Rhizomatous Weeds

CONTROL OF COUCH

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Summary

Glyphosate was shown to be superior to amitrol T and tetrapion* for couch (*Agropyron repens*) control. A rate of 1.8 kg/ha glyphosate has shown to be superior to 0.9 or 3.6 kg/ha, while in one experiment studying stage or time of application, best results were obtained when treating regrowth 3 months after the last cultivation.

INTRODUCTION

Couch has become a more important weed in New Zealand through the intensification of cropping and a reduction in the use of fallowing and cultivation as a means of control. The weed thrives in uncompacted soils and spreads rapidly if the rhizomes are broken up and spread during seed bed preparation.

Some chemicals available for control have been tested in five experiments at sites in Otago and the results are reported in this paper.

MATERIALS AND METHODS

Herbicides were applied by modified Oxford Precision sprayer in 250 - 400 litres/ha water, during good weather conditions. Stage of couch development at the time of spraying was recorded as average height and the stage of leaf or seed head development. A randomised block design with four replicates was used in all experiments, and results were assessed by sub-sampling plots and recording the air dry weight of live rhizomes, 8 - 12 months after application.

Rates and type of herbicide, date or stage at application are shown in Table 1 and Fig. 1.

RESULTS

Comparison of glyphosate with other herbicides

The results of four field experiments are shown in Table 1, although the experiments are not strictly comparable through differences in date of herbicide application and stage of couch growth, they indicate that glyphosate gave marked reductions in live rhizome weights. This was followed by reduced foliage regrowth in the following season. No herbicides performed satisfactorily in Experiment C sprayed 3.4.74, possibly because application was to previously undisturbed couch, very mature, with some senescent leaf already evident.

Amitrol T gave poor results, while tetrapion was variable, giving excellent results in trial D where application was in spring, but only at 4 kg/ha.

Glyphosate was also tested in two treatments of 0.5 and 1.0 kg/ha applied in autumn and re-applied in spring; rhizome weights were significantly higher than 1.8 kg as a single application.

Proc. 32nd N.Z. Weed and Pest Control Conf.

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Table 1. Yield (kg/ha) of live couch rhizomes following treatments.

Experiment		A	B	C	D
Date applied		13 Feb 1973	11 April 1973	3 April 1974	2 Sept. 1974
Stage of growth		1% seed head	5% seed head	post seeding	4 true leaf
Plant height		30-70 cm	15-80 cm	30-80 cm	5-17 cm
Date last cultivation		1.11.72	18.1.73	18.1.73	20.4.74
Date assessed		7.12.73	19.12.73	23.12.74	10.9.75
untreated		10,810 aA	10,220 aA	12,120 aA	3,730 aA
glyphosate 1.8 kg/ha		320 cC	2,560 cB	9,080 abA	710 cBc
glyphosate 2.7 kg/ha				7,580 bA	980 cB
glyphosate 3.6 kg/ha		245 cdC	560 dC	11,900 abA	1,150 bcB
glyphosate 7.2 kg/ha		172 dC			
tetrapion 2.0 kg/ha				12,000 abA	3,500 abAB
tetrapion 4.0 kg/ha			5,720 bA	10,820 abA	270 dC
amitrol T 4.4 kg/ha		2,180 bB		11,650 aA	4,300 aA
CV%		29	9	6	20

Efficiency of glyphosate applied at different stages of couch growth

It was considered that the variability in couch response to glyphosate may have been caused through poor uptake at certain stages of growth. Therefore, an infested area was cultivated to a state of apparently bare ground in December and the regrowth treated as follows.

Glyphosate at 0.9, 1.8 and 3.6 kg/ha was applied to couch at the 1-3 leaf stage (5-12 cm high), 3-6 leaf (25-32 cm), fully tillered (30-60 cm), 4-5 nodes with occasional seed head emerged (40-60 cm). The weight of surviving rhizomes was determined one year later (Fig. 1).

Fig. 1. Effect of glyphosate on yield of couch rhizomes when applied at different stages of growth.

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An increasingly greater reduction in live rhizome weights occurred through application at progressively more mature couch stages ($p < 0.05$). A smaller but significant ($P < 0.05$) dose effect occurred where 1.8 kg/ha yielded lower rhizome weights than either 0.9 or 3.6 kg/ha, which in turn were not significantly different. There was no significant interaction between dose and stage of growth.

DISCUSSION

Although couch is widely distributed, it only assumes major economic importance where cropping is intensive. Under such cropping systems it is imperative that couch control operations do not interfere unduly with agronomic operations by delaying sowing or leaving residual effects. If possible, the aim should be eradication.

Of the herbicides tested for control of couch, glyphosate generally appeared superior to amitrol T and tetrapion, although the latter warrants further investigation in situations where herbicide residues are not important. The great advantage of glyphosate is that no residues persist to interfere with subsequent cropping (Anon 1973).

The results indicate that a high degree of control but not eradication can generally be achieved with glyphosate. In Experiment A glyphosate at 7.2 kg/ha did not eradicate couch and rhizome yields were not significantly lower than with 3.6 kg/ha. Further study may still be required to determine the most cost/effective rate of glyphosate, as in experiments A to D 1.8 kg/ha was not better than 3.6 kg/ha; although in the stage of growth experiment 1.8 kg/ha achieved significantly better couch control than 3.6 kg/ha. Thus, application at earlier than optimum stages of growth may not be compensated for by increasing the dose.

However, this latter experiment showed that glyphosate efficiency in killing couch increased as the plant matured, and although the optimum stage of application may not have been defined, through lack of further tests at full seed head and senescent stages, it did indicate that couch takes some time, in this case, over 3 months, to acquire sufficient foliage cover or physiological maturity to receive maximum effect from a moderate dose. There was no indication that lack of plant maturity could be compensated for by an increase in rate of glyphosate.

From this work it would appear that the best strategy for integration of glyphosate into an intensive cropping system may be to break up the couch rhizomes by cultivation following harvesting of the previous cash crop in autumn or winter. Treat with nitrogen fertilizer in late winter, to encourage an even rapidly growing crop of couch foliage in spring. Glyphosate can be applied in late spring/early summer, leaving time to plant another cash crop.

Some factors in this strategy that may affect couch control, and thus need further study are :

Does added nitrogen fertilizer counteract the effect of glyphosate?

Can good control be obtained in late spring?

How soon can couch be cultivated after glyphosate application?

REFERENCES

Anon, 1973. Roundup R. Tech Bull MON-0573-2-73.

*Tetrapion not an accepted common name at time of publication, chemical name 2,2,3-tetrafluoropropionic acid.