EVALUATION OF THREE HERBICIDES FOR CROP TOLERANCE AND SUMMER GRASS CONTROL IN ONIONS

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Summary

The new herbicide alloxym-sodium showed a good crop tolerance in addition to controlling established summer grass (*Digitaria sanguinalis*) in onions. Diclofop-methyl applied at the 3-4 leaf stage of the crop produced discolouration and twisting of leaves especially at the high rate of 3 kg/ha, but no significant plant weight or yield reductions. When applied 3 days before crop emergence this herbicide caused significant reductions in both plant numbers and weights. Aziprotynne produced an early growth check of onions and failed to control summer grass adequately.

INTRODUCTION

Warm-zone annual grasses such as barnyard grass (*Echinochloa crus-galli*), gulf barnyard grass (*Echinochloa crus-pavonis*), smooth witchgrass (*Panicum dichotomiflorum*) and summer grass have increased as problem weeds in Pukekohe onion crops in recent years (Wilson 1978). Current recommendations for their control are mainly the pre-emergence residual herbicides chlorthal, propachlor and alachlor.

Control of these grasses after their establishment is often difficult, and the exact time of treatment application is important with regard to their efficient control and crop safety. Barnyard grass and smooth witchgrass can be killed up to the 5 leaf stage with linuron or aziprotynne, and up to the 7 leaf stage with diclofop-methyl. Linuron and aziprotynne give some control of summer grass, but only up to the 2 leaf stage (R. Wood pers comm).

The herbicide diclofop-methyl gave good control of 2 - 4 leaf barnyard grass and smooth witchgrass in trials by McDowell (1977). Subsequent evaluations at the Pukekohe Research Station demonstrated good activity on 4-10 leaf barnyard grass and yellow bristle grass (*Setaria glauca*), and useful control of seedling prairie grass (*Bromus unioloides*). The new herbicide alloxym-sodium also showed promising control of up to 10 leaf summer grass in the 1978 season while diclofop-methyl by comparison caused only leaf scorch and some root die-back and the summer grass plants eventually recovered. Some crop chlorosis occurred with both materials (Bristol pers comm).

The work reported here compared the crop tolerance of onions to alloxym-sodium with diclofop-methyl and aziprotynne in three trials at Pukekohe. Data on post-emergence grass control were also collected in one trial.

MATERIALS AND METHODS

All three trials were conducted on a Patumahoe clay loam using a randomised block design with 4 or 6 replications. Herbicides were applied with a modified Oxford Precision sprayer using 400 litres/ha at 200 kPa pressure to a plot size of 5 x 1.5 m. The Pukekohe Longkeeper cultivar was used in all trials with Early Longkeeper also included in trial 3. Normal weed control programmes were followed throughout and in addition some hand weeding was done.

Trial 1 evaluated the effect of two rates (2 and 4 kg/ha) of alloxym-sodium and 3 rates (1, 2 and 3 kg/ha) of diclofop-methyl on the onion plant population and yield. The crop was sown on 22/9/78 and sprayed on 20/11/78 at the early four leaf stage. Plants in four rows, each 4.5 m long were counted on 16/1/79, and the yield of bulbs plus partly dried tops recorded on 3/3/79.

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Crops

Trial 2 compared alloxym-sodium with aziprotryne for established summer grass control. The site was clean except for summer grass (10 plants/m²) with 4 to 5 tillers and some barnyard grass, yellow bristle grass and paspalum (*Paspalum dilatatum*). Treatments were applied on 1/12/78 when the crop was in its four leaf stage. Summer grass control was measured by counting the number of summer grass plants in 1.9 m² quadrats, 3 weeks after treatment application. The final onion stand was counted on 23/1/79 and yields were recorded on 3/3/79.

Trial 3, sown on 25/1/80, was designed to re-evaluate the crop tolerance to two rates (2 and 4 kg/ha) of alloxym-sodium and three rates (1, 2 and 3 kg/ha) of diclofop-methyl on two cultivars, Pukekohe Longkeeper and Early Longkeeper. A pre-crop emergence treatment of diclofop-methyl was sprayed on 31/1/80. All other treatments were applied on 25/3/80 when the crop was in the 3-4 leaf stage. Treatment effects were recorded on 5/5/80 by counting plants in 2 rows of each cultivar and measuring DM weights of 100 plants.

RESULTS AND DISCUSSION

Crop tolerance

Although crop yellowing continued to show for at least 6 weeks after application of alloxym-sodium in all trials, this chemical did not have any effect on the plant population or the crop yield (Tables 1 and 2). Aziprotryne caused leaf tip scorch and a noticeable early growth check particularly in the repeat treatment in trial 2, but neither plant populations nor final yield varied significantly from the untreated controls.

The effect of post-emergence diclofop-methyl was clearly evident 5 days after treatment application and ranged from slight at 1 kg/ha to pronounced leaf twisting at 3 kg/ha. At the high rate plants also appeared to show a dull green instead of the normal blue green colour. However, in spite of the early visual growth check, no detrimental effects were recorded on the plant population, DM weight of plants or the bulb yield (Tables 1 and 2). In fact, most treatments produced bulb yields higher than the

TABLE 1: Effect of Herbicides on crop tolerance and summer grass control in onions

Treatment	Rate (kg/ha)	Summer grass kill (%)	Onion plants (No./m ²)	Bulb yield (t/ha)
Trial 1				
alloxym-sodium	2		39.9 a	51.8 ab
alloxym-sodium	4		40.6 a	51.3 ab
diclofop-methyl	1		36.7 a	50.2 ab
diclofop-methyl	2		38.5 a	54.6 a
diclofop-methyl	3		37.5 a	48.2 ab
Untreated			37.7 a	45.2 b
CV%			8.0	10.8
Trial 2				
alloxym-sodium	2	95	36.7 a	48.0 a
alloxym-sodium	4	100	32.4 a	43.4 a
alloxym-sodium				
+ aziprotryne*	2 + 2	97	31.3 a	42.4 a
aziprotryne	2	15	39.7 a	47.2 a
aziprotryne				
+ aziprotryne*	2 + 2	27	38.5 a	46.5 a
Untreated		0	33.5 a	43.8 a
CV %			21.0	20.5

* applied 7 days after the first treatment

Crops

untreated control; the increase from the 2 kg/ha of diclofop-methyl being statistically significant. This was probably due to the fact that even though hand weeding was carried out, the control plots still suffered some weed competition during the later stages of crop growth.

When applied 3 days before crop emergence, the 2 kg/ha rate of diclofop-methyl caused a significant reduction in the plant numbers of Pukekohe Longkeeper cultivar and a significant plant weight reduction in both cultivars (Table 2).

TABLE 2: Effect of treatments on crop tolerance of two onion cultivars (Trial 3)

Treatment	Rate (kg/ha)	Onion plants/m ²		Onion DM weight (g/100 plants)	
		P.L.K.*	E.L.K.*	P.L.K.*	E.K.L.*
alloxydim-sodium	2	65.2 a	86.1 a	48.7 a	56.1 a
alloxydim-sodium	4	64.5 a	84.8 a	43.2 a	54.1 a
diclofop-methyl	1	63.4 a	84.6 a	41.2 a	53.1 a
diclofop-methyl	2	64.4 a	84.8 a	41.7 a	53.9 a
diclofop-methyl	3	62.7 a	82.0 a	42.8 a	52.4 a
diclofop-methyl**	2	56.9 b	84.4 a	32.7 b	42.3 b
untreated		63.3 a	85.0 a	45.2 a	57.6 a
C V %		6.1	4.8	14.9	14.2

* P.L.K. = Pukekohe Longkeeper; E.L.K. = Early Longkeeper

** applied 3 days before crop emergence

Summer grass control (trial 2)

Five days after application, both rates of alloxydim-sodium caused a major check to summer grass plants. Typically the leaf sheath showed red pigmentation, with yellowing and/or browning of the leaf blade and emerging leaf of each tiller. In contrast, only leaf yellowing and tip scorch was evident in aziprotryne plots. Three weeks after application, alloxydim-sodium at 2 kg/ha had killed 95% of all summer grass plants with 100% kill at the 4 kg/ha rate. Aziprotryne killed only a few very small plants. In addition to summer grass, alloxydim-sodium also gave good control of young barnyard grass, yellow bristle grass, prairie grass, and checked but did not kill small paspalum. In subsequent observation plots alloxydim-sodium also showed promising control of smooth witchgrass and crowfoot grass (*Eleusine indica*).

Warm, showery weather prevailed during the first four weeks of trials 1 and 2, and it is thought that these conditions favoured the good activity obtained with alloxydim-sodium.

CONCLUSIONS

The trials demonstrated very good results with alloxydim-sodium in controlling most warm-zone annual grasses with good crop safety. This herbicide, however, is understood to have a short residual life, and its use would mainly be as a "clean-up" treatment in situations where grasses have become established. Nevertheless, it would still have an important function in providing confidence to growers in their ability to cope with grass weed problems, should they develop.

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