FLAZASULFURON FOR CONTROL OF RAGWORT (*SENECIO JACOBAEA*) IN PASTURE

T.K. JAMES, A. RAHMAN
and P. DE JONG[1]

AgResearch, Ruakura Research Centre, Private Bag 3123, Hamilton
[1]Yates New Zealand Limited, P.O. Box 1109, Auckland

ABSTRACT

Nine trials were carried out over two years in Waikato to evaluate the new sulfonylurea herbicide flazasulfuron for control of ragwort in pasture. It was tested both as a broadcast application and a directed spot treatment. Its effect on pasture was measured in two weed-free trials. At 4 and 5 g/ha flazasulfuron gave very good control of ragwort but was damaging to pasture, particularly the perennial ryegrass component. Applied as a spot treatment at 0.5 g/litre, flazasulfuron gave excellent control of ragwort plants and avoided the problem of pasture damage.

Keywords: flazasulfuron, ragwort, *Senecio jacobaea*, pasture weeds, spot treatment

INTRODUCTION

Ragwort is a serious weed of pasture throughout New Zealand (Bourdôt and Kelly 1986). It is toxic to stock, is a prolific seeder and is able to colonise large tracts of land. The phenoxy herbicide 2,4-D is widely used for control of this weed (Martin*et al*. 1986). Several biological control agents have also been released (Harman and Syrett 1989), but they have not been entirely successful. Repeated use of 2,4-D can lead to the development of large multicrown ragwort plants (Martin *et al*. 1988). Further, with the increase of horticultural land-uses in many parts of the country, it is becoming less acceptable to use phenoxy herbicides. Therefore, there is a clear need for alternatives to phenoxy herbicides in these situations.

Flazasulfuron (SL-160, ISK, 25% WDG) is a recently developed sulfonylurea herbicide similar to thifensulfuron and metsulfuron which have been used successfully to control a variety of herbaceous and scrub weeds in pastures as either broadcast sprays or spot applications (Balneaves and Cosslett 1983; Sanders and Rahman 1994). The present study evaluated the effectiveness of flazasulfuron for controlling ragwort in pastures either as a broadcast or as a spot application, and determined optimum use rates, as it has not previously been used on this weed.

MATERIALS AND METHODS

Nine trials were conducted in Waikato over two years to evaluate the potential of flazasulfuron for control of ragwort in pasture.

Broadcast application - efficacy and pasture tolerance

Trials were conducted at six sites on ragwort at varying growth stages. Broadcast applications of five rates of flazasulfuron were made in Trials 1-6 (Tables 1 and 2). Thifensulfuron (Harmony) was included as a standard sulfonylurea herbicide for comparing pasture tolerance and 2,4-D (Hi-Ester 2,4-D) was included at a low rate for comparing the activity on small ragwort plants. The treatments were applied on 13, 19 and 28 October 1994 for Trials 1 - 3 respectively and Trial 4 was treated on 26 June 1995. The ragwort plants in Trial 1 were mostly rosettes with some at the small cabbage stage; those in Trial 2 were at the cabbage stage and many were multicrown plants; those in Trial 3 were bolting to bud stage and those in Trial 4 were seedlings and small rosettes. The pasture tolerance trials (Trials 5 and 6) were carried out on a ragwort free, established

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perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) sward on 1 October 1995 and 13 November 1995 respectively. All the herbicide treatments were applied with a CO_2 powered precision sprayer using TeeJet 8003 nozzles at 210 kPa to apply 300 litres/ha. Individual plots were 2 m x 10 m and treatments were replicated four times.

Spot application - efficacy

Spot applications of various rates were evaluated in Trials 7 - 9 (Table 3). Metsulfuron (Escort) was used as a comparison treatment in these trials. The effect of the adjuvant Pulse was also determined at two rates of flazasulfuron. Plots varied in size to give a minimum of 20 ragwort plants/plot. The treatments were applied on 8 September 1995, 3 October 1995 and 7 November 1995 in Trials 7 - 9 respectively. The ragwort plants in Trial 7 were mostly rosettes with some small plants present; those in Trial 8 were at the advanced cabbage stage and those in Trial 9 had mostly bolted with some flowering. Two types of spot applicators are in common use and both were included in these trials. One was a modified drench gun fitted with a solid cone nozzle which applied a 5 ml dose of herbicide to each plant, and the other was a standard knapsack sprayer fitted with a measuring device to apply a 10 ml dose of spray mix through a flat fan nozzle. In all the spot application trials except Trial 9, individual ragwort plants were given a single dose of herbicide. In Trial 9 the large flowering plants received two doses each while smaller plants received a single dose. Foliage wetting was maximised by moving the nozzle around over the top of the small plants or up one side and down the other for bolting and flowering plants.

In the herbicide efficacy trials, ragwort control was visually assessed on several occasions and plants counted on a whole plot basis. The visual assessment combined an estimate of growth suppression and physical damage such as discolouration and distortion. In the pasture tolerance trials, total pasture production was measured by mowing two 0.6 m x 8.8 m strips in each plot on three separate occasions at approximately monthly intervals after the treatments were applied. The cut pasture was weighed green and a subsample taken for dry matter determination. At the same time, a 0.1 m x 3 m strip was cut from each plot and dissected to determine pasture species composition.

All trials had four replications for each treatment and the plots were arranged in a randomised block design. All data were subjected to analysis of variance (ANOVA) except for the herbicide efficacy trials where the data for the untreated controls were omitted from the analyses.

RESULTS AND DISCUSSION

Broadcast application - efficacy on ragwort

Flazasulfuron exhibited damage symptoms quickly on rosette and small cabbage ragwort. Within 3 to 5, days the growing point of the plant and surrounding young leaves turned yellow and necrotic regions appeared on those leaves soon after. Within 2 weeks the centre of the plant was usually very brown and beginning to rot out. Soon after this, the petioles of the older leaves rotted at the base and these leaves also withered and died. With larger plants it was necessary to obtain good spray coverage to ensure complete brownoff. To prevent seeding in flowering plants, it was essential to treat the flowers also.

When used as a broadcast application, there was a strong rate effect on ragwort plants (Table 1). The low rates of 1 - 3 g/ha did not offer adequate control of the weed, but rates of 4 and 5 g/ha resulted in much better control and compared favourably with the 2,4-D treatment. However, as the rate of 2,4-D used was below the recommended rate, the level of control from this herbicide was considerably reduced when used on larger ragwort plants (Trials 2 and 3). Flazasulfuron also had less effect on larger plants as shown by the visual scores recorded in Trial 3. In Trial 4 the control score reduced with time as some spring germinating ragwort plants grew in the treated plots. The use of the adjuvant Pulse with flazasulfuron increased its effectiveness on ragwort. Thifensulfuron had very little effect on the ragwort plants.

TABLE 1: Control score[1] of ragwort following broadcast application of herbicides.

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Treatment	Rate g ai/ha	Trial 1 9 WAT	Trial 2 7 WAT	Trial 3 7 WAT	Trial 4 5 WAT	Trial 4 14 WAT
untreated	-	0	0	0	0	0
flazasulfuron	1	10	14	18	40	20
flazasulfuron	2	41	40	50	65	35
flazasulfuron	3	63	54	58	68	58
flazasulfuron	4	85	55	65	78	73
flazasulfuron	5	93	65	75	90	85
flazasulfuron[2]	1	45	25	34	38	20
flazasulfuron[2]	2	69	53	45	55	28
thifensulfuron	15	15	13	8	28	0
2,4-D	1035	81	21	28	58	83
LSD 5%		20	11	11	13	13

[1] Control score, 0 - 100, where 0 = no damage and 100 = complete brownoff
[2] Treatment included Pulse at 0.2%

Broadcast application - pasture tolerance

Flazasulfuron was quite damaging to the perennial ryegrass component of pasture (Table 2). Overall, pasture production was significantly reduced by 4 and 5 g/ha of flazasulfuron and also by 2 g/ha when used in combination with the adjuvant Pulse. The herbage dissections showed that ryegrass was more severely affected than white clover. In both trials the reduction of ryegrass coincided with an increase in other grass species but by the end of summer these other grasses had mostly been replaced by broad-leaved weeds, in particular, plantains (*Plantago* spp.) and other flat weeds. Pasture production was not significantly different between the 2,4-D and thifensulfuron treatments but both herbicides significantly reduced the white clover component of the first production cut, although it had fully recovered by the third cut. These results are similar to our previous findings with respect to these herbicides (Rahman and Martin 1989; James *et al*. 1992). Visual assessments of pasture damage in the ragwort efficacy trial treated in winter (Trial 4) showed that perennial ryegrass possibly sustained greater damage at this time of the year.

TABLE 2: Total DM production[1] (kg/ha) and ryegrass and clover content of pastures treated with various herbicides.

Treatment	Rate g ai/ha	Trial 5 Total DM	Trial 5 Ryegrass (%) 11.11.94	Trial 5 Clover (%) 11.11.94	Trial 6 Total DM	Trial 6 Ryegrass (%) 8.12.94
untreated	-	1875	56	10	1192	36
flazasulfuron	1	1793	51	8	1013	27
flazasulfuron	2	1552	48	6	938	16
flazasulfuron	3	1496	34	6	883	19
flazasulfuron	4	1215	37	7	797	9
flazasulfuron	5	1090	12	4	864	9
flazasulfuron[2]	1	1719	39	9	950	9
flazasulfuron[2]	2	1304	22	10	805	9
thifensulfuron	15	2163	58	2	961	30
2,4-D	1035	2103	65	3	1018	39
LSD 5%		407	21	5	312	12

[1] Total of three pasture cuts after treatment. [2] Treatment included Pulse at 0.2%.

Although flazasulfuron showed considerable promise for controlling ragwort with a broadcast application, the level of damage to pasture, particularly perennial ryegrass, was unacceptable. Chemical safeners have been developed for use with sulfonylurea herbicides,

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particularly for Gramineae species, and one of these may prove useful for enhancing the tolerance of ryegrass to flazasulfuron (Hatzios and Wu 1996).

Spot application - efficacy on ragwort

In six pilot field trials evaluating rates and adjuvants, flazasulfuron proved very effective at rates from 0.063 to 0.25 g/litre (data not presented). The rates used in Trials 7 - 9 were based on the findings of these pilot trials. The use of adjuvants was not pursued as there did not appear to be any cost benefit over using a higher rate of herbicide. Results from trials 7 - 9 show that a concentration of 0.05 g/litre was effective with both application methods and on plants up to the cabbage stage (Table 3). For larger plants the same concentration should be used but the plants should be given two doses. At this concentration, flazasulfuron was as effective as metsulfuron at 0.06 g/litre.

TABLE 3: Control score[1] and number of viable ragwort plants/plot after spot application of various herbicides.

		Trial 13		Trial 14		Trial 15	
Treatment	Rate g ai/litre	Control 10 WAT	Count 27 WAT	Control 8 WAT	Count 19 WAT	Control 8 WAT	Count 13 WAT
Untreated	-	0	24.0	0	21.5	0	19.0
flazasulfuron[2]	0.013	78	7.0	64	5.3	80	1.8
flazasulfuron[2]	0.025	88	5.8	79	7.3	93	0.8
flazasulfuron[2]	0.05	95	4.5	91	2.5	79	2.3
metsulfuron[2]	0.06	79	6.8	89	5.5	95	0.5
flazasulfuron[3]	0.013	98	5.8	96	3.3	88	2.5
flazasulfuron[3]	0.025	98	4.3	81	3.8	93	0.5
flazasulfuron[3]	0.05	99	1.8	96	1.8	98	1.5
metsulfuron[3]	0.06	96	3.3	89	2.8	90	1.0
LSD (5%)		14	3.8	20	3.7	14	1.3

[1] Control score, 0 - 100, where 0 = no damage and 100 = complete brownoff.
[2] 10 ml herbicide mixture applied with a knapsack sprayer.
[3] 5 ml herbicide mixture applied with a spotgun.

CONCLUSION

Results from the field trials reported here show that flazasulfuron at 4 and 5 g/ha gave good control of ragwort but was very damaging to the pasture, particularly the perennial ryegrass component. This precludes its use as a broadcast herbicide unless a safener becomes available. Used as a spot treatment (0.05 g/litre, 5 - 10 ml/dose) flazasulfuron gave excellent control of ragwort plants and avoided the problem of pasture damage.

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