TCA AND CARBETAMIDE FOR CONTROL OF BARLEY GRASS IN COASTAL OTAGO

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Summary

Following the application of TCA and 2,2-DPA to established barley grass (*Hordeum murinum*), grazing increased the degree of control but increased the amount of pasture damage.

A study of carbetamide over two seasons indicated that its efficiency may be greater if the subsequent growing season is dry. The minimum rate of application appeared to be 2 lb a.i./acre with application in spring rather than mid-winter.

INTRODUCTION

TCA was one of the earliest known herbicides with specific activity towards grasses. For many years at Invermay it has been favoured for barley grass (*Hordeum murinum*) control, but it has its drawbacks and its performance in field trials is sometimes erratic.

Experience at Invermay has shown that barley grass occurs under such a wide range of environmental, ecological and managerial situations that all herbicides give erratic results, while TCA is a little more reliable than most. Barley grass has been found to be somewhat resistant to paraquat at rates which were originally thought to be both moderate yet adequate (Leonard, 1964); this has been largely overcome by the adoption of drenching sprays of high strength — *e.g.*, 1 lb (all rates in active ingredient per acre) — or it is often applied through a gorse gun, in which case the rate per acre is seldom calculated. In these cases little barley grass survives and clover is very slow to recover.

Similarly, in practice, 2,2-DPA at 1 to 4 lb frequently allowed undesirable amounts of regrowth to occur, with the added disadvantage of severe damage to associated pasture species, particularly ryegrass (Thompson, 1959).

For two seasons prior to 1962, poor control from low rates of TCA and 2,2-DPA had been noted and it was thought that lack of grazing pressure might be the cause; in fact, it appeared fairly obvious that spraying followed by continuation of defoliation and trampling should result in a lowered potential for plant recovery. There is a need for a study of various levels of grazing intensity, but because of the practical difficulty of organizing these levels on the properties of co-operating farmers only a simple comparison of grazing versus no grazing was carried out in two consecutive years and is reported in section A of the results below.

Subsequently, apart from some seed viability studies, no further herbicide work was undertaken until 1969, when the introduction of carbetamide stimulated an evaluation of its efficiency for barley grass control in pasture and is reported in section B of the results.

MATERIALS AND METHOD

All materials were applied using an Oxford precision sprayer during good weather conditions. Volume of application in 1969 trials was 20 gal water/acre, but 40 gal water/acre were used in all earlier trials.

Herbicides and the quantities tested are shown in various tables in the text.

In the Section A trials, all areas were grazed to give a short sward ½ to 1 in. high before spraying. Ungrazed areas were then fenced, while grazing resumed intermittently where required about one week later.

In the section B trials, grazing occurred according to normal paddock management except for a few days at the time of spraying.

Assessments of percentage cover shown in the text are the means of visual assessments made by three independent observers in mid-summer when barley grass seed-head emergence was complete.

RESULTS

A. Effect of Grazing on the Herbicidal Control of Barley Grass

1962

The treatments and results are given in Table 1.

TABLE 1: EFFECT OF GRAZING ON BARLEY GRASS CONTROL, 1962

(% Barley grass cover, 4/1/63)

Treatment (lb)	*Date Applied*			
	Grazed		*Not Grazed*	
	15/5/62	*5/9/62*	*15/5/62*	*5/9/62*
2,2-DPA 1.5	50	60	35	50
2,2-DPA 2.2	55	20	37	30
TCA 9.0	65	20	30	70
TCA 13.5	50	2	60	60
Control	80	75	70	70

Winter application gave poor results, probably because of the further germination of barley grass after spraying.

Grazing markedly improved control where TCA was applied in spring; in fact, TCA 13.5 lb gave the only acceptable degree of control. Grazing also improved the results from the spring application of 2,2-DPA 2.2 lb, but to a lesser degree.

1963

In this year the rate of 2,2-DPA was increased, as was the lower rate of TCA. Chloropon was included in anticipation of lowered pasture damage with acceptable barley grass control. Experimental design was similar to that of 1962 and results are shown in Table 2.

TABLE 2: EFFECT OF GRAZING ON BARLEY GRASS CONTROL, 1963

(% Barley grass cover, 24/2/64)

Treatment (lb)	*Date Applied*			
	Grazed		*Not Grazed*	
	29/7/63	*18/9/63*	*29/7/63*	*18/9/63*
2,2-DPA 2.2	18	19	29	43
2,2-DPA 3.0	9	15	29	41
TCA 11.3	9	17	29	33
TCA 13.5	3	2	33	34
chloropon 2.5	19	23	28	44
Control	61	88	74	68

TABLE 3: EFFECT OF GRAZING ON BARLEY GRASS CONTROL, 1963

(% Bare ground, 24/2/64)

Treatment (lb)	*Date Applied*			
	Grazed		*Not Grazed*	
	29/7/63	*18/9/63*	*29/7/63*	*18/9/63*
2,2-DPA 2.2	14	36	3	0
2,2-DPA 3.0	31	33	1	3
TCA 11.3	8	46	3	1
TCA 13.5	34	72	3	6
chloropon 2.5	3	31	1	0
Control	—	7	0	0

Grazing gave marked increases in control of barley grass, but this year improved control was noted with all chemicals and at both seasons of application, winter and spring. TCA at 13.5 lb gave the highest and again the most acceptable degree of control; however, this was accompanied by much bare ground, particularly where application was in spring. Considerable reductions in the amount of bare ground occurred if grazing was prevented (Table 3) but, as noted previously, barley grass control suffered.

B. Comparison of Carbetamide and Other Herbicides for Barley Grass Control

Experiment 1, 1968

Materials were applied in late spring (21/10/68) to barley grass growing adjacent to a shelterbelt and merging into a ryegrass/white clover sward.

Asulam and MSMA had no effect on barley grass cover when assessed at the ripe seed-head stage (Table 4).

Carbetamide gave good control although too many tillers survived for it to be included within the category of acceptable treatment; it was also noted that the sward was very open (Table 4) and considered to be in poor condition.

2,2-DPA gave acceptable control and, although the sward was open, it was considered in January to be showing good signs of recovery.

TABLE 4: EXPERIMENT 1, 1968 — BARLEY GRASS COVER AND BARE GROUND AT 6/1/69

Treatment (lb)	*% Barley Grass*	*% Bare Ground*
Control	31	nil
carbetamide 3.0	4	31
asulam 1.5	32	nil
MSMA 2.0	37	nil
2,2-DPA 2.0	1	21

Experiment 2, 1968

Application was in late spring (21/10/68) to barley grass in a similar situation to Experiment 1, 1968.

Carbetamide gave disappointing results; a threshold rate of 2 lb was apparent for any serious reduction in barley grass cover. However, sward damage was light at rates of 2 and 2.5 lb, particularly as instanced by percentage bare ground (Table 5).

Of the standard materials, paraquat was disappointing, TCA was very good considering application was so late in spring, while 2,2-DPA gave very good control although sward damage was severe.

TABLE 5: EXPERIMENT 2, 1968 — BARLEY GRASS COVER AND BARE GROUND AT 6/1/69

Treatment (lb)	*% Barley Grass*	*% Bare Ground*
Control	28	nil
carbetamide 1.0	24	trace
carbetamide 1.5	26	1
carbetamide 2.0	9	7
carbetamide 2.5	6	12
carbetamide 3.0	5	20
paraquat 0.5	5	44
TCA 15	1	14
2,2-DPA 3	trace	36

Experiment 1, 1969

Carbetamide was compared with TCA, 2,2-DPA, paraquat and atrazine. TCA was applied in winter (25/6/69) and the remainder in spring (1/9/69).

Because of exceptional conditions, barley seed-head development was severely retarded this season and an assessment of cover by barley grass in the seed-head stage was not made until 2/3/70 (Table 6).

TABLE 6: EXPERIMENT 1, 1969 — PERCENTAGE COVER AT 2/3/70

Treatment (lb)	*% Barley Grass*	*% Bare Ground*
Control	80	nil
TCA 12.5	48	29
carbetamide 3.0	trace	69
carbetamide 4.0	trace	70
2,2-DPA 2.0	58	18
paraquat 0.5	17	60
atrazine 1.0	43	42

Only carbetamide gave acceptable control throughout the growing season; earlier (21/12/69) all materials except atrazine appeared to be giving good control.

Apart from white clover, there were no pasture species to take the place of barley grass. Thus the removal of barley grass usually meant an increase in bare ground. Only carbetamide gave a small increase in white clover frequency.

Experiment 2, 1969

Throughout the season, carbetamide gave the best control, with September being the best time of application. However, considerable regrowth took place following rain in January together with cessation of grazing after December. Assessments were made 2/3/70 (see Table 7) and show that carbetamide gave the best though hardly acceptable control of barley grass, with a slightly better response to application in September. All other treatments gave very poor control.

TABLE 7: EXPERIMENT 2, 1969 — PERCENTAGE COVER AT 2/3/70

Treatment (lb)	*Date Applied*	*Barley Grass*	*Bare Ground*
Control		38	2
TCA 12.5	10/6/69	30	8
carbetamide 2.0	10/6/69	19	8
carbetamide 3.0	10/6/69	15	9
carbetamide 2.0	23/7/69	15	8
carbetamide 3.0	23/7/69	15	11
carbetamide 2.0	1/9/69	12	10
carbetamide 3.0	1/9/69	12	9
2,2-DPA 2.0	1/9/69	23	8
paraquat 0.5	1/9/69	37	10

DISCUSSION AND CONCLUSIONS

From the two field experiments reported here, it would appear that grazing generally improves the efficiency of herbicides, particularly when applied in spring, and is more marked with TCA than with 2,2-DPA. Subsequently, all field trials have been left open for grazing except for a brief period about the time of spraying. Unfortunately, however, grazing entails considerable losses of pasture cover through the destruction of already weakened pasture components.

It is worth recalling that, in the 1962 trial, further germination of barley grass took place after spraying on May 15; later study of a long series of barley grass trials at Invermay indicated that considerable germination could be expected in some years, if spraying took place before June; usually only scattered or sporadic germination takes place if conditions are favourable in spring.

No clear recommendations on the use of carbetamide can yet be made. The 1968 experiments were conducted under normal seasonal conditions and carbetamide 3 lb was less efficient than TCA and 2,2-DPA, while pasture damage was certainly no less.

In 1969, adequate late winter/early spring rains were followed by very dry conditions until mid-summer. Under these conditions, barley grass sprouted again from the withered and apparently dead crown tissue, and

the situation was probably aggravated through the relaxation of grazing pressure in summer. The traditional materials failed to maintain control throughout the season but carbetamide gave exceptional results in Experiment 1, while in Experiment 2 it was still the better material, particularly if applied in September, although some barley grass still managed to survive.

Carbetamide, however, warrants further study, using rates over 2 lb with application in spring rather than mid-winter.

We would conclude that current Otago/Southland recommendations for application of TCA 12.5 lb winter or spring, or 2,2-DPA 3 lb should be maintained, with the expectation that pasture damage would be less if the former material were used.

Finally, there is no option but to persist with chemical control studies, as it is considered that on a paddock scale the carrying capacity of our pasture species has out-stripped their ability to withstand trampling in areas of heavy traffic, resulting from the gregarious nature of our stock.

REFERENCES

Leonard, W. F., 1964: *Proc. 17th N.Z. Weed & Pest Control Conf.*: 33.
Thompson, A., 1959: *Proc. 12th N.Z. Weed Control Conf.*: 24.