CONTROL OF CAREX LONGEBRACHIATA

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Summary

Australian drooping sedge, *Carex longebrachiata*, is regarded as a potential threat to all hill-country pastures. In the poorer hill country of Northland where it is already strongly established, its eradication is proving difficult and costly. Esters of 2,4-D at rates of 4 lb a.i./acre and 2,2-DPA at 8.5 a.i./acre have in the past given a partial control. In recent trials, paraquat as a follow-up spray to 2,2-DPA, 2,4-D and amitrole has increased the effectiveness of these treatments and facilitated a good burn. An investigation into the effect of paraquat applied at intervals prior to burning indicates that burning should not be attempted less than eight weeks after chemical application.

INTRODUCTION

AUSTRALIAN sedge (*Carex longebrachiata*) was introduced and spread into New Zealand as an impurity in paspalum (*Paspalum dilatatum*) seed. Its distribution in the North Island is at present confined to the "paspalum zone" (Molloy and Edgar, 1967). Spread is entirely by seed which fortunately has no special mechanisms for dispersal and consequently falls close to the parent plant. The sedge will survive under a very wide range of conditions and undoubtedly drought resistance is one of the major factors contributing to its ingress in Northland (Molloy *et al.*, 1967).

Cultivation where possible and grubbing have proved successful in eradicating the weed, but on steep country dense infestations can best be controlled with herbicides and good farming methods. Unfortunately, the dense hanging foliage of a mature plant protects the fast growing tillers around the outside perimeter of the base, by shedding herbicides applied even with high volume and pressures. Consequently, many plants survive chemical treatments and the subsequent fire which seems necessary in establishing a pasture.

GOVERNMENT SUBSIDY SCHEME

The seriousness of the Australian sedge problem was recognized by its inclusion in the Noxious Weeds Act 1962 and more recently by the introduction of a Government-sponsored subsidy scheme. Under this scheme, northern local bodies acting on behalf of the Government can recompense property owners for half the cost of control measures approved by the Department of Agriculture.

PREVIOUS RESEARCH

Chemical control trials (Honore, 1963, 1966; Merry, 1967) have shown 2,2-DPA at a minimum rate of 8.5 lb a.i./ acre and butoxyethanol or octyl ester of 2,4-D at rates of 4 lb a.i./acre have given some control when applied to mature bushes in early summer and followed by autumn burning. Some success has been reported from Northland in the use of 2,4-D/sodium chlorate mixtures (Glue, pers. comm.).

RECENT RESEARCH

Some work from overseas (Headford, 1966) indicated that an application of paraquat following translocated herbicides could produce a greater degree of control than either chemical alone, and in 1966 trials were put down at Kumeu to investigate this.

The first trial examined the control of Australian sedge with 2,2-DPA, amitrole and paraquat alone, and the same treatments followed later by paraquat. The second trial investigated the effects of paraquat applied at intervals from four days to two months to areas treated with 2,2-DPA and 2,4-D. Further work commenced in 1968 near Waiuku with the laying down of two more trials. Trial 1 used low rates of 2,4-D alone, mixed with paraquat, followed by paraquat and mixed with sodium chlorate. Low rates of 2,2-DPA followed by paraquat were also investigated, as were single and double applications of paraquat. The time interval between application of paraquat and burning was examined in Trial 2.

TRIAL MANAGEMENT

All trials were laid down in December on dense infestations of mature Australian sedge up to 4 ft high. At Kumeu the first application of chemicals was made using a boom mounted on a Landrover with 80 gal of water per acre and the subsequent paraquat applications were applied with an Oxford Precision sprayer at the same rate. The Waiuku Trial 1 was put down with the Oxford sprayer using 40 gal/acre of water and paraquat in Trial 2 was applied with a gorse gun with the spray applied to give efficient cover. During the following March, all trials were successfully burnt and a suitable grass seed mixture was sown in the ashes with sufficient lime and superphosphate to establish a good pasture.

TECHNIQUES OF TRIAL ASSESSMENT

A number of methods have been tried and these include:

(1) VISUAL ASSESSMENT

Normally a 1 to 10 scale is used, with 10 indicating complete control. Prior to burning, assessments are generally based on degree of desiccation, and after burning on the vigour and number of regrowths. These assessments are used in the tables of results.

(2) POINT ANALYSIS

This was tried unsuccessfully on one trial.

(3) LINE TRANSECTS

Permanent line transects across each plot have been found useful for identifying and recording detailed data about individual plants. Such measurements as stump height and number and size of regrowths can be accurately recorded. A "tiller volume" figure defined as the product of the height of regrowths in inches and the number of regenerating tillers indicates effectiveness of treatment and is used in the tables.

TRIAL RESULTS

All quantities of herbicides quoted in the following tables are in lb a.i. per acre.

TABLE 1: TRIAL 1 — KUMEU, 1966

<i>Treatments (lb) Applied 12/12/66</i>	<i>Observations made July, 1967</i>	
	<i>Degree of Control (1-10 scale)</i>	<i>"Tiller Volume"</i>
1. 2,2-DPA 5	4.6 bCD	43.2 bAB
2. 2,2-DPA 10	7.9 aAB	17.7 cdBC
3. paraquat 1	5.8 bBC	36.4 bcABC
4. amitrole (+ ammonium thiocyanate) 1	2.8 cD	46.6 bAB
5. amitrole 1	2.7 cD	69.5 aA
6. 2,2-DPA 5/paraquat ½ on 28/12/66	7.8 aAB	8.1 dC
7. 2,2-DPA 10/paraquat ½ on 28/12/66	8.3 aA	5.3 dC
8. paraquat 1/paraquat ½ on 28/12/66	7.5 aAB	21.2 bcdBC
9. amitrole (+ ammonium thio- cyanate) 1/paraquat ½ on 15/12/66	5.2 bC	37.9 bcABC
10. amitrole 1/paraquat ½ on 15/12/66	6.0 b	22.3 bcdBC
CV	17.4%	51%
<i>Main Effect</i>		
No extra paraquat	4.7 bB	42.4 aA
0.5 lb extra paraquat	7.0 aA	19.0 bB

In Table 1 "degree of control" assessments and "tiller volume" measurements clearly show that the additional application of 0.5 lb paraquat has significantly increased the effectiveness of most treatments. The most effective treatments are Treatments 2, 6, 7 and 8 which are not significantly different. The effect of 10 lb of 2,2-DPA has not increased with added paraquat, suggesting that that rate of 2,2-DPA is reasonably effective on its own.

Table 2 shows that in terms of control of Australian sedge, there is no significant difference between times of the second paraquat spraying. This trial suggested that 5 lb of 2,2-DPA might give a more effective control than 3.6 lb of 2,4-D. This comparison was not made in Trial 1 at Kumeu.

No treatments in Trial 1 at Waiuku were as effective as in the previous trials described. There has been a high level of regrowths on all plots and

TABLE 2: TRIAL 2 — KUMEU, 1966

<i>Paraquat ½ lb applied</i>	<i>Visual Observations July, 1967 Degree of Control 1 to 10 Scale</i>	
	<i>5 lb 2,2-DPA applied 7/12/66</i>	<i>3.6 lb Octyl Ester 2,4-D applied 7/12/66</i>
1. 5 days later	8.0 a	7.8 a
2. 8 days later	9.0 a	6.5 a
3. 14 days later	8.2 a	6.2 a
4. 28 days later	9.0 a	6.0 a
5. 56 days later	8.0 a	5.7 a
CV	11.7%	29.4%

TABLE 3: TRIAL 1 — WAIUKU

<i>Treatment (lb) Applied 9/12/68</i>	<i>Pre-burning Observations January, 1969</i>	<i>Post Burning Observations May, 1969</i>	
	<i>Degree of Desiccation 1-10 Scale</i>	<i>Degree of Control 1-10 Scale</i>	<i>"Tiller Volume"</i>
1. Control	1.0 dC	1.8 dC	82
2. Octyl 2,4-D 2	5.2 cB	7.8 abAB	31
3. paraquat ½	8.4 aA	7.0 bcAB	50
4. Octyl 2,4-D 2/ para- quat ½ mixed	8.3 aA	7.4 abcAB	40
5. Octyl 2,4-D 2/para- quat ½ 1 wk later	8.2 aA	7.0 bcAB	43
6. paraquat ½ / para- quat ½ 1 wk later	7.6 aAB	7.8 abAB	30
7. 2,2-DPA 5/paraquat ½ 1 wk later	7.2 abAB	7.4 abcAB	31
8. Octyl 2,4-D 2 / sodium chlorate 9 mixed	5.6 bcB	6.4 cB	52
9. paraquat 1	8.5 aA	8.4 aA	24
CV	20.2%	13.4%	Not analysed

TABLE 4: TRIAL 2 — WAIUKU. TREATMENT MEANS

<i>Interval between Spraying and Burning on 15/3/66</i>	<i>Estimation of Burn (10 = complete burn)</i>	<i>Estimation of Sedge Regrowth (10 = no regrowth)</i>
1. 12 weeks	8.25 aA	7.5 a
2. 10 weeks	8.0 aA	6.3 a
3. 8 weeks	8.0 aA	6.8 a
4. 6 weeks	7.5 aaAB	5.5 a
5. 4 weeks	6.0 bAB	5.8 a
6. 2 weeks	5.0 bC	5.8 a
CV	10.6%	20.0%

pasture has proved difficult to establish. Statistical analysis of visual assessments prior to burning shows that Treatments 3, 4, 5 and 9 were significantly better than Treatments 2 and 8. Both assessments after burning show that Treatment 9 (paraquat at 1 lb) had the highest rating though it was not significantly different from Treatments 2, 4, 6 and 7.

Table 4 suggests that between six to eight weeks should elapse between application of paraquat and burning to get the most effective burn. Observations suggest that there is an advantage to be gained from allowing some regrowth to take place between chemical application and burning. Burning before regrowth will only remove already dead material, while delayed burning will cause further damage to the sedge.

CONTROL RECOMMENDATIONS

CULTIVATION

Australian drooping sedge is sensitive to root disturbance, and cultivation wherever possible is a cheap and efficient means of control. For single bushes, grubbing is an effective control with minimum pasture damage.

CHEMICAL APPLICATION

Investigation into chemical control methods, not yet complete show 10 lb 2,2-DPA, 4 lb octyl 2,4-D and 1 lb paraquat have given some good results.

The trials have also shown that ½ lb paraquat as a second spraying after 2,2-DPA, 2,4-D, amitrole or paraquat improves the degree of kill.

Burning has generally been accepted as part of chemical control, as a means of damaging the sedge and removing the volume of coarse fibrous leaf which, if not removed, could prevent establishment of sown pasture species.

GENERAL

Control measures, even if reasonably successful, will need a rigid follow-up policy of spot spraying or grubbing to prevent re-establishment by partially killed clumps and seedlings which germinate after a burn.

Heavy fertilizer applications, suitable seed mixtures and adequate subdivision so that grazing can be properly controlled are essentials in the establishment of a high-producing pasture which is the farmer's greatest ally in the prevention of re-infestation of the sedge.

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