EFFECT OF QUIZALOFOP ON SOME ANNUAL AND PERENNIAL GRASS WEEDS

P. SANDERS, T.K. JAMES and A. RAHMAN

MAFTech North, Ruakura Agricultural Centre, Private Bag, Hamilton

SUMMARY

The activity of quizalofop was compared with sethoxydim and fluazifop-butyl against three annual and two perennial grass weeds. All herbicides gave effective control of the annuals, barnyard grass (*Echinochloa crus-galli*), summer grass (*Digitaria sanguinalis*) and smooth witchgrass (*Panicum dichotomiflorum*). Quizalofop gave 70-90% control of well established couch (*Elytrigia repens*) with the most cost effective rate being 200 g/ha. Rhizomes sampled at 14 weeks after spraying showed very few live fragments compared with sethoxydim and fluazifop-butyl treatments which were similar to untreated control. *Paspalum* (*Paspalum dilatatum*) was best controlled by fluazifop-butyl, with the other treatments showing regrowth.

INTRODUCTION

Quizalofop is a new post-emergence grass weed herbicide which has been reported to selectively control a wide range of annual and perennial graminaceous weeds in broadleaf crops. Several workers have reported good to excellent control of annual grasses such as *Digitaria* spp, *Setaria* spp. and barnyard grass as well as perennial grasses such as Johnson grass (*Sorghum halepense*) and couch (Doll 1985; Hammes 1986; Huston and Poliquim 1986; Richardson and West 1986; Sakata *et al* 1983). Wells *et al* (1985) found good tolerance of 16 different vegetable crops to this herbicide and similar results have been reported by other workers for a number of broadleaf crops. Excellent control of perennial grass weeds has resulted from applications to crops in the 3 to 6 leaf stage, and effective control has also been achieved at more advanced growth stages, allowing flexibility in application timing (Sakata *et al* 1983).

The rainfastness of quizalofop is very good. In a comparative study with several grass herbicides, it was the least affected by simulated rainfall (Bryson 1984). Like many new post-emergence grass weedkillers, quizalofop is rapidly translocated to the meristematic tissues resulting in a rapid suppression of growth and death of inner tissues (Ikai *et al* 1985).

The objective of this research was to evaluate the efficacy of quizalofop against certain annual and perennial grass weeds under field conditions.

MATERIALS AND METHODS

Trial 1 Annual grasses

The trial site was on the Rukuhia Soil Research Station near Hamilton. The soil type was Hamilton clay loam with 3.1% organic C, 33% clay, 31% sand, a pH of 5.8 and field capacity of 36.8%. Each plot was 6 x 1 m and the treatments (Table 1) were arranged in a randomised block design with four replications. The herbicides were sprayed with a CO₂ powered precision sprayer in 300 litres/ha at 210 kPa. A white emulsifiable crop oil (BP crop oil) was added at 2 litres/ha to quizalofop (Targa) and sethoxydim (Alloxol S) treatments. Fluazifop-butyl (Fusilade) treatments had a wetting agent (Citowett) added to the solution at 450 ml/ha.

The average composition of grass weeds in the trial area at the time of treatment (11 November 1986) was: barnyard grass 560 plants/m², summer grass 260 plants/m² and smooth witchgrass 100 plants/m². The grasses had 2-4 tillers and their height varied from 20-100 mm. Assessments of control of the grasses present and germination of new grass weeds were made 2, 3 and 5 weeks after treatments.

Proc. 41st N.Z. Weed and Pest Control Conf.

Trial 2 Paspalum and couch

This trial site, with a mixed infestation of paspalum and couch, was on the Rukuhia Horticultural Research Station. The soil type was a Horotiu sandy loam with 9.8% organic C, 15% clay, 62% sand, a pH of 5.7 and a field capacity of 41.8%. Individual plots were 5 x 2m and the treatments (Table 2) were arranged in a randomised block design with four replications. The application details of herbicides were the same as for Trial 1, with treatments applied on 15 December 1986.

The site had a heavy infestation of established paspalum and couch which had been mown for the previous 3 years. At the time of treatment the grasses had 100-200 mm of leaf growth. Assessment of control and regrowth of grasses were made at about 4, 6 and 12 weeks after treatment.

Trial 3 Couch

The third trial was conducted on couch alone close to the site of Trial 2. This site had been in maize for several years and was left fallow in the spring of 1987. A vigorous dense stand of couch (average 1300 tillers/m²) had established with 100-200 mm of leaf growth at the time of treatment (6 October 1987). The plot size was 6 x 2 m and treatments (Table 3) were arranged in a randomised block design with five replications. A wetting agent was added at 450 ml/ha to all treatments except sethoxydim which had crop oil added at 2 litres/ha.

A tiller count of one quadrat (0.1 m²) per plot was made at the beginning of the trial. Visual assessments of couch control were made about 4, 6 and 14 weeks after spraying and tillers counted on the last two dates. Counts were made on either two quadrats per plot, or the whole plot for quizalofop treatments of 200 g/ha or more. At the final assessment dry matter measurements of the top growth (0.2m²) and the underground rhizomes (200 x 200 mm soil sample per plot) were also taken. Viability of rhizomes was assessed by selecting five lengths of rhizome, each with five nodes, from each plot, planting into pots in the glasshouse and counting the new shoots after 2 weeks.

For the analyses of variance, a square root transformation was required for tiller counts (17 November 1987 and 13 January 1988) and the shoot dry matter, while an angular transformation was used for percent control (17 November 1987). The SED's are approximate but the outcome of t-tests using them reflect the results of the transformed data analysis.

RESULTS**Trial 1 Annual grasses**

All treatments (Table 1) gave excellent control of barnyard grass and smooth witchgrass. Sethoxydim and the high rate of quizalofop also gave excellent control of summer grass. However fluazifop-butyl and the low rate of quizalofop failed to completely control the summer grass with regrowth occurring from the base of the plants by 5 weeks after treatment.

At 5 weeks after spraying residues of herbicides in the soil were still inhibiting the germination and establishment of new grasses. The three chemicals were equally effective against smooth witchgrass. The higher rate of quizalofop showed greater activity than fluazifop-butyl against summer grass seedlings, while the converse was true for barnyard grass.

Trials 2 and 3 Paspalum and couch

The level of paspalum control in Trial 2 is summarised in Table 2. Fluazifop-butyl provided good control of paspalum and suppressed regrowth completely over the 12-week period of this trial. Quizalofop and sethoxydim gave only partial control with vigorous regrowth occurring 6 weeks after spraying. Quizalofop was the least active of the three herbicides against paspalum (Table 2.)

Trial 2 showed the very good activity of quizalofop against couch. It not only provided good initial control, but also stopped further regrowth. Plots treated with the low rate of 200 g/ha had only a small amount of regrowth 3 months after spraying (Table 2). Plots treated with sethoxydim had considerable regrowth of couch only 6 weeks after spraying and by 3 months after treatment most sethoxydim and fluazifop-butyl plots had regrowth similar to the untreated control.

Trial 3 confirmed the findings of Trial 2 as shown by reductions in couch tiller numbers of 85-92%, compared with the untreated control, 3 months after treatment with quizalofop at rates of 200 g/ha or more (Table 3). The sethoxydim and fluazifop-butyl treatments gave a comparatively poor kill of the couch with regrowth quickly establishing. Percent control at different dates indicates how the couch foliage changed with time showing an initial brownout, then regrowth and new shoots establishing. Dry matter weights of shoot samples taken 14 weeks after treatment are presented to concur with the control assessments (Table 3). Dry matter weights of root samples taken at the same time showed a similar result. Root dry matter weights for quizalofop (200 g/ha and above) were approximately 33% of untreated control; for quizalofop (150 g/ha) and for fluazifop-butyl, 66%; and for sethoxydim, 85%. Live rhizome fragments in the viability test grew quickly with numbers of actively growing nodes (Table 3), numbers of shoots and shoot dry matter data all showing the same trend.

Observations showed that it was important to have a good stand of leaf material present at the time of spraying and that other weeds, such as docks, need to be treated or removed so as not to provide physical shielding of the couch during spraying.

TABLE 1: Effect of herbicides on control and regrowth scores in annual grasses — Trial 1 (treated 11.11.86)

Treatment	Rate g ai/ha	% Control			Seedling Control Score**	
		2*	3*	5*	Barnyard grass	Summer grass
quizalofop	75	81	90	91	8.3	7.0
quizalofop	150	88	99	99	8.8	8.5
sethoxydim	400	83	97	98	8.5	7.5
fluazifop-butyl	500	75	91	91	9.8	7.3
untreated	0.0	0.0	0.0	0.0	0.0	

* Weeks after treatment

** Seedling control score 0 = no control, 10 = complete control.

TABLE 2: Effect of herbicides on control and regrowth scores in paspalum and couch. Trial 2 (treated 15.12.86).

Treatment	Rate g ai/ha	Paspalum			Couch		
		Control	Regrowth score**		Control	Regrowth score**	
			%			%	
			4*	6*		12*	4*
quizalofop	200	45	8.5	10.0	83	0.0	3.4
quizalofop	400	49	7.3	8.8	93	0.3	1.7
sethoxydim	800	61	6.5	7.5	50	7.3	10.0
fluazifop-butyl	750	73	0.0	0.0	50	3.3	10.0
untreated		0	10.0	10.0	0	10.0	10.0

* Weeks after treatment

** Regrowth score 0 = no regrowth; 10 = considerable regrowth

TABLE 3: Effect of herbicides on control and regrowth of couch — Trial 3 (treated 6.10.87).

Treatment	Rate g ai/ha	No. of tillers/m ²			Control (%)			DM Shoots (g/m ²)	Live nodes (%)
		pretreat (5.10.87)	4*	14	4*	6*	14*		
quizalofop	150	1370	28	634	70	91	54	209	5
quizalofop	200	1330	8	320	79	94	71	99	17
quizalofop	300	1280	2	117	87	99	84	37	2
quizalofop	400	1530	1.5	196	93	100	88	37	2
sethoxydim	800	1190	N/C	1425	43	19*	11*	390	64
fluzifop-butyl	500	950	N/C	1142	69	49*	14*	294	54
untreated		1490	N/C	2155	0	0*	0*	234	90
CV%		33	119	38.4	11.1	6.2	24.2	60	12.3
SED		272	7.5	219	4.7	3.7	11.3	79	0.93

* Weeks after treatment

N/C not counted, similar to control

** not included in analysis

DISCUSSION

Results from the three trials presented here show that quizalofop is a very active post-emergence grass herbicide. When used in the early growth stage, it was very effective against the annual grass weeds barnyard grass, summer grass and smooth witchgrass. At 150 g/ha it was equal to or better than fluzifop-butyl and sethoxydim and its residual activity appeared to be better against summer grass. However, overall conditions including the growth stage of the weeds in this trial, were ideal for herbicide activity and further testing of quizalofop is recommended.

Quizalofop was not very effective against paspalum especially when compared with fluzifop-butyl which has previously been shown to be highly active against paspalum (Rahman *et al* 1983). It must be stressed, however, that the site for Trial 2 had a very well established infestation and a higher level of control could be expected with younger plants.

The control of couch with quizalofop was excellent in both trials. As an early summer application on established couch, 200 g/ha appears to be the most cost effective rate. Cultivation to fragment the rhizomes and encourage new shoot production may be desirable either before the initial treatment, or before retreating dense infestations.

Quizalofop has shown excellent promise for control of summer grass and couch (in addition to some other grasses) and deserves further testing over a wide range of conditions.

ACKNOWLEDGEMENTS

Thanks are due to J. Mortimer for technical assistance and Dr J.E. Waller for biometrical analyses and advice.

REFERENCES

- Bryson, C.T., 1984. Simulated rainfall washoff of post-emergence graminicides. *Proc. Southern Weed Sci. Soc.* 37:91.
- Doll, J.D., 1985. Factors affecting control of *Elymus repens* in soybeans with selective post-emergence herbicides. *Proc. 1985 British Crop Protection Conf. — Weeds:* 463-470.
- Hammes, G.G., 1986. Perennial and annual grass control in cotton and soybeans with Assure. *Proc. Southern Weed Sci. Soc.* 39: 31.
- Huston, F. and Poliquim, B., 1986. Assure TM (DPX Y602) for selective grass control in broadleaved crops. *Proc. 32nd Annual Meeting, Canadian Pest Management Soc.:* 12-14.

- Ikai, T., Suzuki, K., Hattori, K., Igarashi, H., 1985. The site of action of quizalofop-ethyl, NCI-96683. *Proc. 1985 British Crop Protection Conference — Weeds*: 163-169.
- Rahman, A., James, T.K., Mortimer, J., 1983. A comparison of some post-emergence herbicides for control of grass weeds. *Proc. 36th N.Z. Weed and Pest Control Conf.*: 269-272.
- Richardson, W.G. and West, T.M., 1986. The activity, pre-emergence selectivity and persistence of some recently developed herbicides. *Technical Report ARC, Long Ashton Research Station, Weed Res. Division No. 91*, 62 pp.
- Sakata, G., Makino, K., Kawamura, Y., Ura, Y., Ikai, T., Kawamura, Y., 1983. NCI-9663, A new selective herbicide for annual and perennial grass weed control in broadleaf crops. *Proc. 10th Internat. Congress Plant Protection*: 315-323
- Wells, D.W., Constantin, R.J., Fontenot, J.F., 1985. Screening and evaluation of selected grass-specific herbicides on vegetables. *Proc. Southern Weed Sci. Soc.* 38: 115.