HOE 35609 AND HOE 33171 : TWO NEW SELECTIVE GRASS HERBICIDES

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SUMMARY

HOE 35609 and HOE 33171 are two new systemic herbicides for selective grass weed control in broadleaf crops. In New Zealand trials these compounds used either alone or as a mixture demonstrated selective control of; ryegrass (*Lolium* spp) in white clover (*Trifolium repens*), wild oats (*Avena fatua*) and smooth witchgrass (*Panicum dichotomiflorum*) in peas, summergrass (*Digitaria sanguinalis*) in onions and phalaris tuberosa (*Phalaris tuberosa*) in carrots. HOE 35609 at 120 g ai/ha demonstrated selective barley grass (*Hordeum murinum*) control in established perennial ryegrass/clover pasture. In each trial all treatments demonstrated excellent broadleaf crop safety.

INTRODUCTION

Hoe 35609 (ethyl 2-[4-(6-chloro-2-benzothiazolyloxy)-phenoxy]propanoate), proposed common name fenthia-prop-ethyl, is a new systemic herbicide synthesised in the laboratories of Hoechst Aktiengesellschaft. Handte *et al* (1982) reported its activity against a wide range of annual and perennial grass weeds, with excellent selectivity towards broadleaf crops. The test product in this report contained 240 g fenthia-prop-ethyl per litre in the form of an emulsifiable concentrate.

Hoe 33171 (ethyl 2-[4-(6-chloro-2-benzoxazolyloxy)-phenoxy]-propanoate), proposed common name fenoxaprop-ethyl, is a new systemic herbicide discovered in the laboratories of Hoechst Aktiengesellschaft. Bieringer *et al* (1982) reported its high activity against "warm zone" grass weeds whilst showing excellent safety to all non-graminaceous crops tested. The test product used in these trials contained 120 g fenoxaprop-ethyl per litre in the form of an emulsifiable concentrate.

Hoe 33171/35609 is a formulated mixture containing 70 g ai/litre of Hoe 33171 and 140 g ai/litre of Hoe 35609.

Results are reported from one season of preliminary trials undertaken in New Zealand for grass weed control in; established pasture, white clover, peas, onions and carrots.

Chemistry and acute toxicity

Hoe 35609

Structure

Formulation

25 EC containing 240 g ai/litre

Toxicity (active ingredient)

Acute Oral	Rat ♂	LD ₅₀	977 mg/kg
	♀	LD ₅₀	919 mg/kg
Dermal	Rat ♀	LD ₅₀	>2000 mg/kg

Hoe 33171

12 EC containing 120 g ai/litre

	Rat ♂	LD ₅₀	2357 mg/kg
	♀	LD ₅₀	2500 mg/kg
	Rat ♀	LD ₅₀	>2000 mg/kg

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Mode of action

Both compounds are very similar in their mode of action. The active ingredient is taken up by the leaves and is translocated in both the phloem and xylem. Its accumulation takes place at the site of action, which is the meristematic tissue. Growth usually ceases within 2-3 days (Bieringer *et al* 1982) although the first symptoms are generally not apparent until 7-10 days following application. Chlorosis begins on the young leaves followed by necrosis which spreads over leaves and shoots. These symptoms may be accompanied by pigment changes and the plant dies with 2-5 weeks depending on growth stage and climatic conditions.

METHOD

All trials were of a randomised block design with plots measuring 1.5-2 x 5-10 m replicated 3-4 times. Treatments were applied in 200-300 litres/ha using a precision knapsack sprayer and hand held boom fitted with teejet 730154 or 8002 nozzles operated at 250-300 kPa.

RESULTS AND DISCUSSION**Barley grass control in established pasture**

Table 1 shows the very high activity of Hoe 35609 at 120 g ai/ha against barley grass. At this rate Hoe 35609 provided a ryegrass dry matter yield higher than 2,2-DPA + TCA but lower than ethofumesate. White clover dry matter yield was, however, significantly higher than ethofumesate. Barley grass control was not improved by doubling the rate and selectivity to white clover was unaffected, but there was some reduction in ryegrass dry matter yield.

Hoe 33171/35609 also demonstrated good control of barley grass and white clover safety, but ryegrass production was considerably reduced. Hoe 33171 showed equivalent white clover safety and better ryegrass safety but gave no control of barley grass.

TABLE 1: Barley grass control and pasture tolerance (Invermay).

Treatment (14.6.82)	Rate g ai/ha	Barley grass			Pasture species		
		Herbicide Effect ¹	% ground cover		damage ²	DM Yield (g/2 m ²) 26.8.82	
			10.11.82	24.1.82		ryegrass	white clover
untreated		0.2	40.0	56	0.3	1153	26
Hoe 33171/35609	52.5 + 105	4.3	6.5	14	3.0	409	45
Hoe 33171/35609	105 + 210	4.3	6.9	7	3.7	235	33
Hoe 33171	120	0.4	44.0	68	0.6	941	33
Hoe 33171	240	0.5	47.0	70	1.2	865	45
Hoe 35609	120	4.1	4.3	8	2.2	685	33
Hoe 35609	240	4.1	5.2	8	2.8	432	49
2,2-DPA + TCA	990 + 5670	2.4	5.7	10	2.5	463	13
ethofumesate	2000	2.2	3.5	8	0.9	1000	0
LSD 5% level		0.5	11.2	13	0.3	107	23

¹ Herbicide knockdown score: 1 = poor, 5 = excellent

² Ryegrass damage score: 1 = trace, 5 = dead

Ryegrass control in white clover

Results of visual grass control and sward composition analysis summarised in Table 2 show selective control of ryegrass with Hoe 33171/35609 at the higher rates. Symptoms of herbicidal activity were slow to appear and it was not until 14-21 days after application that differences between treatments became obvious.

White clover seed yields were relatively low, possibly attributable to a combination of hard pre-spray grazing and the dry climatic conditions after the "closing" date (23

October 1982). The results do, however, indicate there is a potential for this use of Hoe 33171/35609.

Wild oat control in peas

Final wild oat control and pea seed yield summarised in Table 3 show selective wild oat control with Hoe 33171/35609 at 140 + 280 g ai/ha. The surviving plants (7/m²) were small, of low vigour and offered little competition to the peas. The reduction in seed set (to 96 seeds/m²) with this treatment was below the wild oat pre-spray population (246 plants/m²) and was therefore a step towards the depletion of soil seed reserves, an important objective in wild oat control (Elliot 1972).

TABLE 2: Ryegrass control, sward composition and clover seed yield (Willowby).

Treatment (18.11.82)	Rate g ai/ha	Visual grass control%		%Sward composition ¹		
		14 day	35 day	ryegrass	white clover	Clover seed ² kg/ha ²
untreated		0 d	0 e	51	23	210 b
Hoe 33171/35609	122.5 + 245	28 ab	68 c	31	39	283 a
Hoe 33171/35609	175 + 350	38 a	83 a	22	45	267 ab
Hoe 33171/35609	245 + 470	33 ab	85 a	21	40	252 ab
Hoe 35609	240	15 c	50 d	36	34	265 ab
Hoe 35609	480	28 b	75 bc	28	42	275 ab
diclofop methyl ³	750	28 b	55 d	43	35	209 b
	cv%	21.2	9.4			16

¹ % by dry weight of sub sample from 4 x 0.1 m² quadrats/plot on 20.01.83

² Seed yield from 6.8 m² quadrats/plot

³ Applied with surfactant alkylaryl polyglycol ether at 0.3%

TABLE 3: Wild oat control and pea seed yield (Hinds).

Treatment (18.11.82)	Rate g ai/ha	Wild oat control		Pea seed yield % of untreated
		Plants/m ² (16.1.83)	Seed set/m ²	
untreated ¹		200 a	6922 a	100 (1.71 t/ha)
Hoe 33171/35609	70 + 140	44 cd	535 c	116
Hoe 33171/35609	140 + 280	7 d	96 c	133
Hoe 35609	240	78 c	2607 bc	110
Hoe 35609	480	29 d	525 c	122
Hoe 33171	120	141 b	3700 b	108
Hoe 33171	360	43 cd	1168 c	127
fluazifop-butyl ²	375	1 d	6 c	111
	cv%	36	61	10

¹ Pre spray plant population 246 plant/m², mean growth stage 2-6 leaf

² Surfactant nonyl-phenyl-ethoxylate was applied at 0.14%

Though Hoe 35609 and Hoe 33171 also demonstrated activity on wild oats the combination appears to have greater activity than would be expected, given the performance of each chemical applied alone.

Grass weed control in peas, onions and carrots

Results summarised in Table 4 show Hoe 33171/35609 above 140 + 280 g ai/ha provided good control of; smooth witchgrass in peas, summergrass in onions and phalaris tuberosa in carrots. No adverse chemical effects were noted on the crops following application.

TABLE 4: Grass weed control in peas, onions and carrots (Nelson).

Crop:	Peas	Onions	Carrots
Target species:	smooth witchgrass	summergrass	phalaris tuberosa
Growth stage:	early tillering	pre flowering	4-6 leaf
Date applied:	8.12.82	8.12.82	3.2.83
Date assessed:	T + 35 days	T + 51 days	T + 21 days

Treatment	Rate g ai/ha	surviving plants/m ² ²	infestation score ¹	surviving plants/m ² ³
untreated	—	2012	4.5	228
Hoe 33171/35609	70 + 140	155	2.7	46
Hoe 33171/35609	140 + 280	5	1.7	15
Hoe 33171/35609	210 + 420	-	-	7
Hoe 33171/35609	280 + 560	5	1.0	-
fluazifop-butyl ⁴	500	0	1.2	2

¹ Mean scores: 1 = 0-5%, 2 = 5-20%, 3 = 20-50%, 4 = 50-80%, 5 = 80-100%

² Plant counts from 0.1m² quadrat/plot

³ Plant counts from 1 m² quadrat/plot

⁴ The surfactant alkylaryl polyglycol ether was added at 0.025% to all fluazifop-butyl treatments and to all other treatments on carrots.

Growth of smooth witchgrass was stunted after 7 days, with plant death occurring in younger plants at higher rates of application. Plants surviving at 35 days after application were severely stunted and offered little competition to the peas.

Effects on summergrass 14 days after application with Hoe 33171/35609 included stunted growth, death of growing tips and at higher rates death of younger plants. At 51 days post-spray, death had occurred in most plants and those surviving were severely stunted, offering little competition to the onions. Good control of phalaris tuberosa was obtained by 21 days after application. Those plants still surviving at this stage were severely stunted and offered little competition to the carrots.

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