THE EFFECT OF HERBICIDES ON GORSE AND PASTURE SPECIES

A. THOMPSON

Ruakura Agricultural Research Centre, M.A.F., Hamilton

Summary

A 2,4,5-T/picloram formulation has given generally better control of gorse regrowth than has 2,4,5-T, 2,4,5-T/dicamba and 2,4,5-T/diquat. 2,4,5-T/picloram and 2,4,5-T/dicamba were particularly damaging to pasture legumes while 2,4,5-T/diquat caused appreciable grass reduction.

INTRODUCTION

ALTHOUGH esters of 2,4,5-T remain the basic material for the control of gorse *(Ulex europaeus)* there has been increasing emphasis on its use in combination with various additive herbicides; with the objectives of reducing gorse regrowth or extending the time over which the plant may be successfully treated.

Following early work with amine forms of 2,4,5-T/picloram mixtures Upritchard (1969) reviewed trials which showed a combination of esters of 2,4,5-T and the potassium salt of picloram to be superior in regrowth suppression to the earlier amine formulations. Taylor and Patterson (1969) reported that dicamba in combination with 2,4,5-T could have a place in gorse control, also as a means of reducing regrowth. In the same year Williams and Palmer (1969) described trials in which the bipyridylium desiccant herbicides diquat and paraquat used as additives to esters of 2,4,5-T were indicated as greatly accelerating the death and breakdown of treated gorse and markedly extending the time over which an acceptable level of control could be achieved. Two trials were commenced in the spring of 1971 to compare the effectiveness of 2,4,5-T/picloram, 2,4,5-T/dicamba and 2,4,5-T/diquat mixtures with each other and with the ester of 2,4,5-T for gorse control at different times of the year. Further information was also required about their effects on associated pasture species and on regenerating gorse seedlings. Trial A was on partially developed Rukuhia peat near Hamilton and trial B on Komata clay loam near Paeroa.

EXPERIMENTAL

On both sites at the commencement of the trials regrowth gorse was 0.7 m to 1.2 m high following rotary slashing about 2 years previously. Gorse cover was fairly uniform and ranged from 60 to 80% at both sites but was more open and clumpy on trial A. Pasture on both trials was poor, consisting mainly of weed grasses and broadleaf weeds with some white clover *(Trifolium repens)* and *Lotus* spp.

The following herbicide treatments (kg/ha) were applied in both trials:

Herbicide Rate No.	*Butoxy ethanol ester of 2,4,5-T*	*Iso-octyl ester 2,4,5-T + potassium picloram*	*Butoxy ethanol ester 2,4,5-T + methyl ester dicamba*	*Butoxy ethanol ester 2,4,5-T + Q. salt diquat*
1	1.33	0.75+0.19	0.75+0.37	0.75+0.12
2	2.67	1.50+0.37	1.50+0.74	1.50+0.24
3	4.00	2.25+0.56	2.25+1.12	2.25+0.36
4	5.33	3.00+0.75	3.00+1.50	3.00+0.48
5	6.67	3.75+0.95	3.75+1.90	3.75+0.60
6	–	–	–	4.50+0.72

Treatment dates were:
Trial A: 9/11/71, 7/2/72, 14/4/72, 6/6/72.
Trial B: 19/11/71, 8/2/72, 20/4/72, 7/6/72

Treatment rates 1 to 4 were applied at the November and February applications and all rates (1 to 6) at the April and June applications.

Herbicides were applied in water, using a motorised mist blower, at approximately 2000 litre/ha on Trial A and at 2800 litre/ha to the rather more dense gorse on Trial B. Plots were 55 m^2 in Trial A and 40 m^2 in Trial B.

RESULTS

Species content of pasture on all plots in Trial A was determined by point analysis on 31/10/72 and pastures in Trial B were visually assessed on 24/10/72. Because similar trends were apparent at all treatment times in both trials Table 1 gives partial data from Trial A only.

TABLE 1: EFFECT OF HERBICIDES ON PASTURE SPECIES
(per cent presence)
Point analyses: 31/10/72

Treatment	*Herbicide rates (mean of)*	*Grasses*	*White clover*	*Lotus spp.*	*Pasture weeds*	*Litter & bare ground*	*Gorse seedlings*
November							
2,4,5-T	3 & 4	47	3	16	19	14	1
2,4,5-T/picloram	3 & 4	59	0	5	14	22	0
2,4,5-T/dicamba	3 & 4	57	0	10	21	10	2
2,4,5-T/diquat	3 & 4	32	12	18	21	13	4
June							
2,4,5-T	3 & 4	66	0	2	16	15	1
2,4,5-T/picloram	3 & 4	68	0	0	9	23	0
2,4,5-T/dicamba	3 & 4	65	0	1	16	18	0
2,4,5-T/diquat	3 & 4	32	4	9	27	25	3
2,4,5-T/diquat	5 & 6	28	0	8	31	30	3
control		39	11	15	23	12	0

Table 2 shows the effect of herbicides on the establishment of gorse seedlings in Trial A. Young plants which had developed from germination after treatment were counted on 10 random quadrats per plot on 7/11/72. Because of strong competition from inadequately grazed pasture species and weeds on Trial B gorse germination was erratic and few seedlings were observed.

TABLE 2: GORSE NUMBERS IN PASTURE
(Totals from 10 quadrats per plot)
Counted 7/11/72

Treatment	*Rate**	*Treatment applied*			
		November	*February*	*April*	*June*
2,4,5-T	Low	10	12	4	5
	High	19	17	10	10
2,4,5-T + picloram	Low	16	14	4	2
	High	14	7	0	0
2,4,5-T + dicamba	Low	12	14	7	8
	High	18	15	6	2
2,4,5-T + diquat	Low	21	21	10	9
	High	23	30	15	15
control		7			

* Treatment rates: Low = mean of herbicide rates 1 and 2.
High = mean of herbicide rates 3 and 4.

An assessment of regrowth of treated gorse was made on all plots in both trials in January 1973 and repeated in May 1973. Table 3 gives results of the May assessment.

TABLE 3: GORSE RECOVERY AFTER TREATMENT
(percent stems showing regrowth)
Assessed 10/5/73

Treatment Applied	*Rate*	*2,4,5-T*		*2,4,5-T+ picloram*		*2,4,5-T dicamba*		*2,4,5-T diquat*	
	Trial	*A*	*B*	*A*	*B*	*A*	*B*	*A*	*B*
November	1	20	10	10	25	30	60	30	60
	2	2	15	2	10	4	20	25	30
	3	3	5	<1	<1	3	2	4	15
	4	0	0	0	0	5	<1	2	10
February	1	40	90	30	80	70	100	50	80
	2	20	30	10	20	40	50	30	50
	3	4	10	2	3	15	30	20	20
	4	<1	10	<1	1	25	15	3	10
April	1	100	100	90	100	100	100	100	100
	2	50	50	25	40	60	100	50	100
	3	30	50	4	20	60	40	40	60
	4	4	25	<1	2	15	30	20	25
	5	4	10	0	<1	2	6	4	25
	6	–	–	–	–	–	–	5	20
June	1	100	100	80	100	100	100	60	100
	2	80	100	15	60	80	100	40	80
	3	30	90	2	40	30	100	20	40
	4	10	30	0	20	15	70	10	40
	5	6	20	0	5	5	25	8	8
	6	–	–	–	–	–	–	3	10

DISCUSSION

Since the success of gorse control treatments is entirely dependent on the inhibition of regrowth, an effect which usually cannot be reliably judged until at least 12 months after treatment, the present assessment of regrowth percentages must represent to some degree interim results, particularly for April and June applications.

In comparing gorse control data from the two trials the most obvious effect is the usually lower level of regrowth control achieved in Trial B by all materials at most rates and times. Some of the differences may be accounted for by reference to the generally greater density of the gorse cover in Trial B, but observations suggest that a complex of climatic and other factors such as locality, aspect, soil type and soil moisture may also be involved. Whatever the causes, the results from 2,4,5-T in Trial B are more typical of what experience leads us to expect of this material at the different times of application than are those of Trial A. It is therefore probable that the trials represent respectively the average result and the best result that may be expected from the various herbicides at any particular time.

Trial B in particular confirms what is already well known; that 2,4,5-T is highly effective during the spring to early summer period but much less so in the autumn and winter. There was no evidence from either trial that the 2,4,5-T/dicamba mixture, at the rates used, is superior to 2,4,5-T alone.

In terms of initial effect the 2,4,5-T/diquat combination, at rates likely to be used, is by far the most spectacular treatment, giving a consistently good brown off at all times of the year. However, considerable regrowth has occurred even at the highest rates and the mixture does not seem to be greatly superior to 2,4,5-T alone. The level of regrowth suppression achieved by the 2,4,5-T/picloram mixture has been generally superior in both trials to that of other treatments.

The effects on pasture species of 2,4,5-T, picloram and dicamba are well known and in these trials did not depart significantly from the expected pattern of temporary reduction in weed content, the reduction or semi-permanent elimination of pasture legumes and a corresponding increase in the proportion of grasses. The 2,4,5-T/diquat combination had almost the opposite effect. Desiccation of the sward was severe at the higher treatment rates, resulting in a fairly prolonged suppression of grasses and an initial increase in volunteer weed species. Recovery of pasture legumes was generally good and appreciably more rapid than from 2,4,5-T alone.

Where pasture cover is already weak all herbicides, by disturbance and further reduction of ground cover, tend to increase the germination of gorse seedlings. This is particularly apparent where adverse fertility factors are combined with the desiccating effects of 2,4,5-T/diquat.

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