INSTITUTE OF
ARABLE CROPS RESEARCH
Long Ashton Research Station
CROP PROTECTION DEPARTMENT

AFRC Grant Aided

UNIVERSITY OF BRISTOL

TECHNICAL REPORT No.106

THE ACTIVITY, PRE-EMERGENCE SELECTIVITY AND PERSISTENCE OF SOME RECENTLY DEVELOPED HERBICIDES: BAS 51800H, DPX-L5300, triasulfuron, DPX-A7881 and fluroxypyr.

BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

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November 1989

Price: £6.00

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ISSN 0551 4136
ISBN 0 7084 0494 4

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CONTENTS

NOTE

WEST, T.M. The activity, pre-emergence selectivity and persistence of some recently developed herbicides: BAS 51800H, DPX-L5300, triasulfuron, DPX-A7881 and fluroxypyr. Technical Report Long Ashton Research Station, Crop Protection Department, 1989, No. 106, pp. 48.

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ACTIVITY, PRE-EMERGENCE SELECTIVITY AND PERSISTENCE OF SOME RECENTLY DEVELOPED HERBICIDES: BAS 51800H, DPX-L5300, TRIASULFURON, DPX-A7881 and FLUROXYPYR

T.M. WEST

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SUMMARY

In glasshouse pot experiments, five herbicides were tested as pre-emergence surface sprays for selectivity on 17 crop and 26 weed species. Wheat, barley, oat and maize were each treated with seed dressings of the safener, 1,8-naphthalic anhydride (NA) to investigate possible protection from herbicide injury. Soil persistence of the herbicides, except BAS 51800H, was assessed over a 52 week period.

BAS 51800H was active pre-emergence. Some broad-leaved weed species were particularly sensitive, including Galium aparine and Veronica persica, while several others were controlled at higher doses that cereals and maize tolerated. Brassicas, sugar beet, dwarf bean, onion and perennial ryegrass also showed appreciable tolerance.

DPX-L5300 killed a wide range of broad-leaved weeds. The cereals showed excellent tolerance, and maize tolerance was enhanced when seed was dressed with the safener.

Triasulfuron killed many important broad-leaved weeds and a few annual grass weeds. Tolerance of barley and maize was good, and that of wheat was excellent. Oat was less tolerant, however, tolerance was increased by seed dressing with the safener.

DPX-A7881 was active pre-emergence against many broad-leaved and grass weeds. However, crop tolerance, especially of the brassicas, was limited compared with post-emergence treatments. Crops showing the most tolerance were wheat and oat, when seed was dressed with the safener.

Fluroxypyr was active pre-emergence, Galium aparine, Stellaria media and some composite weeds being sensitive at doses tolerated by the cereals and sunflower. Oat showed exceptional tolerance, at 1 kg a.i./ha, to which many broad-leaved weeds were sensitive.

Soil persistence, assessed using suitable test species, was found to be short for DPX-L5300, short-to-moderate for fluroxypyr and long for triasulfuron and DPX-A7881. This was in comparison with cyanazine (short persistence) and simazine and chlorosulfuron (long persistence).

BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

INTRODUCTION

The pre- and post-emergence activities and selectivities of new herbicides are investigated at LARS Weed Research Department on a large number of crop and weed species grown in pots. Persistence in the soil is also assessed and provides data which, in conjunction with data on 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 herbicides. Results of experiments investigating the response of these herbicidea applied separately to shoot, root and seed, to provide information on route, type and degree of phytotoxicity were reported previously for BAS 51800H, DPX-L5300, triasulfuron and DPX-A7881 by West (1988) and for fluroxypyr (DOWCO 433) by Richardson, West and Parker (1981b).

METHODS AND MATERIALS

Pre-emergence selectivity experiment

General techniques for the selectivity experiment were as described by Richardson and Dean (1973). Seeds, rhizomes or roots were sown in 9 cm diameter plastic pots, as described in Appendix 1, containing a Mendip sandy clay loam with Vitax Q4 fertiliser added (Table 1).

To improve germination, *Chenopodium album* seeds were kept in 0.1M potassium nitrate for 48 hours in the light before sowing, and *Fallopia convolvulus* seeds were stored at 4°C in moist sand for two weeks before sowing.

Cirsium arvense root fragments were soaked in thiram, 0.55 g/l, for one hour to protect from soil borne pathogens. Dwarf bean seed was purchased already treated with Bromotex and maize seed with Captan A and teraquinone. The brassicas and *Veronica persica* were given a soil drench with Cheshunt compound (ammonium carbamate + copper sulphate), at 3.05 g/l, one week after spraying to prevent damping-off disease.

An additional series of wheat, barley, oat and maize was treated with a safener, 1,8 naphthalic anhydride (NA) formulated as a wettable powder, to investigate possible protection from herbicide injury. Seeds were dressed by shaking them in a polythene bag with NA, at 0.5% of the seed weight.

Herbicides were applied as pre-emergence surface sprays, using a laboratory track sprayer. The sprayer was fitted with an 8002E Spraying Systems TeeJet operating at a pressure of 210 kPa (30 lb/in^2), delivering 405 l/ha and moving at 0.5 m/sec, 30 cm above the stationary pots. There were two replicates for each treatment. After spraying, pots were set out in randomised blocks in a glasshouse where normal daylight was supplemented by mercury vapour lamps to provide 14 hour photoperiods. Irrigation was by overhead hand watering.

Assessments and processing of results

Results were assessed and processed as in previous work (Richardson and Dean, 1973). Survivors were counted and scored for vigour on a 0 - 7

BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

scale, where 0 = dead and 7 = as untreated control. Pairs of histograms are presented for each treatment, the upper representing plant survival and the lower vigour, both calculated as percentages of untreated controls.

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

Persistence in the soil

Residual phytotoxicity was assessed by bioassay at up to seven dates after spraying. Pots (7.5 cm diameter) containing a 6 cm depth of soil were sprayed with herbicides and then transferred to a temperate glasshouse, together with untreated controls, and watered from overhead to keep soil moist.

For each bioassay, three replicate pots were sown with as little disruption to the soil as possible. Sugar beet was sown 1 cm deep into soil sprayed with either DPX-L5300, triasulfuron or fluroxypyr; perennial ryegrass was sown 0.5 cm deep into soil sprayed with DPX-A7881 and *Veronica persica* was sown 0.25 cm deep into soil sprayed with BAS 51800H. Plants were harvested at a pre-determined 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 was considered to have disappeared when shoot fresh weights of the test plants were 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), simazine (moderate to long persistence) and chlorsulfuron (long persistence) were included for comparison (see page 44). Average temperature during this period was 15°C (minimum 5°C, maximum 35°C) and relative humidity 60% (minimum 20%, maximum 93%).

Table 1. Soil and environment conditions

	Experiment type
	Pre-emergence selectivity
Dates of spraying	29 Jan 87
Main assessment completed	23 Mar 87
Soil - Mendip silt loam	(+ 15% v/v sand)
Particle size analysis	%
coarse sand (600 µm-2mm)	2.1
medium sand (212 µm-600µm)	41.4
fine sand (63µm-212µm)	13.8
silt (2µm-63µm)	26.6
clay (< 2µm)	16.1
Organic matter (%)	4.6
pH (in water: 1:2 soil: water ratio)	6.0
Fertiliser addition	
Vitax Q4	3.3g/litre
Temperature (°C) Glasshouse	
Mean	16
Maximum	25
Minimum	18
Relative humidity (%)	
Mean	62
Maximum	86
Minimum	25

BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

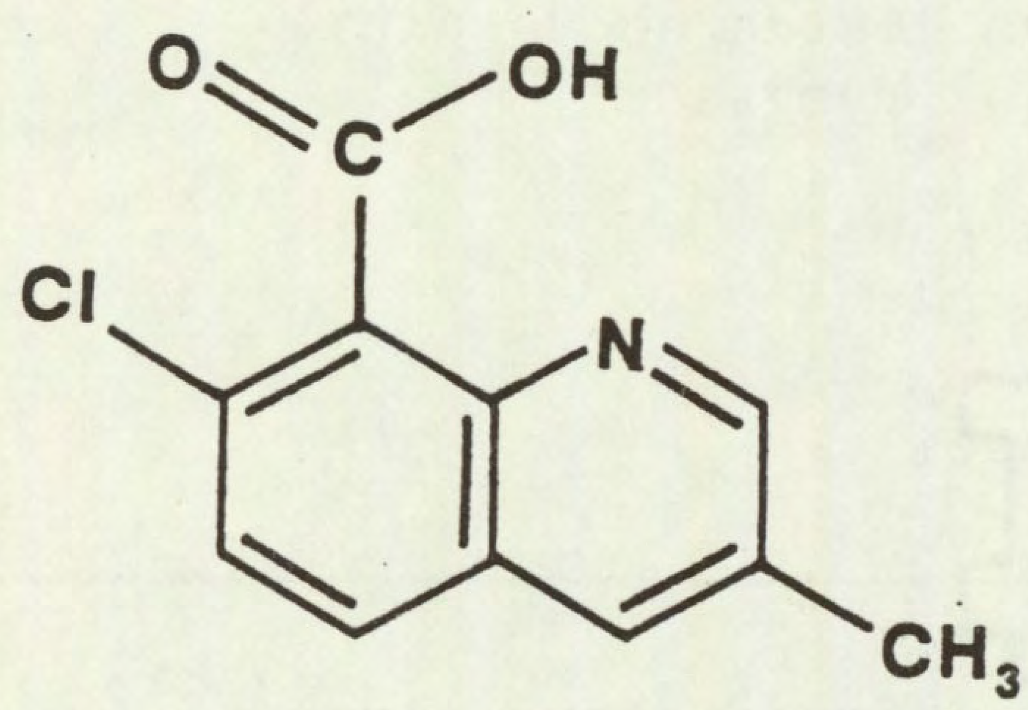
BAS 51800H

Code number BAS 51800H, BAS 518H Trade name Facet

Common name Quinmerac (BSI-approved, ISO-provisional)

Chemical name 7-chloro-3-methylquinoline-8-carboxylic acid

Structure



Source BASF (UK) Ltd.
Agricultural Division
Lady Lane
Hadleigh
Suffolk, IP7 6BQ

Information available and suggested uses from originating company

For control of Galium aparine, Veronica spp. and Lamium spp. pre- and post-emergence in cereals, oilseed rape and sugar beet at rates from 0.5 - 2.0 kg a.i./ha.

Formulation used Wettable powder 50% a.i.

Results

Full results are given in the histograms on pages 8-11 and potential selectivities in Table 4.

Table 4 Crop tolerance and weed sensitivity to pre-emergence treatments of BAS 51800H

Dose (kg a.i./ha)	Tolerant Crops[a]	Sensitive weeds[b]
4.0	wheat +/- safener barley +/- safener oat +/- safener maize +/- safener dwarf bean	Chrysanthemum segetum Senecio vulgaris Viola arvensis Geranium dissectum Cirsium arvense (plus species listed below)
1.0	(species listed above plus) perennial ryegrass onion oilseed rape kale swede sugar beet	Matricaria perforata (plus species listed below)
0.25	(species listed above plus) field bean pea sunflower	Lamium purpureum Galium aparine Veronica persica Convolvulus arvensis Solanum nigrum

[a] Vigour reduced by less than 15%

[b] number or vigour reduced by 70% or more

Comments on results

Activity test data, symptoms caused on susceptible species and post-emergence selectivities of BAS 51800H were reported previously (West, 1988).

Soil persistence

Due to poor germination and damping off disease of the test species, Veronica persica, during the course of the bioassays, the information was inconclusive for BAS 51800H and is not presented. This test will be repeated and information made available at a later date. However, the data collected indicated a moderate to long period of soil persistence, in keeping with information already published (Wuerzer et al., 1985).

Pre-emergence selectivities

Five important broad-leaved weeds, Galium aparine, Veronica persica, Lamium purpureum, Solanum nigrum and Chenopodium album, were susceptible at the lowest dose, 0.25 kg a.i./ha. At 1.0 kg a.i./ha Matricaria perforata was susceptible and at 4.0 kg a.i./ha Viola arvensis, Geranium dissectum and some compositae spp. were controlled. Weed species not affected by 4.0 kg a.i./ha included cruciferous spp, polygonaceous spp, Stellaria media and all graminaceous spp.

Crop tolerance was good for wheat, barley, oat, maize and dwarf bean, all being unaffected at 4.0 kg a.i./ha. The brassicas, sugar beet, onion and perennial rye-grass tolerated 1.0 kg a.i./ha and field bean, pea and sunflower showed no adverse effects from 0.25 kg a.i./ha. White clover, carrot and lettuce were particularly sensitive to BAS 51800H.

Discussion

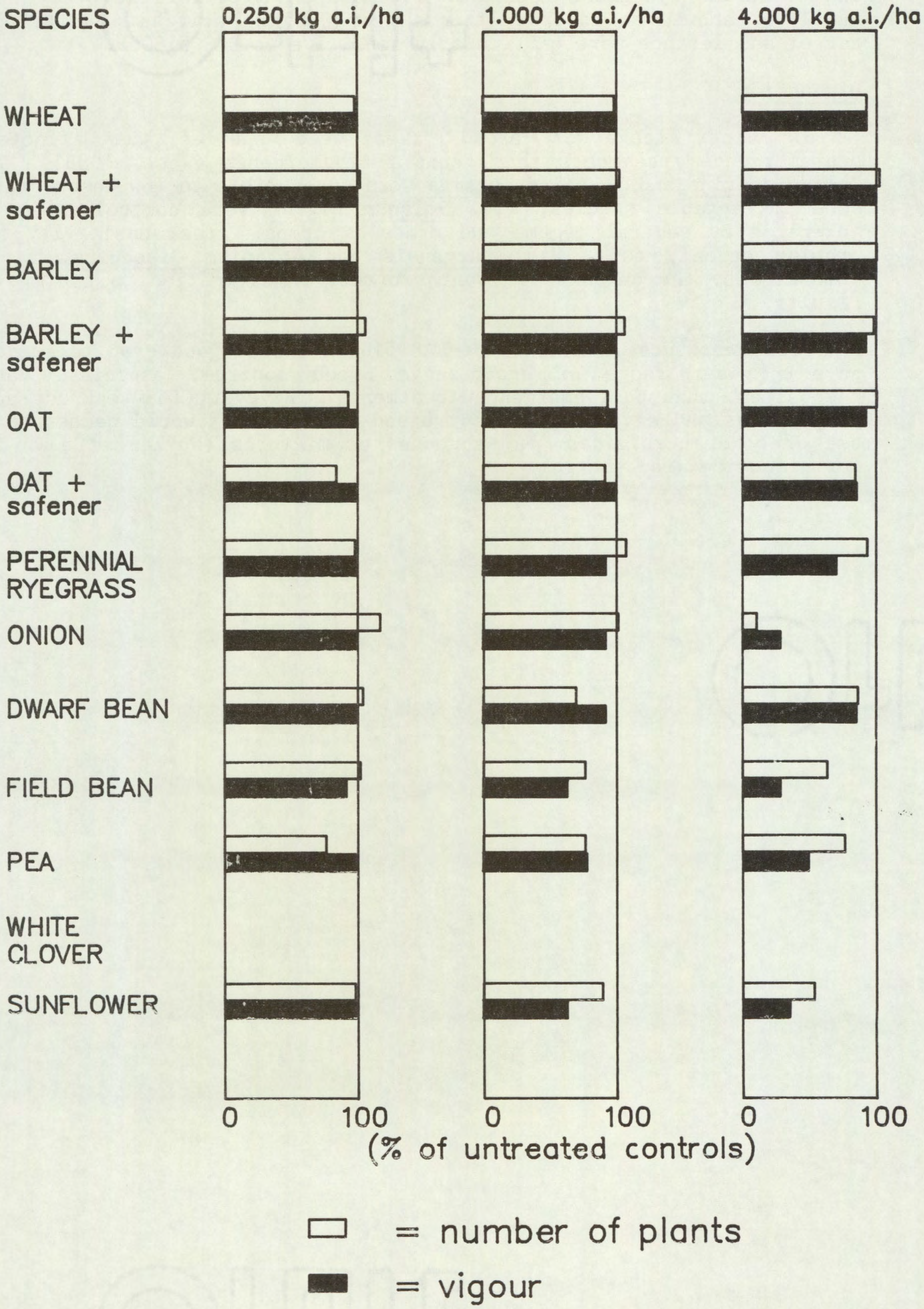
A wider range of broad-leaved weed species was affected by pre-emergence treatments than found post-emergence (West, 1988). Again, *Galium aparine* and *Veronica persica* were susceptible to low doses, but also some intractable species, e.g. *Solanum nigrum* were controlled at doses tolerated by several legume and brassica crops. The sensitivity of the problem cereal weeds, *Viola arvensis* and *Geranium dissectum*, at doses tolerated by the cereals, is worth further investigation to confirm these results.

Pre-emergence treatments of BAS 51800H showed good crop tolerance and gave a wider range of broad-leaved weed control, especially against composites, than post-emergence treatments. However, its weakness against grass weeds and several important broad-leaved weeds would necessitate the use of other herbicides, in sequences or mixtures (Nuyken *et al*., 1985), for effective weed control.

BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

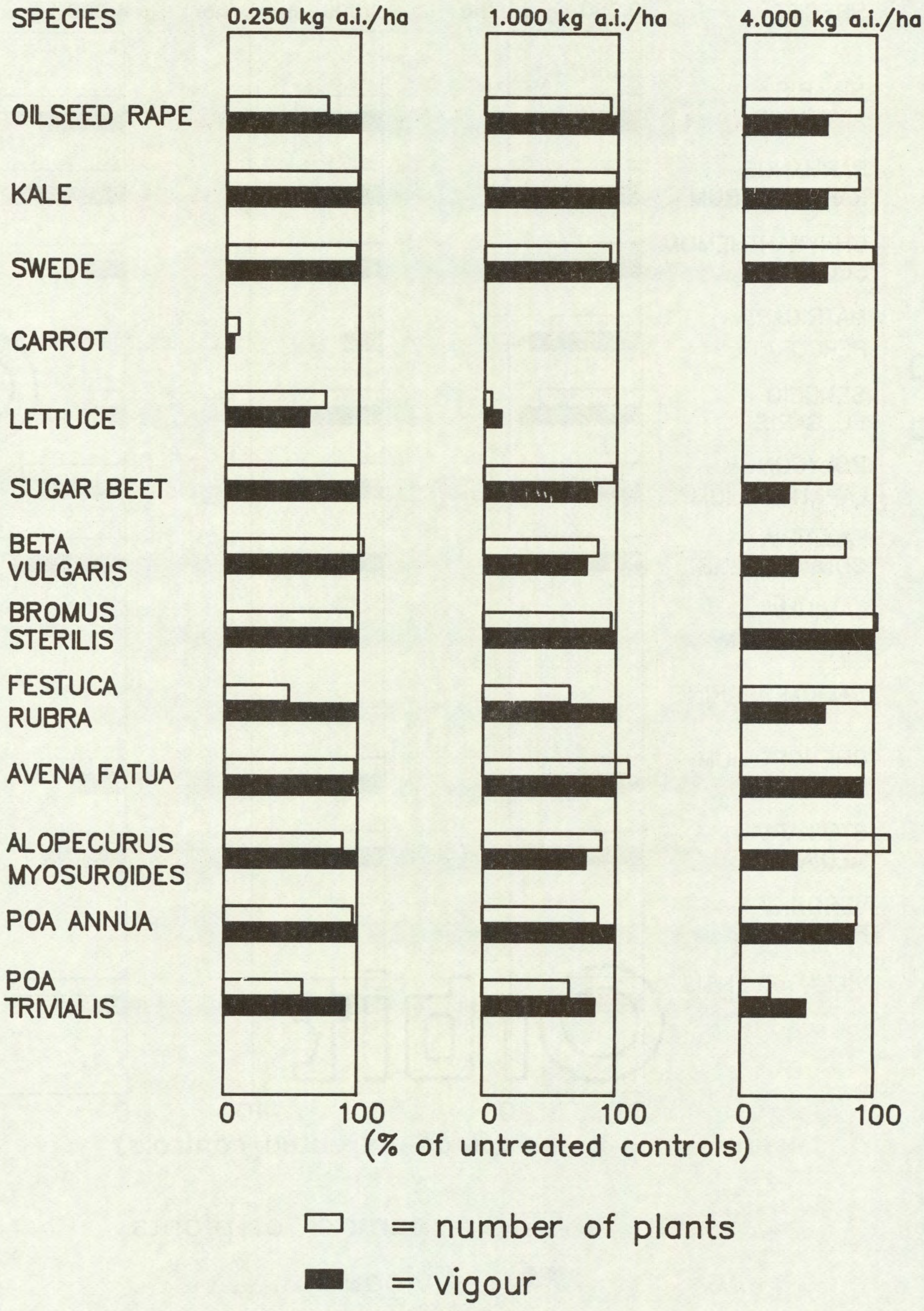
BAS 51800H



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

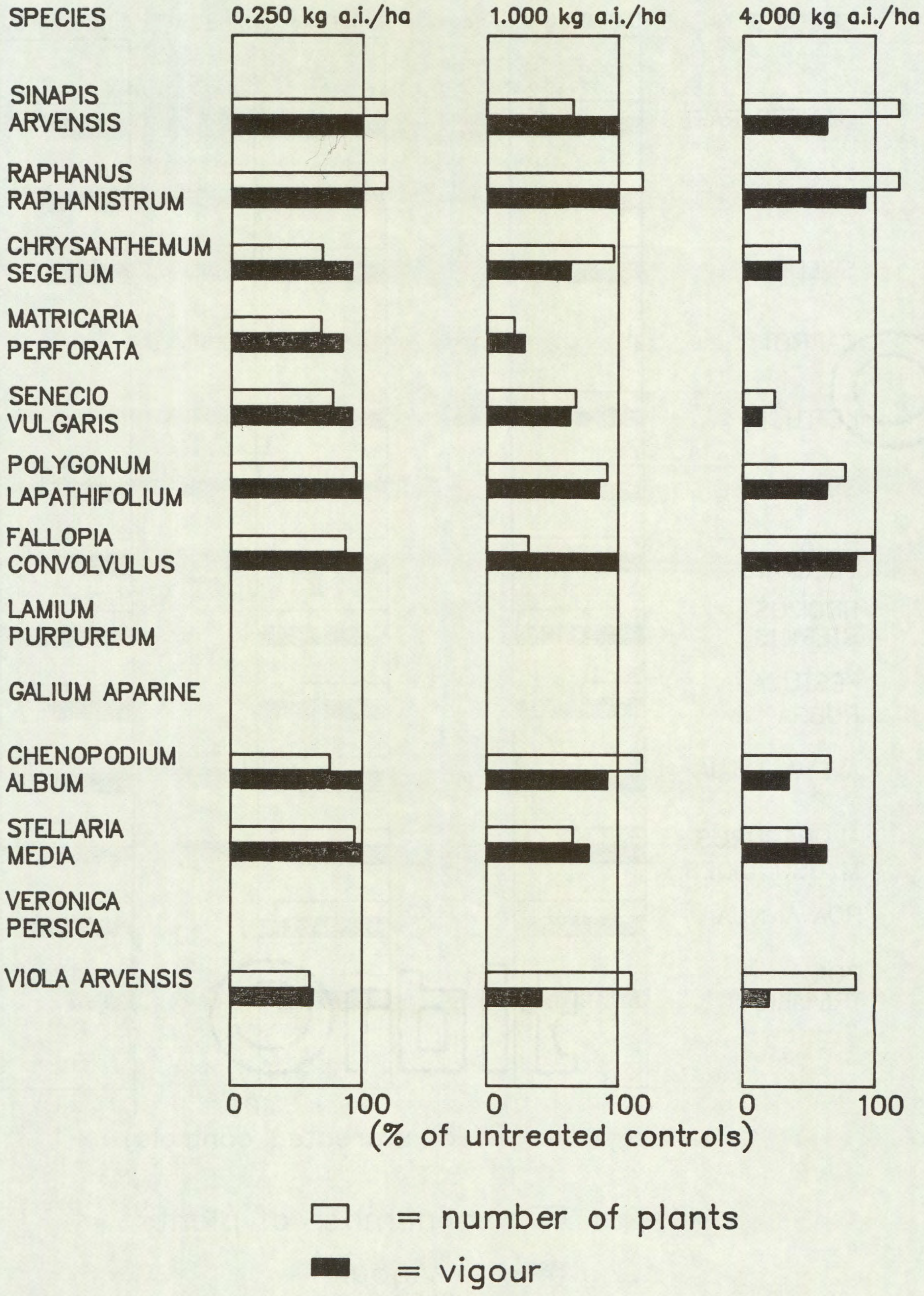
BAS 51800H



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

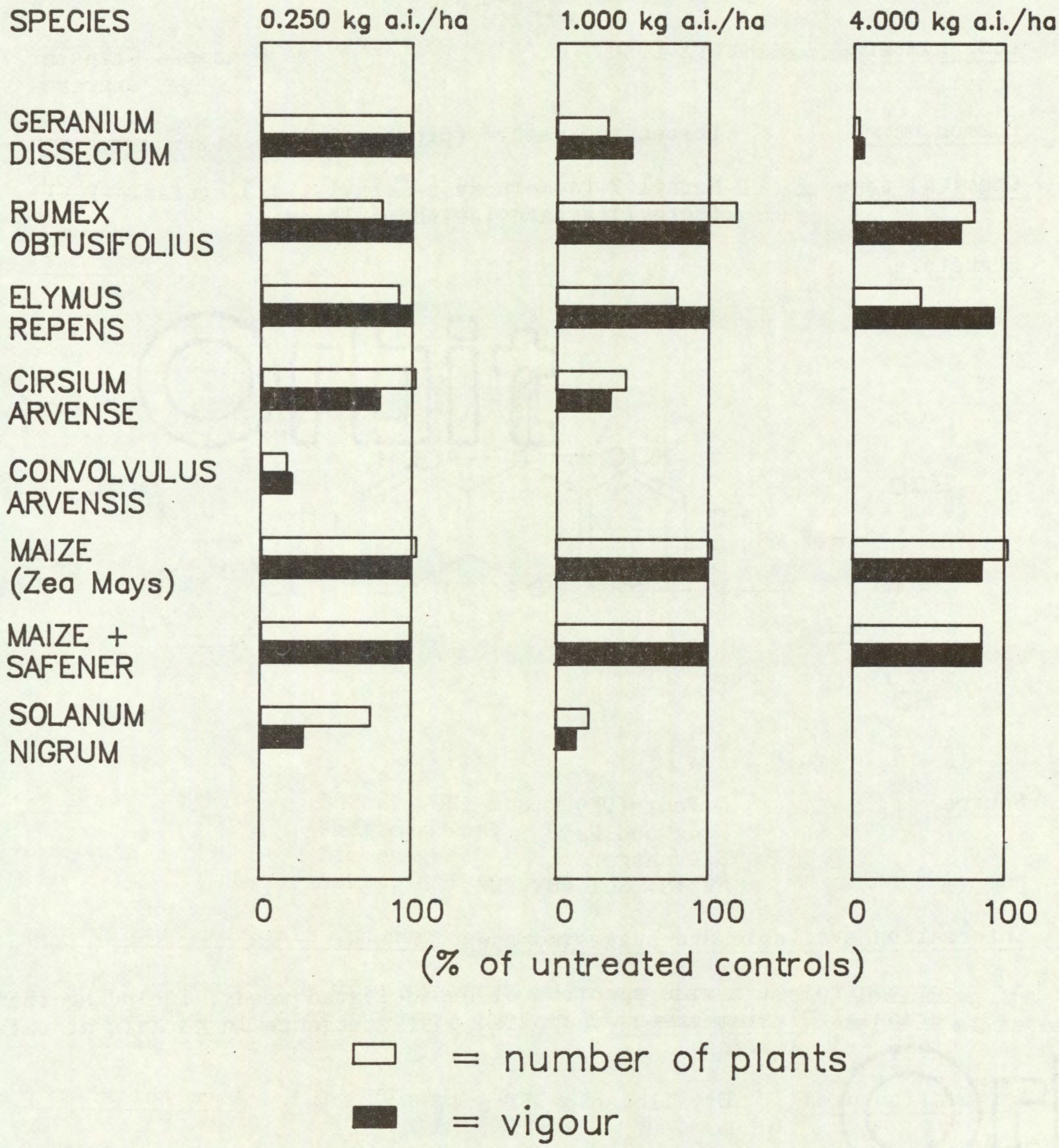
BAS 51800H



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

BAS 51800H



DPX-L5300

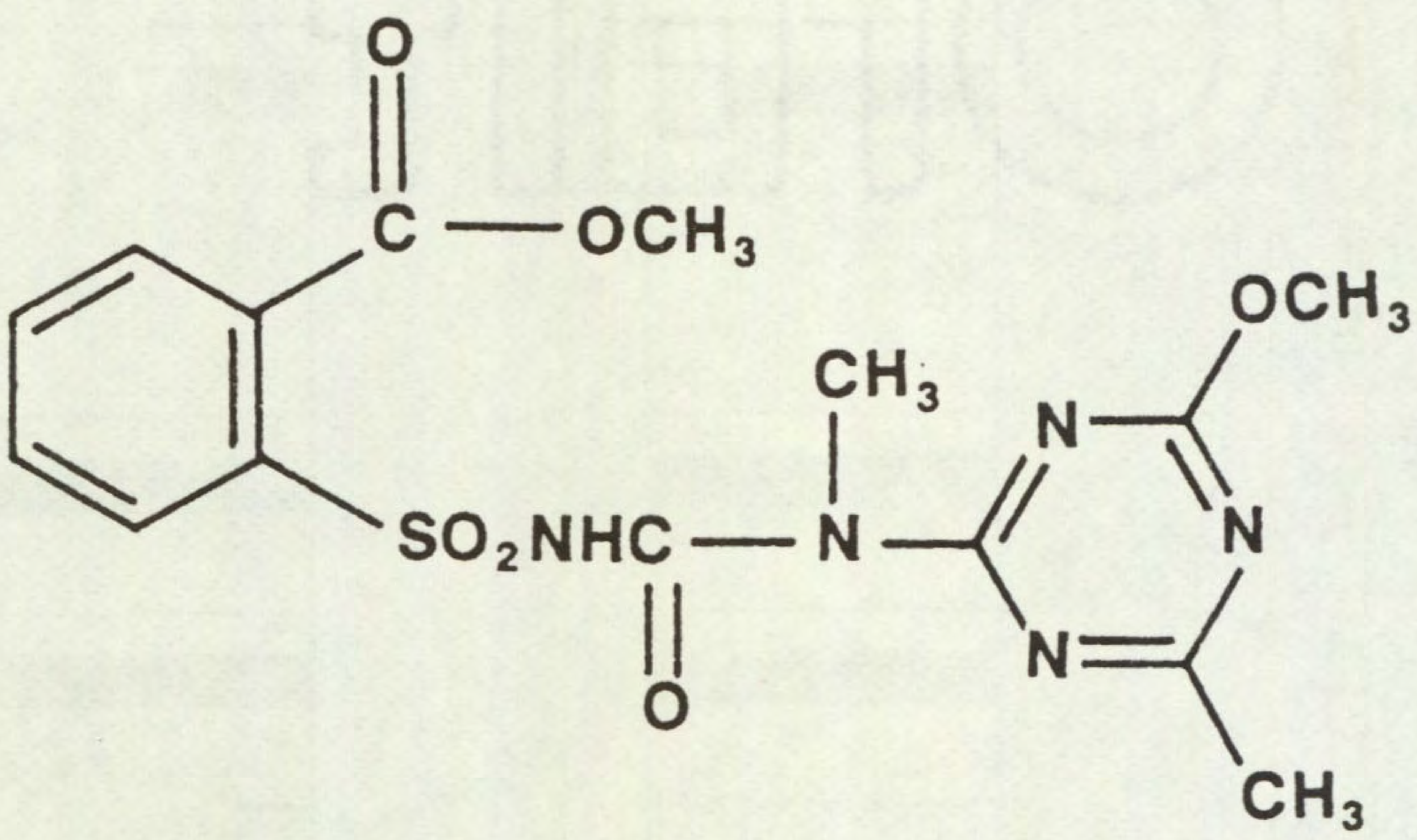
Code number: DPX-L5300

Trade name/s: Granstar Express

Common name: tribenuron-methyl (proposed)

Chemical name: Methyl 2-[4-methoxy-6-methyl-1,3,5,-triazin-2-yl (methyl)carbamoylsulphamoylbenzoate

Structure



Source: DuPont (UK) Ltd
Wedgwood Way
Stevenage
Herts, SG1 4QN, UK.

Information available and suggested uses

For control of a wide spectrum of broad-leaved weeds, including the perennial Cirsium arvense, applied post-emergence in cereals at rates of 10 - 30 a.i./ha.

Formulation used: Dry flowable 75% a.i.

Results

Full results are given in the histograms on pages 15-18 and potential selectivities in Table 5.

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Table 5 Crop tolerance and weed sensitivity to pre-emergence treatments of DPX-L5300

Dose (kg a.i./ha)	Tolerant crops[a]	Sensitive weeds[b]
0.08	Wheat +/- safener Barley +/- safener Oat +/- safener Maize + safener	Alopecurus myosuroides Poa annua Poa trivialis Raphanus raphanistrum Chrysanthemum segetum Matricaria perforata Polygonum lapathifolium Lamium purpureum Viola arvensis Rumex obtusifolius Solanum nigrum (plus species listed below)
0.02	(species listed above plus) Maize Dwarf bean	Beta vulgaris Sinapis arvensis Chenopodium album Veronica persica (plus species listed below)
0.005	(species listed above plus) Field bean Carrot Sunflower	Senecio vulgaris Stellaria media

[a] Vigour reduced by less than 15%

[b] Number or vigour reduced by 70% or more.

Comments on results

Activity test data, symptoms on susceptible species and post-emergence selectivities of DPX-L5300 were reported previously (West, 1988). The herbicide showed pre- and post-emergence activity and caused symptoms of growth inhibition typical of other sulphonyl urea herbicides.

Soil peristence

A short period of persistence was found from 0.005 kg a.i./ha to which sugar beet, initially very sensitive, was unaffected when sown into treated soil 8 weeks after spraying. The higher doses also showed only short to moderate persistence, 0.02 and 0.08 kg a.i./ha, did not affect sugar beet sown 25 and 32 weeks after spraying, respectively.

Pre-emergence selectivities

Many of the broad-leaved weed species tested were sensitive to DPX-L5300. These included several notable weeds i.e. Stellaria media at 0.005 kg a.i./ha, Veronica persica and Chenopodium album at 0.02 kg a.i./ha and Viola arvensis, Lamium purpureum, Matricaria perforata and Rumex obtusifolius at 0.08 kg a.i./ha. A few small seeded annual grasses were also sensitive at 0.08 kg a.i./ha. The only broad-leaved weeds tolerating 0.08 kg a.i./ha were Galium aparine and Geranium dissectum.

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Crop tolerance of wheat, barley and oat was good, all withstanding 0.08 kg a.i./ha, as did maize when seed dressed with the safener. Maize, without safener, and dwarf bean tolerated 0.02 kg a.i./ha while field bean, carrot and sunflower were not affected by 0.005 kg a.i./ha. Crops sensitive to 0.005 kg a.i./ha included brassicas, sugar beet, lettuce, onion and white clover.

Discussion

DPX-L5300 has shown potential for pre-emergence control of many broad-leaved weed species in cereals, in keeping with its post-emergence selectivity. The shorter persistence of this herbicide may be desirable in view of carry over problems encountered with chlorsulfuron, another sulphonyl urea herbicide. This short degradation period should make this a particularly useful herbicide for spring application in cereals. Most varieties of winter and spring-sown barley and wheat have shown good tolerance to post-emergence treatments of DPX-L5300 (Ferguson et al., 1985).

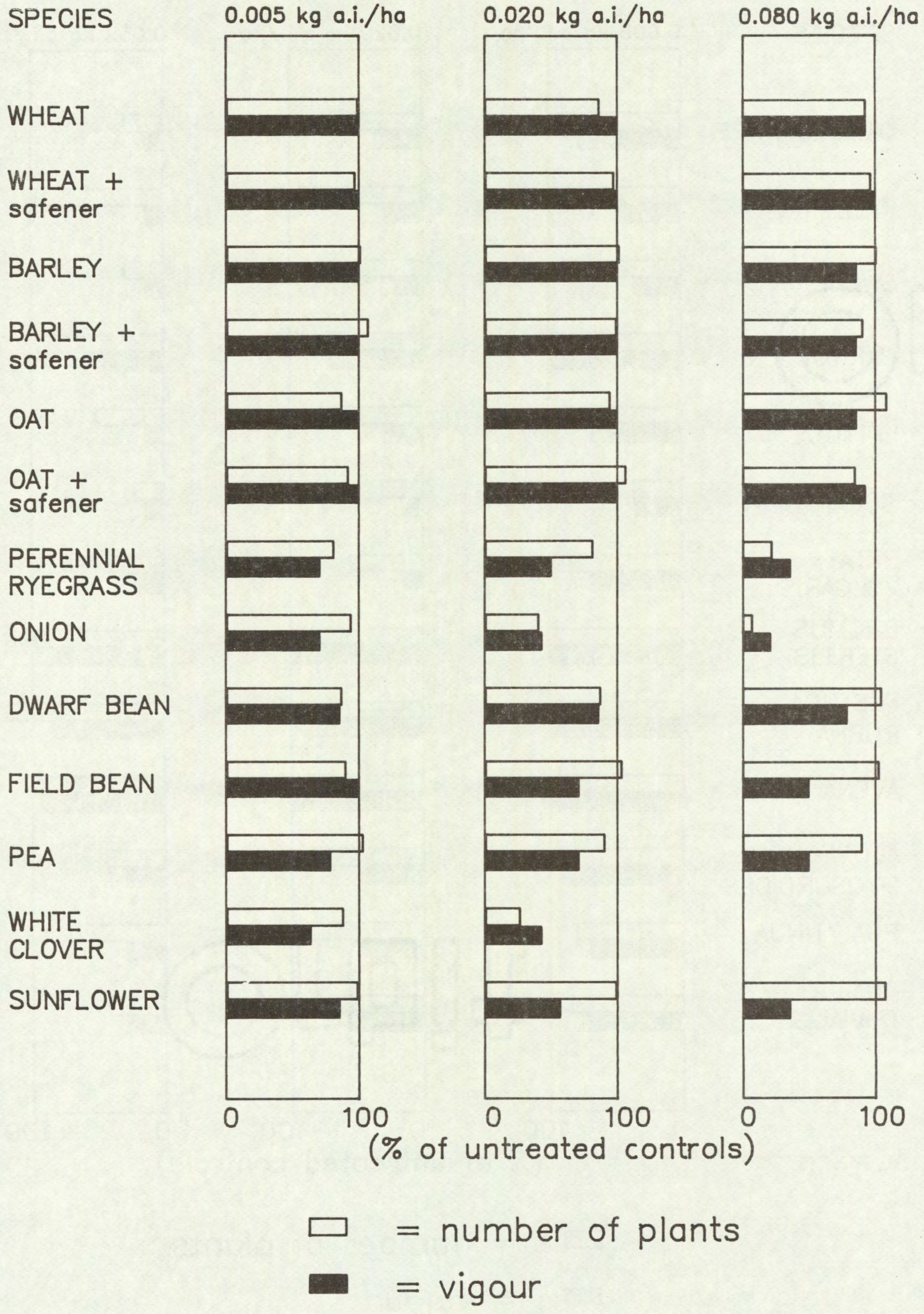
As with other sulphonyl urea cereal herbicides its poor activity against grass weeds and some problem broad-leaved weeds, e.g. Galium aparine, will necessitate investigating suitable herbicide partners for mixtures or sequences.

The enhanced tolerance of maize to DPX-L5300 by seed dressing with NA, also found post-emergence, is similar to the response given with other sulphonyl urea herbicides, e.g. chlorosulfuron, as seen in previous experiments, (Parker et al., 1980; Richardson, et al., 1981a), and may warrant further studies.

BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

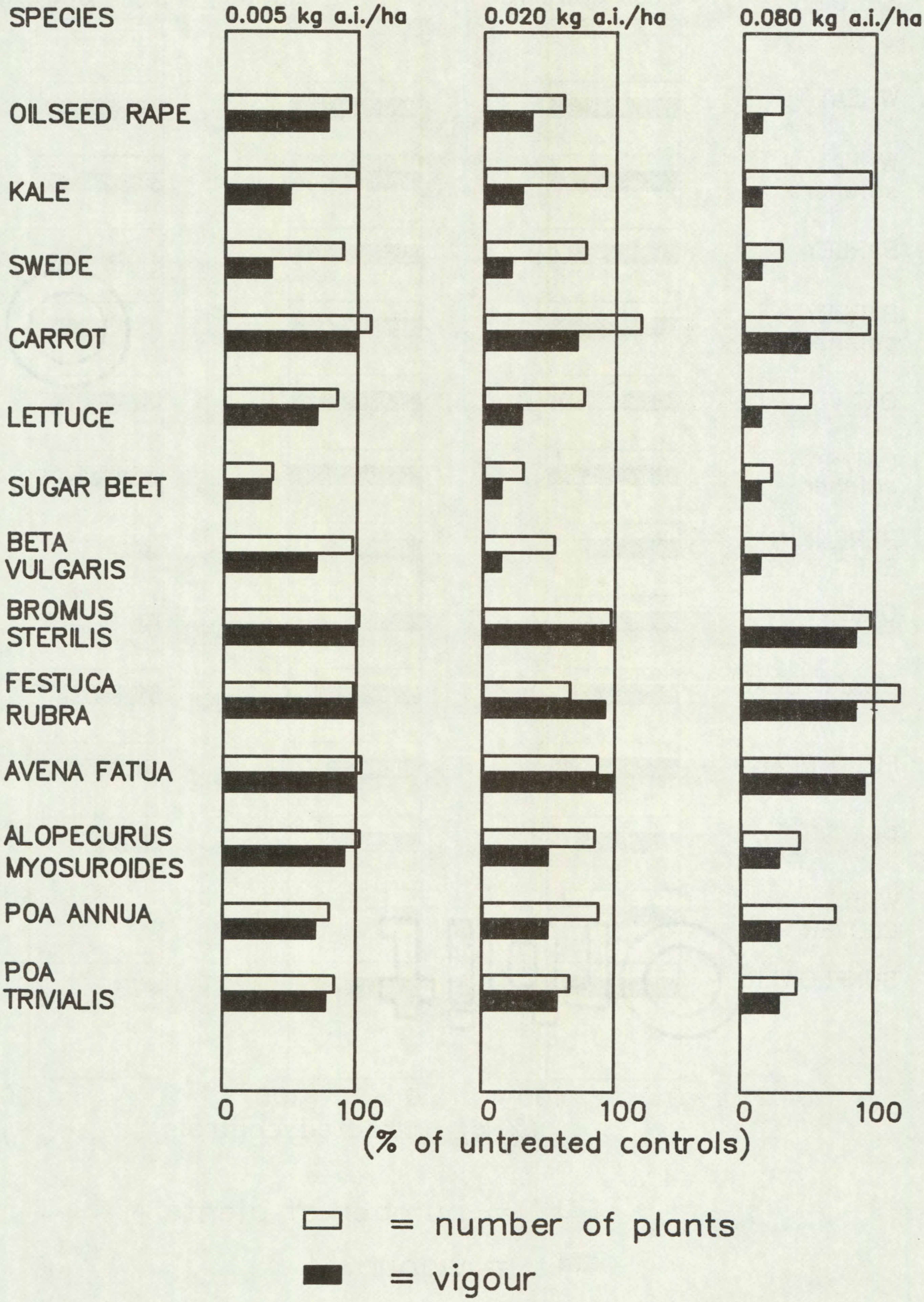
DPX-L5300



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

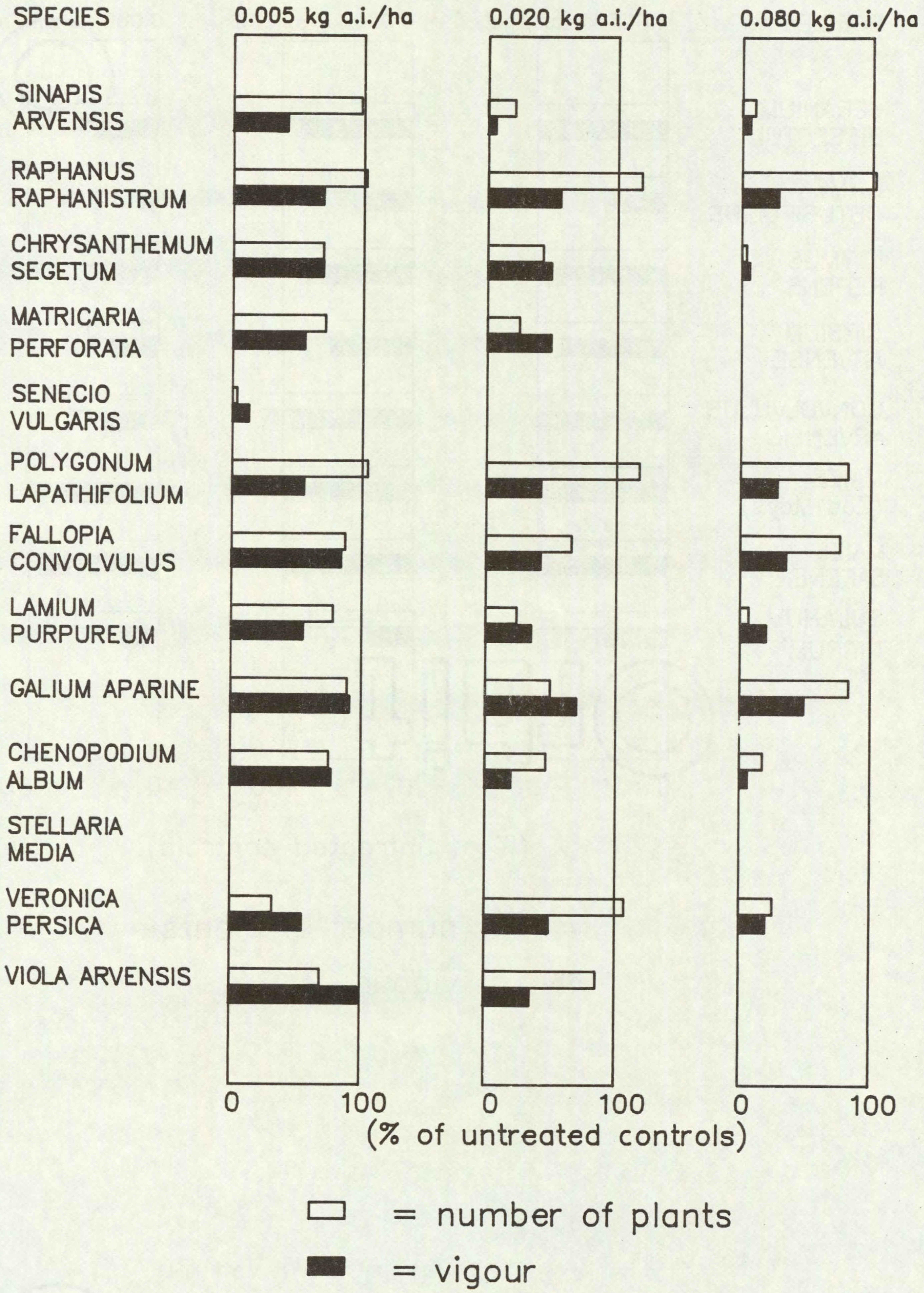
DPX-L5300



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

PRE-EMERGENCE SELECTIVITY EXPERIMENT

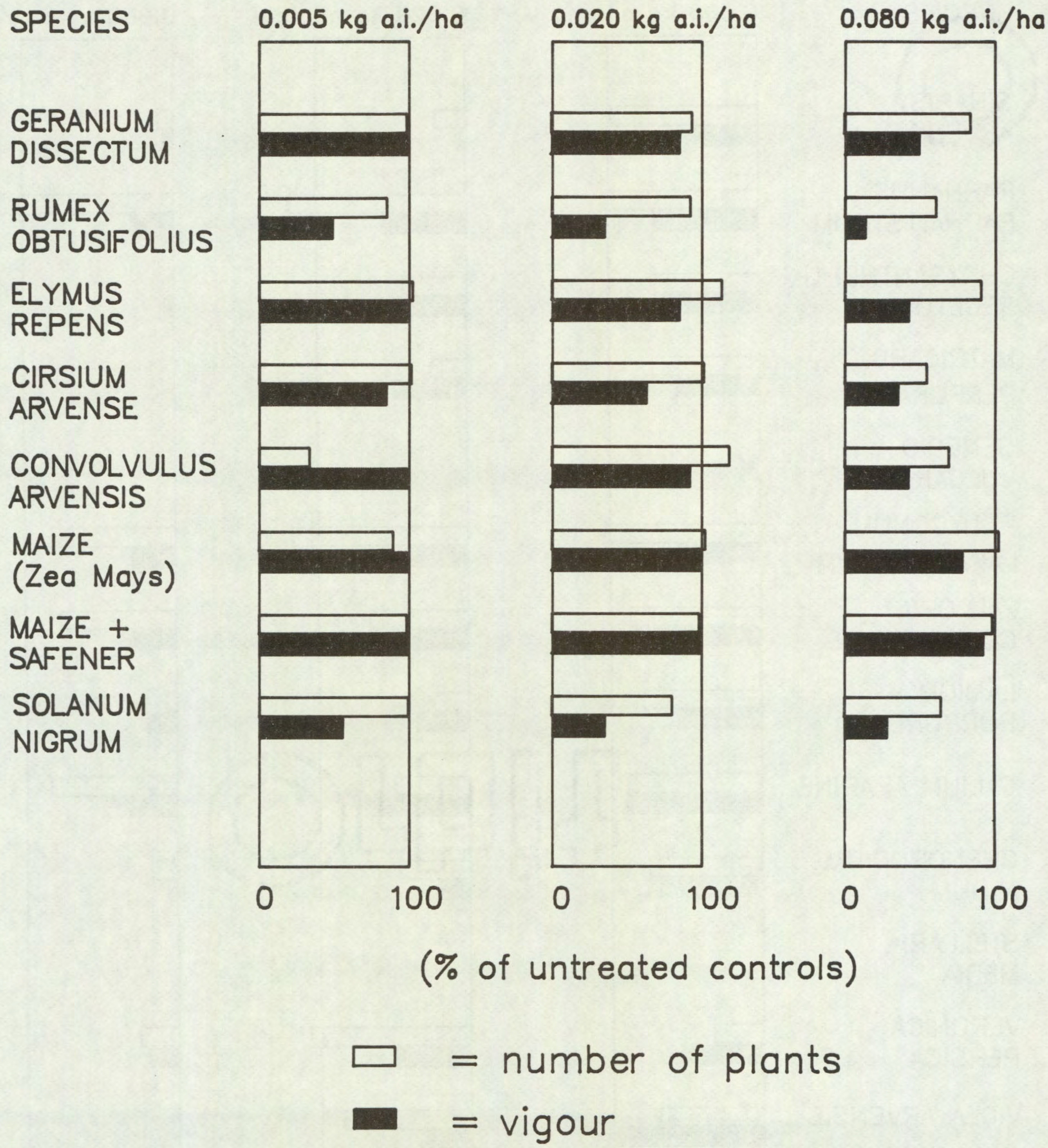
DPX-L5300



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

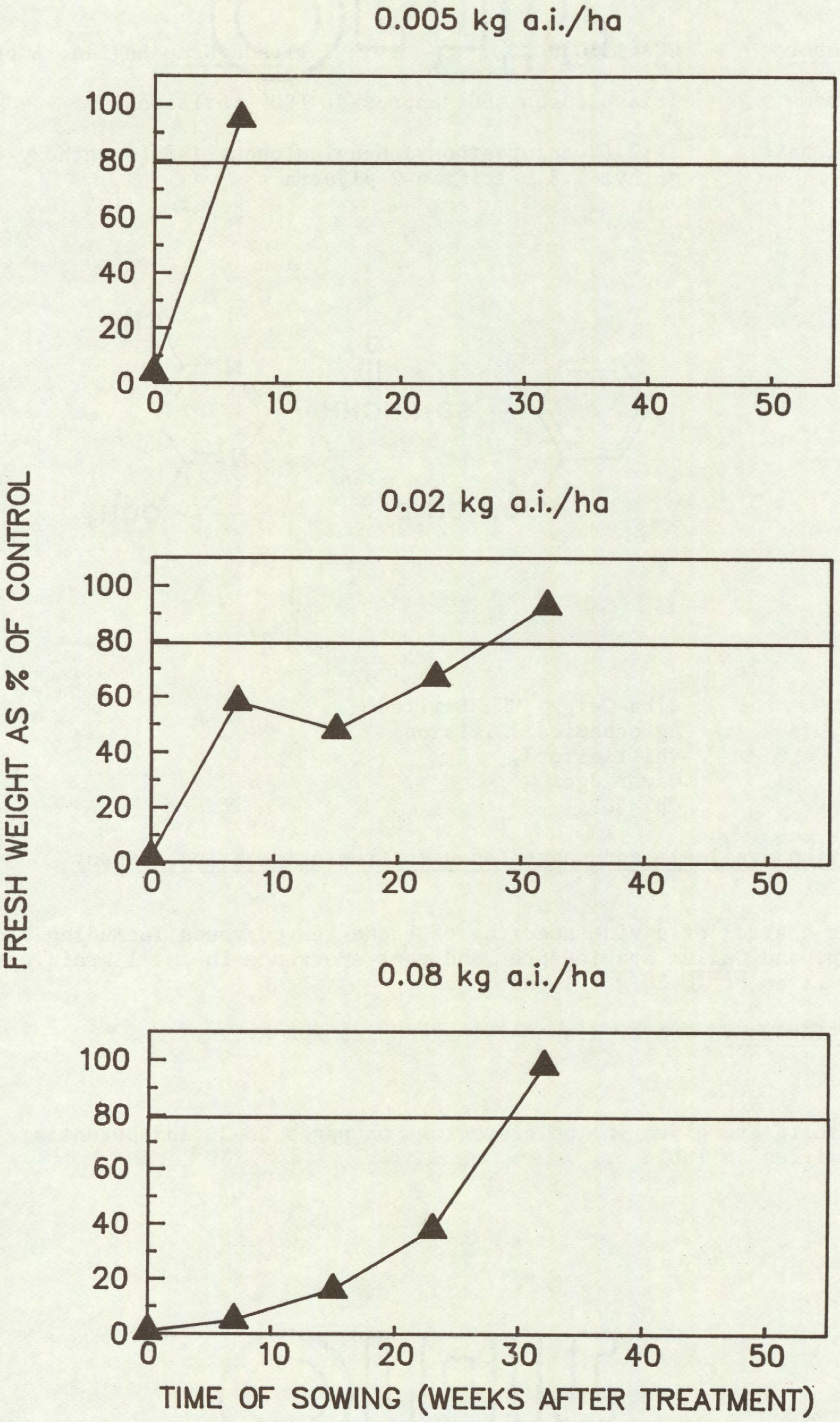
PRE-EMERGENCE SELECTIVITY EXPERIMENT

DPX-L5300



PERSISTENCE OF DPX-L 5300

SPECIES : SUGAR BEET



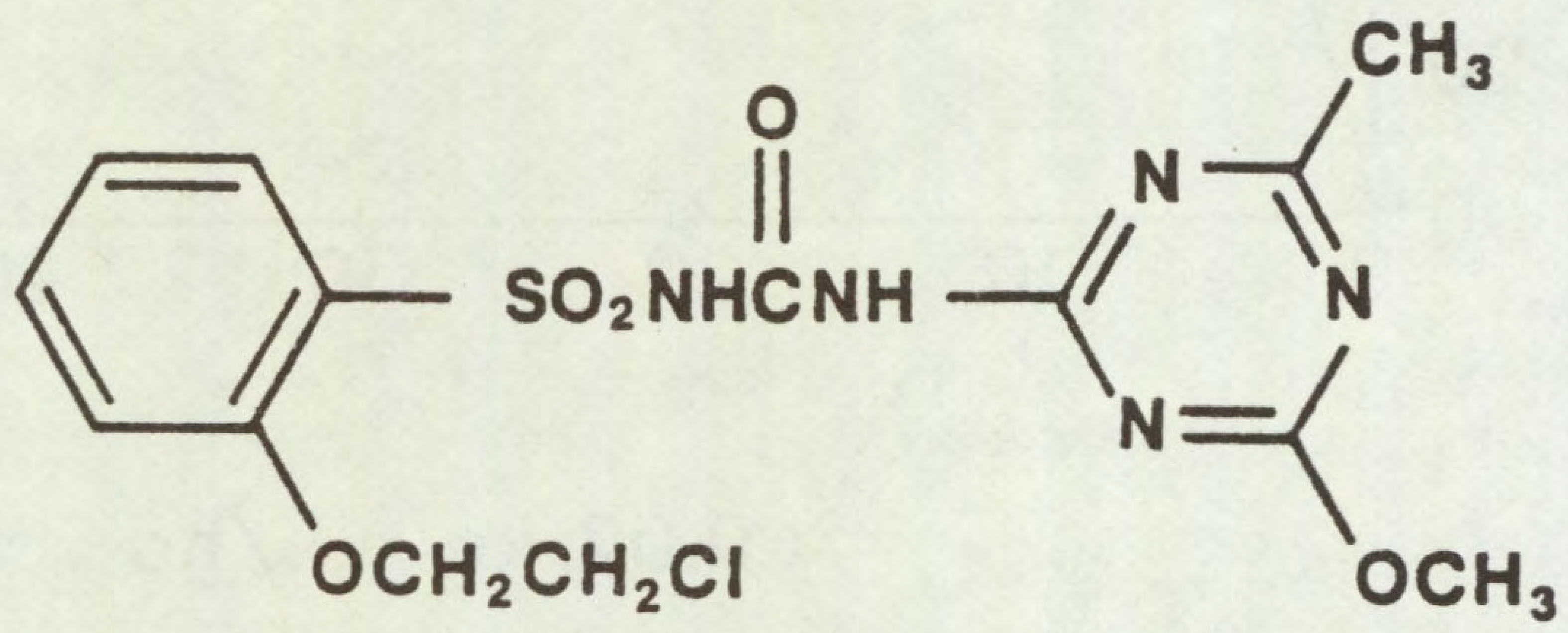
Triasulfuron

<u>Code Number</u> CGA 131036 <u>Trade Name</u> Logran, Amber

<u>Common name</u> Triasulfuron (BSI-approved, ISO-provisional)

<u>Chemical name</u> 1-[2-(2-chloroethoxy)phenylsulphonyl]-3-(4-methoxy-6-methyl-1,3,5-triazin-2-yl)urea

<u>Structure</u>



<u>Source</u> Ciba-Geigy (UK) Limited
Agrochemical Division
Whittlesford,
Cambridge.
CB2 4QT

<u>Information available and suggested uses from originating company</u>

For control of a wide spectrum of broad-leaved weeds including *Viola* spp. and *Galium aparine* pre- and post-emergence in small grain cereals at rates of 10-20 g a.i./ha.

<u>Formulation used</u> Water dispersible granules 20% a.i.

<u>Results</u>

Full results are given in the histograms on pages 23-26 and potential selectivities in Table 6.

Table 6 Crop tolerance and weed sensitivity to pre-emergence treatments of triasulfuron

Dose (kg a.i./ha)	Tolerant Crops[a]	Sensitive weeds[b]
0.08	Wheat +/- safener	Convolvulus arvensis Fallopia convolvulus (plus species listed below)
0.02	(Species listed above plus) Barley +/- safener Oat + safener Maize +/- safener	Festuca rubra Alopecurus myosuroides Raphanus raphanistrum Polygonum lapathifolium Galium aparine Chenopodium album (plus species listed below)
0.005	(Species listed above plus) Oat	Poa annua Poa trivialis Beta vulgaris Sinapis arvensis Chrysanthemum segetum Matricaria perforata Senecio vulgaris Lamium purpureum Stellaria media Veronica persica Viola arvensis Rumex obtusifolius Cirsium arvense

[a] Vigour reduced by less than 15%

[b] Number or vigour reduced by 70% or more

Comments on results

Activity test data, symptoms on susceptible species and post-emergence selectivities of triasulfuron were reported previously (West, 1988). This herbicide proved to be a powerful inhibitor of both shoots and roots of susceptible species and exhibited both pre- and post-emergence activity.

Soil persistence

Triasulfuron showed a moderate to long period of soil persistence. The test species, sugar beet, was still showing symptoms and growth reductions when sown 52 weeks after spraying soil at 0.005 kg a.i./ha, while 0.02 and 0.08 kg a.i./ha were still causing severe growth inhibition.

Pre-emergence selectivities

At the lowest dose applied, 0.005 kg a.i./ha, eleven broad-leaved weeds and two annual grass weeds were sensitive. These included several problem species, i.e. Stellaria media, Veronica persica, Viola arvensis and Poa annua. At 0.02 kg a.i./ha a further six weed species were controlled, notably Galium aparine and Alopecurus myosuroides, and at 0.08 kg a.i./ha Fallopia convolvulus and Convolvulus arvensis were sensitive.

The most tolerant weed species to pre-emergence treatments of triasulfuron were Geranium dissectum, Avena fatua, Bromus sterilis and Elymus repens.

Crop tolerance was limited to the cereals and maize. Wheat was the most tolerant, being unaffected by 0.08 kg a.i./ha. Barley and maize tolerated 0.02 kg a.i./ha, as did oat when seed dressed with the safener. Oat without safener was unaffected by 0.005 kg a.i./ha.

Several crops were sensitive to triasulfuron at 0.005 kg a.i./ha, including brassicas, sugar beet, lettuce, carrot, onion, white clover, pea, sunflower and perennial rye-grass.

Discussion

Triasulfuron appears to have the potential for pre-emergence control of a wide range of annual and perennial dicotyledonous weed species in wheat, barley and maize. Sensitivity of some small seeded grass species was more apparent to pre-emergence than to post-emergence application.

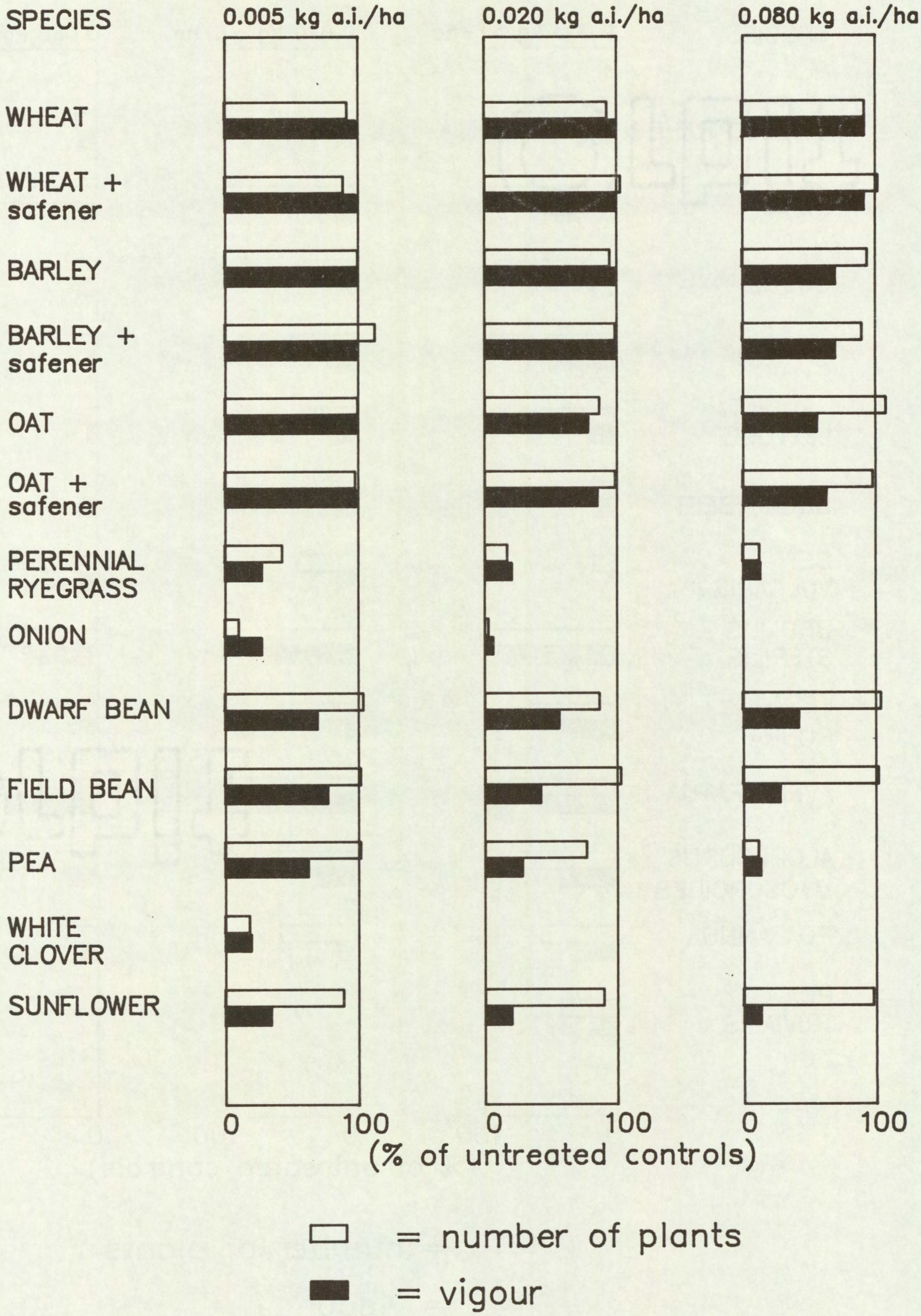
Results of the persistence trial would indicate that some caution may be necessary regarding the choice of crops following the cereals in rotations.

Poor activity against the problem grass weeds Avena fatua and Bromus sterilis will warrant further investigation into mixtures with herbicides active on these species.

The increased tolerance of oat by seed dressing with the safener is interesting and again shows the potential of NA to decrease the activity of a sulphonyl urea herbicide, as seen previously with cholorsulfuron activity in maize (Parker et al., 1980, Richardson et al., 1981a).

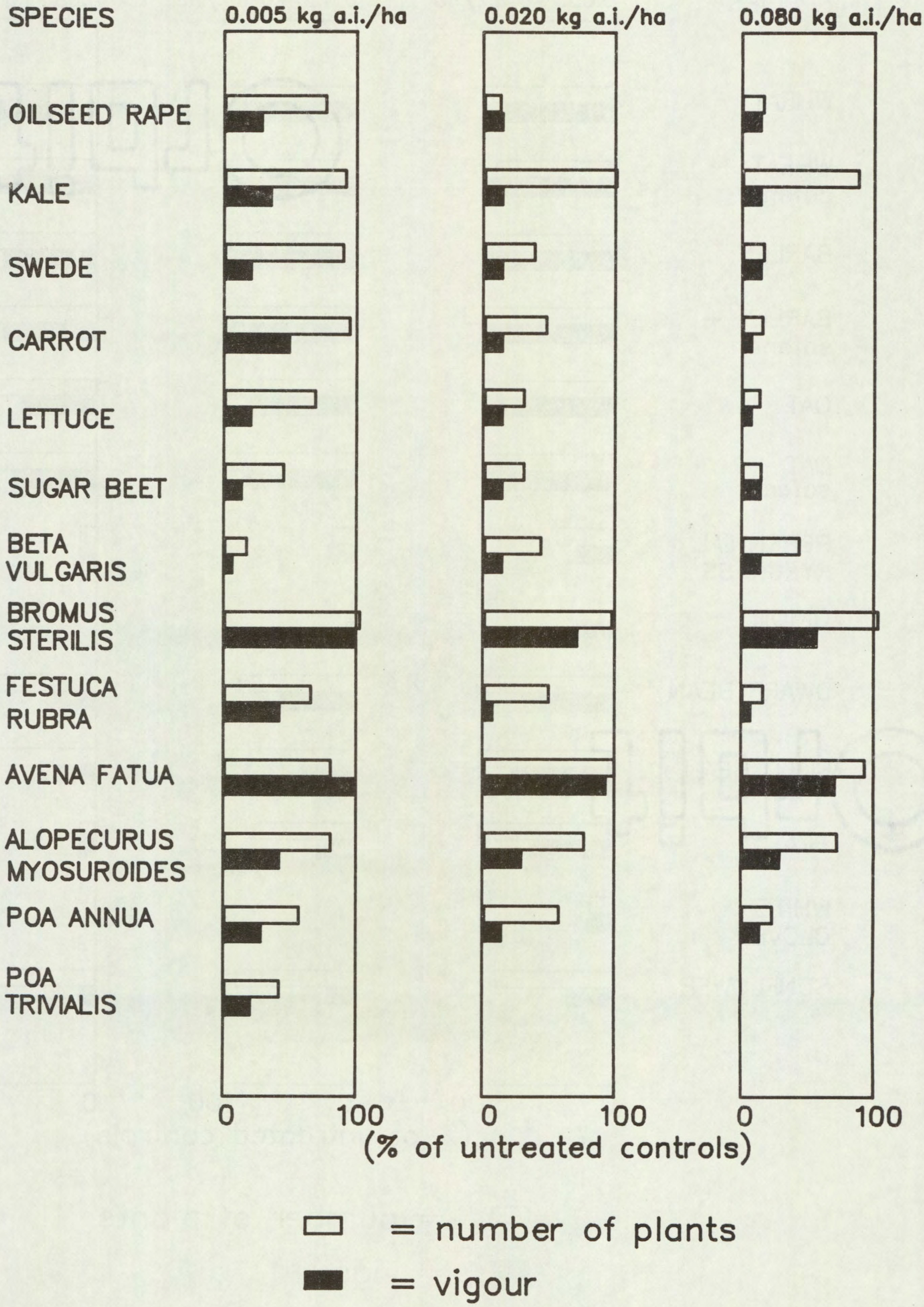
PRE-EMERGENCE SELECTIVITY EXPERIMENT

TRIASULFURON



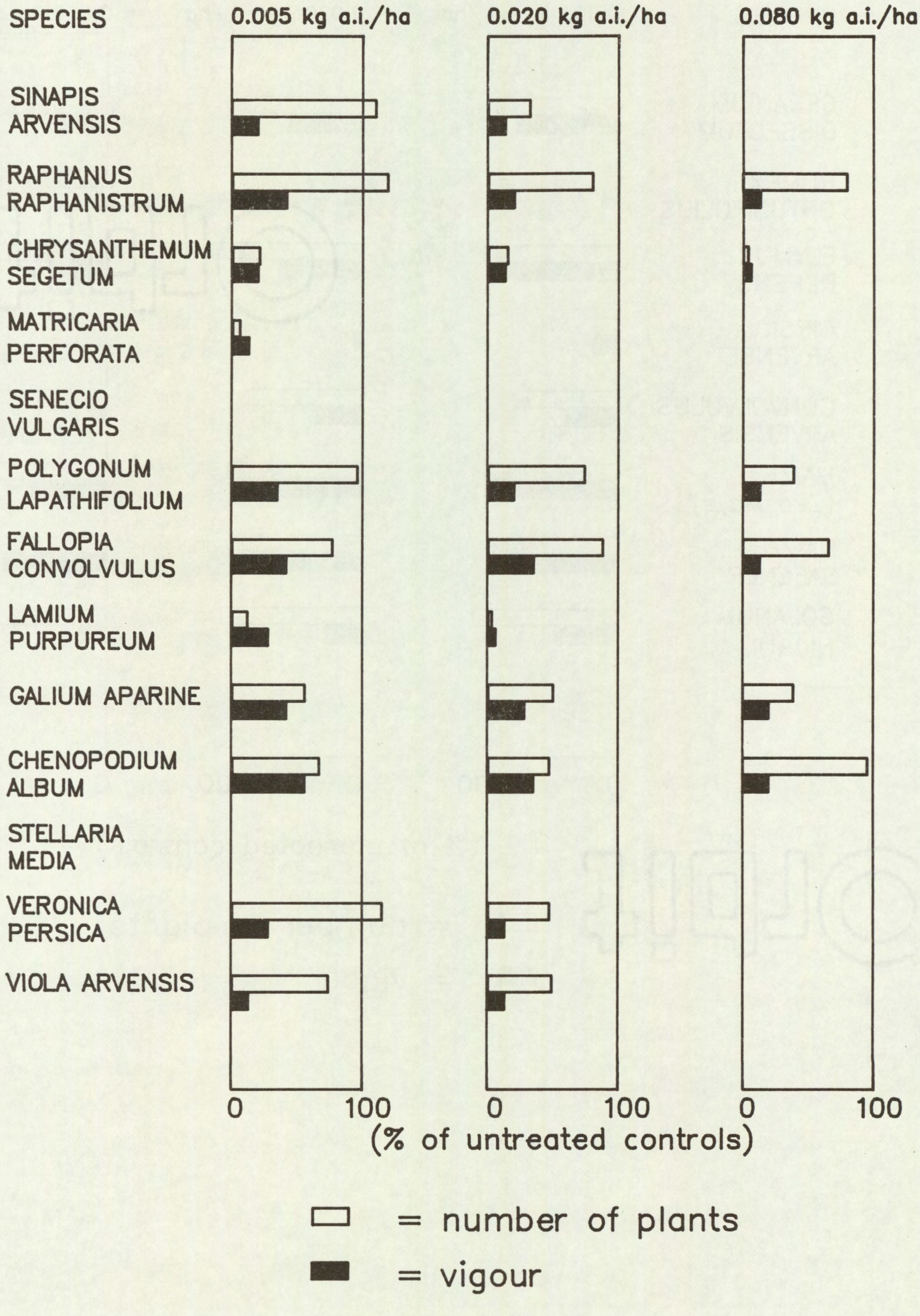
PRE-EMERGENCE SELECTIVITY EXPERIMENT

TRIASULFURON



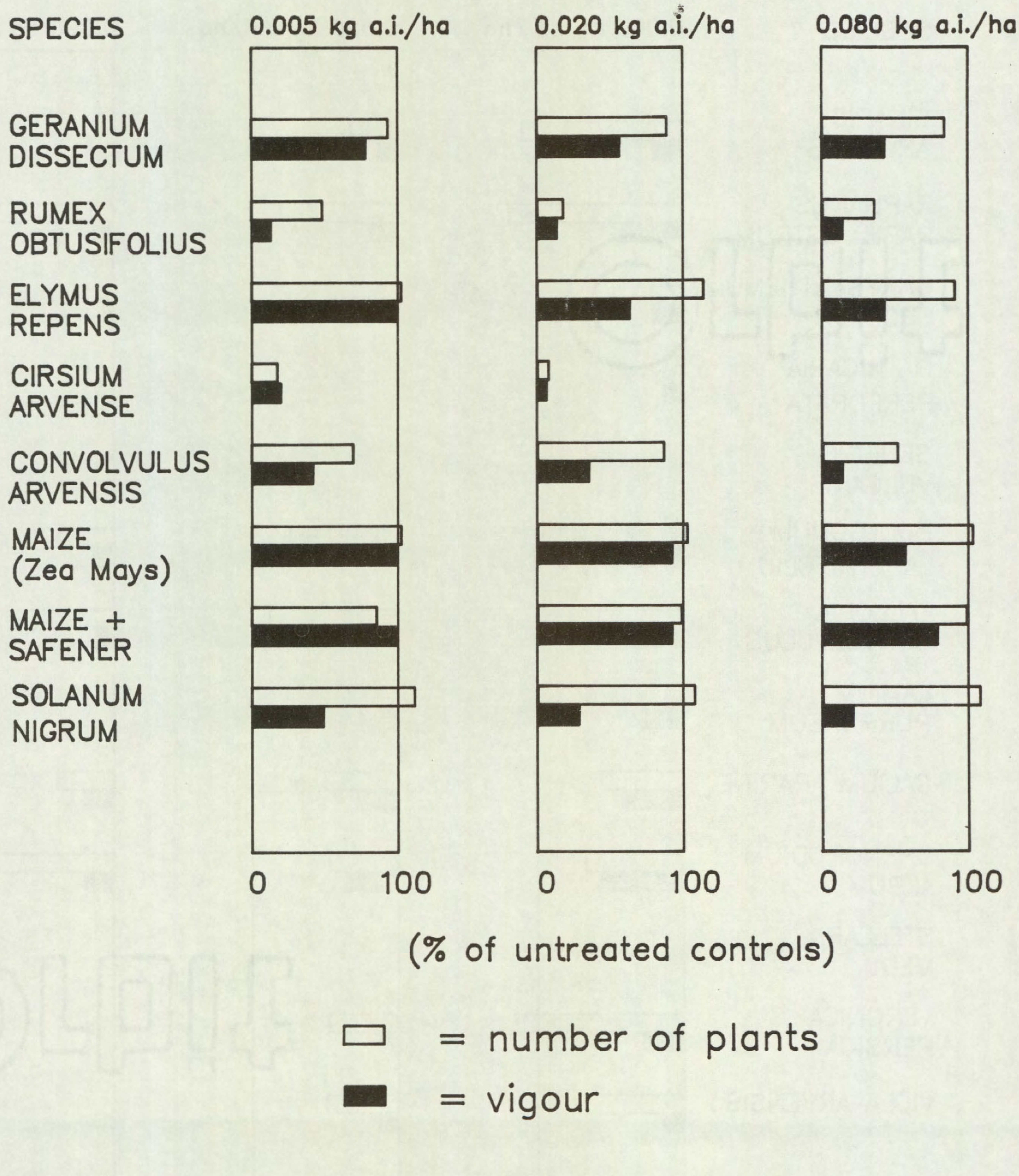
PRE-EMERGENCE SELECTIVITY EXPERIMENT

TRIASULFURON



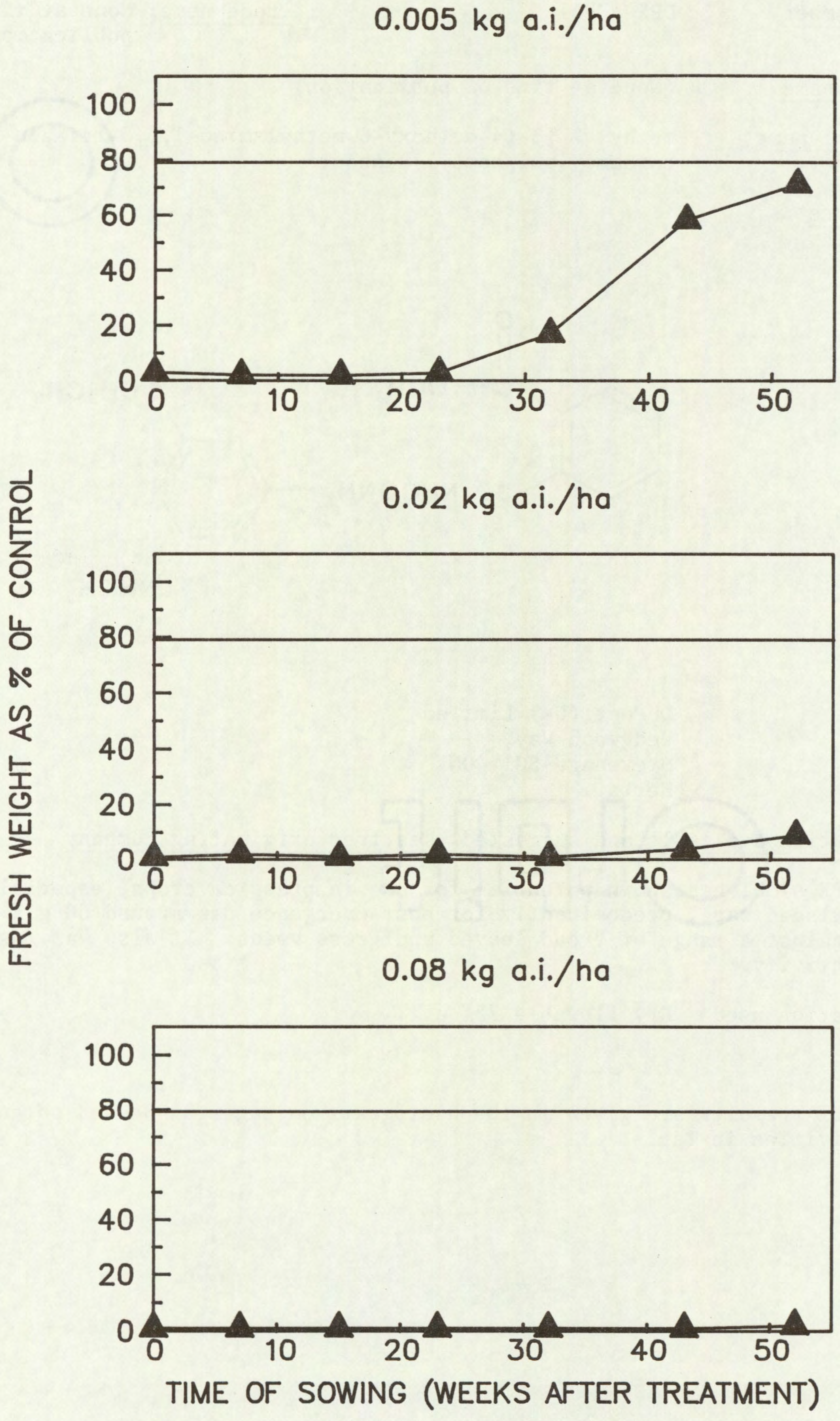
PRE-EMERGENCE SELECTIVITY EXPERIMENT

TRIASULFURON



PERSISTENCE OF TRIASULFURON

SPECIES : SUGAR BEET



BAS 518 00H is cycloxydim, DPX-L5300 is tribenuron-methyl, DPX-A7881 is ethametsulfuron-methyl

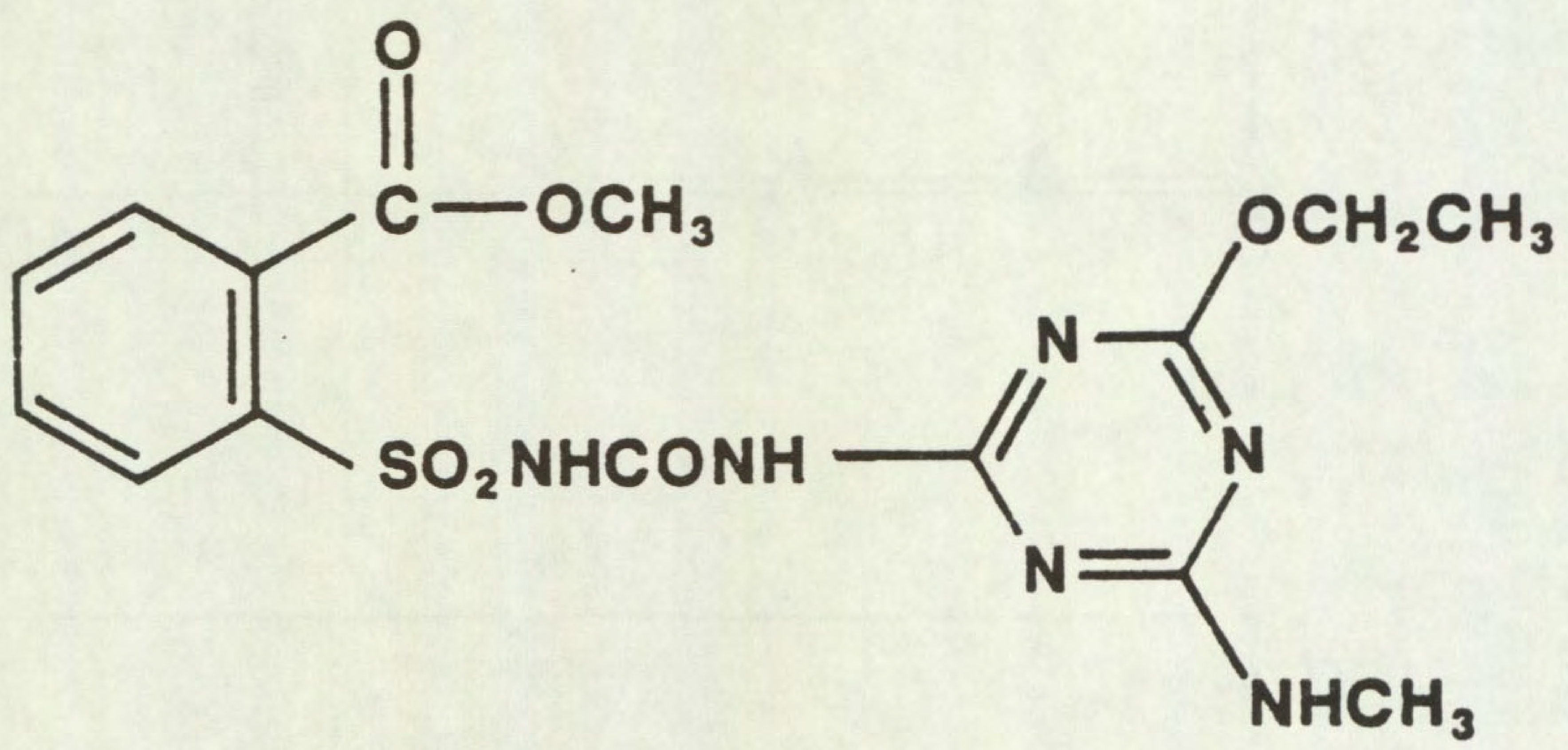
DPX-A7881

Code number DPX-A7881 Trade name: None at time of publication

Common name (None at time of publication)

Chemical name methyl 2-[3-(4-methoxy-6-methylamino-1,3,5-triazin-2-yl) carbamoylsulphamoyl]benzoate

Structure



Source DuPont (UK) Limited
Wedgwood Way,
Stevenage SG1 4QN
Herts.

Information available and suggested uses from originating company

DPX-A7881 has shown potential for use in brassica crops, especially oilseed rape, predominantly for post-emergence use around 60 g a.i./ha against a range of broad-leaved and grass weeds. It also has residual activity.

Formulation used Dry flowable 75% a.i.

Results

Full results are given in the histograms on pages 31-34 and potential selectivities in Table 7.

Click here to continue