WEED RESEARCH ORGANIZATION

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THE ACTIVITY AND POST-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: NP 48, RH 5205 and PYRIDATE

W G Richardson and C Parker

NP 48 is alloxydim, RH 5205 is ethyl 2-[5-(2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrophenoxy]propionate (Rohm & Haas)

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Agricultural Research Council Weed Research Organization, Begbroke Hill, Yarnton, Oxford, OX5 1PF

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NOTE

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THE ACTIVITY AND POST-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: NP 48, RH 5205 AND PYRIDATE

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SUMMARY

Three herbicides were examined for their early post-emergence selectivity on 36 temperate and 26 tropical crop and weed species. The route of action of these herbicides was determined on six selected species in a separate test.

NP 48 possesses considerable foliar and soil activity against grass species and can be used pre- or post-emergence. Most grass weeds were controlled post-emergence and most broad-leaved crops were tolerant. Broad-leaved weeds were generally resistant.

RH 5205 possesses a high degree of activity via foliage and soil, mainly on broad-leaved species and can also be used pre- or post-emergence. Several annual broad-leaved weeds were controlled post-emergence while a few crops were tolerant, particularly the cereals, ryegrass and kale.

Pyridate exerts its effect mainly via the foliage in broad-leaved species. Several annual broad-leaved weeds were controlled post-emergence, notably Galium aparine, while cereals, brassicas and certain legume crops were tolerant.

INTRODUCTION

The pre- and post-emergence selectivities of new herbicides are investigated on a large number of pot-grown crop and weed species at WRO. The objectives are to discover selectivities, crop and weed susceptibilities and to obtain experience of the type of effects produced by each compound. Attention is drawn to the limitations of these investigations; eg use of only one crop variety or source of weed species and growth in one particular soil type at only one depth of sowing without intraspecific competition. Consequently the results should only be used as a guide for further work; plant responses in pot experiments can be very different to those in the field.

The present report gives indications of the post-emergence selectivity of three new herbicides. Results of activity experiments are also included to provide information on levels of phytotoxicity, type and route of action.

METHODS AND MATERIALS

(a) Activity experiments (AE1, AE2)

These were carried out 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:

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* Herbicide Group
** ODM Tropical Weeds Group

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

Species data are summarised in Table 1 and soil and environmental conditions for all experiments in Table 2.

Table 1. Plant data for activity experiments (AE)

Species	Cultivar/ source	No. per pot at spraying		Depth of planting (cm)	Post-emergence stage of growth at spraying	Stage of growth at assessment	
		pre-	post-			pre-	post-
Dwarf bean (*Phaseolus vulgaris*)	The Prince	3	2	1.8	2 unifoliate leaves	$1\frac{1}{2}$-2 trifoliate leaves	2-$2\frac{1}{2}$ trifoliate leaves
Kale (*Brassica oleracea acephala*)	Maris Kestrel	10	5-6	0.6	$1\frac{1}{2}$-2 leaves	3-4 leaves	$3\frac{1}{2}$-$4\frac{1}{2}$ leaves
Polygonum amphibium	WRO Clone 1	6	3-5	1.2	3-6 leaves	6-8 leaves	6-9 leaves
Perennial ryegrass (*Lolium perenne*)	S 23	15-20	10	0.6	2-3 leaves	10 leaves, tillering	8-15 leaves, tillering
Avena fatua	Farthinghoe, 1972	12	3-6	1.2	$2\frac{1}{2}$-3 leaves	$4\frac{1}{2}$-9 leaves, tillering	7-9 leaves, tillering
Agropyron repens	WRO Clone 31	6	4-5	1.2	2-3 leaves	$4\frac{1}{2}$-8 leaves, tillering	7-10 leaves, tillering

(b) Post-emergence selectivity experiment

The technique for this experiment was as before (Richardson and Parker, 1977). Plants were raised in 9 or 10 cm diameter plastic pots in a soil: peat: sand mixture (4:1:1 by volume). The soil was taken from a field (Begbroke North) at Begbroke Hill. Planting dates were staggered so that the majority of species had reached the 2-4 leaf stage by the time of spraying. Temperate species were raised in the open and tropical species in the glasshouse. Herbicides were applied using a laboratory sprayer operating at a pressure of 2.11 kg/cm^2 (30 lb/in^2) and moving at constant speed 45 cm above the plants.

Table 2. Soil and environmental conditions

Experiment number, type and herbicide(s) included	AE 1 NP 48	AE 2 RH 5205 Pyridate	Post-emergence selectivity test NP 48, RH 5205, Pyridate	
Date of spraying	21.4.77	31.8.77	23 & 29.6.77	
Main assessment completed	26.5.77	5.10.77	18.7.77	
Organic matter (%)	4.1	4.1	4.1	
Clay content (%)	15.0	15.0	15.0	
pH	7.0	7.0	7.0	
John Innes base fertilizer (g/kg)	5.0	-	2.5	
Osmacote 15.12.15 (g/kg)	-	3.5	-	
DDT (5% dust) (g/kg)	0.5	0.5	0.5	
Fritted trace elements (g/kg)	0.25	0.25	0.25	
Epsom salts (g/kg)	1.0	1.0	1.0	
Temperature (°C)			Temperate	Tropical
Mean	17	20	12	25
Maximum	25	29	23	35
Minimum	10	13	3	16
Relative humidity (%)				
Mean	55	52	35	55
Maximum	84	80	56	80
Minimum	20	20	18	30

Before spraying, each species was thinned to constant number per pot. Certain plant material was pre-treated to improve establishment:- Chenopodium album seeds were soaked in 0.1 M potassium nitrate solution and then kept in the light for two days prior to planting; Veronica persica seeds were sown in steam sterilized soil and seedlings (1-2 true leaves) transplanted into the potting medium; seeds of Polygonum aviculare were immersed in concentrated sulphuric acid for 20 minutes and then thoroughly washed before being soaked in an aqueous solution of gibberellic acid (250 ppm w/v) for 48 hours; seeds of fenugreek were inoculated with nodule bacteria (Rhizobium meliloti Dang. Rothamsted Catalogue No. 2012); tubers of Cyperus esculentus and Oxalis latifolia were stored moist at 2°C for four and five weeks respectively prior to planting, to break dormancy. Perennial species were propagated vegetatively as indicated in Appendix 1.

To protect them from soil-borne pathogens all seeds except Chenopodium album, Polygonum aviculare and the temperate cereals were pretreated with one of the following: thiram, Harvesan organomercury (for Avena fatua) or ethylmercuric phosphate + dieldrin (for sugar beet). Temperate cereal seeds were purchased already treated with a mercurial seed dressing.

Stages of growth (exclusive of cotyledons) at spraying are summarised in Appendix 1. After spraying, the plants were protected from rainfall for 24 hours and then given an overhead watering, by means of 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 glasshouse or the open. Watering throughout the experiment was done from overhead. Additional fertilizer in solution was applied to all species at one week intervals after spraying (0.5% v/v Vitafeed 301). Insecticide and fungicide solutions were applied to individual species as required.

Radish (Raphanus raphanistrum) was included for ease of propagation and may be regarded as a crop or weed. Soyabean (Glycine max) unfortunately failed to germinate and germination/sprouting of Holcus lanatus, Cirsium arvense and Cyperus esculentus was erratic. With Oxalis latifolia it was not possible to obtain a constant number of plants per pot and, therefore, results were not computerised. Vigour assessments were made, however, and these are referred to in the text, where appropriate. Fenugreek, a newly included species, had fairly healthy shoots but nine weeks after sowing, roots had failed to produce nodules.

(c) Assessment and processing of results

Results were assessed and processed as before (Richardson and Dean, 1974). Stages of growth at the time of assessment are given in Appendix 1. Survivors were counted and scored on a 0-7 scale as previously, where 0 = dead and 7 = control.

Histograms are presented for 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 histogram, 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%; 'R' indicates a result based on one replicate only and 'M' represents a missing treatment. A value of 100 = as untreated control and 0 = a complete kill.

A table of observed selectivities, using the criteria specified, is presented for each compound along with comments to highlight salient points.

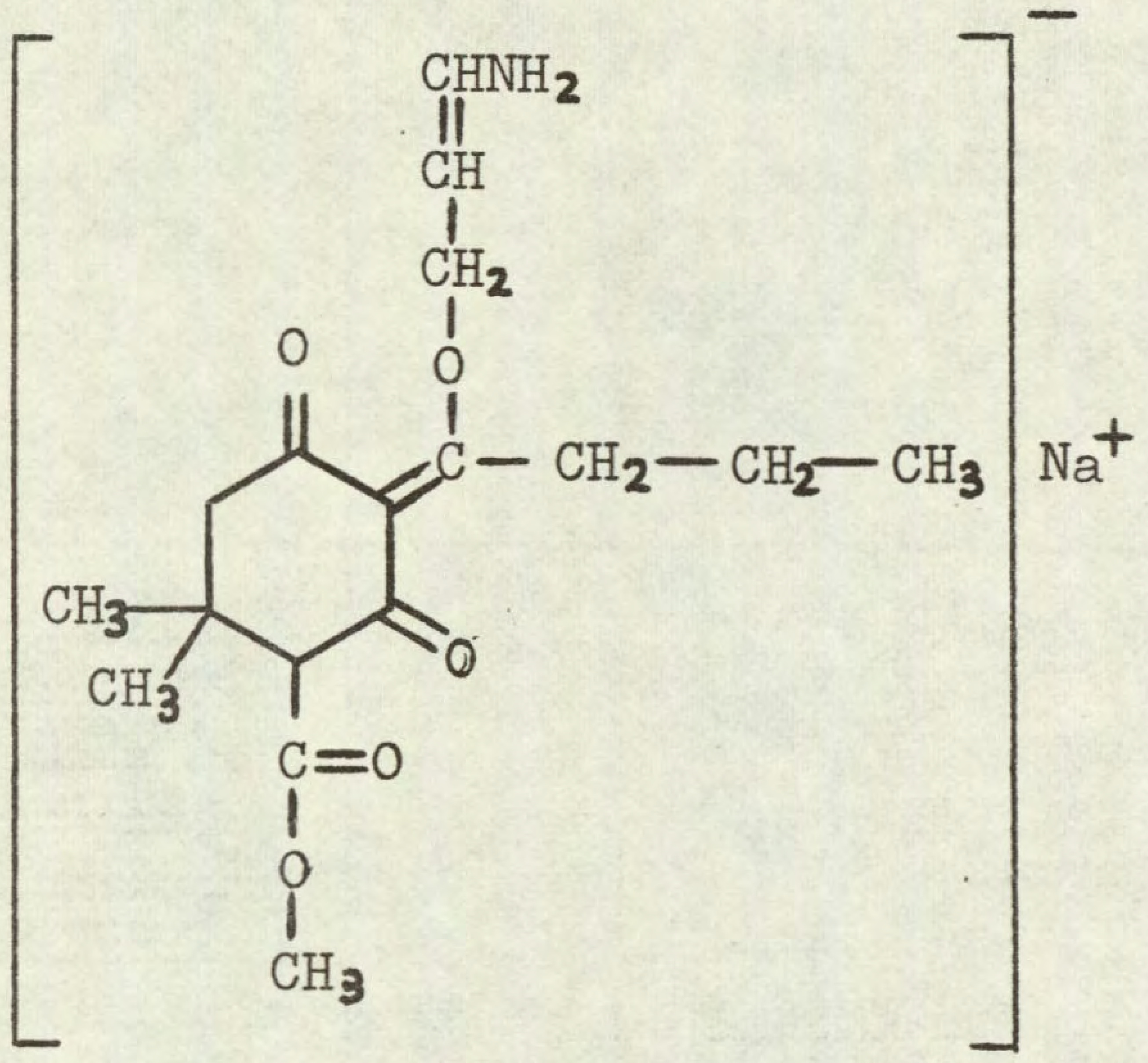
Several species, notably the perennials, were kept for a period of several weeks to observe later effects or the degree of recovery from injury and these final observations are referred to in the text.

Code number NP 48

Proposed common name Alloxydim-sodium
Also has been referred to as Carbodimedon and Alloxydimedon-sodium

Chemical name 2-(1-allyloxyaminobutylidene)-5,5-dimethyl-4-methoxycarbonyl cyclohexane-1,3-dione (sodium salt)

Structure



Source Nippon Soda Co Ltd
Agrochemicals Department
221, Ohtemachi, Chiyoda-ku
Tokyo
Japan

Information available and suggested uses

Suggested post-emergence for control of grass weeds. Broad-leaved weeds are resistant. Dosage for annual weeds, 1.0-2.0 kg a.i./ha; for perennials 1.5-2.5 kg a.i./ha, two application times being advisable. Recommended for use in sugar beet, soybean, cotton and rape. Other tolerant crops are peas, peanuts, potato, beans, sunflower, tobacco, vines and various vegetables. Also active pre-emergence but not recommended due to its short persistence in the soil.

Formulation used Water soluble powder 75% w/w a.i.

Spray volume 345 l/ha for post-emergence selectivity test
340 l/ha for activity experiment

RESULTS

Full results are given in the histograms on pages 9-14 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
4.0	onion dwarf bean field bean pea rape kale cabbage lettuce fenugreek chickpea cotton tobacco tomato	Poa annua Chenopodium album + species below
1.0	species above + white clover carrot parsnip sugar beet radish pigeon pea cow pea groundnut jute kenaf sesamum	Poa trivialis Agropyron repens Agrostis stolonifera Oryza punctata Eleusine indica Rottboellia exaltata Digitaria sanguinalis Snowdenia polystachya + species below
0.25	species above	Avena fatua Alopecurus myosuroides Echinochloa crus-galli

Comments on results

Activity experiment

Grasses were very sensitive, and broad-leaved species resistant, to all four methods of application. With the grasses there was eventually little difference in the level of activity between any of the soil applications. Incorporation pre-emergence was marginally more active against Agropyron repens than the surface spray. A noteable feature, especially with the foliar sprays, was the ability of A. repens (and A. fatua) to recover quite quickly at the lower doses, even after severe initial effects. Thus Agropyron recovered from 1.0 kg/ha eventually, as did Avena from 0.25 kg/ha. This recovery was also seen with Avena at the lowest dose of the pre-emergence surface spray and with Agropyron after the soil drench.

Symptoms

Grasses were inhibited within a few days of treatment, growth of the newest leaf virtually ceasing. Chlorosis, or albinism, developed at the base of the newest leaf and gradually extended throughout the whole shoot system, necrosis developing later. At the lowest doses, some tillers were produced as though to compensate for the main shoot inactivation. The higher pre-emergence doses usually prevented emergence either from the soil or from the coleoptile. At lower doses the growth of both the shoots and roots were severely retarded, the latter often being short and swollen. Symptoms on broad-leaved species were generally minor and usually temporary. Thus, peas recovered from a slight initial stunting of growth. Carrots and Spergula arvensis showed a mild chlorosis and/or necrosis. With Chenopodium album, however, the chlorosis and necrosis were sufficient to kill plants eventually at the highest dose. Onions showed a slight chlorosis and necrosis of their leaf tips.

These symptoms are similar in some respects to those caused by the double phenoxy herbicides eg trifop-methyl, notably with regard to root inhibition. More chlorosis was evident with NP 48 however. Although chlorosis and necrosis are typical herbicide symptoms (eg. with ureas and triazines) NP 48 exerted a much greater and more rapid systemic effect.

Post-emergence selectivity among temperate species

An impressive spectrum of grass weed control was obtained, including perennials as well as annuals. Avena fatua and Alopecurus myosuroides were controlled at the lowest dose of 0.25 kg/ha. The two perennials, Agropyron repens and Agrostis gigantea were severely reduced initially by 0.25 kg/ha and eventually killed by 1.0 kg/ha. Poa trivialis was controlled by 1.0 kg/ha and severely reduced at 0.25 kg/ha but Poa annua proved to be the most resistant of the grass weeds, 4.0 kg/ha being required for control. All broad-leaved species were highly resistant, except Chenopodium album, which was killed at 4.0 kg/ha.

All broad-leaved crops tolerated 1.0 kg/ha or higher. All the large-seeded legumes (dwarf bean, field bean, pea, fenugreek), most of the brassicas (rape, kale, cabbage), as well as onion and lettuce, tolerated 4.0 kg/ha. Even those crops which did not satisfy the criteria of tolerance at 4.0 kg/ha suffered only minor vigour reductions (21-29%) and usually recovered fully. Some caution is necessary with certain of the leguminous species however. When shoots of white clover were harvested four weeks after spraying with 1.0 and 4.0 kg/ha, mean fresh weights were 99 and 63% of control values respectively, showing some reduction at the higher dose. Field bean, harvested at the same time, had shoot fresh weights similar to the controls but minor reductions in dry weight were recorded for shoots, roots and nodules (8 to 29%). Similar effects were found with peas but with somewhat more reduction of the dry weight of roots and nodules (46 and 30%). In a later experiment, peas were treated at the same doses in a similar manner and kept under comparable environmental conditions, until pods had formed. Although dry weights of shoots were not very different from untreated controls, considerable reductions were recorded for root dry weight (41 to 46%), nodule numbers and the fresh weight of nodulated roots. The fresh weight of non-nodulated roots, however was not very much less than in the controls (M P Greaves, unpublished data). Further experiments on peas are being carried out and will be reported later.

From the results of these tests NP 48 would appear to have considerable potential for the control of most annual and perennial grass weeds in most broad-leaved crops, as well as onion. The control of volunteer cereals and grasses (eg perennial ryegrass) is also indicated. Furthermore, selective weed control may be expected pre-emergence (Richardson and Parker, 1978 in press). The similarity between this herbicide and trifop-methyl is quite striking, even though they are chemically unrelated (Richardson and Parker, 1977a and b). The slightly higher resistance of Poa annua as opposed to Poa trivialis and other grass weeds is a feature common to both herbicides. In contrast to trifop-methyl, NP 48 showed a moderate species response difference within the Avena genus. Thus wild oat (A. fatua) was much more susceptible than cultivated oat (Avena sativa) and comparison between NP 48 and chlorfenprop-methyl, the only other herbicide approved for such a purpose, would be worthwhile. It could also be worth looking for intraspecific variation in response among cereal varieties. The short period of persistence in the soil may give NP 48 certain advantages in some situations such as control of grass weeds in stubble after harvest and before planting of a subsequent crop. (Nippon Soda Data Sheet, 1977; Richardson and Parker, 1978, in press).

Post-emergence selectivity among tropical species

All grass weed species, including Rottboellia were effectively controlled by 1 kg/ha whereas all broad-leaved crop and weed species were undamaged at this dose. Chickpea, tomato, tobacco and cotton tolerated the highest dose of 4 kg/ha as did the broad-leaved weeds and Cyperus rotundus. There is a wide range of potential uses for this compound for grass control in tropical broad-leaved crops (and onions). In general the pattern of selectivity is similar to that of trifop-methyl but the greater safety on cotton, if confirmed by further work, could be of particular value.

Rice was more tolerant than other cereals, but all were damaged at the lowest dose of 0.25 kg/ha.

ACTIVITY EXPERIMENT

NP 48

		0.25 kg/ha	1.0 kg/ha	4.0 kg/ha
	F	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx
DWARF BEAN	S	xxxxxxx R xxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx
	P	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	I	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxx
	F	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx
KALE	S	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	P	xxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx	xxxxxxxxxxxx xxxxxxxxxxxxx
	I	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxxx
	F	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx
POLYGONUM AMPHIBIUM	S	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx
	P	xxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx
	F	xxxxxxxxxxxxxx xxxxxx	xxxxxxxxxxxxx xxxx	xxxxxxxxx xx
PERENNIAL RYEGRASS	S	xxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xx	xxxxxxx xx
	P	o o	o o	o o
	I	x xx	o o	o o
	F	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xx
AVENA FATUA	S	xxxxxxxxxxxxxx xxxx	xxxxx x	o o
	P	xxxxxxxxxxxxx xxxxxx	x xx	xxx xx
	I	xxxxxxxxxxxxxx + xxxxx	x xx	o o
	F	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxxx	xxxxxxxxxxxxxx xxxx
AGROPYRON REPENS	S	xxxxxxxxxxxxxx xxxxxxxx	xxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xxx
	P	xxxxxxxxxxxxx xxxxxxxxx	o o	o o
	I	xxxxxx xxxxx	o o	o o

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

POST-EMERGENCE SELECTIVITY EXPERIMENT

NP 48

SPECIES	0.25 kg/ha		1.0 kg/ha		4.0 kg/ha	
WHEAT	100	xxxxxxxxxxxxxxxxxxxx	17	xxx	0	
(1)	57	xxxxxxxxxxx	14	xxx	0	
BARLEY	75	xxxxxxxxxxxxxxx	0		0	
(2)	57	xxxxxxxxxxx	0		0	
OAT	100	xxxxxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx	0	
(3)	71	xxxxxxxxxxxxxx	14	xxx	0	
PER RYGR	100	xxxxxxxxxxxxxxxxxxxx	0		0	
(4)	29	xxxxxx	0		0	
ONION	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(8)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
DWF BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(9)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
FLD BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(10)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
PEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(11)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
W CLOVER	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(12)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
RAPE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(14)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
KALE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(15)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx
CABBAGE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(16)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx

NP 48

SPECIES	0.25 kg/ha		1.0 kg/ha		4.0 kg/ha	
CARROT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(18)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
PARSNIP	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(19)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
LETTUCE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(20)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
SUG BEET	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(21)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
FENUGREK	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(22)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
AVE FATU	83	xxxxxxxxxxxxxxxxx	17	xxx	0	
(26)	29	xxxxxx	7	x	0	
ALO MYOS	10	xx	0		0	
(27)	14	xxx	0		0	
POA ANN	100	xxxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	0	
(28)	93	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	0	
POA TRIV	90	xxxxxxxxxxxxxxxxxx	47	xxxxxxxxx	0	
(29)	36	xxxxxxx	29	xxxxxx	0	
SIN ARV	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(30)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
RAPH RAP	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(31)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
CHRY SEG	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(32)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx

NP 48

SPECIES	0.25 kg/ha		1.0 kg/ha		4.0 kg/ha	
TRIP MAR	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(33)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxxxx
SEN VULG	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(34)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
POL LAPA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(35)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
POL AVIC	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(36)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx
GAL APAR	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(38)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
CHEN ALB	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	0	
(39)	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	0	
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	79	xxxxxxxxxxxxxxxx
VER PERS	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(42)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
RUM OBTU	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(44)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx
AG REPEN	100	xxxxxxxxxxxxxxxxxxxx	70	xxxxxxxxxxxxxx	0	
(47)	50	xxxxxxxxxx	29	xxxxxx	0	
AG STOLO	62	xxxxxxxxxxxx	0		0	
(48)	57	xxxxxxxxxxx	0		0	

POST-EMERGENCE SELECTIVITY EXPERIMENT

NP 48

SPECIES	0.25 kg/ha		1.0 kg/ha		4.0 kg/ha	
MAIZE	100	xxxxxxxxxxxxxxxxxxxx	17	xxx	0	
(58)	43	xxxxxxxxx	21	xxxx	0	
SORGHUM	100	xxxxxxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxxx	0	
(59)	64	xxxxxxxxxxxxx	43	xxxxxxxxx	0	
RICE	100	xxxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	37	xxxxxxx
(60)	79	xxxxxxxxxxxxxxxx	29	xxxxxx	14	xxx
PIGEON P	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(61)	93	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
COWPEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(62)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
CHICKPEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(63)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
GRNDNUT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(64)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
COTTON	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(66)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
JUTE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(67)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
KENAF	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(68)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
TOBACCO	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(69)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx
SESAMUM	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxxx
(70)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx

POST-EMERGENCE SELECTIVITY EXPERIMENT

NP 48

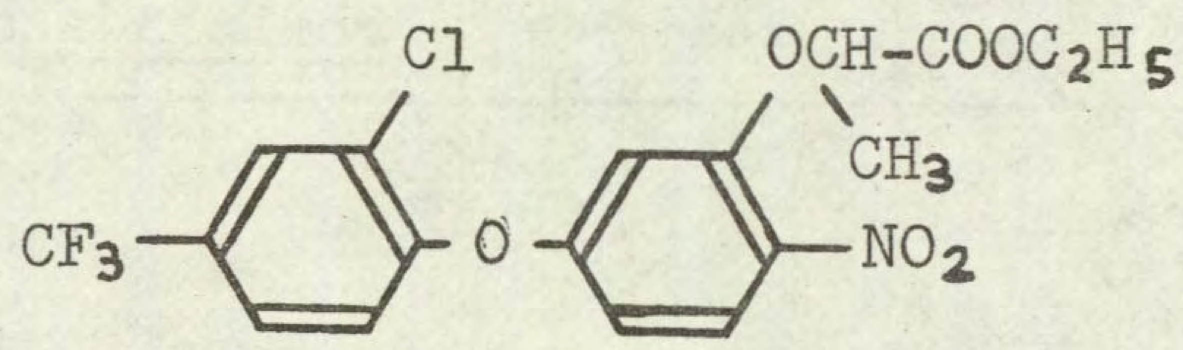
SPECIES	0.25 kg/ha		1.0 kg/ha		4.0 kg/ha	
TOMATO	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(71)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
OR PUNCT	94	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	25	xxxxx
(73)	43	xxxxxxxxx	29	xxxxxx	7	x
ELEU IND	100	xxxxxxxxxxxxxxxxxxxx	60	xxxxxxxxxxxx	0	
(74)	71	xxxxxxxxxxxxxx	29	xxxxxx	0	
ECH CRUS	80	xxxxxxxxxxxxxxxx	0		0	
(75)	29	xxxxxx	0		0	
ROTT EXA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	69	xxxxxxxxxxxxxx
(76)	50	xxxxxxxxxx	29	xxxxxx	29	xxxxxx
DIG SANG	100	xxxxxxxxxxxxxxxxxxxx	6	x	0	
(77)	50	xxxxxxxxxx	7	x	0	
AMAR RET	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(78)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
PORT OLE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(79)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx
SOL NIG	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(81)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
SNOW POL	69	xxxxxxxxxxxxxx	0		0	
(83)	43	xxxxxxxxx	0		0	
CYP ROTU	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(86)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx

RH 5205

Code number RH 5205

Chemical name Ethyl-2-{5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrophenoxy} propionate

Structure



Source Rohm and Haas (UK) Ltd
Lennig House
2 Masons Avenue
Croydon
Surrey CR9 3NB

Information available and suggested uses

Originally suggested for post-emergence control of broad-leaved weeds in cereals at 0.06 kg a.i./ha, but there is at present some doubts about its future development and the manufacturer ought to be consulted.

Formulation used Wettable powder 25% w/w a.i.

Spray volume 345 l/ha for post-emergence selectivity experiment
340 l/ha for activity experiment

RESULTS

Full results are given in the histograms on pages 18-23 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
0.8	perennial ryegrass	Chrysanthemum segetum Polygonum lapathifolium Polygonum aviculare Galium aparine Chenopodium album Solanum nigrum + species below
0.2	species above + barley oat kale rice	Sinapis arvensis Stellaria media Rumex obtusifolius Amaranthus retroflexus + species below

(Table continued overleaf)

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: number or vigour reduced by 70% or more
0.05	species above + wheat onion pea cabbage maize	Raphanus raphanistrum Tripleurospermum maritimum Senecio vulgaris Spergula arvensis Veronica persica Portulaca oleracea

Comments on results

Activity experiment

Substantial activity resulted from the foliar spray, particularly on the broad-leaved species. Activity from soil drenches was generally as great as with the foliar spray in the latter species and on grasses it was even greater.

Pre-emergence treatments to kale, perennial ryegrass and dwarf bean were very active. For ryegrass and kale, surface applications were distinctly more active than where the herbicide was incorporated. On the other species, differences between the two application methods were small and inconsistent.

Symptoms

Severe contact scorch damage resulted from the foliar spray, particularly on the broad-leaved species. However, buds of these, and apical meristems of the grasses, were not always affected and plants were able to recover. This was most striking with perennial ryegrass and some other grass species. Soil drenches caused severe browning and necrosis in the vascular regions of stems and leaves, many of the broad-leaved species apparently dying with wilting symptoms, presumably because of the effect on or via the vascular system. Leaf blades of grasses were often very narrow and occasionally leaf trapping was observed.

In the pre-emergence treatments, higher doses often prevented emergence, while at lower doses, growth was retarded with necrosis, mainly of the older leaves.

Post-emergence selectivity among temperate species

All annual broad-leaved weeds were controlled at 0.8 kg/ha, several of these even at lower doses of 0.2 and 0.05 kg/ha. Cruciferous weeds, especially Raphanus raphanistrum, and two of the composites, Tripleurospermum maritimum and Senecio vulgaris were sensitive. Grass weeds were relatively resistant.

Perennial ryegrass, the most tolerant crop, was the only one to withstand 0.8 kg/ha. Results from the activity experiment suggest that this species may well tolerate higher doses, possibly up to 2.0 kg/ha. The cereals, barley and oat were tolerant to 0.2 kg/ha while wheat was reduced in vigour only marginally. Among the brassica crops, cabbage and kale showed some degree of tolerance but rape was sensitive. Onion and pea were the only other tolerant crops, the latter being reduced in vigour only marginally at 0.2 kg/ha. Field bean, parsnip, lettuce and radish were very sensitive.

The results of this test lend some support to the manufacturers' suggestions for controlling some broad-leaved weeds in cereals. Grass weeds were fairly resistant however. Some further testing is required with regard to the control of certain broad-leaved weeds, notably the crucifers Sinapis arvensis and Raphanus raphanistrum, in kale and cabbage. Further pot work has shown that young seedlings of Rumex obtusifolius, but not more mature plants (c. 4-5 leaf stage), can be controlled in perennial ryegrass.

Post-emergence selectivity among tropical species

Grass weeds and Cyperus rotundus were relatively tolerant whereas small-seeded, broad-leaved species were generally sensitive to this compound. Amaranthus was rather less susceptible than Portulaca and some of the crops such as jute and sesamum. Solanum nigrum was relatively tolerant in this test but was larger than most others at the time of spraying. Very young seedlings of most broad-leaved species should prove susceptible to low doses but, as most crops are damaged even at 0.05 kg/ha, the selectivity of overall post-emergence sprays would be doubtful. Rice was fully tolerant of the lowest dose and small doses of the compound could perhaps be considered in combination with early post-emergence applications of specific sedge and grass-killing herbicides.

If pre-emergence testing confirms good persistent activity, this highly active compound could be of interest as an inter-row directed treatment in annual and perennial row crops, perhaps in combination with one of the new highly selective grass herbicides such as NP 48.

ACTIVITY EXPERIMENT

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		0.1 kg/ha	0.5 kg/ha	2.5 kg/ha
DWARF BEAN	F	xxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xx	xxxxxxxxxxxxxx xx
	S	xxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxx xx	xxxxxxxxxxx xx
	P	xxxxxxxxxxxxxx xxxxxxxxx	xxxxxxx xx	o o
	I	xxxxxxxxxxxx xxxxxxxxx	o o	o o
KALE	F	xxxxxxxxxxxxxx xxxxxxxx	xxxxxx xxxx	xxxxxx xxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxx	xxxxxxx xx
	P	x xx	o o	o o
	I	xxxxxxxxxxxx xxxxxxxxxxxx	x xxx	o o
<u>POLYGONUM AMPHIBIUM</u>	F	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxx xxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxx	xxxxxxxxxxxxxx xxxxx
	P	xxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxx xxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxx	xxxxxxxxxxxxxx xxxxxxxx
PERENNIAL RYEGRASS	F	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	P	xxxxxxxxxx xxxxxxxxxx	xxxx xxxxxxx	o o
	I	xxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxx	xxxxxxx xxxxxx
<u>AVENA FATUA</u>	F	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxx xxxx
	P	xxxxxxxxxxxxxx xxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxx xxxxxxxx
	I	xxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxx
<u>AGROPYRON REPENS</u>	F	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxx
	P	xxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxx
	I	xxxxxxxxxxxxxx + xxxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxx

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

POST-EMERGENCE SELECTIVITY EXPERIMENT

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SPECIES	0.05 kg/ha		0.2 kg/ha		0.8 kg/ha	
WHEAT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(1)	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
BARLEY	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(2)	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
OAT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
PER RYGR	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(4)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
ONION	100	xxxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx	60	xxxxxxxxxxxx
(8)	93	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	57	xxxxxxxxxxx
DWF BEAN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(9)	57	xxxxxxxxxxx	21	xxxx	29	xxxxxx
FLD BEAN	67	xxxxxxxxxxxxx	0		0	
(10)	43	xxxxxxxxx	0		0	
PEA	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(11)	93	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
W CLOVER	100	xxxxxxxxxxxxxxxxxxxx	56	xxxxxxxxxxx	0	
(12)	64	xxxxxxxxxxxxx	29	xxxxxx	0	
RAPE	100	xxxxxxxxxxxxxxxxxxxx	17	xxx	0	
(14)	64	xxxxxxxxxxxxx	21	xxxx	0	
KALE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(15)	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
CABBAGE	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(16)	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	43	xxxxxxxxx

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SPECIES	0.05 kg/ha		0.2 kg/ha		0.8 kg/ha	
CARROT	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
(18)	57	xxxxxxxxxxx	36	xxxxxxx	14	xxx
PARSNIP	40	xxxxxxxx	0		0	
(19)	57	xxxxxxxxxxx	0		0	
LETTUCE	8	xx	0		0	
(20)	36	xxxxxxx	0		0	
SUG BEET	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	17	xxx
(21)	64	xxxxxxxxxxxxx	50	xxxxxxxxxx	14	xxx
FENUGREK	100	xxxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
(22)	71	xxxxxxxxxxxxxx	57	xxxxxxxxxxx	21	xxxx
AVE FATU	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(26)	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
ALO MYOS	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(27)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
POA ANN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	92	xxxxxxxxxxxxxxxxxx
(28)	71	xxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
POA TRIV	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(29)	86	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
SIN ARV	50	xxxxxxxxxx	0		0	
(30)	57	xxxxxxxxxxx	0		0	
RAPH RAP	0		0		0	
(31)	0		0		0	
CHRY SEG	100	xxxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	57	xxxxxxxxxxx
(32)	50	xxxxxxxxxx	79	xxxxxxxxxxxxxxxx	29	xxxxxx

POST-EMERGENCE SELECTIVITY EXPERIMENT

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SPECIES	0.05 kg/ha		0.2 kg/ha		0.8 kg/ha	
TRIP MAR	0		0		0	
(33)	0		0		0	
SEN VULG	10	xx	0		0	
(34)	7	x	0		0	
POL LAPA	100	xxxxxxxxxxxxxxxxxxxx	37	xxxxxxx	6	x
(35)	71	xxxxxxxxxxxxxx	57	xxxxxxxxxxx	7	x
POL AVIC	92	xxxxxxxxxxxxxxxxxx	42	xxxxxxxx	17	xxx
(36)	64	xxxxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
GAL APAR	94	xxxxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx	69	xxxxxxxxxxxxxx
(38)	57	xxxxxxxxxxx	43	xxxxxxxxx	14	xxx
CHEN ALB	83	xxxxxxxxxxxxxxxxx	58	xxxxxxxxxxxx	33	xxxxxxx
(39)	64	xxxxxxxxxxxxx	50	xxxxxxxxxx	21	xxxx
STEL MED	100	xxxxxxxxxxxxxxxxxxxx	25	xxxxx	0	
(40)	86	xxxxxxxxxxxxxxxxx	21	xxxx	0	
SPER ARV	0		0		0	
(41)	0		0		0	
VER PERS	30	xxxxxx	0		0	
(42)	29	xxxxxx	0		0	
RUM OBTU	60	xxxxxxxxxxxx	40	xxxxxxxx	0	
(44)	64	xxxxxxxxxxxxx	29	xxxxxx	0	
AG REPEN	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(47)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
AG STOLO	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx
(48)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx