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THE ACTIVITY, PRE-EMERGENCE SELECTIVITY AND PERSISTENCE OF SOME RECENTLY DEVELOPED HERBICIDES: SMY 1500, PPG 884, PPG 1259, DPX-M 6316 AND FMC 57020

SMY 1500 is ethiozin, PPG 884 is lactofen, PPG1259 is busoxinone, DPM-M6316 is thifensulfuron-methyl, FMC 57020 is clomazone

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THE ACTIVITY, PRE-EMERGENCE SELECTIVITY AND PERSISTENCE OF SOME RECENTLY DEVELOPED HERBICIDES: SMY 1500, PPG 884, PPG 1259, DPX-M 6316 and FMC 57020

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SUMMARY

In a series of pot experiments in the glasshouse, five herbicides were tested as pre-emergence surface sprays for selectivity on 35 crop and weed species. Wheat, barley, and maize were each treated with seed dressings of the safener 1,8-naphthalic anhydride (NA) to investigate possible protection from herbicide injury. The route of entry for FMC 57020 was examined in a separate test on six selected species. Persistence of the herbicides in the soil was assessed over a period of 52 weeks.

SMY 1500 showed potential selective control of important weeds such as Alopecurus myosuroides, Veronica persica and Viola arvensis in cereals. Carrot was outstandingly tolerant while pea tolerated rates at which problem weeds in this crop, such as volunteer rape and Solanum nigrum, were controlled.

PPG 884 was active on a wide spectrum of broad-leaved weeds with tolerance of cereals (especially maize), pea, beans and perennial ryegrass.

PPG 1259 was also active on several annual broad-leaved weeds and Poa species while cereals, legumes, carrot and lettuce were tolerant.

DPX-M 6316 was similar to other sulfonyl-urea herbicides. Though not as active as chlorsulfuron and metsulfuron it controlled several important annual broad-leaved weeds while all four cereals (wheat, barley, oat, maize) were highly tolerant.

FMC 57020 active pre- and post-emergence, especially the former, caused a prominent albinism of susceptible plants. Many annual broad-leaved and grass weeds were controlled. Although crop tolerance was limited to field beans, dwarf beans and carrots, an outstanding safening response was found with NA in maize.

Soil persistence, assessed using suitable sensitive test species, was found to be relatively short for DPX-M6316, short to moderate for PPG 1259 and FMC 57020, and moderate to long for PPG 884 and SMY 1500. This in comparison to cyanazine (short persistence) and simazine (moderate to long persistance).

INTRODUCTION

The pre- and post-emergence activities and selectivities of new herbicides are investigated at LARS Weed Research Division on a large number of crop and weed species grown in pots. Persistence in the soil is also assessed and these data, in conjunction with crop susceptibilities, are useful in considering subsequent cropping of treated land. Although in these investigations only one crop variety or source of weed species is used, in one soil type, at one depth of sowing, the results provide a guide for more detailed investigations where warranted.

This report gives information on the pre-emergence selectivity and persistence of five new herbicides. Results of an experiment for FMC 57020 investigating response of the herbicide applied separately to shoot, root and seed, is also included to provide information on route, type and degree of phytotoxicity. Similar data for SMY 1500, PPG 884, PPG 1259 and DPX-M 6316 were reported previously (Richardson and West, 1986).

METHODS AND MATERIALS

Activity experiment (AE) This was carried out in the glasshouse on six selected species as described previously (Richardson and Dean, 1974). Four annual species were raised from seeds and two perennials from rhizome fragments. Herbicides were applied by four different methods.

i) a post-emergence spray to the foliage only, avoiding contact with the soil,

ii) post-emergence to the soil only, as a drench avoiding foliar contact,

iii) pre-emergence to the soil surface,

iv) pre-emergence with thorough incorporation to 5 cm depth before planting.

Table 1. Plant data for activity experiment

Cultivar /source		No. per pot at spraying		Depth of planting (cm)	Stage of growth		
					Spraying	Assessment	
		pre-	post-		post-em	pre-em	post-em
Dwarf bean (Phaseolus vulgaris)	Masterpiece	3	2	2	2 uni-foliate leaves	2.5 tri-foliate leaves	2 tri-foliate leaves
Kale (Brassica oleraceae acephala)	Marrowstem	10	5	0.5	2-3 leaves	4 leaves	5 leaves
Polygonum amphibium	WRO Clone 1	6	5	1	5.5-6.5 leaves	7 leaves	10 leaves
Perennial ryegrass (Lolium perenne)	S23	10	9	0.5	2-2.5 leaves	4 leaves, 0-1 tiller	6-10 leaves, 1-2 tiller
Avena fatua	WRO 1978	10	5	1	2.5-3 leaves	5 leaves	9 leaves, 1-2 tillers
Elymus repens	WRO Clone 1	6	5	1	2.5-3 leaves	5 leaves	5 leaves

Table 2. Soil and environment conditions

Experiment type	Activity experiment FMC 57020	Pre-emergence selectivity
Dates of spraying	2.Nov.84	16.Oct.85 and 8.Jan.86
Main assessment completed	10.Dec.84	3.Dec.85
Soil		
Organic matter (%)	2.2	2.2
Clay content(%)	15.0	15.0
pH (water; 1:2 soil/water)	7.5	7.5
Fertilizer addition		
Ammonium sulphate (g/kg)	0.4	0.4
Superphosphate (g/kg)	0.8	0.8
Potassium sulphate (g/kg)	0.4	0.4
Fritted trace elements (g.kg)	0.08	0.08
Hydrated Mg_2SO_4 (g/kg)	0.3	0.3
Temperature (^oC)		
Mean	13	12
Maximum	23	22
Minimum	4	3
Relative humidity (%)		
Mean	52	60
Maximum	62	88
Minimum	30	27

Pre-emergence selectivity experiment

Techniques for the selectivity experiment were as described by Richardson and Dean (1973), herbicides being applied as surface pre-emergence treatments. Species were sown as described in Appendix 1, each being replicated twice for every treatment.

To improve germination of Chenopodium album, seeds were kept in 0.1M potassium nitrate for 48 hours in the light before sowing,

To protect from soil-borne pathogens, all seeds (except wheat, barley, oat, A. fatua, C. segetum, G. aparine and most perennials) were pre-treated with one of the following powders; thiram, captan, thiram + benlate (for onion only) bromophos + captan + thiabendazole (pea only). Maize seeds were purchased already treated with captan A + teraquinone. The seeds of kale, radish, swede and dwarf bean were treated with thiram powder, a 6% gum arabic solution being used prior to dressing, to give better adhesion. In addition, Cheshunt Compound (3 g litre $^{-1}$) fungicide solutions were applied to certain species as soil drenches.

A series of treatments were included for wheat, barley and maize in which seeds were treated with NA (1,8 naphthalic anhydride) at 0.5% w/w a.i. of seeds to investigate possible protection from herbicide injury.

Herbicides were applied using a laboratory track sprayer fitted with an 8002E Spraying Systems Tee Jet operating at a pressure of 207 kPa (30 lb/in^2) delivering a volume rate of 373 l/ha and moving at 0.54 m/s, 30 cm above the soil. During the experiment, plants were raised in the glasshouse, normal daylight being supplemented by mercury vapour lighting to provide 14 h photoperiods. Watering was from overhead.

Assessment and processing of results

Results were processed as described by Richardson and Dean (1973). Survivors were counted and scored for vigour on a 0-7 scale where 0 = dead and 7 = as in untreated control. Certain species showed variable germination and in these cases the results were not included in the histograms.

Pairs of histograms are presented for each treatment, the upper representing plant survival and the lower, vigour score, both calculated as percentages of untreated controls. Each 'x' represents a 5% increment in the pre-emergence experiment but 7% in the activity experiments. A '+' indicates a value in excess of 100%; 'R' indicates a result based on one replicate only and 'M' represents a missing treatment.

A table of observed selectivities, using the criteria specified, is presented for each herbicide, along with comments to highlight important results.

Several species, notably the perennials, were kept for an exta period to observe later effects or the degree of recovery from injury and these final observations are referred to in the text.

Persistence in the soil

This was assessed by bioassay, in conjunction with the selectivity experiment. Pots (7.5 cm diameter) containing a 6 cm depth of soil were

sprayed directly with herbicides. All pots were then transferred to a temperate glasshouse together with untreated controls and watered as necessary, from overhead.

For each bioassay three replicate pots per treatment were selected and sensitive species - Stellaria media, perennial ryegrass and sugar beet were sown 0.25, 0.5 and 1.0 cm deep respectively, disturbing the soil as little as possible. Plants were harvested three or four weeks after sowing, at a predetermined growth stage, the number and fresh weight of shoots being recorded. Bioassays were repeated at eight to ten week intervals for one year, unless the phytotoxicity had disappeared before then, the first bioassay commencing within a day of spraying. Toxicity is considered to have disappeared when shoot fresh weights of the test plants are 80% or more of the control values. Results are presented graphically for each herbicide and comments are made in the text. Standard treatments of cyanazine (short persistence) and simazine (moderate to long persistence) were included for comparison (see page). Average temperature during this period was 15°C (minimum 5°C, maximum 35°C) and relative humidity 60% (minimum 20%, maximum 93%).

SMY 1500

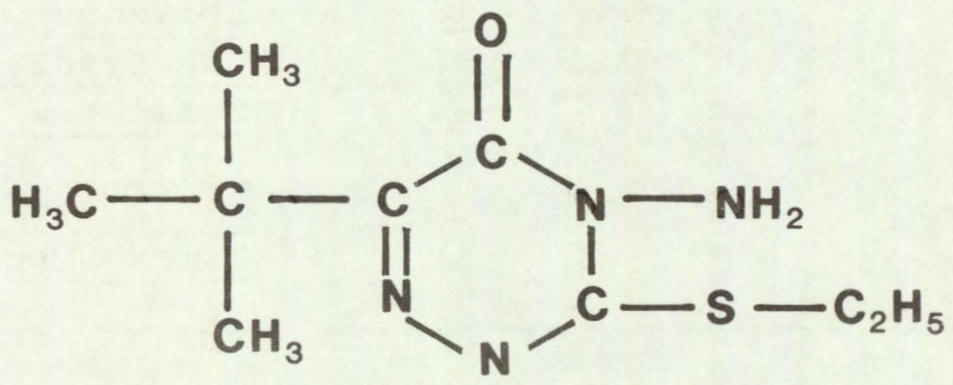
Code number SMY 1500

Trade name/s Tycor (proposed)

Common name Ebuzin (proposed)
Ethiozin (proposed)

Chemical name 4-amino-6-(1,1-dimethylethyl)-3-(ethylthio)-1,2,4-triazin-5(4H)-one

Structure



Source Bayer Agrochemicals (UK) Ltd
Eastern Way
Bury St Edmunds
Suffolk IP32 7AB

Information available and suggested uses

Control of Alopecurus myosuroides, Bromus spp. and broad-leaved weeds in cereals, pre-emergence, early and late post-emergence at 1.4 to 2.1 kg/ha.

Formulation used 60% w/w a.i. wettable powder

RESULTS

Full results are given in the histograms on pages 10 - 12 and potential selectivities are summarised in the following table.

RATE (kg a.i./ha)	CROPS: vigour reduced by less than 15%	WEEDS: number or vigour reduced by more than 70%
2.25	carrot maize + safener (NA)	Avena fatua Elymus repens + species below
0.75	species above + wheat + safener (NA) maize pea	Bromus sterilis Matricaria perforata Senecio vulgaris Solanum nigrum + species below
0.25	species above + wheat barley ± safener (NA) field bean	Alopecurus myosuroides Poa annua Poa trivalis Beta vulgaris Chrysanthemum segetum Polygonum lapathifolium Chenopodium album Stellaria media Veronica persica Viola arvensis Rumex obtusifolius

Comments on results

Activity test data, post-emergence selectivities and the type of symptoms produced by SMY 1500 were reported previously (Richardson and West, 1986). SMY 1500 was similar to other herbicides which inhibit photosynthesis such as triazines and triazinones, both in type of activity and symptoms produced on susceptible species. A wide spectrum of weeds including Alopecurus myosuroides were selectively controlled post-emergence in wheat, barley, maize, carrots and peas.

Soil persistence.

Persistence was moderate to long. The lowest rate of 0.25 kg/ha was undetectable 40 weeks after treatment, but the highest dose 2.25 kg/ha was still damaging Perennial ryegrass after 52 weeks.

Pre-emergence selectivities

Eleven weeds were controlled at the lowest dose of 0.25 kg/ha including Alopecurus myosuroides, Veronica persica and Viola arvensis. Bromus sterilis and a further three annual broad-leaved weeds including Solanum nigrum were controlled at 0.75 kg/ha, while Avena fatua and Elymus repens were controlled at 2.25 kg/ha. Galium aparine was the only weed not controlled although it was considerably weakened at the two higher doses.

Carrot was outstandingly tolerant. Cereals were also tolerant, maize at 0.75 kg/ha and wheat and barley at 0.25 kg/ha. Slight safening effects were observed with maize and wheat. Pea tolerated 0.75 kg/ha and field bean 0.25 kg/ha. Onion, white clover and brassica crops (especially rape and swede) were very sensitive, being killed at 0.25 kg/ha while lettuce and sugar beet were also severely affected.

The weed control and crop tolerance spectra were very similar pre- and post-emergence (Richardson and West, 1986). In addition to the interesting selectivities found between several important weeds and cereals, carrot and pea, the potential control of volunteer rape in pea is also worth further investigation.

TRIAL NUMBER 536

SMY 1500

SPECIES	0.2500 kg/ha		0.7500 kg/ha		2.2500 kg/ha	
WHEAT	102	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx
(1)	93	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	43	xxxxxxxxx
WHEAT+S	96	xxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx
(2)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
BARLEY	102	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx
(3)	86	xxxxxxxxxxxxxxxx	50	xxxxxxxxxx	14	xxx
BARLEY+S	102	xxxxxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxx+	95	xxxxxxxxxxxxxxxxxx
(4)	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxx	43	xxxxxxxxx
OAT	107	xxxxxxxxxxxxxxxxxx+	114	xxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxx
(5)	57	xxxxxxxxxx	29	xxxxx	14	xxx
PER RYGR	84	xxxxxxxxxxxxxxxx	54	xxxxxxxxxx	0	
(6)	43	xxxxxxxxx	29	xxxxxx	0	
ONION	0		0		0	
(8)	0		0		0	
DWF BEAN	88	xxxxxxxxxxxxxxxxx	88	xxxxxxxxxxxxxxxxx	0	
(9)	79	xxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	0	
FLD BEAN	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	0	
(10)	93	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	0	
PEA	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(11)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
W CLOVER	0		0		0	
(12)	0		0		0	
RAPE	0		0		0	
(14)	0		0		0	
KALE	37	xxxxxxx	15	xxx	0	
(15)	36	xxxxxxx	29	xxxxxx	0	

TRIAL NUMBER 536

SMY 1500

SPECIES	0.2500 kg/ha		0.7500 kg/ha		2.2500 kg/ha	
SWEDE	0		0		0	
(17)	0		0		0	
CARROT	102	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx
(18)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
LETTUCE	22	xxxx	0		0	
(20)	21	xxxx	0		0	
SUG BEET	18	xxxx	0		0	
(22)	43	xxxxxxxxx	0		0	
BETA VUL	18	xxxx	0		0	
(23)	21	xxxx	0		0	
BROM STE	100	xxxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxxx	25	xxxxx
(24)	57	xxxxxxxxxxx	29	xxxxxx	7	x
AVE FATU	116	xxxxxxxxxxxxxxxxxxx+	116	xxxxxxxxxxxxxxxxxxx+	10	xx
(26)	57	xxxxxxxxxxx	36	xxxxxxx	7	x
ALO MYOS	0		0		0	
(27)	0		0		0	
POA ANN	4	x	0		0	
(28)	7	x	0		0	
POA TRIV	0		0		0	
(29)	0		0		0	
CHRY SEG	0		0		0	
(32)	0		0		0	
MAT PERF	100	xxxxxxxxxxxxxxxxxxx	25	xxxxx	6	x
(33)	79	xxxxxxxxxxxxxxxx	29	xxxxxx	7	x
SEN VULG	153	xxxxxxxxxxxxxxxxxxx+	6	x	12	xx
(34)	93	xxxxxxxxxxxxxxxxxx	14	xxx	7	x

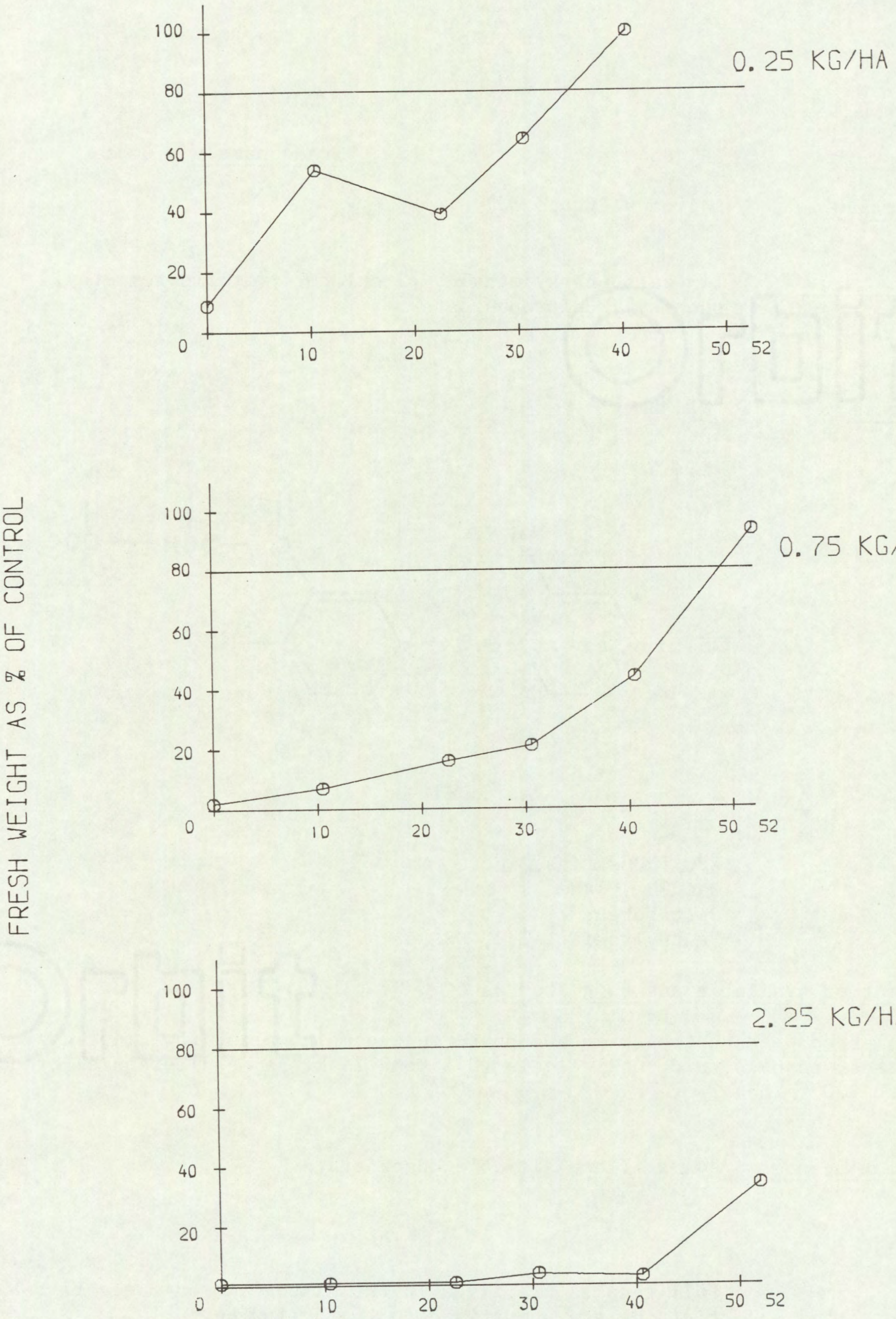
TRIAL NUMBER 536

SMY 1500

SPECIES	0.2500 kg/ha		0.7500 kg/ha		2.2500 kg/ha	
POL LAPA	0		0		0	
(35)	0		0		0	
LAM PUR	164	xxxxxxxxxxxxxxxxxxxx+	0		0	
(37)	57	xxxxxxxxxxx	0		0	
GAL APAR	94	xxxxxxxxxxxxxxxxxx	89	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(38)	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
CHEN ALB	9	xx	0		0	
(39)	21	xxxx	0		0	
STEL MED	0		0		0	
(40)	0		0		0	
VER PERS	6	x	0		0	
(42)	7	x	0		0	
VI ARVE	32	xxxxxx	0		0	
(43)	29	xxxxxx	0		0	
GER DISS	10	xx	0		0	
(44)	7	x	0		0	
EL REPEN	88	xxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxx+	71	xxxxxxxxxxxxxx
(47)	64	xxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
MAIZE+S	109	xxxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxxx+
(56)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx
MAIZE	109	xxxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxxx+	95	xxxxxxxxxxxxxxxxx
(57)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
SOL NIG	130	xxxxxxxxxxxxxxxxxxx+	27	xxxxx	0	
(81)	79	xxxxxxxxxxxxxxx	29	xxxxxx	0	

PERSISTENCE OF SMY1500

SPECIES: PERENNIAL RYEGRASS



PPG 884

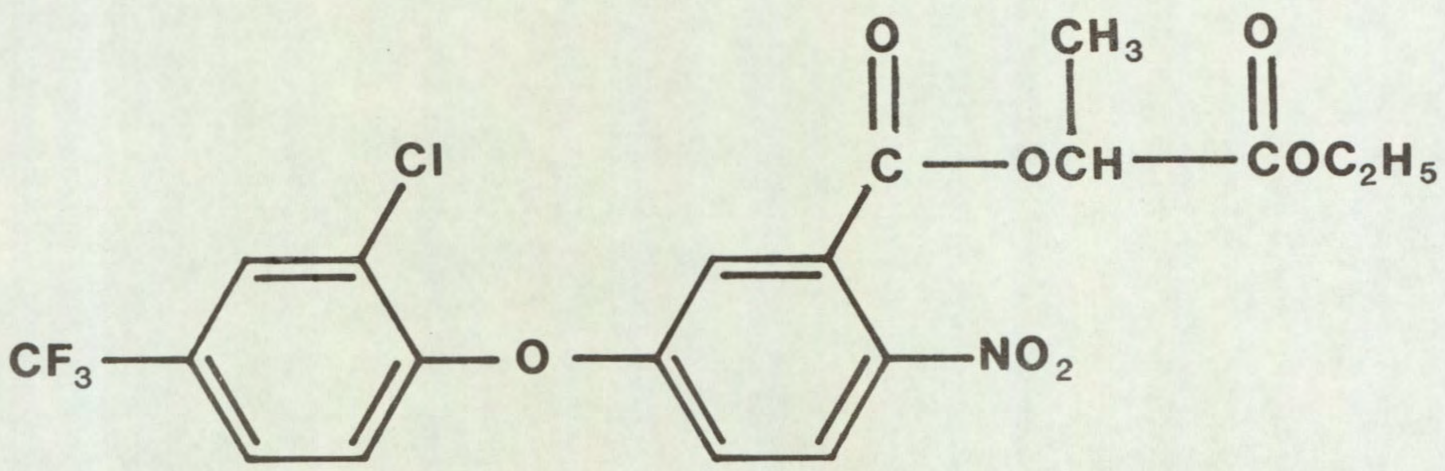
Code number PPG 884

Trade name/s Cobra

Common name Lactofen (proposed)

Chemical name 1'-(carboethoxy)ethyl 5-[2-chloro-4-(trifluoro-methyl) phenoxy]-2-nitrobenzoate

Structure



Source

PPG Industries, Inc
One PPG Place
Pittsburgh,
Pennsylvania 15272, USA

Information available and suggested uses

Broad-leaved weed control pre- and post-emergence in maize, row crops e.g. soyabeans, peanuts, rice and cereals (0.1 to 0.25 kg/ha) and perennial crops (0.5 to 2.0 kg/ha).

Formulation used 24% a.i. emulsifiable concentrate

RESULTS

Full results are given in the histograms on pages 17 - 19 and potential selectivities are summarised in the following table.

RATE (kg a.i./ha)	CROPS: vigour reduced by less than 15%	WEEDS: number or vigour reduced by more than 70%
0.8	maize field bean	Poa trivialis Polygonum lapathifolium Stellaria media Viola arvensis + species below
0.2	species above + wheat ± safener (NA) barley ± safener (NA) maize ± safener (NA) oat perennial ryegrass dwarf bean	Beta vulgaris Chrysanthemum segetum Rumex obtusifolius Solanum nigrum + species below
0.05	species above + pea	Matricaria perforata Senecio vulgaris Lamium purpureum Chenopodium album Veronica persica

Comments on results

A previous report (Richardson and West, 1986) described the activity, post-emergence selectivity and type of symptoms of PPG 884. It was typical of other diphenyl-ether herbicides in most respects.

Soil persistence

A moderate period of persistence was found, using Sugar beat as the test species. The 0.05 and 0.20 kg/ha treatments were not toxic at 25 and 43 weeks respectively, but 0.80 kg/ha was still causing herbicidal symptoms after 52 weeks.

Pre-emergence selectivities

A wide spectrum of annual broad-leaved weeds were controlled, five of these being at the lowest dose of 0.05 kg/ha. Composite weeds (Matricaria perforata, Senecio vulgaris, Chrysanthemum segetum) were susceptible as were polygonaceous weeds (Rumex obtusifolius at 0.2 kg/ha and Polygonum lapathifolium at 0.8 kg/ha). Veronica persica and Lamium purpureum were killed at 0.05 kg/ha and Solanum nigrum controlled at 0.2 kg/ha.

Stellaria media needed the highest dose for control, although there was nearly 50% kill at 0.2 kg/ha. Galium aparine was not controlled although 50% of plants were killed at the highest dose. Unfortunately information was los on cruciferous weeds due to inadequate germination but results with brassica crops would suggest moderate susceptibility. Poa trivialis was the only gras weed controlled.

Maize and field bean were the two most tolerant crops, withstanding th

highest dose of 0.8 kg/ha. Temperate cereals (wheat, barley, oat) tolerated 0.2 kg/ha, as did dwarf bean and perennial ryegrass. Pea was the only other tolerant crop, withstanding 0.05 kg/ha. The safener (NA) did not greatly influence tolerance of the cereals. White clover, sugar beet and lettuce were sensitive.

The potential selective control of certain problem weeds such as Veronica persica and Lamium purpureum in cereals at a very low dose is perhaps the most noteworthy feature of PPG 884, but potential control of Solanum nigrum in beans and maize is also interesting. However failure to control Galium aparine, and grass weeds in these crops is a disadvantage and would require mixtures with complimentary herbicides for effective field use.

TRIAL NUMBER 536

PPG 884

SPECIES	0.0500 kg/ha		0.2000 kg/ha		0.8000 kg/ha	
WHEAT	96	xxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxx
(1)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxx
WHEAT+S	102	xxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxx
(2)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
BARLEY	89	xxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
BARLEY+S	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+
(4)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
OAT	107	xxxxxxxxxxxxxxxxxx+	114	xxxxxxxxxxxxxxxxxx+	107	xxxxxxxxxxxxxxxxxx+
(5)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
PER RYGR	114	xxxxxxxxxxxxxxxxxx+	96	xxxxxxxxxxxxxxxxx	60	xxxxxxxxxxx
(6)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	50	xxxxxxxxx
ONION	60	xxxxxxxxxxx	60	xxxxxxxxxxx	0	
(8)	79	xxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	0	
DWF BEAN	106	xxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxx+
(9)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
FLD BEAN	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxx
(10)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
PEA	100	xxxxxxxxxxxxxxxxxx	50	xxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
(11)	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	71	xxxxxxxxxxxxx
W CLOVER	5	x	0		0	
(12)	14	xxx	0		0	
RAPE	40	xxxxxxxx	7	x	0	
(14)	64	xxxxxxxxxxxx	21	xxxx	0	
KALE	73	xxxxxxxxxxxxxx	44	xxxxxxxxx	0	
(15)	71	xxxxxxxxxxxxx	57	xxxxxxxxxx	0	

TRIAL NUMBER 536

PPG 884

SPECIES		0.0500 kg/ha		0.2000 kg/ha		0.8000 kg/ha
SWEDE	92	xxxxxxxxxxxxxxxxxx	35	xxxxxxx	0	
(17)	71	xxxxxxxxxxxxxx	43	xxxxxxxxx	0	
CARROT	57	xxxxxxxxxxx	6	x	0	
(18)	79	xxxxxxxxxxxxxxxx	21	xxxx	0	
LETTUCE	11	xx	0		0	
(20)	29	xxxxxx	0		0	
SUG BEET	0		0		0	
(22)	0		0		0	
BETA VUL	42	xxxxxxxx	24	xxxxx	0	
(23)	36	xxxxxxx	29	xxxxxx	0	
BROM STE	106	xxxxxxxxxxxxxxxxxxx+	119	xxxxxxxxxxxxxxxxxxx+	81	xxxxxxxxxxxxxxx
(24)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
AVE FATU	116	xxxxxxxxxxxxxxxxxxx+	116	xxxxxxxxxxxxxxxxxxx+	116	xxxxxxxxxxxxxxxxxxx+
(26)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
ALO MYOS	72	xxxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxx	114	xxxxxxxxxxxxxxxxxxx+
(27)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
POA ANN	118	xxxxxxxxxxxxxxxxxxx+	114	xxxxxxxxxxxxxxxxxxx+	45	xxxxxxxxx
(28)	100	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	43	xxxxxxxxx
POA TRIV	86	xxxxxxxxxxxxxxxxx	61	xxxxxxxxxxxx	0	
(29)	86	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	0	
CHRY SEG	35	xxxxxxx	0		0	
(32)	36	xxxxxxx	0		0	
MAT PERF	6	x	0		0	
(33)	14	xxx	0		0	
SEN VULG	0		0		0	
(34)	0		0		0	

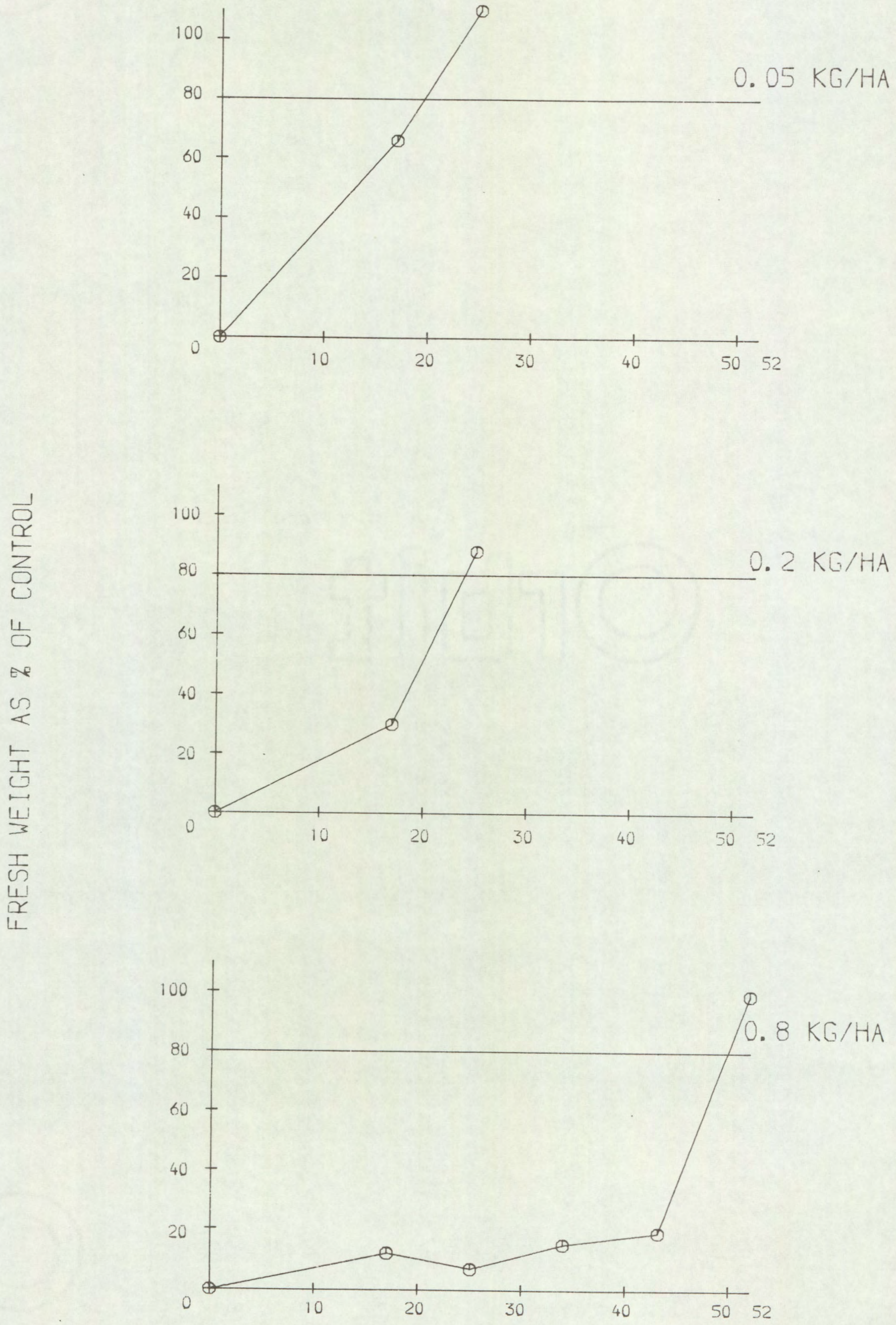
TRIAL NUMBER 536

PPG 884

SPECIES	0.0500 kg/ha		0.2000 kg/ha		0.8000 kg/ha	
POL LAPA	87	xxxxxxxxxxxxxxxxx	32	xxxxxx	24	xxxxx
(35)	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	29	xxxxxx
LAM PUR	0		14	xxx	0	
(37)	0		21	xxxx	0	
GAL APAR	100	xxxxxxxxxxxxxxxxxxx	72	xxxxxxxxxxxxxx	50	xxxxxxxxxx
(38)	100	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	57	xxxxxxxxxxx
CHEN ALB	0		9	xx	0	
(39)	0		29	xxxxxx	0	
STEL MED	80	xxxxxxxxxxxxxxxx	51	xxxxxxxxxx	0	
(40)	93	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	0	
VER PERS	0		0		0	
(42)	0		0		0	
VI ARVE	79	xxxxxxxxxxxxxxx	32	xxxxxx	0	
(43)	71	xxxxxxxxxxxxxx	36	xxxxxxx	0	
GER DISS	114	xxxxxxxxxxxxxxxxxxx+	0		0	
(44)	93	xxxxxxxxxxxxxxxxxx	0		0	
EL REPEN	97	xxxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxx+	97	xxxxxxxxxxxxxxxxxx
(47)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
MAIZE+S	82	xxxxxxxxxxxxxxxx	95	xxxxxxxxxxxxxxxxxx	95	xxxxxxxxxxxxxxxxxx
(56)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
MAIZE	109	xxxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxxx+
(57)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
SOL NIG	61	xxxxxxxxxxx	7	x	0	
(81)	79	xxxxxxxxxxxxxxx	21	xxxx	0	

PERSISTENCE OF PPG 884

SPECIES. SUGAR BEET



TIME OF SOWING

WEEKS AFTER TREATMENT

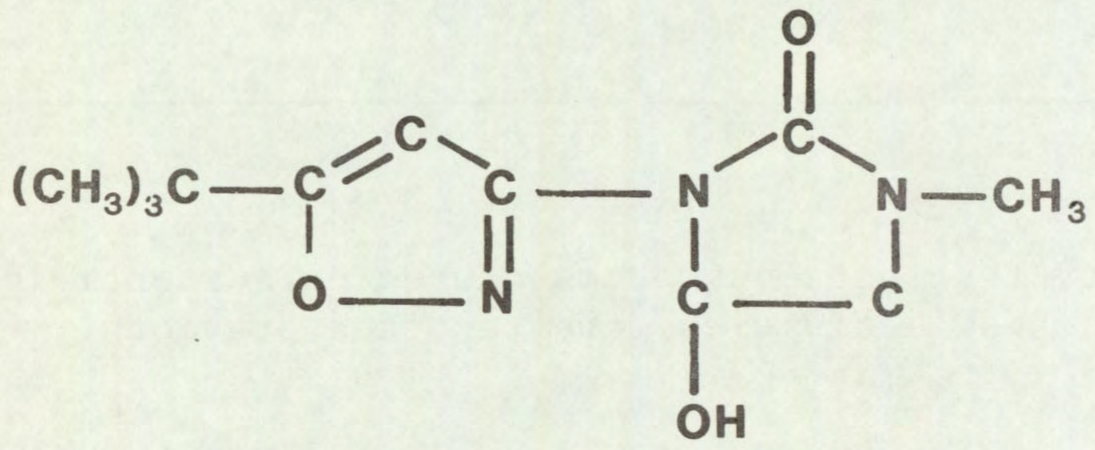
PPG 1259

Code number PPG 1259 Trade name/s -

Common name Busoxinone (WSSA approved)

Chemical name 3-[5(1,1-dimethylethyl)-3-isoxazolyl]-4-hydroxy-1-methyl-2-imidazolidinone

Structure



Source PPG Industries, Inc.
One PPG Place
Pittsburgh
Pennsylvania 15272, USA

Information available and suggested uses

Pre- and post-emergence control of broad-leaved weeds in cereals, grasses, conifers at 0.05 to 0.15 kg/ha.

Formulation used 60% a.i. emulsifiable concentrate

RESULTS

Full results are given in the histograms on pages 24 - 26 and potential selectivities are summarised in the following table

RATE (kg a.i./ha)	CROPS: vigour reduced by less than 15%	WEEDS: number or vigour reduced by more than 70%
1.0	wheat + safener (NA) maize ± safener (NA) pea	Poa annua Poa trivialis Polygonum lapathifolium Chenopodium album Veronica persica Solanum nigrum + species below
0.5	species above + wheat barley ± safener (NA) oat dwarf bean field bean carrot lettuce	Matricaria perforta Stellaria media + species below
0.25	species above + perennial ryegrass onion sugar beet	Chrysanthemum segetum Senecio vulgaris

Comments on results

Activity test data, symptoms caused on susceptible species and post-emergence selectivities were reported previously (Richardson and West 1986).

Soil persistence

The lower doses of 0.25 and 0.5 kg/ha showed a short period of persistence, no effects on Stellaria media were apparent after 17 weeks. However, phytotoxicity was not lost until about 50 weeks post spraying from the higher dose of 1.0 kg/ha.

Pre-emergence selectivities

Control of certain annual broad-leaved weeds was the main feature, with composite weeds being particularly susceptible. Thus Chrysanthemum segetum and Senecio vulgaris were controlled at 0.25 kg/ha and Matricaria perforata at 0.5 kg/ha. Stellaria media was also controlled at the latter dose. Four more were controlled at 1.0 kg/ha including Veronica persica and Solanum nigrum. Galium aparine was very resistant while Lamium purpureum, Viola arvensis and Rumex obtusifolius were also not adequately controlled. Poa annua and Poa trivialis were the only grasses controlled.

Pea was the most tolerant crop, being unaffected at the highest dose of 1.0 kg/ha. Maize also tolerated this dose. Other cereals (wheat, barley, oat), lettuce, carrot and two large-seeded legumes, dwarf and field beans tolerated 0.5 kg/ha, the two latter species being reduced by less than 30% even at the highest dose of 1.0 kg/ha. Perennial ryegrass, onion and sugar beet were the only other tolerant crops, withstanding the lowest dose of 0.25 kg/ha. Slight safening effects were observed with wheat, barley and maize. White clover was very sensitive.

The high tolerance of pea was unexpected and worth further investigation. If this is verified then the potential to control problem weeds such as Solanum nigrum and more notably, volunteer rape, would be most advantageous. However the ability to control composite weeds in lettuce is perhaps even more outstanding, no other herbicide having yet shown this possibility. Even so the limited weed control spectrum in these and other crops will necessitate studies with herbicide mixtures.

TRIAL NUMBER 536

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SPECIES		0.2500 kg/ha		0.5000 kg/ha		1.0000 kg/ha
WHEAT	102	xxxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx
(1)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
WHEAT+S	96	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx
(2)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
BARLEY	96	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
BARLEY+S	102	xxxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxxxx+
(4)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
OAT	114	xxxxxxxxxxxxxxxxxxxx+	107	xxxxxxxxxxxxxxxxxxxx+	114	xxxxxxxxxxxxxxxxxxxx+
(5)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
PER RYGR	102	xxxxxxxxxxxxxxxxxxxx	66	xxxxxxxxxxxx	48	xxxxxxxxxx
(6)	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	36	xxxxxxx
ONION	97	xxxxxxxxxxxxxxxxxx	15	xxx	15	xxx
(8)	86	xxxxxxxxxxxxxxxx	29	xxxxxx	21	xxxx
DWF BEAN	88	xxxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxxxx+
(9)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
FLD BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(10)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
PEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(11)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
W CLOVER	10	xx	0		0	
(12)	43	xxxxxxxxx	0		0	
RAPE	80	xxxxxxxxxxxxxxxx	53	xxxxxxxxxxx	0	
(14)	71	xxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	0	
KALE	95	xxxxxxxxxxxxxxxxxx	73	xxxxxxxxxxxxxxx	0	
(15)	71	xxxxxxxxxxxxxx	57	xxxxxxxxxxx	0	

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PPG 1259

SPECIES		0.2500 kg/ha		0.5000 kg/ha		1.0000 kg/ha
SWEDE	92	xxxxxxxxxxxxxxxxxx	40	xxxxxxxx	0	
(17)	71	xxxxxxxxxxxxxx	50	xxxxxxxxxx	0	
CARROT	89	xxxxxxxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxxx	19	xxxx
(18)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
LETTUCE	100	xxxxxxxxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxxx	11	xx
(20)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	21	xxxx
SUG BEET	91	xxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	0	
(22)	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	0	
BETA VUL	138	xxxxxxxxxxxxxxxxxxx+	90	xxxxxxxxxxxxxxxxx	36	xxxxxxx
(23)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
BROM STE	106	xxxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxxx+	75	xxxxxxxxxxxxxxx
(24)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
AVE FATU	126	xxxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxxx+	145	xxxxxxxxxxxxxxxxxxx+
(26)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
ALO MYOS	93	xxxxxxxxxxxxxxxxxx	62	xxxxxxxxxxxx	52	xxxxxxxxxx
(27)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
POA ANN	65	xxxxxxxxxxxxx	73	xxxxxxxxxxxxxx	24	xxxxx
(28)	71	xxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	36	xxxxxxx
POA TRIV	43	xxxxxxxxx	61	xxxxxxxxxxxx	0	
(29)	36	xxxxxxx	43	xxxxxxxxx	0	
CHRY SEG	0		0		0	
(32)	0		0		0	
MAT PERF	87	xxxxxxxxxxxxxxxx	19	xxxx	25	xxxxx
(33)	71	xxxxxxxxxxxxxx	21	xxxx	21	xxxx
SEN VULG	12	xx	0		0	
(34)	29	xxxxxx	0		0	

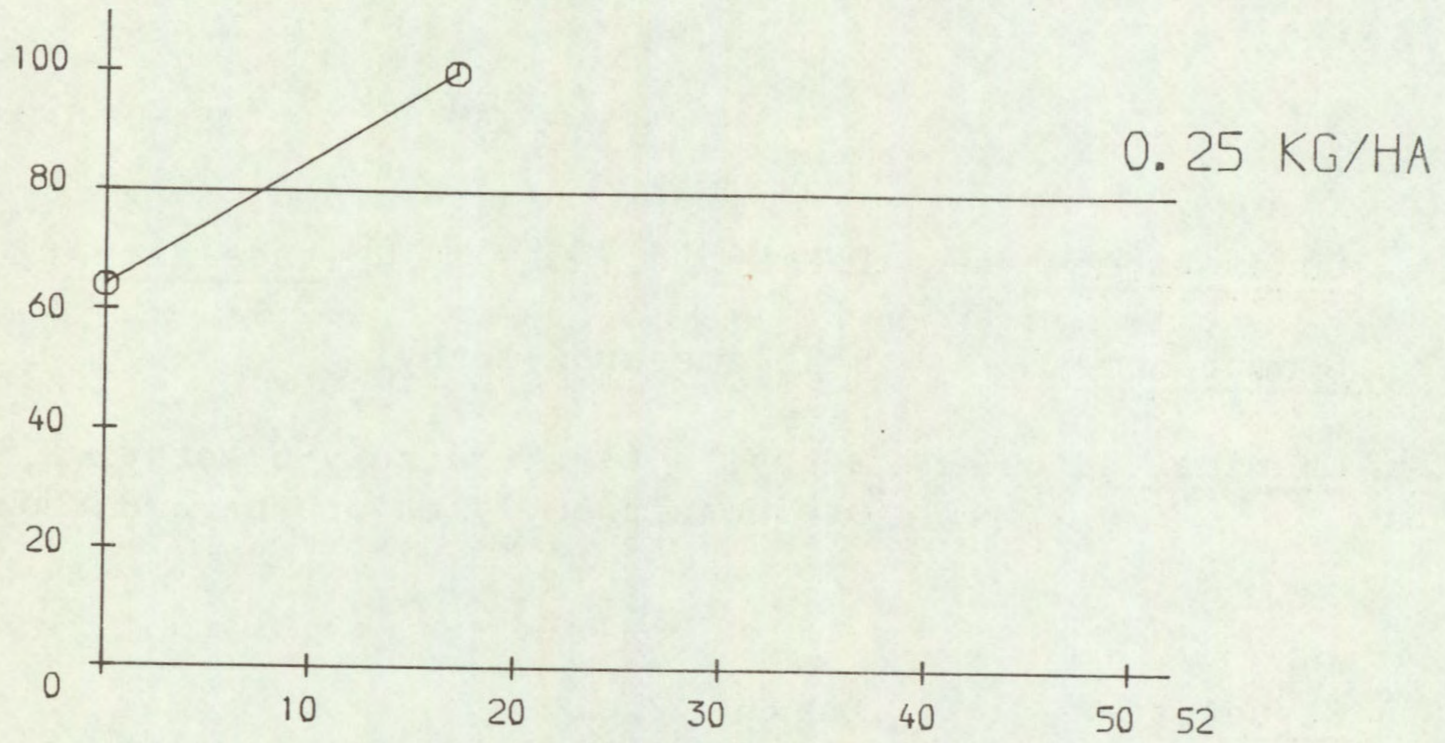
TRIAL NUMBER 536

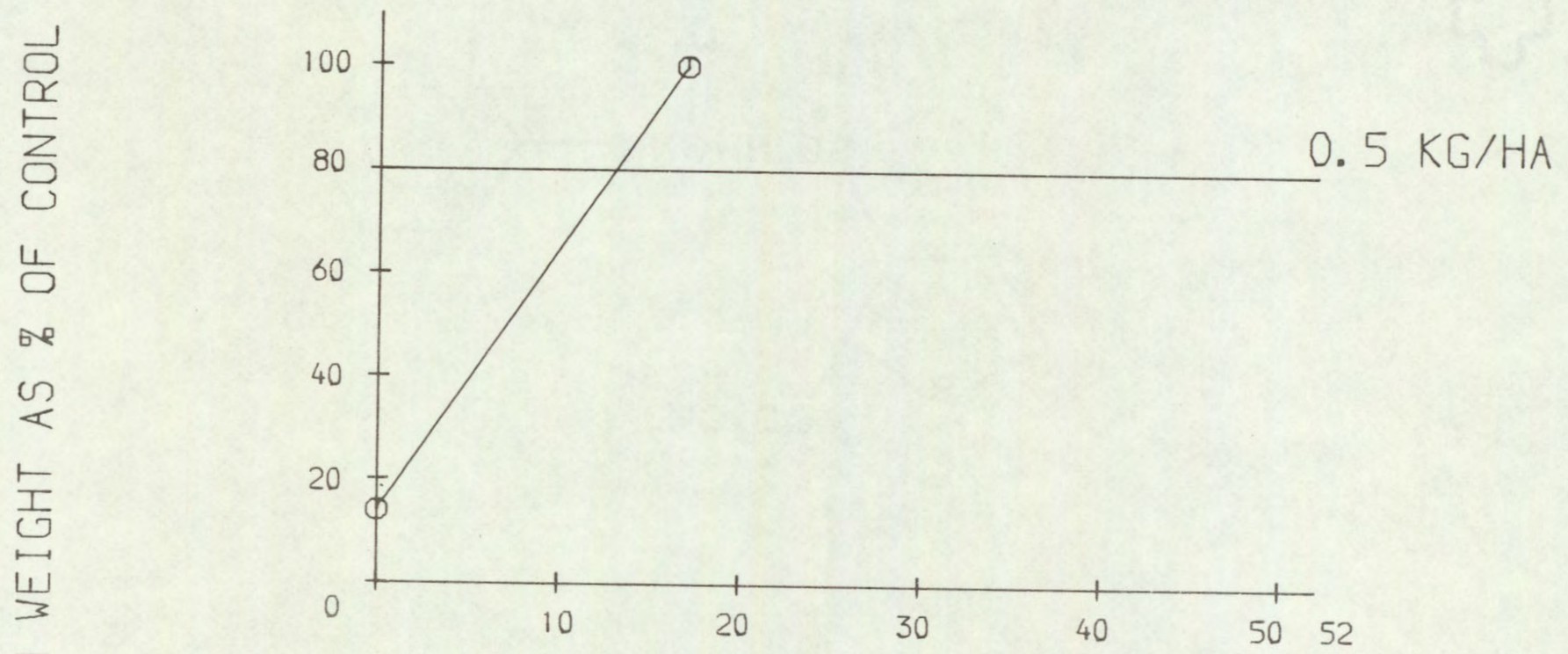
PPG 1259

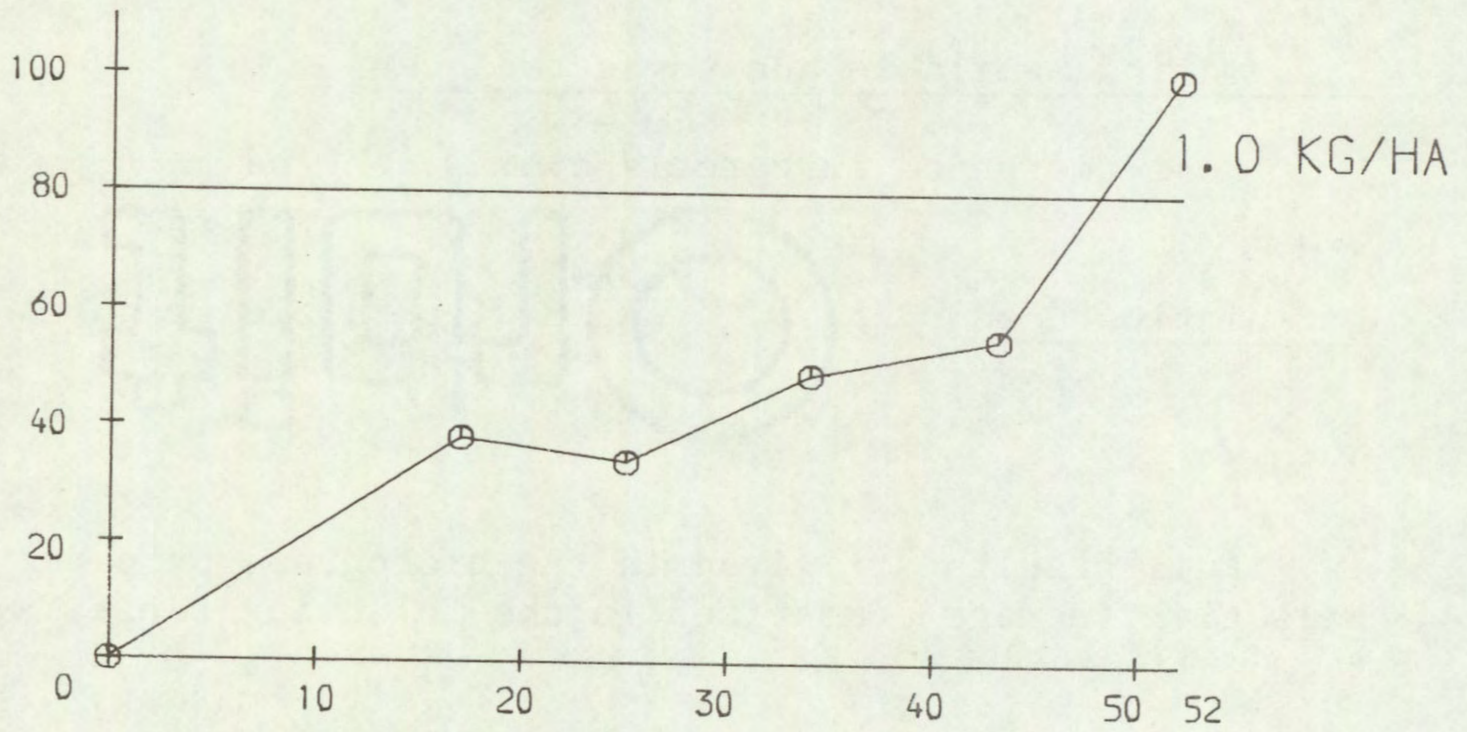
SPECIES		0.2500 kg/ha		0.5000 kg/ha		1.0000 kg/ha
POL LAPA	87	xxxxxxxxxxxxxxxx	47	xxxxxxxxx	24	xxxxx
(35)	93	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	29	xxxxxx
LAM PUR	82	xxxxxxxxxxxxxxx	55	xxxxxxxxxx	68	xxxxxxxxxxxxx
(37)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
GAL APAR	122	xxxxxxxxxxxxxxxxxx+	111	xxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxx+
(38)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
CHEN ALB	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	0	
(39)	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	0	
STEL MED	37	xxxxxxx	7	x	0	
(40)	64	xxxxxxxxxxxx	14	xxx	0	
VER PERS	73	xxxxxxxxxxxxxx	49	xxxxxxxxxx	0	
(42)	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	0	
VI ARVE	95	xxxxxxxxxxxxxxxxx	55	xxxxxxxxxx	39	xxxxxxxx
(43)	100	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	50	xxxxxxxxx
GER DISS	72	xxxxxxxxxxxxx	134	xxxxxxxxxxxxxxxxxx+	62	xxxxxxxxxxx
(44)	86	xxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	50	xxxxxxxxx
EL REPEN	106	xxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxx+
(47)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
MAIZE+S	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+
(56)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
MAIZE	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+
(57)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx
SOL NIG	68	xxxxxxxxxxxxxx	41	xxxxxxxx	0	
(81)	71	xxxxxxxxxxxxxx	57	xxxxxxxxxx	0	

PERSISTENCE OF PPG 1259

SPECIES: STELLARIA MEDIA







TIME OF SOWING

WEEKS AFTER TREATMENT

Click here to continue