SEED SET CONTROL - POTENTIAL OF FLUAZIFOP - BUTYL AND DOWCO 453.

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Summary: Field trials demonstrated that the grass killers fluazifop-butyl[1] and Dowco 453[2] were both effective in reducing seed set of Barley Grass (*Hordeum leporinum*). Fluazifop-butyl was also effective on great brome (*Bromus diandrus*). The results achieved were comparable to glyphosate[3] and paraquat[4], however safety to pasture legumes was far superior at the time of flowering and seed set of the legumes.

These, and similar products, offer considerable potential for grass seed set control in pasture at rates considerably lower than those for total control of the growing plant. Further investigation into seed set control and legume safety at flowering is warranted.

INTRODUCTION

The use of paraquat and glyphosate for the prevention of seed set of annual grasses in pasture and a reduction in subsequent weed burden for the following year, particularly in-crop, is a well established commercial practice. 'Spray-topping' was originally developed by ICI for ryegrass; however, seed set control in pasture of all annual grasses is now undertaken. Grasses for which there are no registered in-crop herbicides in cereals are receiving particular attention.

Both paraquat and glyphosate are not selective when used for seed set control. Pasture legumes, especially when flowering and setting seed, can be adversely affected. This is especially so with glyphosate due to the earlier timing of application and with paraquat when used in the 'Spraytop-Graze' technique for annual ryegrass toxicity control. Barley grass requires application of both herbicides when medics and clovers are possibly still flowering and setting seed. Paraquat does not always perform well against this grass (Holmes; unpublished data).

It is essential for clover seed banks to be as high as possible in the season prior to a cropping cycle. If the herbicides used to control seed set in pasture reduce the seed set substantially, the pasture following the crop may be very poor. The arrival of the new grass specific herbicides allows the possibility of control of grasses without damaging clover seed set. However, there is the possibility that there may be some damage to the legume flower with these products or the solvents contained in the formulation.

With these considerations in mind, three trials were undertaken to evaluate the potential of fluazifop-butyl for barley and brome grass and Dowco 453 for barley grass seed set control.

MATERIALS AND METHODS

Three trials were set up comparing Fluazifop or Dowco 453, at two rates, and the recommended rates of paraquat and glyphosate. As there are considerable timing effects for paraquat and glyphosate, a range of spraying times were selected to cover the flowering and seed development stages of the target plants. Two trials at Merredin and Williams were on barley grass, and one at Newdegate on brome grass. At one barley grass site (Williams) Dowco 453 replaced fluazifop.

The herbicides were applied in 50 to 70 L ha^{-1} of water with the wetter at 0.25% of the spray volume. Plot size was three by 40 metres and the trial design randomised complete block with three replications. Two sites have been planted to crop for further assessment in late 1984.

Measurements taken are counts of target species emerging after the opening rains prior to planting and within the crop.

RESULTS

The treatments applied and preliminary results from three sites are set out in tables 1, 2 and 3.

Table 1: Control of barley grass using two rates of fluazifop at three time of spraying.
Merredin Research Station.

Treatment	Rate ha^{-1}	Application date	Plant counts per square metre: Barley grass pre-crop	Medic pre-crop	Barley grass in crop
Nil			522 a*	181 ab*	22.25 abcd*
Paraquat	100g	15/9/83	296 d	171 ab	12.7 cdef
Glyphosate	126g	16/9/83	289 d	160 ab	9.3 ef
Fluazifop	53g	15/9/83	444 abc	141 ab	26.0 abc
Fluazifop	212g	15/9/83	326 cd	145 ab	6.7 f
Paraquat	100g	23/9/83	336 cd	219 a	13.3 bcdef
Glyphosate	126g	23/9/83	334 cd	156 ab	11.3 def
Fluazifop	53g	23/9/83	573 a	178 ab	27.0 abc
Fluazifop	212g	23/9/83	527 a	166 ab	11.7 def
Paraquat	100g	30/9/83	466 ab	168 ab	23.7 abcd
Glyphosate	126g	30/9/83	578 a	125 b	24.3 abcd
Fluazifop	53g	30/9/83	432 a	142 ab	28.7 ab
Fluazifop	212g	30/9/83	610 a	189 ab	23.9 abcd
Coefficient of variation			9.2%	12.9%	19%

* Duncans Multiple Range test.
Means with the same subscript are not significantly different at P <0.05.

Fluazifop at 212g ha^{-1} applied at the earliest timing gave control of barley grass assessed pre-cropping and in-crop equal to that achieved with recommended rates of glyphosate or paraquat. Later applications of fluazifop proved ineffective in preventing formation of viable seed (Table 1.)

Table 2: Control of brome grass using two rates of fluazifop at four times of spraying.
Newdegate Research Station.

Treatment	Rate ha^{-1}	Application date	Plant counts per square metre (7/6/84) Brome pre-crop	Clover pre-crop	Ryegrass pre-crop	Erodium (% ground cover)
Nil			202 a*	155 abc*	124 ns	58 a*
Paraquat	100g	23/9/83	48 def	105 abcd	198	20 cd
Glyphosate	126g	23/9/83	12.7 e	58 d	152	10 d
Fluazifop	53g	23/9/83	72 de	107 abc	156	57 a
Fluazifop	212g	23/9/83	13 e	187 a	142	10 e
Paraquat	100g	30/9/83	82 d	188 a	145	18 cd
Glyphosate	126g	30/9/83	16 e	68 cd	178	25 bcd
Fluazifop	53g	30/9/83	40 ef	95 abcd	106	63 a
Fluazifop	212g	30/9/83	51 def	171 ab	160	24 bcd
Paraquat	100g	11/10/83	63 de	150 abc	205	55 a
Glyphosate	126g	11/10/83	35 ef	96 abcd	205	36 abc
Fluazifop	53g	11/10/83	106 bcd	106 abcd	164	50 ab
Fluazifop	212g	11/10/83	34 ef	130 abc	164.7	52 a
Paraquat	100g	11/10/83	47 def	98 abcd	146	59 a
Glyphosate	126g	11/10/83	61 de	90 bcd	143	54 a
Fluazifop	53g	17/10/83	184 ab	94 abc	143	58 a
Fluazifop	212g	17/10/83	102 cd	92 abcd	134	56 a
Coefficient of variation			24	21	14	18

* Duncans Multiple Range test.
Means with the same subscript are not significantly different at P <0.05.
Transform of square root plus 0.5 used.

At Newdegate (Table 2) great brome, erodium (*Erodium botrys*) and sub. clover were the dominant species. There was very little ryegrass (*Lolium rigidum*) present at the time of treatment.

All herbicides were effective in reducing the brome grass. The lower rate of fluazifop was not as effective and shows a marked time effect. Glyphosate and paraquat were very effective at all timings.

Apart from glyphosate, none of the treatments significantly reduced clover density.

An unexpected result was the control of erodium by fluazifop at the higher rate applied early.

Ryegrass was fairly even over the whole site at the time of assessment. It was either not susceptible at the times of application or was blown into the trial site during a wind event.

Table 3: Control of barley grass by Dowco 453 compared to paraquat and glyphosate.
Williams trial site.

Treatment	Rate ha^{-1}	Application date	Plant counts per square metre (5/6/84) Barley grass	Clover	Ryegrass
Nil			209 a*	206 ab*	168 ns
Paraquat	100g	27/9/83	181 a	95 bcd	245
Glyphosate	126g	27/9/83	18 de	95 bcd	245
Dowco 453	37g	27/9/83	39 cde	181 abc	201
Dowco 453	123g	27/9/83	46 cde	182 abc	326
Paraquat	100g	4/10/83	65 bcde	177 ab	215
Glyphosate	126g	4/10/83	14 e	34 d	253
Dowco 453	37g	4/10/83	42 cde	147 abc	190
Dowco 453	123g	4/10/83	47 cde	197 ab	118
Paraquat	100g	11/10/83	107 abc	163 ab	285
Glyphosate	126g	11/10/83	52 cde	39 cd	174
Dowco 453	37g	11/10/83	95 abcd	192 ab	124
Dowco 453	123g	11/10/83	65 cde	159 ab	208
Paraquat	100g	21/10/83	45 cde	168 ab	206
Glyphosate	126g	21/10/83	50 cde	81 bcd	207
Dowco 453	37g	21/10/83	208 abc	173 ab	211
Dowco 453	123g	21/10/83	64 cde	331 a	154
Coefficient of variation			32%	27%	18%

* Duncans Multiple Range test $P < 0.05$.
Square root of mean plus 0.5 transform.

The weeds present at Williams (Table 3) were barley grass, winter grass (*Poa annua*), silver grass (*Vulpia* spp.), clover and some ryegrass. Counting was quite difficult as very high densities of silver and winter grasses, which were not counted, made identification of ryegrass difficult.

Again there is good control of the target grass, with safety to clover by Dowco 453 and damage by glyphosate.

Dowco 453 demonstrated excellent seed set control of barley grass at both rates when applied early with the higher rate having best effect when applied late.

DISCUSSION

The results from these trials show that there is considerable potential for these grass herbicides for use in the prevention of annual grass seed set. There appears to be good tolerance by the legumes with applications near to or at flowering time. Further investigation is required, however.

The consistent failure by all treatments against ryegrass where it was present in the trials indicates that either there was unusually high seed dormancy present, spraying times were completely wrong, or contamination of the sites from external sources was a problem.

The rates at which some effect is being measured for both fluazifop and Dowco 453 indicate that there is similarity to the rates used with both glyphosate and paraquat. These are much lower than those required to kill fully developed grasses prior to flowering. This lowers the cost of the treatment, making it more commercially attractive.

In each trial there is a strong time of spraying effect, especially for fluazifop. This is consistent with that seen with paraquat and glyphosate. There also appears to be a rate response with time. Careful evaluation of the rate by time interaction together with the growth stage of the target plant is needed to fully exploit the potential of this technique, using these and similarly acting herbicides.

The control of erodium reinforces the need to carefully explore the possibility of using suitable herbicides to control non-grass weeds in the same way.

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1 Fusilade^{R} (25% w/v) ICI
2 Haloxyfop-ethoxy-ethyl (24.6% w/v) Dow
3 Gramoxone^{R} (20% w/v) ICI
4 Roundup^{R} (36% w/v) Monsanto