plants were killed. The results of measurements made are presented in Tables 1 and 2.

DISCUSSION

In Trial 1 the measurements made on plants in Treatment 4 differed so much from the control and other treatments that it is concluded that growing plants in sterilized soil introduced a further factor into the trial which favoured this treatment so it cannot be compared with the remaining treatments. (This factor may have been the complete elimination of weed competition.) Only in the results on the third planting, that is the youngest seedlings, is there any sign of the 2,4-DB depressing growth. The difference between Treatment 3 and control is not sufficient to be significant but a trend was indicated that deserved closer investigation. The first and second plantings appear to have been at a sufficiently advanced stage of growth when treated for them to be unaffected by the 2,4-DB. It is interesting to note in the first planting, though, that the plots receiving the 2,4-DB have outyielded the control, owing no doubt to the removal of weed competition, the weeds having been checked by the treatment. Even where the weeds were protected from the spray in Treatment 2, sufficient of the herbicide penetrated the blotting paper cover to check them, though not so completely as in Treatment 3. The difference would have no doubt been greater if the plots had not just been hand-weeded in an effort to reduce the weed competition effect.

Trial 2 was designed to assess mortality to ryegrass seedlings when treated with high rates of 2,4-DB at very young growth stages. No deaths occurred, however, though the youngest plants were distorted for a few days after spraying. However, there was no significant difference in yield between treatments. These differences may have been greater had the plants been grown in unsterilized soil where a suitable population of soil micro-organisms may have broken down the 2,4-DB to 2,4-D. However, the time between spraying and harvesting would be hardly sufficient for this breakdown to take place, in previously unsprayed soil.

TABLE 1: 2,4-DB ON RYEGRASS SEEDLINGS
(Harvested 12 days after spraying)

*Treatment**	*Average Weight per Plant (mg)*	*Leaves per Plant*	*Average Leaf Length (mm)*	*No. of Tillers*
	1ST PLANTING (3- to 5-leaf stage, 5 to 6 in. high)			
1.	74.4	12.9	90.9	3.6
2.	82.5	13.4	98.3	3.8
3.	88.8	14.1	97.3	3.7
4.	115.8	14.8	113.6	3.5
	2ND PLANTING (2-leaf 3 to 4 in. high)			
1.	31.6	7.5	82.1	2.5
2.	34.1	7.8	85.5	2.2
3.	34.1	7.4	90.6	2.2
4.	62.0	10.4	95.4	2.6
	3RD PLANTING (1-leaf 1 to 2 in. high)			
1.	13.6	4.6	73.5	1.5
2.	13.0	4.3	77.6	1.6
3.	12.9	4.1	76.6	1.4
4.	21.2	5.2	82.8	1.7

* Treatment: (1) Control; (2) 2,4-DB 1½ lb (soil covered); (3) 2,4-DB 1½ lb (soil uncovered); (4) 2,4-DB 1½ lb (soil sterilized).

TABLE 2: 2,4-DB ON RYEGRASS SEEDLINGS
(Harvested 11 days after spraying)

	Planting		
	1	2	3
Stage of Growth when sprayed	1½ to 2½ in. high, 2nd leaf appearing	1 to 2 in., 1 leaf	¼ to 1 in., 1 leaf
Rate	*Average weight of plants (mg)*		
0 lb 2,4-DB	131	77	43
2 lb 2,4-DB	129	68	44
4 lb 2,4-DB	133	76	38
6 lb 2,4-DB	151	81	42
8 lb 2,4-DB	150	70	41

These trials have provided no evidence that 2,4-DB will kill ryegrass seedlings even at much higher rates than are recommended for weed control. Neither do they give an explanation of the mortality mentioned above. If 2,4-DB did contribute to the death of the grass seedlings, it would seem that it was only because of a most unusual combination of circumstances.

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REFERENCE

British Weed Control Council, 1960: *Weed Control Handbook,* 2nd ed., p.51.