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THE ACTIVITY AND PRE-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: WL 49818, WL 82830, WL 83627, WL 83801 AND DPX 5648

DPX 5648 is sulfometuron-methyl, WL 83627 is 3-(3-methyl-4-isopropylphenyl)-1,1-dimethylurea
WL49818, WL 82830 & WL 83801 are confidential (Shell)

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THE ACTIVITY AND PRE-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: WL 49818, WL 82830, WL 83627, WL 83801 AND DPX 5648

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SUMMARY

In a series of pot experiments in the glasshouse, five herbicides were examined for pre-emergence selectivity as soil surface sprays on 66 temperate and tropical crop and weed species. Wheat, barley, maize, rice and sorghum were each treated with seed dressings of safeners to investigate possible protection from herbicide injury. The route of entry was examined in a separate test on six selected species. Persistence of the herbicides in the soil was examined over a period of 36 weeks.

WL 49818, active mainly pre-emergence, controlled a wide range of weeds, including many important temperate and tropical annual grasses while dwarf bean, cereals (wheat, barley, maize and rice) and several other crops such as brassicas were tolerant.

WL 82830, similar in its pattern of effects to WL 49818, was however much more active. It controlled a wide range of mainly grass weeds while showing potential selectivity in certain legume (dwarf bean and chickpea) and brassica (rape and radish) crops and also barley when the latter was treated with the safener, naphthalic anhydride (NA).

WL 83627 was typical of many other substituted urea herbicides, with high soil activity, mainly pre-emergence on many annual weeds, including *Alopecurus myosuroides* but also *Veronica persica*. Most cereals were tolerant (wheat, barley, oat, maize, sorghum and millet). An appreciable safening effect was found on barley with NA.

WL 83801 acted as a powerful herbistat on the majority of crop and weed species tested, exerting its effect via the soil. Carrot showed outstanding tolerance at doses where certain weeds were controlled and many more suppressed.

DPX 5648 was highly active post- and pre-emergence. Nearly all plant species were severely damaged or killed. A moderate safening effect with NA was obtained on barley and wheat.

Persistence in the soil was moderate to long for all five herbicides relative to the standard cyanazine (short persistence) and simazine (long persistence).

INTRODUCTION

The pre- and post-emergence activities and selectivities of new herbicides are investigated at WRO on a large number of pot-grown crop and weed species, at the same time obtaining experience of the type of effects produced by each compound. Persistence in the soil is also monitored and these data, in conjunction with crop susceptibilities, are useful in considering subsequent

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* Herbicide Group ** Tropical Weeds Group

cropping of treated land. The limitations of these investigations are that only one crop variety or source of weed species is used; they are grown in one particular soil type, at only one depth of sowing and 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 from those in the field.

This report gives pre-emergence selectivity data on these five new herbicides. Results of activity experiments are also included to provide information on levels of phytotoxicity, type and route of action.

METHODS AND MATERIALS

Activity experiment (AE) This was carried out in the glasshouse on six selected species as described previously (Richardson and Dean, 1973). Four annual species were raised from seeds and two perennials from rhizome fragments. Herbicides were applied by four different methods:

i) a post-emergence spray to the foliage only, avoiding contact with the soil,
ii) post-emergence to the soil only, as a drench avoiding foliar contact,
iii) pre-emergence to the soil surface,
iv) pre-emergence with thorough incorporation to 5 cm depth before planting.

Table 1. Plant data for activity experiments

Species	Cultivar /source	No. per pot at spraying		Depth of planting (cm)	Stage of growth		
					Spraying	Assessment	
		pre-	post-		post-em	pre-em	post-em
Dwarf bean (*Phaseolus vulgaris*)	The Prince	3	2	2	2 uni-foliate leaves	2½ tri-foliate leaves	2½ tri-foliate leaves
Kale (*Brassica oleraceae acephala*)	Marrowstem	10	5	0.5	1½ leaves	4½ leaves	4 leaves
Polygonum amphibium	WRO Clone 1	6	4	1	6-6½ leaves	8 leaves	8-9 leaves
Perennial ryegrass (*Lolium perenne*)	S 23	12	5	0.5	3 leaves	8-9 leaves, tillering	10-16 leaves, tillering
Avena fatua	WRO 1978	10	5	1	2½-3 leaves	4½-8½ leaves, some tillering	6-10 leaves, tillering
Agropyron repens	WRO Clone 1	6	5	1	2-3 leaves	5½-9 leaves, tillering	6-10 leaves, tillering

Table 2. Soil and environment conditions

Experiment type	Activity experiment	Pre-emergence selectivity test	
Date of spraying	23.9.81	16 & 17.12.81	
Main assessment completed	29.10.81	12.1.81	
Organic matter (%)	4.1	4.1	
Clay content (%)	15.0	15.0	
pH (water; 1:2 soil/water)	7.0	7.0	
Ammonium sulphate (g/kg)	1.0	1.0	
Superphosphate (g/kg)	2.0	2.0	
Potassium sulphate (g/kg)	1.2	1.2	
DDT (5% dust) (g/kg)	0.4	0.4	
Hydrated Mg_2SO_4 (g/kg)	0.8	0.8	
Temperature (°C)		Temperate	Tropical
Mean	17	15	21
Maximum	28	21	29
Minimum	11	2	1
Relative humidity (%)			
Mean	62	64	55
Maximum	96	90	75
Minimum	30	40	44

Pre-emergence selectivity experiment

Techniques for the selectivity experiment were as described by Richardson and Dean (1973), all herbicides being applied as surface pre-emergence treatments. Species were sown as detailed in Appendix 1, each being replicated twice for every treatment. To improve growth of rice, the nitrogen fertilizer was omitted from the soil (for this species only).

Radish (Raphanus raphanistrum) was included for ease of propagation and may be regarded as a crop or weed. To improve establishment of certain species, the following treatments were applied:- seeds of Chrysanthemum segetum and Chenopodium album were kept in 0.1 M potassium nitrate for 48 hours in the light; tubers of Cyperus esculentus and bulbs of Oxalis latifolia were kept at 2°C for six weeks prior to planting. Dwarf bean seeds were selected by testing their electrical conductivity, after soaking for one hour in water, discarding those whose conductivity was greater than 10 mhos. Seeds of fenugreek were inoculated by pipetting a 10 ml infusion of Rhizobium meliloti Dang (Rothamsted Catalogue No 2012) directly onto the soil beneath plants which had reached the cotyledon stage.

To protect from soil-borne pathogens, all seeds (except wheat, barley, oat, perennial ryegrass, fenugreek, A. fatua, B. sterilis, C. segetum, G. aparine and most perennials) were pre-treated with one of the following:- thiram, captan, thiram + benlate (for onion only), bromophos + captan + thiabendazole (pea only), aldrin (cotton only). Maize seeds were purchased already treated with captan A + teraquinone. The seeds of kale, radish, swede, dwarf bean, white clover and S. arvensis were treated with thiram, a 6% gum arabic solution

being used prior to dressing, to give better adhesion. In addition, 'Cheshunt Compound' (3 g litre $^{-1}$) fungicide solutions were applied to certain species as soil drenches and sprays respectively, to protect against fungal diseases. Root fragments of Cirsium arvense were washed in a 2 ml litre $^{-1}$ colloidal copper solution.

A series of treatments were included for wheat, barley, maize, rice and sorghum in which seeds were treated with safeners to investigate possible protection from herbicide injury. Wheat, barley, maize and rice seeds were treated with NA (1,8-naphthalic anhydride) at 0.5% w/w a.i. of seeds, while sorghum seeds were acquired from Ciba-Geigy already dressed with cyometrinil (CGA 43089). Metolachlor, which is commercially recommended for sorghum treated with cyometrinil, was included as a standard for comparison.

Herbicides were applied using a laboratory sprayer embodying an 8002E Spraying Systems Tee Jet operated at a pressure of 207 kPa (30 lb/in^2) and moving at 0.54 m/s,30 cm above the soil. Subsequent watering was from overhead. During the experiment, plants were raised in the glasshouse, normal daylight being supplemented by mercury vapour or high pressure sodium lighting to provide 14 or 12 hour photoperiods for temperate and tropical species respectively.

Assessment and processing of results

Results were processed as described by Richardson and Dean (1973). Survivors were counted and scored for vigour on a 0-7 scale where 0 = dead and 7 = as in untreated control. Certain species showed variable germination and results were not fed into the computer. However, observations were possible on some treatments and are referred to in the text. Such species were pigeon pea, cowpea, soyabean, cotton, sesamum and Oxalis latifolia. Polygonum aviculare, Phalaris paradoxa and groundnut failed to germinate. To improve growth, dwarf bean was germinated under tropical conditions and then transferred to the temperate glasshouse. Conversely, Phalaris minor was raised under temperate conditions until emergence, then transferred to the tropical glasshouse.

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

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

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

Persistence in the soil

This was monitored, by bioassay, in conjunction with the pre-emergence selectivity experiment. Square pots (7 cm wide x 6 cm deep) containing soil were sprayed directly with the herbicides. All pots were then transferred to the temperate glasshouse together with untreated controls and watered as necessary, from overhead. Soil moisture before watering was 11%.

For each bioassay three replicate pots per treatment were selected and a sensitive species (perennial ryegrass) was sown 0.5 cm deep disturbing the soil as little as possible. Plants were harvested three or four weeks after sowing at a predetermined growth stage, the number and fresh weight of shoots being recorded. Bioassays were repeated at six to eight week intervals for one year, unless the herbicides had disappeared before then. Herbicides are considered to have disappeared when shoot fresh weights of the test plants are 80% or more as compared with the controls. Results are presented graphically for each herbicide and comments are made in the text. Standard treatments of cyanazine (short persistence) and simazine (moderate to long persistence) were included for comparison (see page 61). Average temperature during this period was 15°C (minimum 2 °C, maximum 34°C) and relative humidity 60% (minimum 25%, maximum 90%).

WL 49818

Code number WL 49818

Chemical name Confidential

Structure Confidential

Source

Shell Biosciences Laboratory
Sittingbourne Research Centre
Sittingbourne
Kent ME9 8AG

Information available and suggested uses

Suggested for grass weed control in sugar beet, legumes, brassica crops and cotton, pre-emergence at 1.0 to 4.0 kg a.i./ha.

Formulation used 40% w/v a.i. emulsifiable concentrate

Spray volume 386 l/ha

RESULTS

Full results are given in the histograms on pages 9-16 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	dwarf bean	Chrysanthemum segetum Stellaria media Veronica persica Cirsium arvense + species below
1.0	species above + wheat ± safener (NA) barley oat pea carrot tomato chickpea kenaf	Rumex obtusifolius Oryza rufipogon Bromus pectinatus Cyperus esculentus

(Table continued overleaf)

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: number or vigour reduced by 70% or more
0.25	species above + barley + safener (NA) field bean lucerne rape kale radish lettuce maize ± safener (NA) rice ± safener (NA)	Festuca rubra Alopecurus myosuroides Poa annua Poa trivialis Holcus lanatus Eleusine indica Snowdenia polystachya Echinochloa crus-galli Rottboellia exaltata Digitaria sanguinalis Phalaris minor

Comments on results

Activity experiment

The foliar spray caused minor, non-lethal, effects, more so on broad-leaved than on grass species. The latter were more susceptible to soil drench treatments, though again, effects were non-lethal. Pre-emergence application was the most active form of treatment, particularly on the grasses, perennial ryegrass and Agropyron repens. Surface treatments were more toxic to perennial ryegrass than when the herbicide was incorporated into the soil. However the reverse was true for the two perennial species, Polygonum amphibium and A. repens and also dwarf bean. However, there was little difference between surface and incorporated treatments for kale and Avena fatua. This should be taken into consideration in the pre-emergence selectivity test where the herbicide was surface applied.

Symptoms

The foliar spray inhibited growth of broad-leaved species, new leaves often being deformed. Chlorosis was seen on kale and dwarf bean but with P. amphibium there was increased reddening. Some extra tillering of A. repens occurred, these tillers being slightly retarded. With soil drenches, growth was inhibited, new leaves again being deformed and sometimes grass leaves were trapped. P. amphibium showed yellowing of foliage whereas new leaves of perennial ryegrass and A. fatua had a darker green colour. High doses pre-emergence resulted in failure of most grasses and some broad-leaved species to emerge from the soil. At lower doses severe inhibition of shoots and buds and consequent deformities occurred. With certain broad-leaved species (notably brassicas) abnormally large cotyledons were seen and there was a proliferation of new buds. Leaves were often strap-shaped or narrow, somewhat reminiscent of symptoms caused by phenoxyalkanoic herbicides such as 2,4-D. Some species showed pale or chlorotic foliage, others a more intense green colouration. Necrosis usually developed later from leaf tips or margins.

Persistence in the soil

Using perennial ryegrass as the sensitive test species WL 49818 was still detectable 36 weeks after spraying, indicating a relatively long period of soil persistence. Shoot fresh weights were reduced by 24, 54 and 99% from doses of 0.25, 1.0 and 4.0 kg/ha respectively.

Pre-emergence selectivity among temperate species

Five of the seven annual grass weeds were controlled at the lowest dose of 0.25 kg/ha, including Alopecurus myosuroides, the two Poa species, Festuca rubra and Holcus lanatus. Avenua fatua, Bromus sterilis and Agropyron repens, however, were resistant especially the latter. Certain broad-leaved weeds were controlled at higher doses; Rumex obtusifolius at 1.0 kg/ha, Chrysanthemum segetum, Stellaria media, Veronica persica and Cirsium arvense at 4.0 kg/ha. Several others were resistant even at the high dose, notably the perennials, Allium vineale and Tussilago farfara.

Dwarf bean was the most tolerant crop, recovering from a temporary lack of vigour to pod normally. The cereals (wheat, barley and oat) tolerated 1.0 kg/ha. Although they were much reduced in vigour at 4.0 kg/ha they made a good recovery, especially wheat. There were no marked safening effects of NA, but barley showed a little more sensitivity at 1.0 kg/ha. Pea and carrot were the only other crops to tolerate 1.0 kg/ha the latter being reduced in vigour by only 29% at 4.0 kg/ha and eventually making a full recovery. Field bean, lucerne, lettuce and three brassica crops (rape, kale and radish) withstood 0.25 kg/ha, rape being reduced in vigour by only 29% at 1.0 kg/ha. Perennial ryegrass, onion and white clover were very sensitive.

The potential control of A. myosuroides and possibly Veronica persica in cereals are interesting features of WL 49818. In this respect it is worth comparing it with other conventional pre-emergence treatments such as the ureas (isoproturon, chlortoluron) and tri-allate, none of which control V. persica. If WL 49818 is active and selective in higher organic soils then it may be worth testing in direct drilling and minimum tillage situations where the ureas have sometimes given inadequate control of blackgrass. The quicker action of this herbicide (at or near emergence) as opposed to the slower effect of the ureas may also prove advantageous. If incorporation into the soil is unnecessary (as suggested from the results with ryegrass) it would be interesting to compare WL 49818 with tri-allate. In this respect, granular formulations of the herbicide(s) may be worth testing.

Selectivity among tropical species

Most annual grass weeds were killed by 0.25 kg/ha and good selectivity against these was confirmed in three of the four broad-leaved crops for which results are presented ie kenaf, tomato and chickpea which tolerated 1 kg/ha. Other legumes cowpea, soyabean and pigeon pea also appeared to tolerate 1 kg/ha. Cotton was almost certainly unharmed at 0.25 kg/ha and perhaps also at 1 kg/ha. Further work would appear well justified in all these larger crops. Jute and sesamum however were more sensitive. The major cereals, maize and rice showed only mild symptoms at 0.25 kg/ha while sorghum was a little more seriously damaged. The safeners NA and cyometrinil had only very slight protective effects.

Broad-leaved weeds and Cyperus species were almost unharmed at 1 kg/ha but C. esculentus was suppressed for almost six months by a dose of 4 kg/ha.

ACTIVITY EXPERIMENT

WL 49818

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

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

UNTREATED xxxxxxxxxxxxxx no. of survivors
CONTROL xxxxxxxxxxxxxx vigour of survivors

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 49818 0.25 kg/ha		WL 49818 1.0 kg/ha		WL 49818 4.0 kg/ha
WHEAT	107	xxxxxxxxxxxxxxxxxxx +	93	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
(1)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
WHEAT + S	88	xxxxxxxxxxxxxxxxx	110	xxxxxxxxxxxxxxxxxxx +	110	xxxxxxxxxxxxxxxxxxx +
(2)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
BARLEY	100	xxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxx
BARLEY + S	100	xxxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx
(4)	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	57	xxxxxxxxxx
OAT	96	xxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx
(5)	93	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
PER RYGR	21	xxxx	0		0	
(6)	36	xxxxxxx	0		0	
ONION	85	xxxxxxxxxxxxxxxx	40	xxxxxxxx	9	xx
(8)	71	xxxxxxxxxxxxxx	43	xxxxxxxxx	14	xxx
DWF BEAN	104	xxxxxxxxxxxxxxxxxxx +	104	xxxxxxxxxxxxxxxxxxx +	91	xxxxxxxxxxxxxxxxx
(9)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
FLD BEAN	105	xxxxxxxxxxxxxxxxxxx +	90	xxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx
(10)	100	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	50	xxxxxxxxxx
PEA	60	xxxxxxxxxxxx	120	xxxxxxxxxxxxxxxxxxx +	80	xxxxxxxxxxxxxxxx
(11)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxx
W CLOVER	80	xxxxxxxxxxxxxxxx	7	x	0	
(12)	43	xxxxxxxxx	7	x	0	
LUCERNE	78	xxxxxxxxxxxxxxxx	78	xxxxxxxxxxxxxxxx	103	xxxxxxxxxxxxxxxxxxx +
(13)	86	xxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	43	xxxxxxxxx

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 49818 0.25 kg/ha		WL 49818 1.0 kg/ha		WL 49818 4.0 kg/ha
RAPE	96	xxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx	108	xxxxxxxxxxxxxxxxxxx +
(14)	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	36	xxxxxxx
KALE	102	xxxxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxx +	111	xxxxxxxxxxxxxxxxxxx +
(15)	93	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	36	xxxxxxx
SWEDE	97	xxxxxxxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxx	88	xxxxxxxxxxxxxxxxx
(17)	79	xxxxxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
CARROT	92	xxxxxxxxxxxxxxxxx	104	xxxxxxxxxxxxxxxxxxx +	92	xxxxxxxxxxxxxxxxx
(18)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx
LETTUCE	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	104	xxxxxxxxxxxxxxxxxxx +
(20)	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
FENUGREEK	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxx +
(21)	71	xxxxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
SUG BEET	84	xxxxxxxxxxxxxxxxx	77	xxxxxxxxxxxxxxx	95	xxxxxxxxxxxxxxxxxxx
(22)	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	29	xxxxxx
BETA VUL	59	xxxxxxxxxxxx	123	xxxxxxxxxxxxxxxxxxx +	54	xxxxxxxxxxx
(23)	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
BROM STE	90	xxxxxxxxxxxxxxxxxx	85	xxxxxxxxxxxxxxxxx	85	xxxxxxxxxxxxxxxxx
(24)	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	43	xxxxxxxxx
FEST RUB	0		0		0	
(25)	0		0		0	
AVE FATU	68	xxxxxxxxxxxxxx	74	xxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
(26)	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
ALO MYOS	12	xx	6	x	0	
(27)	43	xxxxxxxxx	14	xxx	0	

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 49818 0.25 kg/ha		WL 49818 1.0 kg/ha		WL 49818 4.0 kg/ha
POA ANN	0		0		0	
(28)	0		0		0	
POA TRIV	3	x	0		0	
(29)	21	xxxx	0		0	
SIN ARV	97	xxxxxxxxxxxxxxxxxx	121	xxxxxxxxxxxxxxxxxxxx +	88	xxxxxxxxxxxxxxxxx
(30)	71	xxxxxxxxxxxxxx	50	xxxxxxxxxx	36	xxxxxxx
RAPH RAP	92	xxxxxxxxxxxxxxxxxx	92	xxxxxxxxxxxxxxxxx	78	xxxxxxxxxxxxxxx
(31)	1000	xxxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	36	xxxxxxx
CHRY SEG	55	xxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxxx +	0	
(32)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	0	
TRIP MAR	66	xxxxxxxxxxxxx	84	xxxxxxxxxxxxxxxx	72	xxxxxxxxxxxxx
(33)	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	50	xxxxxxxxxx
SEN VULG	95	xxxxxxxxxxxxxxxxxx	114	xxxxxxxxxxxxxxxxxxx +	85	xxxxxxxxxxxxxxxx
(34)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
POL LAPA	122	xxxxxxxxxxxxxxxxxxx +	117	xxxxxxxxxxxxxxxxxxx +	117	xxxxxxxxxxxxxxxxxxx +
(35)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxx
GAL APAR	74	xxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	40	xxxxxxxx
(38)	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	43	xxxxxxxxx
CHEN ALB	74	xxxxxxxxxxxxxxx	81	xxxxxxxxxxxxxxx	57	xxxxxxxxxxx
(39)	71	xxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
STEL MED	119	xxxxxxxxxxxxxxxxxxx +	128	xxxxxxxxxxxxxxxxxxx +	110	xxxxxxxxxxxxxxxxxxx +
(40)	86	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
VER PERS	82	xxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxxx +	0	
(42)	57	xxxxxxxxxxx	43	xxxxxxxxx	0	

SPECIES		WL 49818 0.25 kg/ha		WL 49818 1.0 kg/ha		WL 49818 4.0 kg/ha
RUM OBTU	102	xxxxxxxxxxxxxxxxxxx	70	xxxxxxxxxxxxx	83	xxxxxxxxxxxxxxxxx
(44)	43	xxxxxxxxx	29	xxxxxx	29	xxxxxx
HOLC LAN	0		0		0	
(45)	0		0		0	
AG REPEN	89	xxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxx +	88	xxxxxxxxxxxxxxxxx
(47)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
ALL VIN	93	xxxxxxxxxxxxxxxxxx	97	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
(49)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
CIRS ARV	92	xxxxxxxxxxxxxxxxx	115	xxxxxxxxxxxxxxxxxxx +	0	
(50)	100	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	0	
TUS FARF	133	xxxxxxxxxxxxxxxxxxx +	100	xxxxxxxxxxxxxxxxxxx	133	xxxxxxxxxxxxxxxxxxx +
(51)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
MILLET	7	x	0		0	
(55)	7	x	0		0	
MAIZE + S	100	xxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxx	0	
(56)	86	xxxxxxxxxxxxxxxx	50	xxxxxxxxxx	0	
MAIZE	91	xxxxxxxxxxxxxxxxx	52	xxxxxxxxxx	0	
(57)	86	xxxxxxxxxxxxxxxx	36	xxxxxxx	0	
SORG + S	107	xxxxxxxxxxxxxxxxxxx +	87	xxxxxxxxxxxxxxxxx	0	
(58)	71	xxxxxxxxxxxxxx	50	xxxxxxxxxx	0	
SORGHUM	107	xxxxxxxxxxxxxxxxxxx +	47	xxxxxxxxx	0	
(59)	79	xxxxxxxxxxxxxxxx	36	xxxxxxx	0	

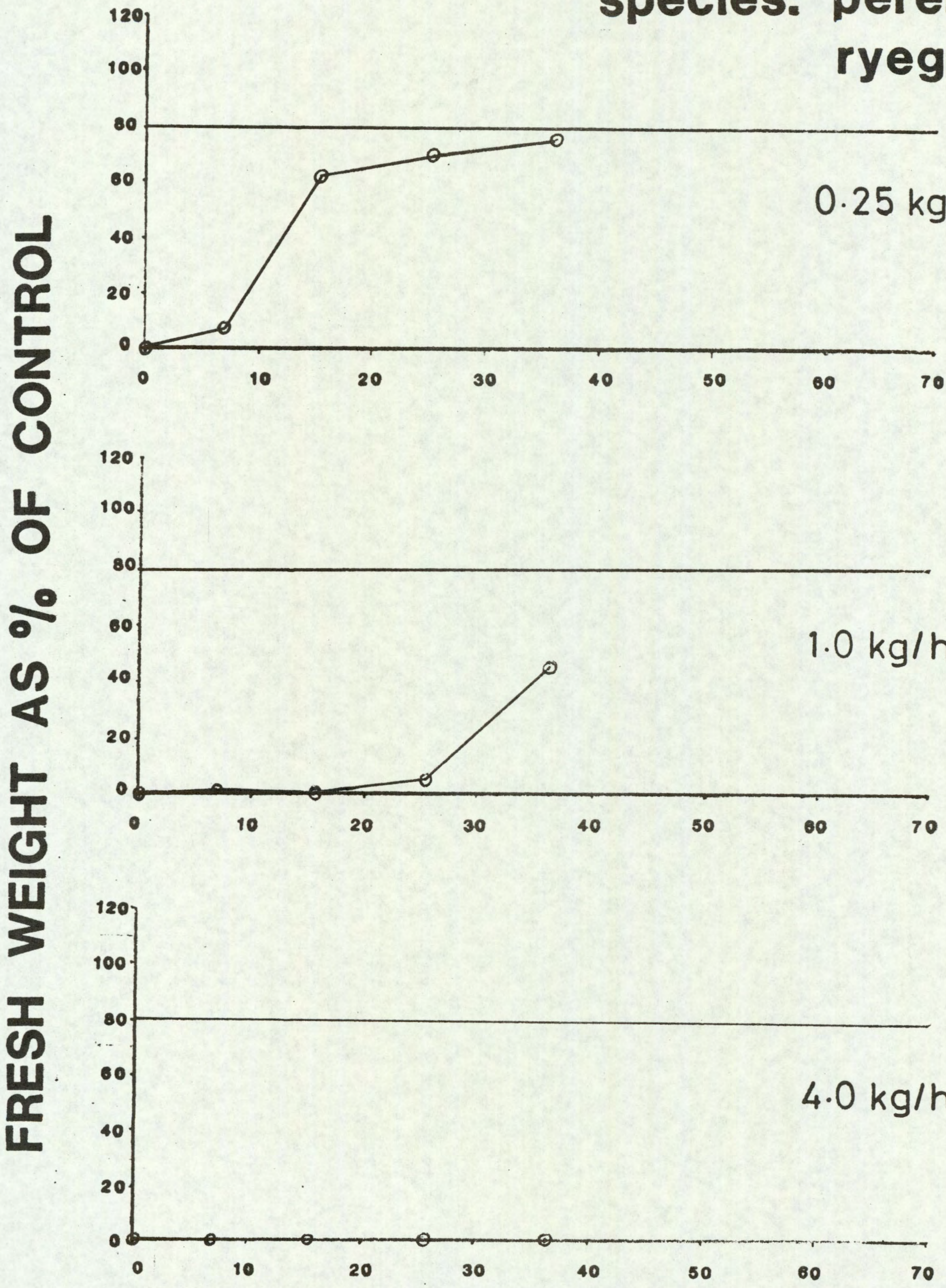
PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 49818 0.25 kg/ha		WL 49818 1.0 kg/ha		WL 49818 4.0 kg/ha
TOMATO	109	xxxxxxxxxxxxxxxxxxxx +	82	xxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx
(60)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
CHICKPEA	92	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
(63)	93	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
JUTE	183	xxxxxxxxxxxxxxxxxxx +	91	xxxxxxxxxxxxxxxxxx	78	xxxxxxxxxxxxxxx
(67)	64	xxxxxxxxxxxxx	36	xxxxxxx	14	xxx
KENAF	105	xxxxxxxxxxxxxxxxxxx +	120	xxxxxxxxxxxxxxxxxxx	67	xxxxxxxxxxxxx
(68)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
ORYZA	94	xxxxxxxxxxxxxxxxxx	28	xxxxxx	19	xxxx
(71)	86	xxxxxxxxxxxxxxxxx	36	xxxxxxx	36	xxxxxxx
RICE	96	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	21	xxxx
(72)	86	xxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	43	xxxxxxxxx
RICE + S	111	xxxxxxxxxxxxxxxxxxx +	106	xxxxxxxxxxxxxxxxxxx +	28	xxxxxx
(73)	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	50	xxxxxxxxxx
ELEU IND	0		0		0	
(74)	0		0		0	
ECH CRUS	0		0		0	
(75)	0		0		0	
ROTT EXA	0		0		0	
(76)	0		0		0	
DIG SANG	0		0		0	
(77)	0		0		0	
AMAR RET	53	xxxxxxxxxxx	81	xxxxxxxxxxxxxxx	61	xxxxxxxxxxxx
(78)	86	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 49818 0.25 kg/ha		WL 49818 1.0 kg/ha		WL 49818 4.0 kg/ha
SOL NIG	46	xxxxxxxxx	208	xxxxxxxxxxxxxxxxxxx +	46	xxxxxxxxx
(81)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
BROM PEC	45	xxxxxxxxx	0		0	
(82)	64	xxxxxxxxxxxx	0		0	
SNO POL	0		0		0	
(83)	0		0		0	
PHAL MIN	0		0		0	
(84)	0		0		0	
CYP ESCU	57	xxxxxxxxxx	21	xxxx	0	
(85)	86	xxxxxxxxxxxxxxx	57	xxxxxxxxxx	0	
CYP ROTU	98	xxxxxxxxxxxxxxxxxx	105	xxxxxxxxxxxxxxxxxx +	77	xxxxxxxxxxxxxx
(86)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx

PERSISTENCE OF WL 49818
species: perennial ryegrass



Code number WL 82830

Chemical name Confidential

Structure Confidential

Source Shell Biosciences Laboratory
Sittingbourne Research Centre
Sittingbourne
Kent ME9 8AG

Information available and suggested uses

Suggested for grass and broad-leaved weed control in dicotyledonous crops, pre-emergence at 0.5 to 1.0 kg a.i./ha.

Formulation used 40% w/v a.i. emulsifiable concentrate

Spray volume 386 l/ha

RESULTS

Full results are given in the histograms on pages 20-27 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
4.0	None	None listed as no crops tolerant
1.0	kenaf	Rumex obtusifolius Agropyron repens Amaranthus retroflexus Bromus sterilis Chrysanthemum segetum Senecio vulgaris Chenopodium album Stellaria media + species below
0.25	species above + barley + safener (NA) dwarf bean rape radish tomato	Festuca rubra Avena fatua Alopecurus myosuroides Poa annua Poa trivialis Galium aparine Veronica persica Holcus lanatus Cirsium arvense Oryza rufipogon Eleusine indica

(Table continued overleaf)

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: number or vigour reduced by 70% or more
0.25		Echinochloa crus-galli Rottboellia exaltata Digitaria sanguinalis Bromus pectinatus Snowdenia polystachya Phalaris minor

Comments on results

Activity experiment

The foliar spray caused minor, non-lethal effects, with broad-leaved species being more sensitive than grasses. With the exception of dwarf bean, soil drenches were more effective than foliar sprays, this difference being most marked with the grasses. However, pre-emergence treatments were the most active mode of application especially on grasses. Surface pre-emergence sprays to grasses were much more toxic than when incorporated into the soil. Differences between these two types of treatment were much less marked with broad-leaved species. These features should be borne in mind when considering results of the pre-emergence selectivity test, where the herbicide was applied to the soil surface only. The overall pattern of activity was similar to that found with the previous herbicide, WL 49818. However, WL 82830 possesses a much higher level of activity.

Symptoms

These were identical to those caused by the previous herbicide WL 49818. However, the majority of species were much more sensitive to WL 82830.

Persistence in the soil

The test species, perennial ryegrass indicated relatively long soil persistence. Doses of 0.25, 1.0 and 4.0 kg/ha reduced shoot fresh weights by 94, 99 and 100%, 36 weeks after spraying.

Pre-emergence selectivity among temperate species

All annual grass weeds were killed or controlled by the lowest dose of 0.25 kg/ha with the exception of B. sterilis. However, more than 50% of plants of the latter species were killed and vigour of survivors was reduced by 36%. Although only three broad-leaved weeds were controlled at 0.25 kg/ha, these included Galium aparine, Veronica persica and Cirsium arvense. Many other broad-leaved weeds were resistant, notably the two crucifers (Sinapis arvensis and Raphanus raphanistrum) as were three of the perennials A. repens, A. vineale and T. farfara.

Dwarf bean was the most tolerant crop, recovering from initial stunting and chlorosis to pod normally after treatment at 1.0 kg/ha. Two of the brassica crops (rape and radish) were tolerant to 0.25 kg/ha. The cereals (wheat, barley and oat) were sensitive at this dose but barley was safened by the NA seed dressing. Perennial ryegrass, pea and white clover were very sensitive.

The possible control of annual grasses, G. aparine and V. persica in dwarf bean and rape is interesting, deserving further testing. However, the weakness on the other, mainly broad-leaved weeds means that mixing with other herbicides may be necessary. The safening effect on barley warrants further investigation,

initially in pots. Although the weed and crop spectra of activity and selectivity were broadly similar to the previous herbicide WL 49818, WL 82830 was generally much more active and gave better control of certain important weeds such as Avena fatua and Galium aparine.

Selectivity among tropical species

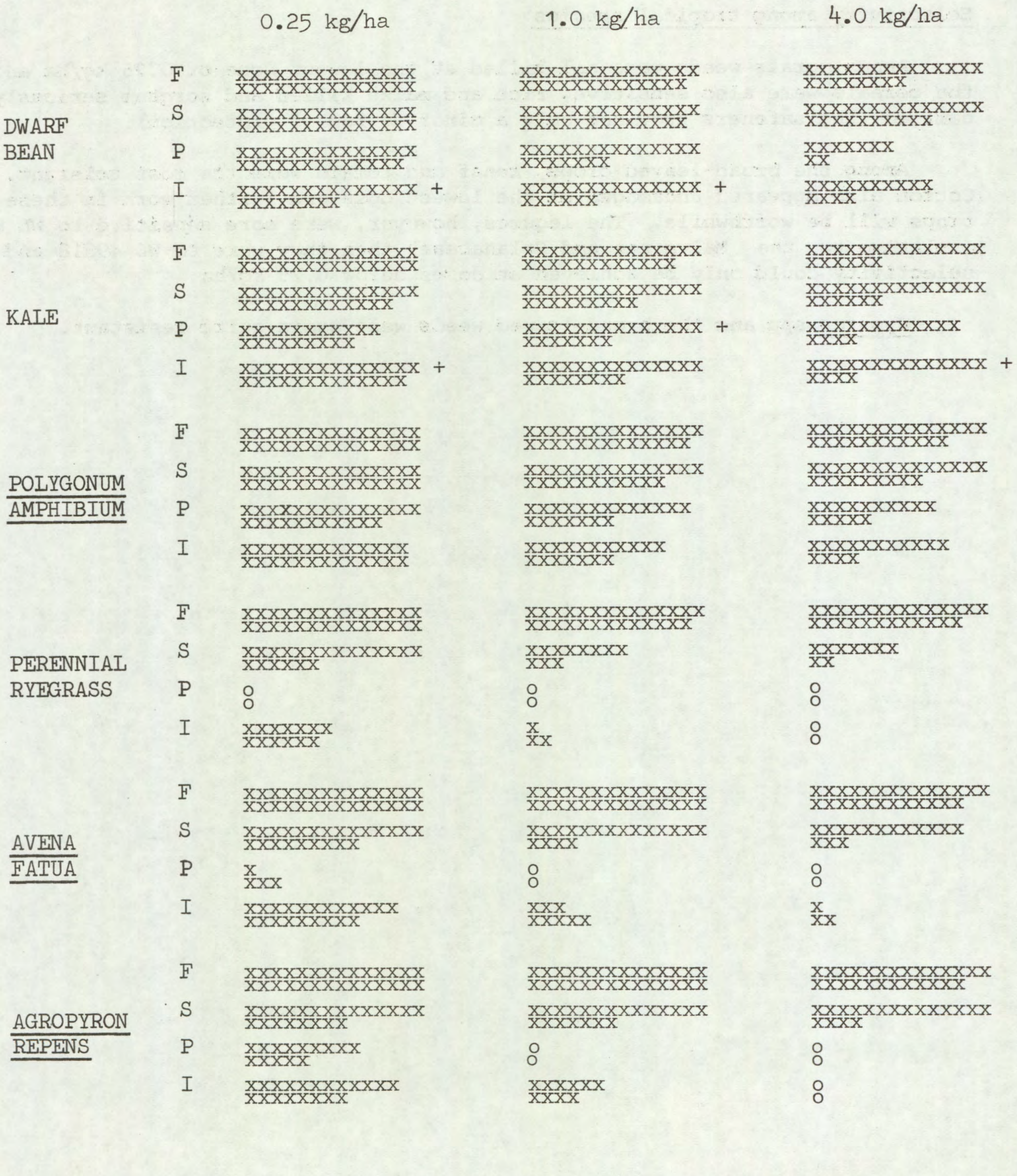
Annual grass weeds were all killed at the lowest dose of 0.25 kg/ha and the cereals were also sensitive, rice and maize killed and sorghum seriously damaged (the safeners provided only a minor degree of protection).

Among the broad-leaved crops, kenaf and tomato were the most tolerant. Cotton also appeared undamaged at the lowest dose and further work in these crops will be worthwhile. The legumes, however, were more sensitive to WL 82830 (relative to the Malvaceae and Solanaceae) than they were to WL 49818 and selectivity could only be achieved at doses below 0.25 kg/ha.

Cyperus spp and the broad-leaved weeds were again quite resistant.

ACTIVITY EXPERIMENT

WL 82830



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

UNTREATED xxxxxxxxxxxxxx no. of survivors
CONTROL xxxxxxxxxxxxxx vigour of survivors

SPECIES		WL 82830 0.25 kg/ha		WL 82830 1.0 kg/ha		WL 82830 4.0 kg/ha	
WHEAT	73	xxxxxxxxxxxxxxx	13	xxx	0		
(1)	64	xxxxxxxxxxxxx	36	xxxxxxx	0		
WHEAT + S	73	xxxxxxxxxxxxxxxxx	0		0		
(2)	57	xxxxxxxxxxx	0		0		
BARLEY	100	xxxxxxxxxxxxxxxxxxxx	0		0		
(3)	71	xxxxxxxxxxxxxx	0		0		
BARLEY + S	94	xxxxxxxxxxxxxxxxxx	25	xxxxx	0		
(4)	86	xxxxxxxxxxxxxxxx	29	xxxxxx	0		
OAT	45	xxxxxxxxx	6	x	0		
(5)	64	xxxxxxxxxxxxx	21	xxxx	0		
PER RYGR	0		0		0		
(6)	0		0		0		
ONION	81	xxxxxxxxxxxxxxxx	18	xxxx	9	xx	
(8)	57	xxxxxxxxxxx	43	xxxxxxxxx	7	x	
DWF BEAN	104	xxxxxxxxxxxxxxxxxxx +	104	xxxxxxxxxxxxxxxxxxx +	13	xxx	
(9)	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	14	xxx	
FLD BEAN	90	xxxxxxxxxxxxxxxxx	15	xxx	0		
(10)	50	xxxxxxxxxx	14	xxx	0		
PEA	0		0		0		
(11)	0		0		0		
W CLOVER	20	xxxx	27	xxxxx	0		
(12)	14	xxx	14	xxx	0		
LUCERNE	98	xxxxxxxxxxxxxxxxxx	103	xxxxxxxxxxxxxxxxxx +	88	xxxxxxxxxxxxxxxxx	
(13)	79	xxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	36	xxxxxxx	

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 82830 0.25 kg/ha		WL 82830 1.0 kg/ha		WL 82830 4.0 kg/ha
RAPE	113	xxxxxxxxxxxxxxxxxxx +	91	xxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx
(14)	86	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
KALE	106	xxxxxxxxxxxxxxxxxxx +	120	xxxxxxxxxxxxxxxxxxx +	111	xxxxxxxxxxxxxxxxxxx
(15)	64	xxxxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
SWEDE	92	xxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxx +	106	xxxxxxxxxxxxxxxxxxx +
(17)	71	xxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
CARROT	104	xxxxxxxxxxxxxxxxxxx +	6	x	0	
(18)	57	xxxxxxxxxxx	14	xxx	0	
LETTUCE	96	xxxxxxxxxxxxxxxxxx	104	xxxxxxxxxxxxxxxxxxx +	100	xxxxxxxxxxxxxxxxxxx
(20)	57	xxxxxxxxxxx	29	xxxxxx	14	xxx
FENUGREEK	106	xxxxxxxxxxxxxxxxxxx +	94	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(21)	43	xxxxxxxxx	29	xxxxxx	29	xxxxxx
SUG BEET	84	xxxxxxxxxxxxxxxxx	99	xxxxxxxxxxxxxxxxxxx	110	xxxxxxxxxxxxxxxxxxx +
(22)	71	xxxxxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
BETA VUL	32	xxxxxx	102	xxxxxxxxxxxxxxxxxxx	123	xxxxxxxxxxxxxxxxxxx +
(23)	57	xxxxxxxxxxx	57	xxxxxxxxxxx	43	xxxxxxxxx
BROM STE	45	xxxxxxxxx	4	x	0	
(24)	64	xxxxxxxxxxxxx	7	x	0	
FEST RUB	0		0		0	
(25)	0		0		0	
AVE FATU	23	xxxxx	0		0	
(26)	29	xxxxxx	0		0	
ALO MYOS	0		0		0	
(27)	0		0		0	

SPECIES		WL 82830 0.25 kg/ha		WL 82830 1.0 kg/ha		WL 82830 4.0 kg/ha
POA ANN	0		0		0	
(28)	0		0		0	
POA TRIV	0		0		0	
(29)	0		0		0	
SIN ARV	88	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx
(30)	79	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	36	xxxxxxx
RAPH RAP	97	xxxxxxxxxxxxxxxxxx	97	xxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx
(31)	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	43	xxxxxxxxx
CHRY SEG	164	xxxxxxxxxxxxxxxxxxx +	109	xxxxxxxxxxxxxxxxxxx +	0	
(32)	43	xxxxxxxxx	29	xxxxxx	0	
TRIP MAR	66	xxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxx	18	xxxx
(33)	36	xxxxxxx	43	xxxxxxxxx	7	x
SEN VULG	121	xxxxxxxxxxxxxxxxxxx +	140	xxxxxxxxxxxxxxxxxxx +	124	xxxxxxxxxxxxxxxxxxx +
(34)	36	xxxxxxx	29	xxxxxx	14	xxx
POL LAPA	104	xxxxxxxxxxxxxxxxxx +	109	xxxxxxxxxxxxxxxxxx +	117	xxxxxxxxxxxxxxxxxx +
(35)	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	43	xxxxxxxxx
GAL APAR	23	xxxxx	11	xx	0	
(38)	50	xxxxxxxxxx	36	xxxxxxx	0	
CHEN ALB	92	xxxxxxxxxxxxxxxxx	77	xxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxx
(39)	43	xxxxxxxxx	29	xxxxxx	29	xxxxxx
STEL MED	117	xxxxxxxxxxxxxxxxxxx +	110	xxxxxxxxxxxxxxxxxxx +	99	xxxxxxxxxxxxxxxxxxx
(40)	50	xxxxxxxxxx	29	xxxxxx	21	xxxx
VER PERS	55	xxxxxxxxxxx	55	xxxxxxxxxxx	0	
(42)	21	xxxx	7		0	

SPECIES		WL 82830 0.25 kg/ha		WL 82830 1.0 kg/ha		WL 82830 4.0 kg/ha
RUM OBTU	102	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxxx
(44)	57	xxxxxxxxxxx	29	xxxxxx	29	xxxxxx
HOLC LAN	0		0		0	
(45)	0		0		0	
AG REPEN	97	xxxxxxxxxxxxxxxxxx	9	xx	0	
(47)	79	xxxxxxxxxxxxxxxx	29	xxxxxx	0	
ALL VIN	85	xxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	25	xxxxx
(49)	100	xxxxxxxxxxxxxxxxxxx	43	xxxxxxxxx	21	xxxx
CIRS ARV	0		0		0	
(50)	0		0		0	
TUS FARF	117	xxxxxxxxxxxxxxxxxxx +	117	xxxxxxxxxxxxxxxxxxx +	17	xxx
(51)	86	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	14	xxx
MILLET	0		0		0	
(55)	0		0		0	
MAIZE + S	50	xxxxxxxxxx	0		0	
(56)	43	xxxxxxxxx	0		0	
MAIZE	0		0		0	
(57)	0		0		0	
SORG + S	80	xxxxxxxxxxxxxxxx	7	x	0	
(58)	50	xxxxxxxxxx	14	xxx	0	
SORGHUM	87	xxxxxxxxxxxxxxxxx	0		0	
(59)	50	xxxxxxxxxx	0		0	

PRE-EMERGENCE SELECTIVITY TEST

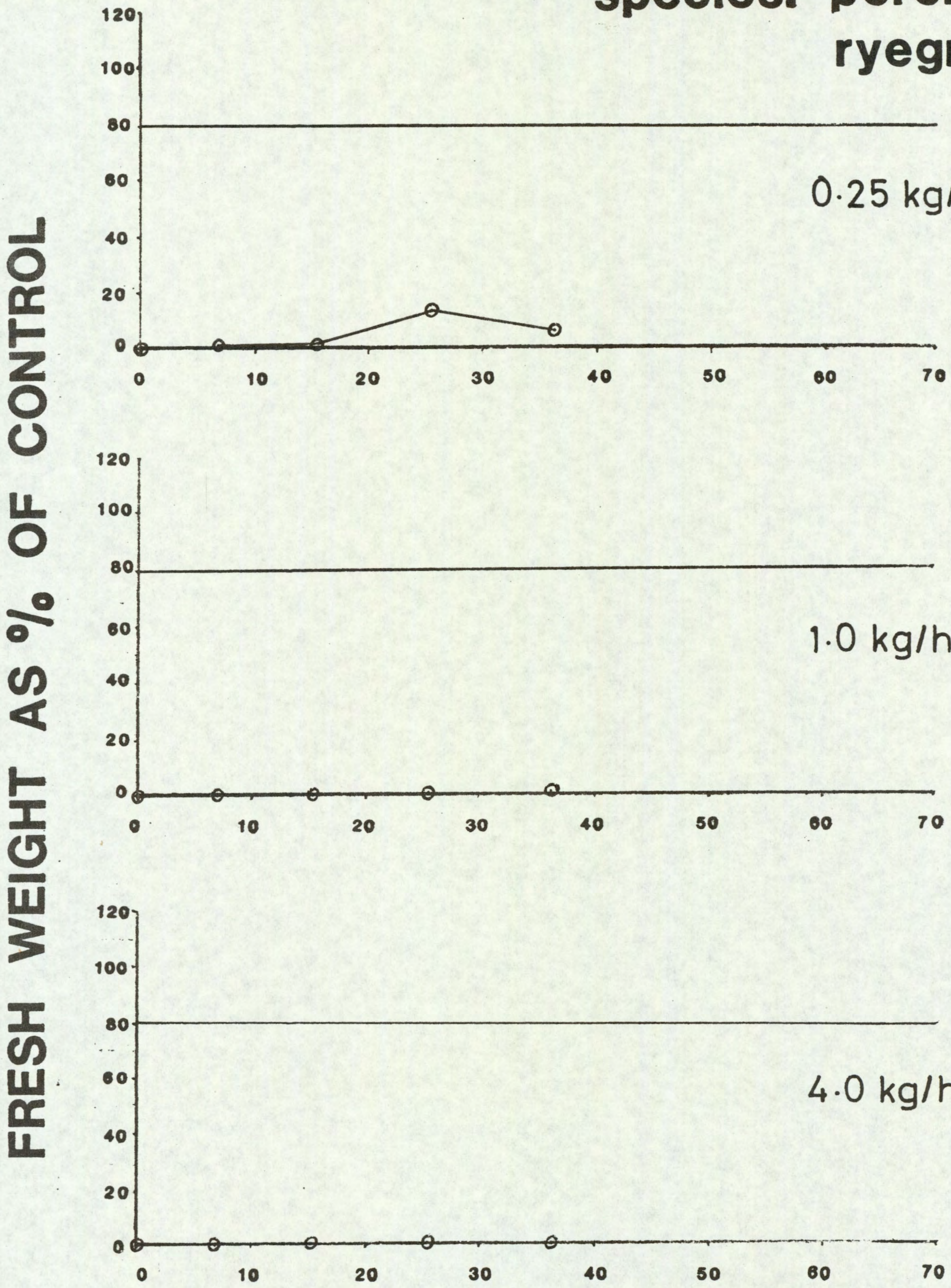
SPECIES		WL 82830 0.25 kg/ha		WL 82830 1.0 kg/ha		WL 82830 4.0 kg/ha
TOMATO (60)	95	xxxxxxxxxxxxxxxxxxx	95	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx
	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	50	xxxxxxxxxx
CHICKPEA (63)	67	xxxxxxxxxxxxx	17	xxx	0	
	57	xxxxxxxxxxx	29	xxxxxx	0	
JUTE (67)	130	xxxxxxxxxxxxxxxxxxx +	13	xxx	0	
	43	xxxxxxxxx	7	x	0	
KENAF (68)	127	xxxxxxxxxxxxxxxxxxx +	112	xxxxxxxxxxxxxxxxxxx +	120	xxxxxxxxxxxxxxxxxxx +
	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
ORYZA (71)	0		0		0	
	0		0		0	
RICE (72)	0		0		0	
	0		0		0	
RICE + S (73)	0		0		0	
	0		0		0	
ELEU IND (74)	0		0		0	
	0		0		0	
ECH CRUS (75)	0		0		0	
	0		0		0	
ROTT EXA (76)	0		0		0	
	0		0		0	
DIG SANG (77)	0		0		0	
	0		0		0	
AMAR RET (78)	66	xxxxxxxxxxxxx	60	xxxxxxxxxxxx	44	xxxxxxxxx
	64	xxxxxxxxxxxxx	29	xxxxxx	29	xxxxxx

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 82830 0.25 kg/ha		WL 82830 1.0 kg/ha		WL 82830 4.0 kg/ha
SOL NIG	185	xxxxxxxxxxxxxxxxxxx +	138	xxxxxxxxxxxxxxxxxxx +	162	xxxxxxxxxxxxxxxxxxx +
(81)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	36	xxxxxxx
BROM PEC	0		0		0	
(82)	0		0		0	
SNO POL	0		0		0	
(83)	0		0		0	
PHAL MIN	0		0		0	
(84)	0		0		0	
CYP ESCU	79	xxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	57	xxxxxxxxxx
(85)	93	xxxxxxxxxxxxxxxxx	50	xxxxxxxxx	43	xxxxxxxxx
CYP ROTU	98	xxxxxxxxxxxxxxxxxx	77	xxxxxxxxxxxxxx	84	xxxxxxxxxxxxxxxx
(86)	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	57	xxxxxxxxxx

PERSISTENCE OF WL 82830

species: perennial ryegrass

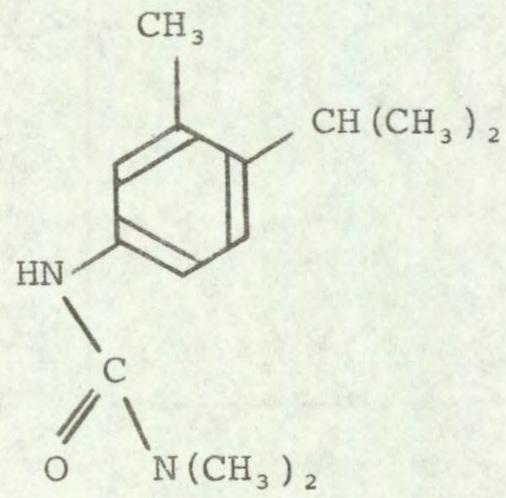


WL 83627

Code number WL 83627

Chemical name 3-(3-methyl-4-isopropylphenyl)-1,1-dimethylurea

Structure



Source

Shell Biosciences Laboratory
Sittingbourne Research Centre
Sittingbourne
Kent ME9 8AG

Information available and suggested uses

Suggested for broad-spectrum selective weed control pre- and post-emergence in small grain cereals at 1.0 to 3.0 kg a.i./ha.

Formulation used 50% w/w a.i. wettable powder

Spray volume 386 l/ha

RESULTS

Full results are given in the histograms on pages 31-38 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	None	None listed as no crops tolerant
1.0	barley + safener (NA) maize ± safener (NA) sorghum ± safener (cyometrinil)	Alopecurus myosuroides Raphanus raphanistrum Polygonum lapathifolium Veronica persica Tussilago farfara
0.25	species above + wheat ± safener (NA) barley oat field bean pea fenugreek* millet chickpea kenaf	Beta vulgaris Festuca rubra Poa annua Poa trivialis Sinapis arvensis Chrysanthemum segetum Tripleurospermum maritimum Senecio vulgaris Chenopodium album Stellaria media

* but note stand reduction

(Table continued overleaf)

RATE (kg a.i./ha)	CROPS: vigour reduced by 15% or less	WEEDS: number or vigour reduced by 70% or more
0.25		Rumex obtusifolius Holcus lanatus Cirsium arvense Eleusine indica Echinochloa crus-galli Digitaria sanguinalis Amaranthus retroflexus Solanum nigrum Snowdenia polystachya Phalaris minor

Comments on results

Activity experiment

Although the foliar spray was damaging at higher doses, particularly on kale and dwarf bean, applications to the soil resulted in greatest activity. The soil drench, post-emergence and the pre-emergence surface spray were the most effective forms of treatment. The pre-emergence spray tended to be more phytotoxic than when the herbicide was incorporated into the soil, this difference being seen more with the smaller-seeded species, particularly kale. This should be borne in mind when considering the results of the present selectivity test where application was to the surface.

Symptoms

These were typical of herbicides, such as ureas and triazines, which inhibit photosynthesis. Scorch symptoms appeared with the foliage spray and chlorosis developed. Chlorosis was the first symptom to develop with soil treatments, and was followed by necrosis. Germination was unaffected by pre-emergence treatments.

Persistence in the soil

The sensitive test species, perennial ryegrass was reduced 93, 99 and 100% (shoot fresh weight basis) by doses of 0.25, 1.0 and 4.0 kg/ha, respectively, 36 weeks after spraying, thus indicating a relatively long period of persistence in the soil.

Pre-emergence selectivity among temperate species

A wide range of annual broad-leaved and grass weeds were susceptible.

In the broad-leaved range, all composite, cruciferous and polygonaceous weeds were controlled as well as Veronica persica, Chenopodium album, Stellaria media, Solanum nigrum, Beta vulgaris and the two perennials Cirsium arvense and Tussilago farafara. Galium aparine, however, was resistant. Most annual grasses were controlled, including Alopecurus myosuroides, but Avena fatua and Bromus sterilis were resistant.

Crop tolerance was confined to the cereals (wheat and barley) and certain legumes (pea, field bean and fenugreek). Safening effects were found on the two cereals, especially barley. At final assessment 10 weeks after spraying, the shoot fresh weight of wheat treated at 1.0 kg/ha was 60% of untreated control whereas with the safener (NA) it was 80% of untreated. The condition of barley

treated at this dose had deteriorated considerably after the main assessment such that shoot fresh weights at harvest were only 19% of control. With the NA safener, however, shoot fresh weights were 93% of control. Onion, white clover, kale, swede and sugar beet were very sensitive.

The potential control of a wide spectrum of weeds in wheat and barley, notably A. myosuroides and V. persica, is of considerable interest, deserving comparative testing with herbicides such as isoproturon and chlortoluron. A possible advantage could be control of Veronica species which are known to be quite resistant to these other ureas. The resistance of Galium aparine is a disadvantage, common to all three herbicides however and may necessitate studies in mixture with other herbicides to control this species. The increase in tolerance conferred on barley by the NA safener could also be of value. This safening effect has been verified in a follow up pot test, again being better with barley than with wheat (Richardson et al, unpublished data). Another selectivity of potential interest is the control of a wide range of weeds including Solanum nigrum in pea, which deserves further investigation.

Selectivity among tropical species

Several crops tolerated 0.25 kg/ha but some annual weeds including Echinochloa crus-galli were not adequately controlled at this dose. At 1 kg/ha maize and sorghum were tolerant but Rottboellia exaltata was still not controlled. At 4 kg/ha there was only a mild protective effect from NA on maize, surprising in view of the more significant protection of barley reported above. Sorghum was not protected at all by cyometrinil. Rice was susceptible even to 0.25 kg/ha (and not protected by NA) but millet was only a little retarded at 1 kg/ha and selectivity could be expected against a number of grass and broad-leaved weeds in this crop.

The susceptibility of Phalaris minor suggests useful selectivity against this species in wheat.

Cyperus spp were only temporarily affected by 4 kg/ha and in general, the tropical uses of this compound would appear very limited.

ACTIVITY EXPERIMENT

WL 83627

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

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

UNTREATED xxxxxxxxxxxxx no. of survivors
CONTROL xxxxxxxxxxxxx vigour of survivors

SPECIES		WL 83627 0.25 kg/ha		WL 83627 1.0 kg/ha		WL 83627 4.0 kg/ha
WHEAT	100	xxxxxxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx
(1)	93	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
WHEAT + S	102	xxxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxxx
(2)	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxxx
BARLEY	94	xxxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	50	xxxxxxxxxx
BARLEY + S	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx
(4)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
OAT	102	xxxxxxxxxxxxxxxxxxxx	89	xxxxxxxxxxxxxxxxxx	89	xxxxxxxxxxxxxxxxxx
(5)	86	xxxxxxxxxxxxxxxxx	36	xxxxxxx	14	xxx
PER RYGR	55	xxxxxxxxxxx	4	x	0	
(6)	64	xxxxxxxxxxxxx	21	xxxx	0	
ONION	0		0		0	
(8)	0		0		0	
DWF BEAN	91	xxxxxxxxxxxxxxxxx	91	xxxxxxxxxxxxxxxxx	0	
(9)	71	xxxxxxxxxxxxxx	21	xxxx	0	
FLD BEAN	105	xxxxxxxxxxxxxxxxxxxx +	120	xxxxxxxxxxxxxxxxxxxx +	0	
(10)	93	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx	0	
PEA	80	xxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxxx
(11)	86	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx	14	xxx
W CLOVER	0		0		0	
(12)	0		0		0	
LUCERNE	21	xxxx	0		0	
(13)	29	xxxxxx	0		0	

SPECIES		WL 83627 0.25 kg/ha		WL 83627 1.0 kg/ha		WL 83627 4.0 kg/ha	
RAPE	74	xxxxxxxxxxxxxx	6	x	0		
(14)	64	xxxxxxxxxxxxx	7	x	0		
KALE	5	x	0		0		
(15)	14	xxx	0		0		
SWEDE	5	x	0		0		
(17)	21	xxxx	0		0		
CARROT	104	xxxxxxxxxxxxxxxxxxx +	0		0		
(18)	79	xxxxxxxxxxxxxxx	0		0		
LETTUCE	25	xxxxx	0		0		
(20)	50	xxxxxxxxxx	0		0		
FENUGREK	33	xxxxxxx	0		0		
(21)	86	xxxxxxxxxxxxxxxx	0		0		
SUG BEET	0		0		0		
(22)	0		0		0		
BETA VUL	5		0		0		
(23)	14	xxx	0		0		
BROM STE	90	xxxxxxxxxxxxxxxxx	72	xxxxxxxxxxxxx	54	xxxxxxxxxx	
(24)	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	36	xxxxxxx	
FEST RUB	8	xx	0		0		
(25)	7	x	0		0		
AVE FATU	62	xxxxxxxxxxx	62	xxxxxxxxxxx	79	xxxxxxxxxxxxxxx	
(26)	86	xxxxxxxxxxxxxxxx	50	xxxxxxxxx	29	xxxxxx	
ALO MYOS	49	xxxxxxxxx	6	x	0		
(27)	43	xxxxxxxxx	7	x	0		

PRE-EMERGENCE SELECTIVITY TEST

SPECIES		WL 83627 0.25 kg/ha		WL 83627 1.0 kg/ha		WL 83627 4.0 kg/ha	
POA	23	xxxxx	0		0		
(28)	36	xxxxxxx	0		0		
POA TRIV	3	x	0		0		
(29)	21	xxxx	0		0		
SIN ARV	3	x	0		0		
(30)	21	xxxx	0		0		
RAPH RAP	92	xxxxxxxxxxxxxxxxx	5	x	0		
(31)	57	xxxxxxxxxxx	14	xxx	0		
CHRY SEG	0		0		0		
(32)	0		0		0		
TRIP MAR	6	x	18	xxxx	12	xx	
(33)	14	xxx	14	xxx	14	xxx	
SEN VULG	13	xxx	3	x	16	xxx	
(34)	29	xxxxxx	7	x	7	x	
POL LAPA	78	xxxxxxxxxxxxxxxx	13	xxx	0		
(35)	79	xxxxxxxxxxxxxxxx	29	xxxxxx	0		
GAL APAR	85	xxxxxxxxxxxxxxxxx	108	xxxxxxxxxxxxxxxxxxx +	79	xxxxxxxxxxxxxxx	
(38)	93	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	
CHEN ALB	2	x	3	x	3	x	
(39)	14	xxx	7	x	7	x	
STEL MED	25	xxxxx	0		0		
(40)	64	xxxxxxxxxxxx	0		0		
VER PERS	55	xxxxxxxxxx	0		0		
(42)	36	xxxxxxx	0		0		

SPECIES		WL 83627 0.25 kg/ha		WL 83627 1.0 kg/ha		WL 83627 4.0 kg/ha
RUM OBTU	0		0		0	
(44)	0		0		0	
HOLC LAN	15	xxx	0		0	
(45)	7	x	0		0	
AG REPEN	97	xxxxxxxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxxxxx +	62	xxxxxxxxxxxx
(47)	86	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
ALL VIN	97	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	85	xxxxxxxxxxxxxxxx
(49)	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	57	xxxxxxxxxx
CIRS ARV	23	xxxxx	0		0	
(50)	7	x	0		0	
TUS FARF	117	xxxxxxxxxxxxxxxxxx +	83	xxxxxxxxxxxxxxxx	50	xxxxxxxxxx
(51)	79	xxxxxxxxxxxxxxx	21	xxxx	14	xxx
MILLET	93	xxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	33	xxxxxxx
(55)	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	36	xxxxxxx
MAIZE + S	87	xxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxx
(56)	86	xxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
MAIZE	104	xxxxxxxxxxxxxxxxxx +	104	xxxxxxxxxxxxxxxxxx +	104	xxxxxxxxxxxxxxxxxx +
(57)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxx
SORG + S	107	xxxxxxxxxxxxxxxxxx +	100	xxxxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxx
(58)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
SORGHUM	107	xxxxxxxxxxxxxxxxxx +	100	xxxxxxxxxxxxxxxxxx	107	xxxxxxxxxxxxxxxxxx +
(59)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx

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