THE USE OF FLUROXYPYR FOR BROAD-LEAVED WEED CONTROL IN SORGHUM IN SOUTHERN QUEENSLAND AND NORTHERN NEW SOUTH WALES.

C.O. Love
DowElanco Australia Ltd, Tamworth NSW 2340, Australia

Summary. Following an extensive series of experiments, fluroxypyr is now registered for the control of noogoora burr, *Xanthium pungens*, pigweed, *Portulaca oleracea*, wild gooseberry, *Physalis minima*, annual ground cherry, *Physalis angulata*, and thornapples, *Datura* spp., at 0.1-0.15 kg acid equivalent/ha. Optimum control was achieved when fluroxypyr was applied to actively growing weeds up to and including the 6 leaf stage. The combination of fluroxypyr (0.1-0.15 kg/ha) and atrazine (1.0 kg active ingredient/ha) broadened the spectrum of broad-leaved weeds controlled with no effect on sorghum yield. Plant back periods ranging from 7 to 28 days after spraying were established for wheat, barley, sorghum, sunflower, chickpea, maize, soybean and cotton.

INTRODUCTION

Fluroxypyr (1-methyl heptyl ester) is a readily translocated herbicide, exhibiting a high degree of activity with post-emergent foliar application to a range of broad-leaved weeds. In susceptible species, it induces characteristic auxin-type responses, frequently within a few hours of application. The activity of fluroxypyr has been well documented (2,3,4,5). Results indicated that fluroxypyr is most effective when the weeds to be controlled are growing actively, with conditions favourable for plant growth. The potential use of fluroxypyr with glyphosate to control a broad range of weeds in fallow has required plant-back studies to be conducted to determine safe plant-back intervals to major crops following application of fluroxypyr.

This paper reports the results of field experiments conducted between 1983 and 1992, in southern Queensland and northern NSW to:

1. determine activity on a range of broad-leaved weeds with and without atrazine;
2. establish plant-back times for major rotational crops; and
3. determine tolerance of the major sorghum varieties.

METHODS

Formulations of fluroxypyr methyl heptyl ester contained an adequate level of adjuvant and no additional adjuvants were used in the experiments. Experiments were randomised complete block design with three or four replicates. The treatments were applied with an Azo propane precision sprayer delivering 80-120 L/ha, using 110 degree flat fan nozzles. Weed control was assessed visually 4-6 weeks after application using a 0-100 percent rating scale, where 0 = no control and 100 = complete control. Grain yields were also obtained. The data for each weed is presented as the mean % control where trials were conducted over several seasons.

RESULTS AND DISCUSSION

Weed control. Results in table 1 show fluroxypyr at 0.105 kg/ha gave acceptable control (>85%) of noogoora burr, pigweed, annual ground cherry and wild gooseberry, which were actively growing and up to the 6 leaf stage.

On noogoora burr, pigweed and *Physalis* spp. more than 6 leaf and thornapple up to the 8 leaf stage, 0.15 kg/ha was required. Fluroxypyr at 0.21 kg/ha gave the best control of volunteer sunflower, *Helianthus annus*, up to 45 cm high.

Fluroxypyr at 0.3 kg/ha or 0.15 kg/ha plus atrazine at 1.0 kg/ha was required to control caltrop, *Tribulus terrestris*. This mixture of fluroxypyr and atrazine gave the best control of the range of weeds shown in table 1.

Table 1. Percent control of broad-leaved weeds with fluroxypyr, with and without atrazine, applied post-emergence in grain sorghum in Southern Queensland and Northern NSW, 1983-91.

Weed	Height diameter (cm)	Fluroxypyr (kg/ha)					Combination (kg/ha) 0.15+1.0
		0.075	0.105	0.15	0.21	0.3	
Xanthium pungens	<20	77 (7)[a]	98 (5)	100 (7)	100 (7)	99 (7)	
	20-50	26 (2)	87 (1)	95 (3)	95 (2)	100 (3)	96 (5)
Datura spp.	<15	87 (6)	80 (6)	94 (8)	-	97 (5)	
	15-30	82 (3)	88 (3)	88 (5)	92 (2)	89 (4)	97 (7)
Physalis spp.	<15	100 (2)	100 (2)	100 (4)	100 (2)	100 (4)	
	15-230	98 (2)	87 (3)	98 (4)	100 (4)	100 (2)	100 (5)
Portulaca oleracea	10	95 (2)	100 (3)	100 (4)	99 (3)	100 (2)	
	10-30	84 (3)	92 (3)	97 (3)	98 (2)	100 (1)	-
Tribulus terrestris	<15	27 (6)	59 (5)	78 (6)	75 (7)	80 (5)	
	15-40	45 (2)	34 (3)	62 (6)	78 (9)	82 (9)	97 (7)
Nicandra physalodes	30	-	-	100 (2)	10 (2)	-	100 (2)
Anoda cristata	5-8	-	58 (1)	71 (1)	-	-	100 (1)
Helianthus annus	15-45	-	-	60 (2)	97 (3)	98 (4)	60 (2)
Hibiscus trionum	4-28	-	18 (5)	22 (8)	28 (8)	37 (7)	85 (8)
Salvia reflexa	12-15	-	30 (1)	75 (2)	80 (2)	75 (2)	85 (1)
Amaranthus cruentus	8-20	-	20 (3)	29 (4)	43 (4)	58 (4)	86 (5)
Amaranthus macrocarpus	8-25	-	0 (4)	4 (9)	13 (9)	23 (10)	94 (9)
Sesbania cannabina	5-12	-	-	81 (2)	-	96 (2)	100 (2)
Commelina benghalensis	3-6	-	61 (1)	71 (1)	-	-	100 (1)

[a] () = number of trials.

Plant back studies. In the 1990/91 and 1991/92 experiments, a period of seven days after application was used to simulate the time required for fluroxypyr to effect weed control before planting. Wheat, barley, sorghum, sunflower, chickpea and maize were the least sensitive crops showing no visual effects when planted 7 days after application of fluroxypyr at 0.075-0.3 kg/ha. Soybean was slightly sensitive requiring a 14 day plant-back period for fluroxypyr over 0.15 kg/ha and cotton, the most sensitive, requiring a 14 day plant-back period for fluroxypyr 0.075-0.15 kg/ha, and 28 days for fluroxypyr at 0.3 kg/ha as shown in table 2.

Table 2. The plant-back period (days) required for a number of crops following application of fluroxypyr to a black clay soil, northern NSW, 1990-92

Crop	Rate of fluroxypyr (kg/ha)		
	0.075	0.15	0.3
Wheat	7	7	7
Barley	7	7	7
Sorghum	7	7	7
Sunflower	7	7	7
Maize	7	7	7
Chickpea	7	7	7
Soybean	7	7	14
Cotton	14	14	28

Crop tolerance. The yield results in table 3 show fluroxypyr formulations applied to 4-6 leaf sorghum grown under weed free conditions did not cause a significant reduction in yield.

Table 3. Yield response (t/ha) of two weed free sorghum varieties following the application of fluroxypyr at two growth stages, Breeza, NSW, 1990/91.

Treatment	Rate (kg/ha)	DeKalb 37		Goldfield	
		4 leaf	6 leaf	4 leaf	6 leaf
Fluroxypyr[a]	0.15	1.9	2.0	1.0	0.9
Fluroxypyr[a]	0.3	1.9	2.4	1.2	0.9
Fluroxypyr[b]	0.15	1.8	1.9	1.0	0.8
Fluroxypyr[b]	0.3	1.8	2.0	1.0	0.8
Fluroxypyr[a]	0.15	2.3	2.5	1.1	0.8
+ atrazine	1.0				
Untreated	-	1.8	1.8	1.0	0.8
	l.s.d.	0.4	0.5	0.3	0.2
	c.v. (%)	13	17	19	16

[a] = 200 g/L formulation
[b] = 300 g/L formulation

Results from the 1991 Agrisearch weed free sorghum variety crop tolerance screen (1) showed across the sixteen sorghum varieties screened, that a significant increase in yield occurred when treated with fluroxypyr at 0.15 and 0.3 kg/ha compared to the standard, 2,4-D (dimethylamine salt) at 1.05 kg/ha. There was no difference between the untreated controls and fluroxypyr applications. Overall, no effects on crop vigour were seen or measured following the application of fluroxypyr.

Conclusion. Fluroxypyr at 0.105- 0.15 kg/ha gave excellent control of noogoora burr, pigweed, thornapple and *Physalis* spp. up to the 6 leaf growth stage. Fluroxypyr at 0.15 kg/ha plus atrazine at 1.0 kg/ha provided excellent control of all broad-leaved weeds present in the sorghum trials, with no effect on the yield of sorghum in a weed free environment.

At the use rate of 0.105-0.15 kg/ha, an interval of 7 days after application of fluroxypyr was required prior to planting wheat, barley, chickpea, sorghum, maize, sunflower and soybean. An interval of 14 days after application of fluroxypyr at 0.105-0.15 kg/ha was required for the safe planting of cotton.

Selectivity of fluroxypyr at 0.15-0.3 kg/ha to sorghum, applied at the 4-6 leaf growth stage, was excellent, with no yield reduction compared to the untreated.

ACKNOWLEDGEMENTS

The majority of the data presented in this paper was generated by DowElanco Australia Ltd. The author would like to thank everyone who contributed to this paper.

REFERENCES

1. Agrisearch 1991. Sorghum variety crop tolerance screen. Mt Marie, Queensland, 1991.
2. Dow Chemical Europe 1987. Brochure: Starane Herbicide - to help you grow.
3. Dow Chemical Europe 1984. Brochure: Starane Herbicide - technical information. 8pp.
4. DowElanco 1991. Technical information: Starane Selective Herbicide.
5. Webb, K.R. and Feez, A. M. 1987. 11th Asian-Pacific Weed Sci. Soc. Conf. Abst. 64.