Some results of field trials in wheat with Hoe 23408 for the control of annual ryegrass (*Lolium* sp.) and wild oats (*Avena* spp.)

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SUMMARY

The results of six field trials in wheat with the selective post-emergent grass herbicide Hoe 23408 are reported. In three trials against annual ryegrass (*Lolium* sp.), rates of 0.56, 0.375 and 0.188 kg a.i./ha gave an average weed control of 93%, 85% and 60%, and yield increases (relative to unsprayed) of 114%, 84% and 38% respectively. The optimum rate is suggested at 0.375 kg a.i./ha for ryegrass control in wheat.

In three trials against wild oats (*Avena* spp.), rates of 0.94, 0.75 and 0.56 kg a.i./ha gave an average weed control of 88%, 79% and 67% and relative yield increases of 62%, 44% and 36% respectively. It is suggested that an optimum rate for wild oats in wheat would be in the vicinity of 0.75 kg a.i./ha.

INTRODUCTION

Hoe 23408 (proposed common name : diclofop-methyl) is a new post-emergent herbicide for the control of grass weeds. It is formulated as an emulsifiable concentrate containing 375 g a.i./ℓ. Preliminary field trials were commenced in Australia in 1974 and it is expected that registration will be obtained in 1978. The following report on field trials conducted by Hoechst Australia Limited includes three trials against annual ryegrass (*Lolium* sp.) and three trials against wild oats (*Avena fatua / A. ludoviciana*). These trials are representative of some 70 field trials which have been conducted in the past 4 years.

MATERIALS AND METHODS

The trials were laid out as a randomized block design using four replications. In general there were 8 to 12 treatments which included lower and higher rates than those reported, but these have been omitted for reasons of space. The plot size used was 2 m x 20 m and spraying was carried out with a propane gas powered hand-held boom from AZO, Holland. The boom was fitted with Teejet 650067 flat fan nozzles, applying between 110 and 125 ℓ of water per ha, depending on walking speed. The trials were conducted on farm properties on commercially sown areas. Results were assessed by:

(a) Weed counts - usually 3 x 0.1 m^2 quadrats at random sites on each plot, taken 6 to 8 weeks after spraying.

(b) Weed rating - generally taken 12 to 15 weeks after spraying and based on the European Weed Rating Scheme.

(c) Yield - a 0.6 m x 20 m strip was harvested from the centre of each plot, using a Poynter Stripper Harvester.

The trials were applied as follows:

Cowra, N.S.W. - Annual ryegrass - sprayed 16 August 1976
Weed: 1½ to 2½ leaf; crop: 2 to 3 leaf.

Torrumbarry, Vic. - Annual ryegrass - sprayed 20 July 1976
Weed: 2½ leaf; crop; 3 leaf.

Murchison, Vic.- Annual ryegrass - sprayed 18 August 1976
Weed: 2 to 3 leaf; crop: 2½ to 3½ leaf.

Parkes, N.S.W. - Wild oats - sprayed 18 August 1976
Weed: 2 to 2½ leaf; crop: 2 leaf.

Bellata, N.S.W. - Wild oats - sprayed 10 September 1976
Weed: 3 leaf to early till; crop: early till.

Minimay, Vic. - Wild oats - sprayed 16 August 1976
Weed: early till; crop: tillering.

Growing conditions were good in all trials except at Parkes and Bellata where growth was slow and limited by dry weather. Heavy rain fell three hours after application of the trial at Minimay.

RESULTS

Yields, expressed as t/ha and weed counts, expressed as plants per m^2 are recorded in Table 1 (annual ryegrass) and Table 2 (wild oats). Infestation of annual ryegrass varied from moderate (296 plants per m^2) up to very heavy (1100 plants per m^2). The degree of weed control was to a large extent related to the dosage applied. This was also true of the yield response i.e. the highest yields were obtained at the highest rates of application.

Table 1. Effect of Hoe 23408 on annual ryegrass and wheat yield

Treatment (a.i./ha)	Yield, weed density	Cowra	Torrumbarry	Murchison
Hoe 23408 (0.56 kg)	t/ha	1.44 a	1.73 a	3.12 a
	plants/m^2	18	33	108
Hoe 23408 (0.375 kg)	t/ha	1.33 a	1.52 a	2.56 ab
	plants/m^2	53	98	203
Hoe 23048 (0.188 kg)	t/ha	0.85 b	1.4 a	1.79 bc
	plants/m^2	157	263	408
Metoxuron (1.36 kg)	t/ha	0.72 c	-	1.96 bc
	plants/m^2	288	-	608
Control nil	t/ha	0.68 c	0.87 b	1,38 c
	plants/m^2	296	898	1100

Values followed by same letter do not differ significantly according to Duncan's Multiple Range Test ($P<0.05$)

Table 2. Effect of Hoe 23408 on wild oats and wheat yield

Treatment (a.i./ha)	Yield, weed density	Parkes	Bellata	Minimay
Hoe 23408 (0.94 kg)	t/ha	1.60 a	2.02 a	3.71 a
	plants/m^2	11	5	3
Hoe 23408 (0.75 kg)	t/ha	1.40 ab	1.86 ab	3.27 a
	plants/m^2	6	16	2
Hoe 23408 (0.56 kg)	t/ha	1.15 b	1.88 ab	3.28 a
	plants/m^2	17	12	4
Standard*	t/ha	1.21 ab	1.77 b	2.29 b
	plants/m^2	3	23	36
Control nil	t/ha	1.06 b	1.76 b	1.70 b
	plants/m^2	90	33	90

Values followed by same letter do not differ significantly according to Duncan's Multiple Range Test ($P<0.05$)

* At the Parkes and Bellata sites, the standard treatment was barban at 0.14 kg a.i./ha whilst at Minimay, difenzoquat at 0.75 kg a.i./ha plus 0.94 ℓ Agral 60/ha was used.

Infestation of wild oats was moderate (33 plants per m^2) to high (90 plants per m^2). Differences in effect between rates of Hoe 23408 were not as marked as in the ryegrass trials. The results of these trials are depicted graphically in Figure 1. In this graph, the percent weed control and percent yield increase (cf. control) have been calculated for each trial and averaged for the three trials on each weed species.

DISCUSSION

Annual ryegrass - The weed count data were not analysed but it is clear that rates of 0.375 and 0.56 kg a.i./ha (equivalent to 1.0 and 1.5 ℓ product per ha) were the most effective for weed control. The lower rate of 0.188 kg a.i./ha did not give acceptable control. From Figure 1, it can be seen that the average weed control for these three trials was only about 65% for the low rate compared to over 85% for the two higher rates.

The yield data indicated that rates of 0.375 and 0.56 kg a.i./ha were not significantly different ($P<0.05$) from each other, but were better than the standard treatment in one trial, and better than the control in all trials. The low rate of 0.188 kg a.i./ha was better than unsprayed in two trials, but no difference was seen in the Murchison trial. This rate was equal to other rates of Hoe 23408 in the Torrumbarry trial, and to the median rate of Hoe 23408 in the Murchison trial. On the basis of these trials and our other trials which gave similar results, it appears that a rate of 0.188 kg a.i./ha is marginal at this stage, when both yield and weed control are taken together.

In Figure 1, it can be seen that the differences in percent weed control are not as great as the differences in percent yield increases. It is suggested that this is due partly to a faster control of grass weeds by the higher rates, resulting in earlier reduction in competition and thus greater yield responses.

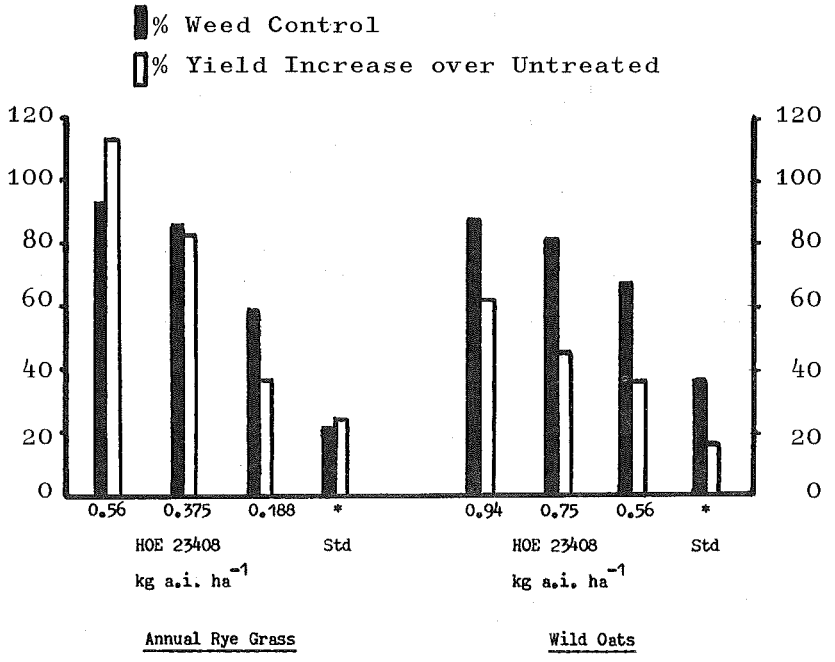

Figure 1. Average weed control and wheat yield increase*

* see Tables 1 and 2 for details

Wild oats - Weed control was good with all rates of Hoe 23408, which in general was not very much better than with the standard treatments. In the Bellata trial, weed control was not as good as in the other two trials due to two factors, the dry conditions and the late growth stage at application. In the Minimay trial, where growing conditions were very favourable, weed control was excellent despite the late growth stage at application.

The yield responses in these trials were variable, and in two cases, (Parkes and Bellata) the two lower rates (equivalent to 1.5 ℓ to 2.0 ℓ product per ha) were not significantly different ($P<0.05$) to the controls, despite good weed control. This lack of significant yield response is probably due to the dry conditions, and a slower kill of the weeds. The high rate of 0.94 kg a.i./ha (2.5 ℓ product per ha) did give significant yield responses, and it is suggested that this was due to the faster and more complete kill of weeds with the high rate.

This latter point is depicted in Figure 1 where it can be seen that the average weed control of the three rates of Hoe 23408 were similar, but yield increases showed a distinct difference, due to the relative speed of kill and reduction in competition.

It is interesting to note in the Minimay trial, where heavy rain fell 3 hours after spraying, that Hoe 23408 treatments were significantly better than difenzoquat. This confirms earlier indications that Hoe 23408 is not significantly affected by rainfall some 3 to 4 hours after application.

It would appear from these trials that a rate of 0.75 kg a.i./ha could be the optimum rate for wild oat control.

CONCLUSION

In setting a rate for commercial usage two factors are important; the "cosmetic" weed control effect, and the economic responses. With wild oats, there is also the problem of seed contamination by even a few remaining plants.

The "cosmetic" effect is becoming less critical, providing adequate and economic yield increases can be demonstrated.

It is felt that Hoe 23408 rates will be varied from farm to farm, (within the recommended range) to obtain the degree of response required.

It is suggested that the best indication for setting final recommendations in cereal herbicide trials should be to some extent based on an overall average of a great number of trials (percent weed control and percent yield increase) rather than on a few where significant differences are obtained. The general trend can be readily seen by graphing the results (such as in Figure 1) and decisions can then be made on both efficacy and economic grounds.

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