CONTROL OF BARLEY GRASS

F. B. THOMPSON

Department of Agriculture, Wellington

Summary

Results are described of trials in which chemicals were applied to barley grass (*Hordeum murinum*) in the seed-head stage, with a view to inhibiting germination of the seed. The most promising treatment was paraquat at 1 lb active ingredient per acre, applied before the seed-heads turned brown. The practical difficulty arising from the fact that the most mature plants in a pasture were too far advanced before the youngest plants could be readily seen, is discussed.

INTRODUCTION

THE recommended treatments for the control of barley grass (*Hordeum murinum*) involve spraying when the plants are in the vegetative stage and cannot readily be distinguished from other grasses in a pasture.

Many barley grass plants are missed in spraying operations particularly when spot spraying with a hand wand. It was also found that, when boom spraying infestations which had spread into a paddock from a hedge, it was difficult to judge how far out into the paddock the spraying should extend and many barley grass plants were missed (Thompson, 1962). The plants which are missed are not conspicuous until later in the season when the seed-heads are formed.

Barley grass is an annual and the seed does not remain viable in the soil for more than one year (Harris, 1959). Therefore, theoretically, barley grass could be eliminated from an area in one season, if all plants were prevented from shedding viable seed. Destruction of all seeding plants by burning with a flame-thrower is one method of achieving this. However, in many instances the barley grass infestations are in situations, such as adjacent to shelterbelts, where fire hazards would preclude burning. Therefore, it would be of considerable value if a practical method were available of treating plants in the seed-head stage to render the seed non-viable.

This paper gives the results of trials in which the viability of seed was determined after spraying the plants in the seed-head stage with various chemicals.

EXPERIMENTAL

Treatments were applied to barley grass when the seed-heads were at the following stages of development:

Early: Approximately two-thirds of seed-head had emerged from the sheath.

Medium: The seed-head had emerged but was still green.

Late: The distal half of the seed-head was brown and the remaining portion still green.

Very late: The seeds were ripe and were beginning to fall.

The chemicals used and the rates at which they were applied are stated in Table 1. All rates of application are expressed as pounds active ingredient per acre. A non-ionic wetting agent was added to the paraquat. All treatments were applied in 30 gal of water except the "late" and "very late" treatments in Trial 1, which were applied in 80 gal.

In a preliminary field trial in December, 1961, in which barley grass was sprayed with paraquat, very promising, but variable, reductions in the germination of the barley grass seed were obtained. The variability was partly attributed to the fact that, at the time of spraying, the seed-heads on the plots were not all at the same stage of maturity.

In Trial 1 in which barley grass in pots was sprayed in December, 1962, with paraquat the rates and stages of development stated in Table 1, an attempt was made to reduce variability by removing seed-heads not typical of the desired stage of growth for that particular treatment. However, this was not entirely successful, and, in spite of removal of atypical seed-heads, ripening dates varied over a week for most treatments. There were originally 4 replications, but so many atypical seed-heads were eliminated that, in order to provide samples large enough for germination tests, in general, the seed from the 4 replications was bulked.

Trial 2 was on barley grass sown in plots in the field. The plants at the "medium" stage were sprayed on November 26, 1963, and those at the "very late" stage on December 10, 1963. The figures in Table 1 are the averages for the 3 replications. Trial 3 was on natural infestations in the field. The treatments, which were not replicated, were applied in November, 1963, when the seed-heads were at the "medium" stage.

RESULTS

The percentage germination of the ripe seeds from the various treatments is given in Table 1.

The plots in Trial 3 were examined in April and again in May, 1964, for barley grass seedlings which may have appeared under natural conditions. There were a few seedlings on all the plots except that treated with paraquat at 1 lb.

DISCUSSIONS AND CONCLUSIONS

The results are somewhat variable and there are anomalies. Some of the variability is perhaps due to seed-heads which were not of the stated degree of maturity at the time of treatment. Thus the germination of seeds from the "medium" treatments in Trial 2 could be due to the presence of more mature seed-heads on the plots at the time of treatment. There is no explanation for the high germination (72) for the "late" treatment of 2 lb paraquat in Trial 1.

In Trial 1, seed-heads treated at the "early" and "medium" stages were individually examined and tagged six days after treat-

TABLE 1: PERCENTAGE GERMINATION OF BARLEY GRASS SEED

Treatment (lb)	Stage of Treatment							
	Early		Medium		Late		Very late	
	Tr. 1	Tr. 1	Tr. 2	Tr. 3	Tr. 1	Tr. 1	Tr. 2	
Control	70	83	65		84	65	65	
Paraquat ¼			5					
Paraquat ½	2	0	12	0	14	2*	16	
Paraquat 1	0	0	4	0	9	5*	8	
Paraquat 2	0	0			72	24	4	
Diquat 1				11				
Maleic hydrazide 4			2	0			27	
Cacodylic acid ¼			28	38				
Cacodylic acid ½			2					

* Most of the ripe seed had dropped before the samples for testing were taken.

ment. Most of the seed-heads were completely brown, whereas those in the control pots were still green. However, some treated seed-heads, particularly those which received $\frac{1}{2}$ lb or 1 lb paraquat at the "early" stage, were wholly or partly green. When the ripe seeds were harvested, those within each treatment were bulked according to colour at the six-day examination, and each group was tested separately for germination. Some of those which received $\frac{1}{2}$ lb paraquat at the "early" stage, and were wholly or partly green at six days, had up to 7% germination, whereas seeds with no green had nil germination. The 2% germination for this treatment quoted in Table 1 is the average of 10 separate tests. As indicated in Table 1, 1 lb of paraquat at the "early" stage completely suppressed germination, irrespective of colour at the six-day examination. The inference is that some seeds still in the sheath at the "early" stage were protected sufficiently to resist $\frac{1}{2}$ lb paraquat but not 1 lb.

Therefore, although low germination figures were obtained from $\frac{1}{2}$ lb and even $\frac{1}{4}$ lb of paraquat, it is recommended that 1 lb be used in practice. Since the treatments would be applied by spot application, labour would probably be more expensive than the material, and the extra cost of the higher rate of paraquat would not be prohibitive.

The results indicate that paraquat does not completely inhibit germination if the application is made after the seed-head has started to turn brown.

During the summer and autumn of 1963-64, an attempt was made on a portion of the Ruakura Agricultural Research Centre, Hamilton, to treat on a farm scale all barley grass plants which had been missed or survived the spring applications of 2,2-DPA. This was difficult because barley grass seeds over a long period. The aim was to spray the paraquat on all plants which could be seen as soon as the first seed-heads started to turn brown. It was found that within a few weeks of this spraying, seed-heads appeared on other plants which had not been noticed at the time of spraying and it was necessary to go over a paddock two or three times to treat all the barley grass. In practice, it is therefore important that the spring applications of 2,2-DPA should be as thorough as possible to reduce to a minimum the follow-up treatment with paraquat.

Although the figures in Table 1 indicate that maleic hydrazide at 4 lb is as effective as paraquat at 1 lb, the latter treatment is preferred. Some of the results obtained with maleic hydrazide, but not reported in this paper, were very contradictory. Since the required rate of maleic hydrazide is more expensive than paraquat, it appears that the latter material is preferable.

Insufficient trials have been conducted with cacodylic acid.

From the results presented, it appears that spot applications of paraquat at 1 lb as soon as the first seed-heads show brown coloration, can be recommended to prevent germination of the seed. It is considered that this treatment should be regarded as a method of dealing with plants which have been missed in earlier spraying with other materials and not as the principal means of eradicating barley grass infestations.

ACKNOWLEDGEMENTS

Thanks are due to the Seed Testing Station, Palmerston North, for the germination tests, and to the staff of the Weed Section, Ruakura Agricultural Research Centre, for assistance in conducting the trials.

REFERENCES

- Harris, G. S., 1959: *Proc. 12th N.Z. Weed Control Conf.*, p. 85.
Thompson, F. B., 1962: *N.Z. J. Agric.*, 105: 353.