CONTROL OF ANNUAL GRASSES IN LUPINS

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Summary. Haloxyfop is a highly active post-emergence herbicide for use in broad-leaved crops. In trials in lupins haloxyfop consistently gave commercially acceptable control of ryegrass, *Lolium rigidum*, wild oats, *Avena fatua*, and great brome, *Bromus diandrus*, at rates between 45 and 78 g a.i./ha.

INTRODUCTION

Haloxyfop formulated as an ethoxyethyl ester, is the active ingredient in VERDICT[R] 104. It is a post-emergence herbicide for the selective control of annual and perennial grasses in broad-leaved crops (2, 3, 4,). Although taken up by both foliage and roots, major herbicidal activity is through foliar application. The ester is rapidly absorbed and hydrolysed inside the leaf to haloxyfop acid which is then translocated to metabolically active sites within the plant. Significant translocation occurs within 48 hours of application though complete control of grasses may take up to five weeks (1).

Field trials investigating haloxyfop commenced in Australia in 1982. Trial work has concentrated on grass weed control in all major broad-leaved crops but principally in oilseed crops and grain legumes.

Good efficacy on annual ryegrass, wild oats, great brome, barley grass, *Hordeum* spp., paradoxa grass, *Phalaris* spp., and volunteer cereals has been observed at rates between 45 and 90 g a.i./ha of haloxyfop, while 90 to 150 g a.i./ha has given good control of barnyard grass, *Echinochloa* spp., liverseed grass, *Urochloa panicoides*, volunteer sorghum, *Sorghum bicolor*, and seedling Johnson grass, *Sorghum halepense*. Silver grass, *Vulpia* spp., is not controlled by haloxyfop.

This paper presents the results of field trials on annual grass weeds in Victoria, S.A., W.A., and southern N.S.W. The potential role of haloxyfop in overall weed management in southern Australia is also discussed.

METHODS

Trials were carried out with the ethoxyethyl ester formulation containing 104 g/L haloxyfop acid. An adequate level of non-ionic surfactant was present in the formulation for normal boom spraying volumes. The effect of additional surfactant was also investigated. Treatments were applied with a range of small plot sprayers with 110 degree nozzles and in spray volumes of between 50 and 150 L/ha.

Grass control data are presented from field trials in lupins, field peas and oilseed rape. Plots were assessed visually for weed control. Weed counts were taken 6 to 8 weeks post-treatment. Only grain yield data for lupins are given.

RESULTS AND DISCUSSION

Excellent control of wild oats, annual ryegrass, and great brome was achieved with rates as low as 30 g/ha of haloxyfop when applied at the 2 to 5 leaf stage. However, rates of 45 g/ha or over were required to consistently give a commecially acceptable result of more than 75% control.

The results in Table 1 are based on weed counts and visual assessments from 27 trials (13 wild oats, 12 annual ryegrass, 8 great brome). The three weed species were equally susceptible at this early growth stage, but annual ryegrass was least susceptible at the lowest rate of 30 g/ha. Fluazifop was considerably less effective than haloxyfop on 2 to 5 leaf stage grass weeds.

Table 1. Effect of haloxyfop applied at the 2 to 5 leaf stage (grasses) on the control of wild oats (WO), annual ryegrass (ARG) and great brome (GB) and on lupin grain yield

Treatment	Weed control			Lupin grain yield		
	WO	ARG	GB	WO	ARG	GB
(g/ha)		(%)			(% of control)	
Haloxyfop						
30	76 (26)[a]	62 (47)	80 (38)	254	133	151
45	89 (8)	89 (14)	92 (13)	282	113	111
52	99 (2)	93 (3)	98 (3)	203	203	-
60	91 (9)	94 (7)	95 (11)	308	127	136
78	100 (0)	95 (8)	100 (0)	195	158	-
Fluazifop[b]						
106	77 (46)	70 (44)	72 (56)	256	140	96

[a] Numbers in parentheses are the c.v.'s for the data from all trials included in the treatment mean
[b] Fluazifop contains both R and S isomers.

In all trials there were two or more timings of application. Control of larger grasses from early to mid-tillering is shown in Table 2. Results in Table 2 are based on weed counts and visual assessment from 24 trials (11 wild oats, 10 annual ryegrass, 5 great brome).

There was no marked decline in susceptibility of larger wild oats and control of larger plants was actually better than at the 2 to 5 leaf stage of growth with the two lowest rates of 30 and 45 g/ha haloxyfop and both these rates gave commercially acceptable control. Control of annual ryegrass and great brome was generally lower on tillered grasses than on pre-tillering grasses at the same site, and this was reflected in the overall results in Table 2. Commercially acceptable results were obtained on annual ryegrass and brome grass with 52 g/ha haloxyfop, and of the two grasses annual ryegrass was the least susceptible and control was more variable at the two lowest rates of 30 and 45 g/ha.

Table 2. Effect of haloxyfop applied at the early to mid tillering stage (grasses) on the control of wild oats (WO), annual ryegrass (ARG), and great brome (GB) and on lupin grain yield

Treatment (g/ha)	Weed control (%)			Lupin yield (% of control)		
	WO	ARG	GB	WO	ARG	GB
Haloxyfop						
30	88 (15)[a]	71 (39)	76 (24)	317	133	136
45	95 (6)	78 (26)	84 (17)	422	126	111
52	93 (7)	89 (10)	92 (11)	170	170	-
60	92 (13)	87 (7)	87 (14)	313	163	140
78	99 (3)	94 (6)	93 (12)	192	219	173
90	100 (1)	96 (3)	92 (-)	158	227	131
Fluazifop[b]						
106	81 (26)	75 (25)	84 (19)	311	109	118
212	96 (3)	78 (27)	-	180	101	-

[a] Numbers in parentheses are the c.v.'s for the data from all trials included in the treatment mean.
[b] Fluazifop contains both R and S isomers.

Results show that complete control of ryegrass was much more difficult to achieve than with wild oats or great brome with haloxyfop (Table 3).

Table 3. Percentage of trials in which 100% weed control was obtained when haloxyfop was applied at two growth stages to wild oats (WO), annual ryegrass (ARG), and great brome (GB)

Haloxyfop (g/ha)	Growth stage of weed: 2 to 5 leaves			Tillered		
	WO	ARG	GB	WO	ARG	GB
52	60	36	67	53	10	27
78	100	44	100	67	9	40

Of the three grasses wild oats was the easiest to control and the level of control of this species was the same for all growth stages up to the mid-tillering stages. Without the necessity to apply the herbicide to an early growth stage of weeds a more flexible weed control program can be followed. In controlling wild oats it was often found to be beneficial to delay herbicide application past the 2 to 5-leaf stage to achieve control of successive germinations and obtain maximum population reduction. In some trials yield response to later treatment was also higher than with earlier treatments.

Compatibility studies showed that there was no loss of efficacy or increase in crop damage resulting from tank-mixes of haloxyfop with clopyralid or diflufenican herbicides, or with chlorpyrifos, dimethoate or omethoate insecticides at rates used for red-legged mite and blue oat mite control.

Haloxyfop has an obvious application in a winter cropping program for post-emergence grass control in break crops such as oilseed rape, lupins, field peas, faba beans and chick peas. Good control of annual grasses in such crops will ensure a reduced weed seed bank and disease inoculum for subsequent cereal crops and will also maximise yield and nitrogen input from legumes in the rotation.

A less obvious but important potential use is for the control of grass weeds in pastures in the year prior to cereal cropping to increase nitrogen input from medics and clovers. Haloxyfop has been found to be completely selective to all commonly grown pasture legume cultivars even at the full flowering stage. Results from the use of low rates of haloxyfop for pasture-topping have been variable and this technique requires further research. This wide safety margin at flowering is a major advantage of haloxyfop over the standard herbicides used for pasture-topping (glyphosate and paraquat plus diquat).

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