WEED RESEARCH ORGANIZATION

TECHNICAL REPORT No. 69

THE ACTIVITY AND LATE POST-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: AC 252925, DOWCO 453, HOE 33171 and HOE 35609

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

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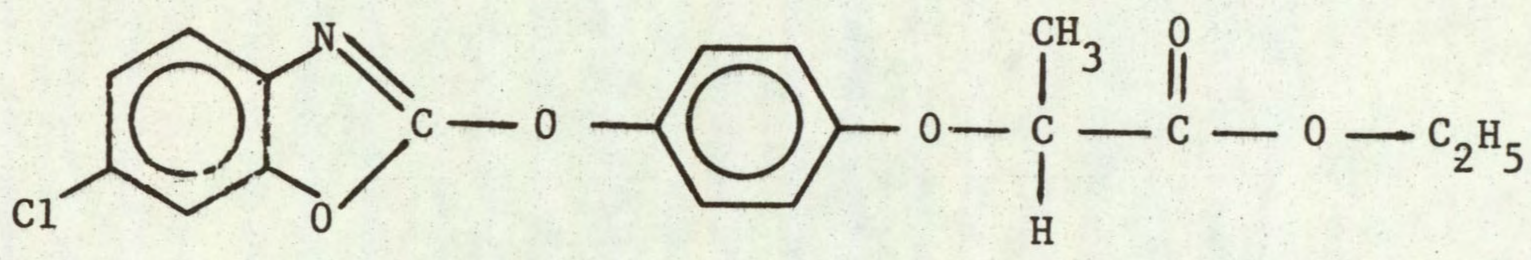
NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

E R R A T A

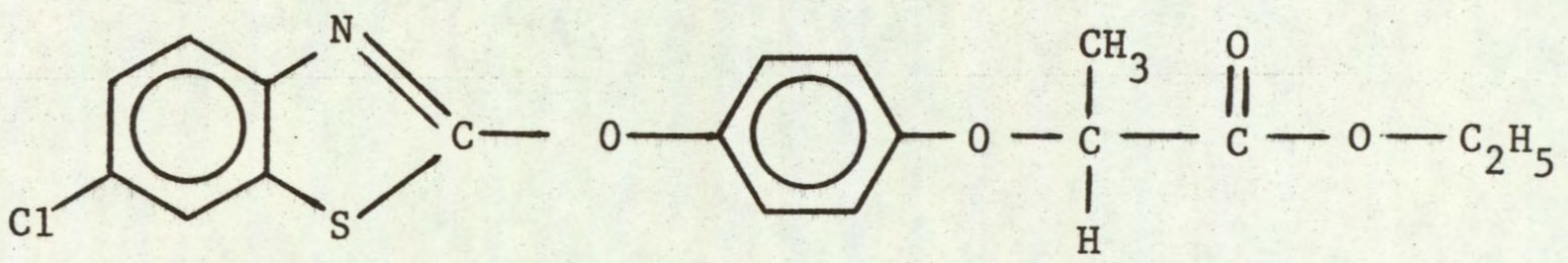
The corrected structures and chemical names for fenoxaprop-ethyl (HOE 33171) and fenthiaprop-ethyl (HOE 35609) are :-

FENOXAPROP-ETHYL (HOE 33171)



(RS)-2-[4-(6-chloro-1,3-benzoxazol-2-yloxy)phenoxy] propionic acid, ethyl ester.

FENTHIAPROP-ETHYL (HOE 35609)



(RS)-2-[4-(6-chloro-1,3-benzothiazol-2-yloxy)phenoxy] propionic acid, ethyl ester.

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

CONTENTS

NOTE

RICHARDSON, W.G., WEST, T.M. and WHITE, G.P. The activity and late post-emergence selectivity of some recently developed herbicides: AC 252925, DOWCO 453, HOE 33171 and HOE 35609. Technical Report Agricultural Research Council Weed Research Organization, 1982, 69, pp. 39.

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THE ACTIVITY AND LATE POST-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: AC 252925, DOWCO 453, HOE 33171 and HOE 35609

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SUMMARY

Four herbicides were examined for post-emergence selectivity on 44 crop and weed species. The route of action of these herbicides was determined on six selected species in a separate test. The safener 1,8 naphthalic anhydride (NA) was used as a seed dressing on wheat, barley and maize to see if herbicide effects could be reduced.

AC 252925 was highly active both pre- and post-emergence on all crop and weed species, thus indicating its high potential as a total herbicide.

Dowco 453, HOE 33171 and HOE 35609 showed outstanding potential control of many grass weeds, including volunteer cereals, in onion and most broad-leaved crops. All broad-leaved weeds were resistant however. Festuca rubra and Poa annua were the two most resistant grasses but showed some susceptibility to Dowco 453. An interesting difference in susceptibility to perennial grasses was evident with HOE 33171 and HOE 35609. HOE 33171 gave much better control of Agrostis stolonifera while HOE 35609 was much more active against Agropyron repens.

INTRODUCTION

The pre- and post-emergence selectivities and effects of new herbicides are investigated at WRO on a large number of pot-grown crop and weed species. The limitations of these investigations are that only one crop variety or source of weed species is used and growth is in one particular soil type, at only one depth of sowing without interspecific competition. Consequently the results should only be used as a guide for further work, as plant responses in pot experiments can be very different to those in the field.

This report gives indications of the post-emergence selectivity of four new herbicides. Results of an activity experiment are also included to provide information on levels of phytotoxicity, type and route of action.

METHODS AND MATERIALS

(a) Activity experiment (AE 1)

This was carried out on six selected species as described previously (Richardson and Dean, 1974). Three annual species and perennial ryegrass were raised from seeds and two perennials from rhizome fragments. There were two replicates for each treatment. Herbicides were applied by four different methods:-

(i) post-emergence to the foliage only, avoiding contact with the soil,
(ii) post-emergence to the soil only, as a drench avoiding foliage contact,

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* Herbicide Performance Group

(iii) pre-emergence to the soil surface,
(iv) pre-emergence with thorough incorporation, before planting.

Experimental details are summarised in Tables 1 and 2.

(b) Post-emergence selectivity experiment

The experimental details were as previously described (Richardson and Parker, 1977). Plants were raised in 9 or 10 cm diameter plastic pots in soil taken from a field near Begbroke Hill (Yarnton). Planting dates were staggered so that the majority of species would reach a pre-determined stage (2-4 leaves) by the time of spraying. However, as noted in Appendix I, several species were at a more advanced stage of growth. All species were raised in the open.

Table 1. Plant data for activity experiment (AE 1)

Species	Cultivar/ source	No. per pot at spraying		Depth of planting (cm)	Stage of growth at:		
					Spraying	Assessment	
		pre-	post-		post-em	pre-em	post-em
Dwarf bean (*Phaseolus vulgaris*)	The Prince	4	1-2	1.5	2 unifoliate leaves	3 trifoliate leaves	4 trifoliate leaves
Kale (*Brassica oleracea acephala*)	Marrowstem	12	6	0.5	2-2½	5 leaves	4 leaves
Polygonum amphibium	WRO Clone 1	6	5	1.0	5½ leaves	9 leaves	10 leaves
Perennial ryegrass (*Lolium perenne*)	S 23	15	10	0.5	3½ leaves	5 tillers	6 tillers
Avena fatua	WRO 1978	12	5	1.0	3 leaves	1-2 tillers	3-5 tillers
Agropyron repens	WRO Clone 31	6	4	1.0	3 leaves	2-3 tillers	2 tillers

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

Table 2. Soil and environmental conditions in two experiments

Experiment number type and herbicide(s) included	AE 1 AC 252925 Dowco 453 HOE 33171 HOE 35609	Post-emergence selectivity test AC 252925 HOE 33171 Dowco 453 HOE 35609
Date of spraying	14.5.82	9.6.82
Main assessment completed	18.6.82	30.6.82
Organic carbon (%)	1.3	1.3
Clay content (%)	16.0	16.0
pH (in water; 1:2 soil:water ratio)	7.5	7.5
Superphosphate (g/kg)	2.0	2.0
Vitax QS fertilizer (g/kg)	2.5	2.5
Hydrated Mg SO_4 $7H_2O$ (g/kg)	0.8	0.8
Temperature (^oC)	Glasshouse	Outdoors
Mean	19	17
Maximum	34	30
Minimum	10	10
Relative humidity (%)		
Mean	60	60
Maximum	90	87
Minimum	26	22

Certain plant material was pre-treated to improve establishment:- seeds of Chenopodium album and Polygonum lapthifolium were soaked in 0.1 M potassium nitrate solution and then kept in the light for two and three days respectively prior to planting; seeds of Alopecurus myosuroides were soaked in distilled water and kept in the light for 24 hours; Rumex obtusifolius seeds were dehusked; Veronica persica and Agrostis stonifera were sown in a tray of peat compost and seedlings (1-2 true leaves) transplanted into the potting medium.

To protect from soil-borne pathogens all seeds except wheat, barley, oat, sugar beet, Avena fatua and those soaked in KNO_3 solution were pretreated with one of the following: thiram, Harvesan organomercury, thiram + benlate (onion). Root fragments of Cirsium arvense were washed in a colloidal copper solution (2 ml litre^{-1}) prior to planting. For dwarf bean, field bean and certain brassicas (kale, rape, cabbage, radish) 6% gum arabic solution was included with the thiram fungicide seed dressing to improve adhesion, as most of these species are susceptible to "damping off" diseases.

A series of treatments was included to investigate possible uses for safeners. Maize, wheat and barley were treated with NA (1,8-naphthalic anhydride) at 0.5% a.i. w/w of seeds. Before spraying, each species was thinned to constant number per pot.

Herbicides were applied using a laboratory sprayer operating at a pressure of 207 kPa (30 lb/in^2) with an 8002 Tee Jet band spray nozzle moving at 0.5 m sec^{-1}, 45 cm above the stationary plants. There were two replicates for each treatment. Stages of growth at spraying and assessment are summarised in Appendix I. After spraying, the plants were protected from rainfall for 24 hours and then watered overhead from a rose at the end of a trigger hose attached to the mains water supply, to wash any residues off the foliage. The pots were then returned to their original position in the open. Watering throughout the experiment was done from overhead. Additional fertilizer in solution was applied to all species at one week intervals once after spraying (5 ml litre^{-1} Vitafeed 301). Insecticide and fungicide solutions were applied to individual species as required.

(c) Assessment and processing of results

Results were assessed and processed as before (Richardson and Dean, 1974). Survivors were counted and scored for vigour on a 0-7 scale as previously, where 0 = dead and 7 = as untreated control. Histograms are presented for the results of each treatment, the upper of each pair represents mean plant survival and the lower, mean vigour score, both calculated as percentages of untreated controls. Actual percentage figures are displayed to the left of each row of x's (in selectivity test only). The same information is displayed in the histograms, each 'x' representing a 5% increment, but in the activity experiment each 'x' represents a 7% increment. A '+' indicates a value in excess of 100%. A value of 100 = as untreated control and 0 = a complete kill. 'R' indicates results based on one replicate only.

A table of observed selectivities, using the criteria specified, is presented below for each compound along with comments to highlight salient points. Radish (Raphanus raphanistrum) which was included because it is easy to propagate), may be regarded as a crop or a weed.

Several species, notably the perennials, were kept for extra periods to observe later effects, or the degree of recovery from injury.

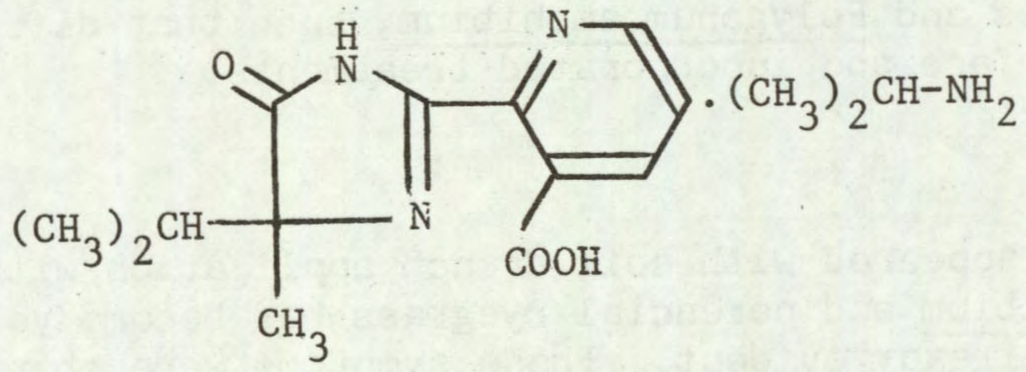
NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

AC 252925

Code number: AC 252925

Chemical name: Isopropylammonium 2-(4-isopropyl-4-methyl-5-oxo-2-imidazolin-2-yl)nicotinate

Structure



Source: Cynamid International Limited
Fareham Road
Gosport
Hants PO13 0AS, UK

Information available and suggested uses

For total and aquatic weed control. Herbaceous weeds controlled at 0.25 to 1.0 kg a.e./ha; woody weeds at 0.75-3.0 kg a.e./ha.

Formulation used: Liquid concentrate 22.6% a.e.

Spray volume: For activity experiment 373 l/ha
For post-emergence selectivity experiment 371 l/ha

RESULTS

Full results are given in the histograms on pages 7-11 and potential selectivities are summarised in the following table.

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: number or vigour reduced by 70% or more
0.3 and 0.9	None	None listed as no crops tolerant
0.1	Field bean	Festuca rubra Avena fatua Poa trivialis Raphanus raphanistrum Tripleurospermum maritimum Polygonum lapathifolium Galium aparine Stellaria media Spergula arvensis Veronica persica Rumex obtusifolius Phalaris paradoxa Solanum nigrum Oxalis latifolia

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

Comments on results

Activity experiment

AC 252925 was highly active on all species pre- and post-emergence, the lowest dose of 0.125 kg/ha either killing or severely damaging all plants. Such high activity meant that differences between application methods were small. However, grasses were more susceptible to soil drenches than foliar sprays, post-emergence. Pre-emergence activity was very high on all species, especially on the grasses and Polygonum amphibium, such that differences were not apparent between surface and incorporated treatments.

Symptoms

The first symptoms appeared with soil drench application within 48 hours. Leaves of kale, P. amphibium and perennial ryegrass had become yellow and growth retardation was already evident. These symptoms were characteristic of nearly all other affected species with all application methods, increasing in severity, to be followed by necrosis and plant death. The chlorosis was sometimes interveinal, for example, with peas and beans. With some species, a deep red or purple colour of leaves developed. With pre-emergence treatments, some species failed to emerge from the soil or died back from an early growth stage. Occasionally, at lower doses, grasses produced additional tillers but these were inhibited or chlorotic. Leaves of some broad-leaved species were distorted with inrolling from leaf margins.

Post-emergence selectivities

Fourteen of the twenty-six species tested were controlled at the lowest dose of 0.1 kg/ha. With one exception all other weeds were reduced in vigour by about 50% or more. Chenopodium album was the most resistant weed, reduced by only 50% at the highest dose (0.9 kg/ha) but this may have been due to its advanced growth stage at spraying.

Field bean was the only crop to tolerate even the lowest dose of 0.1 kg/ha. It was reduced in vigour by only 29% at higher doses. All other crops were very sensitive. The safener, NA, did not influence phytotoxicity on wheat, barley or maize.

The potential of AC 252925 appears to be as a total herbicide and in selective application techniques (SELAP). The selectivity obtained with field bean needs verification, initially in pots.

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ACTIVITY EXPERIMENT

AC 252925

		0.125 kg/ha	0.5 kg/ha	2.0 kg/ha
DWARF BEAN	F	xxxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxxx xxx	xxxxxxxxx xx
	S	xxxxxxxxxxxxxxx xxxxxx	xxxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxxx xx
	P	xxxxxxxxxxxxxxx xxxxxxx	xxxxxxxxxxxxx xxxxx	xxxxxxxxx xxxx
	I	xxxxxxxxxxxxxxx xxxxxxx	xxxxxxxxxxxx xxxx	o o
KALE	F	xxxxxxxxxxxxxxx xxxxx	xxxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxxx xxxx
	S	xxxxxxxxxxxxxxx xxxxx	xxxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxxx xxxx
	P	xxxxxxxxxxxxxxx+ xxxx	xxxxxxxxxxx xxxx	xxxxxxx xxxx
	I	xxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xxxx
POLYGONUM AMPHIBIUM	F	xxxxxxxxxxxxxxx xxx	xxxxxxxxxxxxxxx xx	xxxxxxxxxxxxxxx xx
	S	xxxxxxxxxxxxxxx xxxxxx	xxxxxxxxxxxxxR xx	xxxxxxxxxxxxxx xx
	P	o o	o o	o o
	I	o o	o o	o o
PERENNIAL RYEGRASS	F	xxxxxxxxxxxxxx xxxxx	xxxx xx	xxx x
	S	o o	xxxxx xx	x x
	P	o o	o o	o o
	I	xx x	o o	o o
AVENA FATUA	F	xxxxxxxxxxxxxxx xxxxxxx	o o	o o
	S	o o	o o	o o
	P	o o	o o	o o
	I	o o	o o	o o
AGROPYRON REPENS	F	xxxxxxxxxxxxxxx xxxxxxx	xxxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxxx xxx
	S	xxxxxxxxxxxxx xxx	xxxxxxxxxxxxxxx xx	o o
	P	o o	o o	o o
	I	o o	o o	o o

KEY: F = post-emergence, foliar application
S = post-emergence, soil drench
P = pre-emergence, surface film
I = pre-planting, incorporated

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl,
HOE 35609 is fenthiaprop-ethyl

AC 252925

Species	0.1 kg/ha		0.3 kg/ha		0.9 kg/ha	
WHEAT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx
(1)	29	xxxxxx	21	xxxx	21	xxxx
WHEAT + S	100	xxxxxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx	62	xxxxxxxxxxxx
(2)	29	xxxxxx	21	xxxx	21	xxxx
BARLEY	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(3)	29	xxxxxx	36	xxxxxxx	14	xxx
BARLEY + S	100	xxxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx
(4)	29	xxxxxx	29	xxxxxx	21	xxxx
OAT	100	xxxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(5)	21	xxxx	14	xxx	14	xxx
PER RYGR	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(6)	29	xxxxxx	29	xxxxxx	14	xxx
ONION	62	xxxxxxxxxxxx	75	xxxxxxxxxxxxxx	37	xxxxxxx
(8)	50	xxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
DWF BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(9)	64	xxxxxxxxxxxxx	29	xxxxxx	29	xxxxxx
FLD BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(10)	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
PEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(11)	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxx	43	xxxxxxxxx
W CLOVER	37	xxxxxxx	37	xxxxxxx	37	xxxxxxx
(12)	29	xxxxxx	21	xxxx	29	xxxxxx

POST-EMERGENCE SELECTIVITY TEST

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

AC 252925

Species	0.1 kg/ha		0.3 kg/ha		0.9 kg/ha	
RAPE	90	xxxxxxxxxxxxxxxxxx	70	xxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(14)	29	xxxxxx	14	xxx	14	xxx
KALE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(15)	50	xxxxxxxxxx	36	xxxxxxx	29	xxxxxx
CABBAGE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	70	xxxxxxxxxxxxxx
(16)	29	xxxxxx	21	xxxx	29	xxxxxx
CARROT	90	xxxxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxxx	30	xxxxxx.
(18)	36	xxxxxxx	29	xxxxxx	21	xxxx
PARSNIP	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(19)	43	xxxxxxxxx	29	xxxxxx	21	xxxx
LETTUCE	100	xxxxxxxxxxxxxxxxxxxx	110	xxxxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxxxx
(20)	50	xxxxxxxxxx	43	xxxxxxxxx	43	xxxxxxxxx
FENUGREK	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(21)	43	xxxxxxxxx	29	xxxxxx	21	xxxx
SUG BEET	90	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx
(22)	36	xxxxxxx	36	xxxxxxx	29	xxxxxx
BETA VUL	90	xxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx
(23)	36	xxxxxxx	21	xxxx	29	xxxxxx
BROM STE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	70	xxxxxxxxxxxxxx
(24)	43	xxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
FEST RUB	94	xxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
(25)	29	xxxxxx	29	xxxxxx	14	xxx
AVE FATU	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(26)	29	xxxxxx	36	xxxxxxx	29	xxxxxx

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Species	AC 252925 0.1 kg/ha		AC 252925 0.3 kg/ha		AC 252925 0.9 kg/ha	
ALO MYOS	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(27)	43	xxxxxxxxx	29	xxxxxx	36	xxxxxxx
POA ANN	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	67	xxxxxxxxxxxxx
(28)	36	xxxxxxx	29	xxxxxx	29	xxxxxx
POA TRIV	43	xxxxxxxxx	26	xxxxx	17	xxx
(29)	29	xxxxxx	14	xxx	7	x
SIN ARV	80	xxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(30)	43	xxxxxxxxx	36	xxxxxxx	29	xxxxxx
RAPH RAP	75	xxxxxxxxxxxxxx	125	xxxxxxxxxxxxxxxxxx+	62	xxxxxxxxxxx
(31)	21	xxxx	29	xxxxxx	14	xxx
CHRY SEG	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
(32)	50	xxxxxxxxxx	43	xxxxxxxxx	36	xxxxxxx
TRIP MAR	30	xxxxxx	20	xxxx	30	xxxxxx
(33)	29	xxxxxx	7	x	21	xxxx
SEN VULG	90	xxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
(34)	43	xxxxxxxxx	29	xxxxxx	14	xxx
POL LAPA	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(35)	29	xxxxxx	29	xxxxxx	29	xxxxxx
GAL APAR	67	xxxxxxxxxxxxx	67	xxxxxxxxxxxxx	0	
(38)	21	xxxx	21	xxxx	0	
CHEN ALB	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(39)	86	xxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	50	xxxxxxxxxx
STEL MED	100	xxxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx	0	
(40)	14	xxx	7	x	0	

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AC 252925

Species	0.1 kg/ha		0.3 kg/ha		0.9 kg/ha	
SPER ARV	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(41)	29	xxxxxx	29	xxxxxx	21	xxxx
VER PERS	29	xxxxxx	29	xxxxxx	57	xxxxxxxxxx
(42)	14	xxx	14	xxx	14	xxx
RUM OBTU	33 R	xxxxxxx	0 R		100 R	xxxxxxxxxxxxxxxxxxx
(44)	29 R	xxxxxx	0 R		29 R	xxxxxx
AG REPEN	100	xxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(47)	43	xxxxxxxxx	29	xxxxxx	21	xxxx
AG STOLO	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(48)	36	xxxxxxx	43	xxxxxxxxx	29	xxxxxx
CIRS ARV	100 R	xxxxxxxxxxxxxxxxxxx	100 R	xxxxxxxxxxxxxxxxxxx	100 R	xxxxxxxxxxxxxxxxxxx
(50)	57 R	xxxxxxxxxxx	57 R	xxxxxxxxxxx	57 R	xxxxxxxxxx
PHAL PAR	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxx
(54)	29	xxxxxx	29	xxxxxx	29	xxxxxx
MAIZE + S	100	xxxxxxxxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxx	50	xxxxxxxxx
(56)	57	xxxxxxxxxxx	29	xxxxxx	14	xxx
MAIZE	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(57)	57	xxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
SOL NIG	12	xx	31	xxxxxx	25	xxxxx
(81)	7	x	14	xxx	7	x
PHAL MIN	90	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxx
(84)	43	xxxxxxxxx	29	xxxxxx	14	xxx
OXAL LAT	90	xxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxx	0	
(87)	29	xxxxxx	21	xxxx	0	

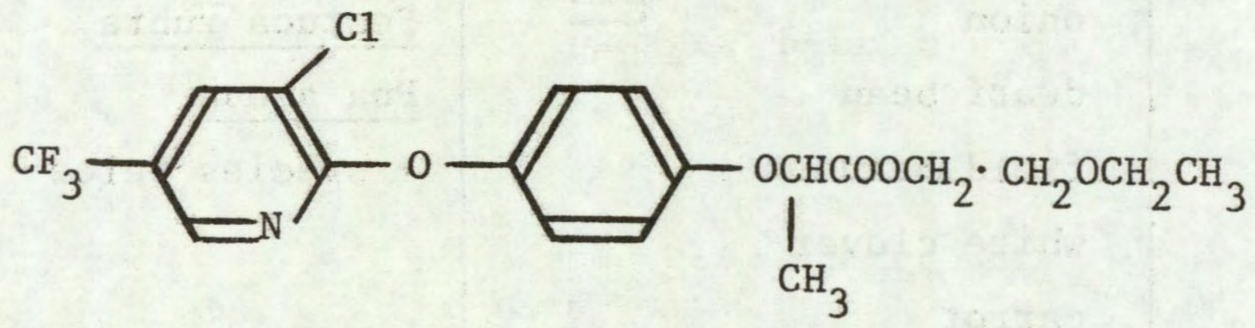
NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

DOWCO 453

Code number Dowco 453

Chemical name 2-Ethoxyethyl 2-[4-(3-chloro-5-trifluoromethyl-2-pyridyloxy)phenoxy]propionate

Structure



Source Dow Chemical Co Ltd
Kings Lynn
Norfolk PE30 2JD
UK

Information available and suggested uses

For grass weed control in broad-leaved crops (sugar beet, pea, oil-seed rape).

Formulation used Emulsifiable concentrate 10.4% a.e.

Spray volume For activity experiment 373 l/ha.
For post-emergence selectivity experiment 371 l/ha.

RESULTS

Full results are presented in the histograms on pages 15-19 and potential selectivities are summarised in the following table.

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: Number of vigour reduced by 70% or more
0.8	onion dwarf bean field bean white clover carrot parsnip lettuce fenugreek sugar beet	Festuca rubra Poa annua + species below
0.2	species above + pea kale cabbage radish	Phalaris paradoxa + species below
0.05	species above + rape	Bromus sterilis Avena fatua Alopecurus myosuroides Poa trivialis Agropyron repens Agrostis stolonifera Phalaris minor

Comments on results

Activity experiment

Activity was confined almost entirely to the grass species. These were highly sensitive pre- and post-emergence. The foliar spray was more active than the soil drench, post-emergence. The surface spray, pre-emergence was more effective than when incorporated, with perennial ryegrass and Agropyron repens, but this difference was less clear with Avena fatua and tended to vary with the dose. The foliar spray caused some damage on the broad-leaved species, notably kale, which showed symptoms at the lowest dose, but effects were non-lethal at any dose on any of these species.

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Symptoms

Stunting and necrosis of leaves and shoots were common on most susceptible grass species, pre- and post-emergence. Chlorosis of leaves often preceded necrosis. Higher doses, pre-emergence, prevented grass species from emerging from the soil. Symptoms were much less severe on broad-leaved species, plants often recovering from an initial minor scorch or necrosis. However with certain species (brassicae, white clover and Cirsium arvense) usually at the higher doses, a lack of vigour and stunting was observed and there was a proliferation of miniature leaves at the base of the first true leaves.

Post-emergence selectivities

Seven grass weeds were controlled at the lowest dose of 0.05 kg/ha including the two perennials, Agropyron repens and Agrostis stolonifera. At 0.2 kg/ha Phalaris paradoxa was controlled but 0.8 kg/ha was necessary to control Festuca rubra and Poa annua. However the latter was reduced in vigour by 57% at 0.2 kg/ha. All broad-leaved weeds were resistant.

Onion and nearly all broad-leaved crops tolerated the high dose of 0.8 kg/ha. The brassicae however were slightly less tolerant, rape only to 0.05 kg/ha and kale, cabbage and radish to 0.2 kg/ha. All graminaceous crops were sensitive, notably the cereals (wheat, barley, oat and maize). The safener, NA did not influence herbicidal activity on wheat, barley or maize.

Dowco 453 possesses high potential for control of most grass weeds (including volunteer cereals) in onion and broad-leaved crops. Although the margin of selectivity is less with brassica crops, many important grass weeds can still be adequately controlled.

NB: AC 25225 is imazapyr, DOWCO 453 is haloxyfop, HOE 33171 is fenoxaprop-ethyl, HOE 35609 is fenthiaprop-ethyl

ACTIVITY EXPERIMENT

DOWCO 453

		0.05 kg/ha	0.25 kg/ha	1.25 kg/ha
DWARF BEAN	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
	P	xxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
	I	xxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
KALE	F	xxxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
	P	xxxxxxxxxxxxxxx+ xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx+ xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx+ xxxxxxxxxxxxxxx
	I	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
POLYGONUM AMPHIBIUM	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
	P	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx+ xxxxxxxxxxxxxxx
PERENNIAL RYEGRASS	F	xxxxxxxxxxxxxx xxxxxxxxx	x x	o o
	S	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxx xxxxxxxx	o o
	P	xxx xx	o o	o o
	I	xxxxxxxxx xxxxx	o o	o o
AVENA FATUA	F	xxxxxxxxxx xxxxxxx	o o	o o
	S	xxxxxxxxxxxxxx xxxxxxxxxxx	o o	o o
	P	xxxxxxxxxxxxxx xxxxxxxx	o o	o o
	I	xxxxxxxxx xxxxxxxx	xxxxxxxxxxxxxx xxx	xx x
AGROPYRON REPENS	F	xxxxxxxxxxxxxx xxxxxxxxx	o o	o o
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxx	o o
	P	xxxx xxxxxx	o o	o o
	I	xxxxxxxxxxxxxx xxxxxxx	o o	o o

KEY: F = post emergence, foliar application
S = post-emergence, soil drench
P = pre-emergence, surface film
I = pre-planting, incorporated

Species	DOWCO 453 0.05 kg/ha		0.2 kg/ha		0.8 kg/ha	
WHEAT	50	xxxxxxxxxx	12	xx	0	
(1)	7	x	7	x	0	
WHEAT + S	0		0		0	
(2)	0		0		0	
BARLEY	50	xxxxxxxxxx	0		0	
(3)	7	x	0		0	
BARLEY + S	0		0		0	
(4)	0		0		0	
OAT	0		0		0	
(5)	0		0		0	
PER RYGR	70	xxxxxxxxxxxxxx	0		0	
(6)	43	xxxxxxxxx	0		0	
ONION	100	xxxxxxxxxxxxxxxxxxxx	112	xxxxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxxxx
(8)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
DWF BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(9)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
FLD BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(10)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
PEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(11)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
W CLOVER	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(12)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
RAPE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxxx
(14)	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	36	xxxxxxx

DOWCO 453

Species		0.05 kg/ha		0.2 kg/ha		0.8 kg/ha
KALE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx
(15)	79	xxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
CABBAGE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	70	xxxxxxxxxxxxxx
(16)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
CARROT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(18)	93	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
PARSNIP	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(19)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
LETTUCE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(20)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
FENUGREK	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(21)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
SUG BEET	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(22)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
BETA VUL	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(23)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
BROM STE	70	xxxxxxxxxxxxxx	0		0	
(24)	21	xxxx	0		0	
FEST RUB	94	xxxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxx	56	xxxxxxxxxx
(25)	79	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	29	xxxxxx
AVE FATU	25	xxxxx	12	xx	0	
(26)	7	x	7	x	0	
ALO MYOS	50	xxxxxxxxxx	0		0	
(27)	21	xxxx	0		0	
POA ANN	100	xxxxxxxxxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxxx	17	xxx
(28)	79	xxxxxxxxxxxxxxxx	43	xxxxxxxxx	14	xxx

DOWCO 453

Species	0.05 kg/ha		0.2 kg/ha		0.8 kg/ha	
POA TRIV	0		0		0	
(29)	0		0		0	
SIN ARV	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(30)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
RAPH RAP	87	xxxxxxxxxxxxxxxxx	112	xxxxxxxxxxxxxxxxxxx+	112	xxxxxxxxxxxxxxxxxxx+
(31)	86	xxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
CHRY SEG	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(32)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
TRIP MAR	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(33)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
SEN VULG	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(34)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
POL LAPA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(35)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
GAL APAR	89	xxxxxxxxxxxxxxxxx	67	xxxxxxxxxxxxx	67	xxxxxxxxxxxxx
(38)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
CHEN ALB	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(39)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
STEL MED	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(40)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
SPER ARV	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(41)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
VER PERS	71	xxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
(42)	86	xxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx

DOWCO 453

Species	0.05 kg/ha		0.2 kg/ha		0.8 kg/ha	
RUM OBTU	67	R xxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxxx
(44)	86	R xxxxxxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxxx
AG REPEN	100	xxxxxxxxxxxxxxxxxxx	25	xxxxx	62	xxxxxxxxxxxx
(47)	21	xxxx	7	x	14	xxx
AG STOLO	17	xxx	0		0	
(48)	7	x	0		0	
CIRS ARV	100	R xxxxxxxxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxx
(50)	100	R xxxxxxxxxxxxxxxxxxx	100	R xxxxxxxxxxxxxxxxxxx	71	R xxxxxxxxxxxxxx
PHAL PAR	100	xxxxxxxxxxxxxxxxxxx	10	xx	20	xxxx
(54)	43	xxxxxxxxx	7	x	7	x
MAIZE + S	33	xxxxxxx	0		0	
(56)	14	xxx	0		0	
MAIZE	0		0		0	
(57)	0		0		0	
SOL NIG	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(81)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
PHAL MIN	40	xxxxxxxx	0		0	
(84)	14	xxx	0		0	
OXAL LAT	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(87)	50	xxxxxxxxxx	71	xxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx

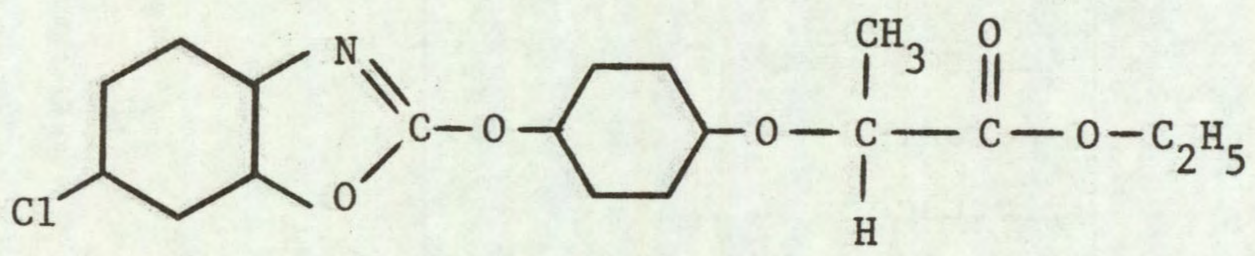
HOE 33171

Code numbers HOE 33171
HOE 00581

Proposed common name Fenoxaprop-ethyl (BSI approved March 1983)

Chemical name Ethyl 2-[4-(6-chloro-3a,4,5,6,7,7a-hexahydrobenzoxazol-2-yloxy)cyclohexyloxy]propionate.

Structure



Source Hoechst UK Ltd
Agriculture Division
Each Winch Hall
East Winch
Norfolk PE32 1HN

Information available and suggested uses

For control of grasses in dicotyledonous crops at 0.18 to 0.22 kg a.i/ha; control of Sorghum halepense (2 applications of 0.18 kg a.i./ha).

Formulation used Emulsifiable concentrate 12% a.i.

Spray volume For activity experiment 373 l/ha.
For post-emergence selectivity experiment 371 l/ha.

RESULTS

Full results are presented in the histograms on pages 23-27 and potential selectivities are summarised in the following table.

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: number or vigour reduced by 70% or more
0.9	onion dwarf bean field bean wheat clover rape kale carrot parsnip lettuce fenugreek sugar beet radish	Phalaris paradoxa + species below
0.3	species above + pea cabbage	Alopecurus myosuroides Phalaris minor + species below
0.1	species above	Avena fatua Poa trivialis Agrostis stolonifera

Comments on results

Activity experiment

Effects were largely confined to the grass species, in particular perennial ryegrass and Avena fatua. With these species, post-emergence activity was due more to the foliar spray, than soil drenches, the latter in fact having no effect on perennial ryegrass and A. repens. Pre-emergence activity was found on perennial ryegrass and A. fatua, but greater activity was found with the foliar spray for the latter species. Differences between surface and incorporated pre-emergence treatments were small, although perennial ryegrass tended to be slightly more sensitive to the surface spray. Only minor, temporary effects were found on broad-leaved species and then only at the high dose.

Symptoms

Susceptible grass species were severely inhibited and turned necrotic. In pre-emergence treatments necrosis was usually preceded by chlorosis.

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