HERBICIDE EFFECTS ON RAGWORT AND PASTURE

A. THOMPSON

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

Summary

2,4-D treatments had little effect on pasture production or on ragwort reinvasion, but clover suppression by picloram/2,4-D and to a less extent by dicamba/2,4-D reduced herbage production and allowed greater ingress of ragwort seedlings. Picloram granules gave the most effective control of ragwort root regrowth with 2,4-D least effective.

INTRODUCTION

That herbicide treatments seldom if ever give permanent control of established infestations of ragwort *(Senecio jacobaea)* is well known, but the extent to which this is due to recovery of treated plants or reinvasion by seedlings has not been very clearly understood. Nor has there been much information about the longer term effect of herbicides on the competitive relationship between ragwort and the associated pasture. To obtain some more precise data on these aspects of ragwort treatment, trials have been conducted to determine the amount of root regrowth from spot treated plants and in separate trials to examine he effects of boom sprayed herbicides on pasture production, composition and ground cover in relation to the ingress of ragwort seedlings and the recovery of treated plants.

EXPERIMENTAL

Effect of herbicides on ragwort and pasture

On sites where ragwort was known to have flowered and seeded in the previous summer overall applications of the herbicide treatments shown in table 1 were made to dairy pastures heavily infested with ragwort on a pumice soil near Whakamaru and on a clay soil at Paeroa. Treatments at both sites were replicated four times.

Full pasture yields were collected from the Whakamaru trial with occasional cuts for comparative purposes from the Paeroa site. Pastures in both trials were point analysed in autumn and spring and soil samples examined to determine the presence of ragwort seed in the soil.

Effect of herbicides on ragwort root regrowth

In trials on a pumice soil near Atiamuri and on a clay soil at Whatawhata spot treatments of ester 2,4-D, 2,4-D + picloram, 2,4-D + dicamba and picloram granules (see table 5 for rates) were applied in September and November 1972 to treatment groups of 20 large multi-crowned ragwort plants. Other groups of plants were allowed to flower, seed and die (flowers covered to retain seed) or were chipped below ground level. To avoid complications due to the ingress of seedlings trials were sited where ragwort had not been allowed to shed seed for several years. In addition, soil samples were examined at the beginning and end of the trials for ragwort seed in the soil and the trial sites inspected at frequent intervals for the presence or ragwort seedlings. The site of each trial plant was regularly inspected for evidence of root regrowth until a final inspection in August 1973.

RESULTS

Effect of herbicides on ragwort and pasture

Since the initial effects on pasture of the herbicides used are well known, production data for the summer-autumn 1972-73 period are not shown in table 1 which gives relative pasture dry matter yields for subsequent periods from the Whakamaru trial.

TABLE 1: RELATIVE PASTURE DM PRODUCTION — WHAKAMARU

Treatments (kg/ha)				
Applied October 1972	*Applied June 1973*	*Winter-Spring 1973*	*Summer-Autumn 1973-74*	*Total yields*
2,4-D 1.5	—	90	91	90
2,4-D 0.8+picloram 0.2	—	65	59	66
2,4-D 1.2+dicamba 0.3	—	75	82	78
2,4-D 1.5	+2,4-D 0.6	82	94	86
2,4-D 0.8+picloram 0.2	+2,4-D 0.6	63	61	66
2,4-D 1.2+dicamba 0.3	+2,4-D 0.6	69	66	71
—	2,4-D 0.6	86	91	92
control		100	100	100

Periodic assessments and occasional cuts confirmed that herbicide effect on pasture production was much less severe at Paeroa where a cut in September 1973 gave a herbage dry matter yield from 2,4-D+picloram the lowest production treatment, only 15 percent below that of control. Assessments at this site in May 1974 indicated no significant production differences between treatments.

At both sites clover was initially eliminated by picloram, very severely reduced by dicamba and significantly reduced by 2,4-D. Point analyses assessment of recovery is given in table 2.

TABLE 2: MEAN PERCENT CLOVER COVER

Treatments (kg/ha)		*Whakamaru*		*Paeroa*	
Applied October 1972	*Applied June 1973*	*Oct. 1973*	*May 1974*	*Oct. 1973*	*May 1974*
2,4-D 1.5	—	28	38	23	27
2,4-D 0.8+picloram 0.2	—	3	18	5	20
2,4-D 1.2+dicamba 0.3	—	14	31	9	24
2,4-D 1.5	+2,4-D 0.6	26	39	23	25
2,4-D 0.8+picloram 0.2	+2,4-D 0.6	2	21	4	22
2,4-D 1.2+dicamba 0.3	+2,4-D 0.6	12	28	8	21
—	2,4-D 0.6	31	42	26	24
control		33	41	27	25

Ragwort plants which came in as seedlings subsequent to herbicide treatment were also assessed by point analyses at both sites. Results from three pointings at both sites are shown in table 3.

TABLE 3: RAGWORT SEEDLINGS AND JUVENILE PLANTS
(Cover Hits/400 Points)

Treatments (kg/ha)		*Whakamaru*			*Paeroa*		
Applied Oct. 1972	*Applied June 1973*	*May 1973*	*Oct 1973*	*May 1974*	*May 1973*	*Oct 1973*	*May 1974*
2,4-D 1.5	—	28	33	25	4	12	49
2,4-D 0.8 +picloram 0.2	—	16	46	56	8	18	45
2,4-D 1.2 +dicamba 0.3	—	24	45	3€	9	16	54
2,4-D 1.5	+2,4-D 0.6	17	0	14	8	1	7
2,4-D 0.8 +picloram 0.2	+2,4-D 0.6	21	3	3C	8	2	6
2,4-D 1.2 +dicamba 0.3	+2,4-D 0.6	27	3	27	10	1	4
—	2,4-D 0.6	31	3	12	11	2	8
control		26	35	23	8	21	63

An assessment made in January 1974 of the number of treated mature ragwort plants which regrew after treatment and flowered is given in table 4.

TABLE 4: PERCENT RECOVERY OF TREATED MATURE RAGWORT — JANUARY 1974

Treatments (kg/ha)		*Whakamaru*	*Paeroa*
Applied October 1972	*Applied June 1973*		
2,4-D 1.5	—	8	15
2,4-D 0.8+picloram 0.2	—	0	7
2,4-D 1.2+dicamba 0.3	—	19	18
2,4-D 1.5	+2,4-D 0.6	9	1
2,4-D 0.8+picloram 0.2	+2,4-D 0.6	0	0
2,4-D 1.2+dicamba 0.3	+2,4-D 0.6	4	0
—	2,4-D 0.6	36	0
control		100	100

TABLE 5: PERCENT ROOT REGROWTH IN MATURE RAGWORT PLANTS

Treatment (kg/ha)	*September*		*November*	
	Atiamuri	*Whata.*	*Atiamuri*	*Whata.*
2,4-D 2.0	30	60	15	20
2,4-D 0.8+picloram 0.2	20	0	0	5
2,4-D 1.2+dicamba 0.3	40	30	10	10
picloram granules (0.02 g picloram/plant)	5	5	0	0
Flower, seed and die			0	0
Crown chipped out			80	75

Several hundred ragwort seeds/m² were found in the surface soil at both Whakamaru and Paeroa.

Effect of herbicides on ragwort root regrowth

A final assessment of the number of ragwort plants showing root regrowth in the trials at Atiamuri and Whatawhata was made in August 1973. Results are given in table 5.

No ragwort seed was found in the soil at either site at the beginning or end of the trials and in a detailed examination of both sites in August 1973, no ragwort seedlings could be located.

DISCUSSION

Because grasses were weak on the droughty low fertility pumice, clover was a much more important pasture component at Whakamaru than on the fertile grass dominant Paeroa clay. For this reason and because clover was also slower to recover from suppression on the pumice soil herbicides which seriously interferred with it had a greater and more lasting effect on pasture cover and herbage production in the Whakamaru trial than at Paeroa.

The differences in competitive ability between the swards on these extreme soil types is reflected in the pattern of reinvasion by ragwort seedlings shown in table 3. In the open pumice swards the level of ragwort seed germination was high and seedling reinfestation rapid. Seedling growth was slow in the cold winter environment of Whakamaru and although summer mortality of juvenile plants was often high infestations on this soil usually contained large numbers of small rosettes. In contrast, under the more benign Paeroa conditions strong pasture competition greatly limited both ragwort germination and the proportion of seedlings able to establish, but was unable to prevent reinvasion by seedlings. Once established the relatively small number of plants grew so vigorously that when pointed in May 1974 ragwort ground cover on plots not treated in winter 1973 was higher than on similar treatments at Whakamaru.

Even on the vulnerable pastures at Whakamaru the limited use of 2,4-D had little effect on the level of ragwort seedling reinvasion, but because of the serious adverse effect on the dominant clover of the pumice site, picloram and to a rather less extent dicamba, caused a very substantial increase in the survival of invading ragwort at Whakamaru. In the more favourable growth conditions at Paeroa where the competitive potential of the pasture was not seriously reduced by clover suppression, none of the herbicides had much real or differential effect on ragwort seedling re-establishment.

The assessment of flowering ragwort shown in table 4 indicates that of the spring applied treatments, picloram/2,4-D gave the most effective control, particularly at Whakamaru, of the initial ragwort infestation. Assessments in tables 3 and 4 also show that winter applied 2,4-D was more effective in the milder conditions of the Paeroa site.

Table 5 indicates that the fairly marked differences in sites environment between Atiamuri and Whatawhata did not greatly influence the effect of herbicides on the amount of root regrowth from large multi-crowned ragwort plants. In addition to determining the relative efficiency of herbicide treatments in controlling ragwort root regrowth, these trials by demonstrating the absence from both sites of ragwort seed or seedlings, have indicated that ragwort infestations which persist in spite of repeated herbicide treatment may be composed largely of regrowth plants.

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