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Pre-emergence selectivity among temperate species

The annual grasses, Holcus lanatus and the Poa species were sensitive to the lowest dose and although Alopecurus myosuroides needed the highest dose for actual control, it was severely affected at both lower doses; Avena fatua and Bromus sterilis were not controlled however. Certain annual broad-leaved weeds were susceptible, Rumex obtusifolius at 0.25 kg/ha, Polygonum aviculare and Veronica persica at 1.0 kg/ha, Polygonum lapathifolium, Stellaria media and more notably Galium aparine at 4.0 kg/ha. Cruciferous weeds were resistant, as were perennial weeds with the exception of Convolvulus arvensis which was controlled at 4.0 kg/ha and considerably weakened at lower doses.

Barley and carrot tolerated 4.0 kg/ha, while wheat, pea and radish were reduced in vigour by only 21% at this dose and tolerant at 1.0 kg/ha as were oat, rape and sugar beet. Onion, perennial ryegrass and white clover were sensitive.

Selective control of some annual grass and broad-leaved weeds in certain crops such as cereals, carrot, pea and brassicas is probable. Further, the margin of selectivity may possibly be increased if the herbicide is incorporated, judging from the results obtained in the activity experiment. Some further work, initially in pots, may be worthwhile concerning the selective control of Galium aparine in barley and carrot.

Pre-emergence selectivity among tropical species

Butralin showed somewhat less activity on weeds than pendimethalin and a smaller range of selectivities, the most interesting being in kenaf and cow-pea. Solanum nigrum and Oxalis latifolia were apparently susceptible to 1 kg/ha and certainly to 4 kg/ha. Selectivity in rice appeared slightly inferior to that of pendimethalin especially in relation to Rottboellia. There was some protection of maize by NA but not of sorghum by CA 43089.

ACTIVITY EXPERIMENT

Pre-em (P & I) and Post-em Foliar (F) 0.23 Post-em Soil Drench (S) 0.2 kg/ha		BUTRALIN 0.90 0.8 kg/ha	BUTRALIN 3.61 3.2 kg/ha
DWF BEAN	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	P	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
KALE	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxx
	P	xxxxxxxxxxxxxx xxxxxxxxxxxx (+)	xxxxxxxxxxxxxx xxxx (+)
	I	xxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxx xxxxxxxxxxxxx (+)
POL AMPH	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	P	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxx
PER RYGR	F	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	P	xxxxxxxxxxxxx xxxxxxxxxx	xxxxxx xxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxx	x xx
AVE FATU	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	P	xxxxxxxxxxxxx xxxxxxxxxxxx (+)	xxxxxxxxxxxxx xxxxxxxx
	I	xxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxx xxxxxx
	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	P	xxxxxxxxxxxxxx xxxxxxxxxxxx (+)	xxxxxxxxxxxxxx xxxxxxxxxx (+)
	I	xxxxxxxxxxxxxx xxxxxxxxxxxx (+)	xxxxxxxxxxxxxx xxxxxxxxxx (+)

Control xxxxxxxxxxxxxx % No. of survivors
xxxxxxxxxxxxxx % Vigour

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

PRE-EMERGENCE SELECTIVITY EXPERIMENT

BUTRALIN

SPECIES	0.25 Kg/ha		1.0 Kg/ha		4.0 Kg/ha	
WHEAT	115	xxxxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxxxx	115	xxxxxxxxxxxxxxxxxxxx+
(1)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
BARLEY	112	xxxxxxxxxxxxxxxxxxxx+	119	xxxxxxxxxxxxxxxxxxxx+	112	xxxxxxxxxxxxxxxxxxxx+
(2)	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx
OAT	100	xxxxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxxxx	82	xxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
PER RYGR	65	xxxxxxxxxxxxx	76	xxxxxxxxxxxxxx	47	xxxxxxxxx
(4)	64	xxxxxxxxxxxxx	29	xxxxxx	14	xxx
ONION	69	xxxxxxxxxxxxxx	73	xxxxxxxxxxxxxx	99	xxxxxxxxxxxxxxxxxxx
(8)	71	xxxxxxxxxxxxxx	57	xxxxxxxxxx	36	xxxxxxx
FLD BEAN	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
(10)	79	xxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	57	xxxxxxxxxx
PEA 133	133	xxxxxxxxxxxxxxxxxxx+	117	xxxxxxxxxxxxxxxxxxx+	117	xxxxxxxxxxxxxxxxxxx+
(11)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxxx
W CLOVER	103	xxxxxxxxxxxxxxxxxxx+	116	xxxxxxxxxxxxxxxxxxx+	81	xxxxxxxxxxxxxxxx
(12)	36	xxxxxxx	29	xxxxxx	21	xxxx
RAPE	99	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	105	xxxxxxxxxxxxxxxxxxx+
(14)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxx
KALE	93	xxxxxxxxxxxxxxxxxx	97	xxxxxxxxxxxxxxxxxx	97	xxxxxxxxxxxxxxxxxx
(15)	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	50	xxxxxxxxxx
CARROT	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
(18)	86	xxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
LETTUCE	103	xxxxxxxxxxxxxxxxxx+	103	xxxxxxxxxxxxxxxxxx+	103	xxxxxxxxxxxxxxxxxx+
(20)	36	xxxxxxx	29	xxxxxx	21	xxxx

BUTRALIN

SPECIES		0.25 Kg/ha		1.0 Kg/ha		4.0 Kg/ha
SUG BEET	97	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	90	xxxxxxxxxxxxxxxxxx
(21)	100	xxxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	43	xxxxxxxxx
BROM STE	124	xxxxxxxxxxxxxxxxxxxx+	124	xxxxxxxxxxxxxxxxxxxx+	117	xxxxxxxxxxxxxxxxxxx
(24)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	57	xxxxxxxxxx
AVE FATU	86	xxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	61	xxxxxxxxxxx
(26)	93	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	43	xxxxxxxxx
ALO MYOS	111	xxxxxxxxxxxxxxxxxxx+	107	xxxxxxxxxxxxxxxxxxx+	55	xxxxxxxxxx
(27)	50	xxxxxxxxxx	36	xxxxxxx	14	xxx
POA ANN	18	xxxx	7	x	0	
(28)	36	xxxxxxx	14	xxx	0	
POA TRIV	5	x	0		0	
(29)	14	xxx	0		0	
SIN ARV	100	xxxxxxxxxxxxxxxxxxx	89	xxxxxxxxxxxxxxxxxx	103	xxxxxxxxxxxxxxxxxxx+
(30)	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	36	xxxxxxx
RAPH RAP	96	xxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx	107	xxxxxxxxxxxxxxxxxxx+
(31)	93	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxx
TRIP MAR	98	xxxxxxxxxxxxxxxxxx	98	xxxxxxxxxxxxxxxxxx	84	xxxxxxxxxxxxxxxx
(33)	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxx	57	xxxxxxxxxx
SEN VULG	78	xxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	144	xxxxxxxxxxxxxxxxxx+
(34)	71	xxxxxxxxxxxxx	57	xxxxxxxxxx	36	xxxxxxx
POL LAPA	125	xxxxxxxxxxxxxxxxxx+	300	xxxxxxxxxxxxxxxxxx+	125	xxxxxxxxxxxxxxxxxx+
(35)	100	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	29	xxxxxx
POL AVIC	41	xxxxxxxx	83	xxxxxxxxxxxxxxx	41	xxxxxxxx
(36)	43	xxxxxxxxx	29	xxxxxx	29	xxxxxx

PRE-EMERGENCE SELECTIVITY TEST

BUTRALIN

SPECIES		0.25 Kg/ha		1.0 Kg/ha		4.0 Kg/ha
GAL APAR	121	xxxxxxxxxxxxxxxxxxxx+	94	xxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx
(38)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	29	xxxxxx
STEL MED	96	xxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxx
(40)	71	xxxxxxxxxxxxx	57	xxxxxxxxxx	29	xxxxxx
VER PERS	89	xxxxxxxxxxxxxxxxx	40	xxxxxxxx	77	xxxxxxxxxxxxxx
(42)	43	xxxxxxxxx	29	xxxxxx	29	xxxxxx
RUM OBTU	62	xxxxxxxxxxxx	137	xxxxxxxxxxxxxxxxxxx+	25	xxxxx
(44)	29	xxxxxx	14	xxx	7	x
HOLC LAN	18	xxxx	0		0	
(45)	7	x	0		0	
AG REPENS	109	xxxxxxxxxxxxxxxxxx+	91	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
(47)	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
ALL VIN	111	xxxxxxxxxxxxxxxxxx+	130	xxxxxxxxxxxxxxxxxx+	111	xxxxxxxxxxxxxxxxxx+
(49)	93	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx
CIRS ARV	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	117	xxxxxxxxxxxxxxxxxx+
(50)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx
TUS FARF	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+	95	xxxxxxxxxxxxxxxxx
(51)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
CONV ARV	37	xxxxxxx	62	xxxxxxxxxxx	12	xx
(52)	57	xxxxxxxxxx	43	xxxxxxxxx	7	x
MILLET	86	xxxxxxxxxxxxxxxx	48	xxxxxxxxx	0	
(55)	29	xxxxxx	21	xxxx	0	
MAIZE + A	100	xxxxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxx+	82	xxxxxxxxxxxxxxx
(56)	86	xxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	50	xxxxxxxxxx

BUTRALIN

SPECIES							
MAIZE	103	xxxxxxxxxxxxxxxxxxxxxx+	103	xxxxxxxxxxxxxxxxxxxxxx+	103	xxxxxxxxxxxxxxxxxxxx+
(57)	79	xxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	36	xxxxxxx
SORG + A	107	xxxxxxxxxxxxxxxxxxxxx+	93	xxxxxxxxxxxxxxxxxx	60	xxxxxxxxxxxx
(58)	64	xxxxxxxxxxxxx	57	xxxxxxxxxx	29	xxxxxx
SORGHUM	100	xxxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxxx	60	xxxxxxxxxxxx
(59)	57	xxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
RICE	93	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	98	xxxxxxxxxxxxxxxxxxx
(60)	79	xxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	50	xxxxxxxxxx
PIGEON P	91	xxxxxxxxxxxxxxxxx	55	xxxxxxxxxx	64	xxxxxxxxxxxx
(61)	79	xxxxxxxxxxxxxxx	57	xxxxxxxxxx	29	xxxxxx
COWPEA	97	xxxxxxxxxxxxxxxxxx	97	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
(62)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
CHICKPEA	78	xxxxxxxxxxxxxxx	111	xxxxxxxxxxxxxxxxxxx+	111	xxxxxxxxxxxxxxxxxxx+
(63)	93	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
GRNDNUT	68	xxxxxxxxxxxxx	41	xxxxxxx	82	xxxxxxxxxxxxxxx
(64)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
SOYABEAN	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	92	xxxxxxxxxxxxxxxxx
(65)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
COTTON	110	xxxxxxxxxxxxxxxxxx+	110	xxxxxxxxxxxxxxxxxx+	80	xxxxxxxxxxxxxx
(66)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxx
JUTE	76	xxxxxxxxxxxxxx	70	xxxxxxxxxxxxx	43	xxxxxxxx
(67)	57	xxxxxxxxxx	29	xxxxx	14	xxx
KENAF	88	xxxxxxxxxxxxxxxx	65	xxxxxxxxxxx	112	xxxxxxxxxxxxxxxxx+
(68)	100	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxx	86	xxxxxxxxxxxxxx

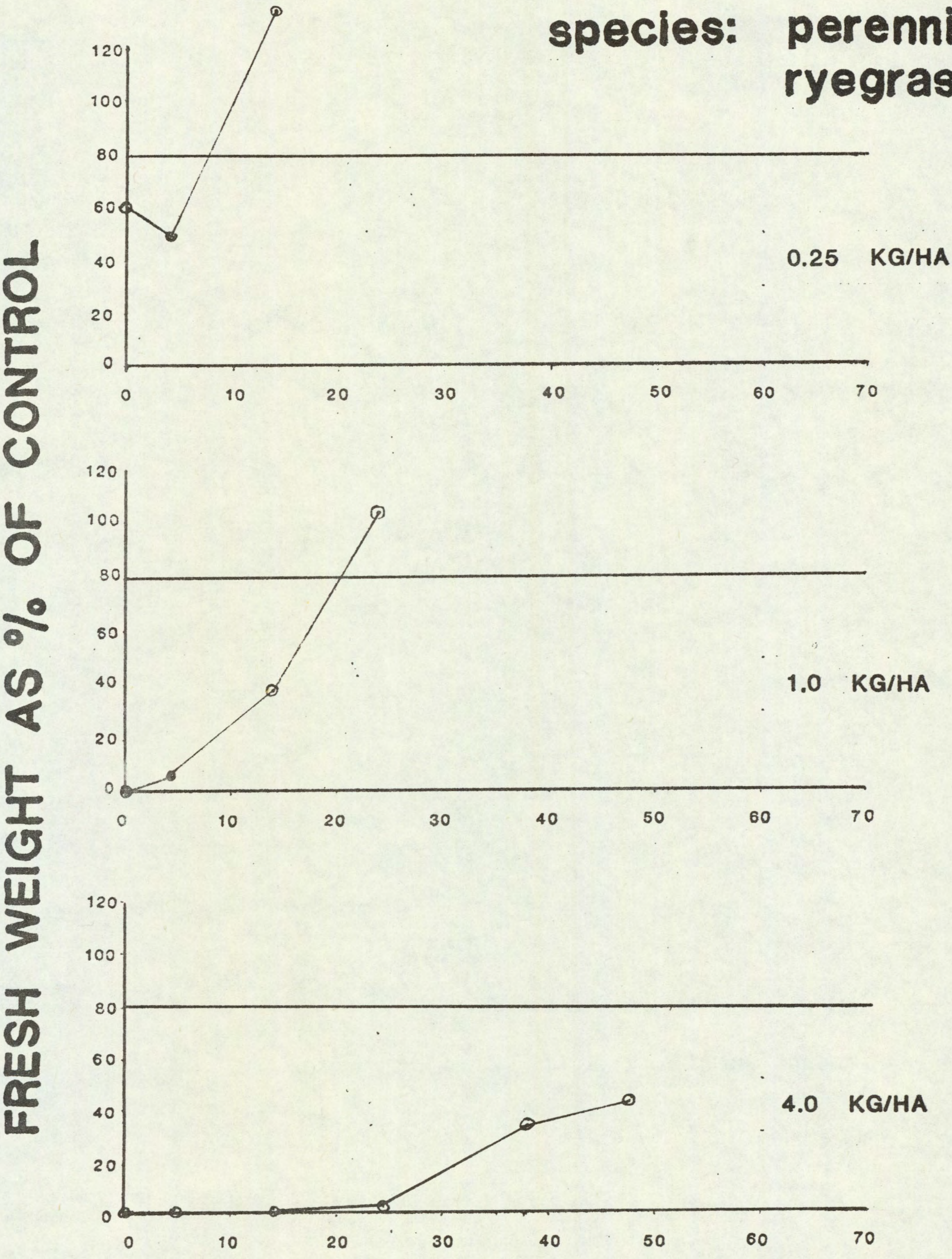
PRE-EMERGENCE SELECTIVITY EXPERIMENT

BUTRALIN

SPECIES		0.25 Kg/ha		1.0 Kg/ha		4.0 Kg/ha
SESAMUM	70	xxxxxxxxxxxxx	70	xxxxxxxxxxxxx	26	xxxxx
(70)	57	xxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
TOMATO	93	xxxxxxxxxxxxxxxxxx	114	xxxxxxxxxxxxxxxxxx+	93	xxxxxxxxxxxxxxxxxx
(71)	100	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	29	xxxxxx
OR PUNCT	72	xxxxxxxxxxxxx	107	xxxxxxxxxxxxxxxxx+	54	xxxxxxxxxx
(73)	71	xxxxxxxxxxxxx	71	xxxxxxxxxxxxx	36	xxxxxxx
ELEU IND	4	x	0		0	
(74)	14	xxx	0		0	
ECH CRUS	32	xxxxxx	0		0	
(75)	29	xxxxxx	0		0	
ROTT EXA	95	xxxxxxxxxxxxxxxxx	46	xxxxxxxxx	41	xxxxxxxx
(76)	71	xxxxxxxxxxxxx	50	xxxxxxxxxx	21	xxxx
DIG SANG	47	xxxxxxxxx	0		0	
(77)	29	xxxxxx	0		0	
AMAR RET	111	xxxxxxxxxxxxxxxxxx+	104	xxxxxxxxxxxxxxxxxx+	33	xxxxxxx
(78)	64	xxxxxxxxxxxx	36	xxxxxxx	14	xxx
SNOW POL	48	xxxxxxxxxx	0		0	
(83)	29	xxxxxx	0		0	
PHAL MIN	82	xxxxxxxxxxxxxxx	45	xxxxxxxxx	4	x
(84)	29	xxxxxx	29	xxxxxx	7	x
CYP ROTU	94	xxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxx	103	xxxxxxxxxxxxxxxxxx+
(86)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx
BROM PEC	90	xxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxx+	29	xxxxxx
(88)	93	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxx	29	xxxxxx

PERSISTENCE OF BUTRALIN

species: perennial ryegrass



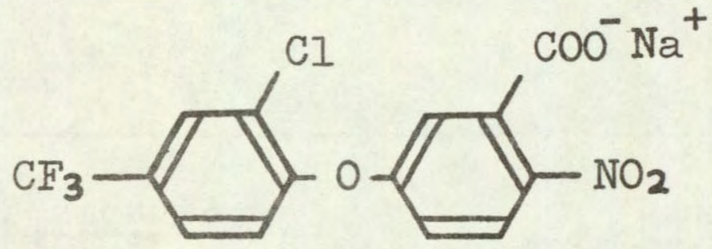
TIME OF SOWING
weeks after treatment

Acifluorfen

Code number RH 6201 Trade name Blazer

Chemical name Sodium 5-[2-chloro-4-(trifluoromethyl)phenoxy]-2-nitrobenzoate

Structure



Source

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

Information available and suggested uses

A contact and residual herbicide, pre- and post-emergence in all large-seeded legumes (peas, beans, peanuts, soyabeans) at 0.14 to 1.12 kg/ha and possibly in rice, wheat, lucerne, clover, onions. It is already marketed for post-emergence use in soyabean in some countries. Its chemical, physical and biological properties have been reported by Johnson et al, 1978.

Formulation used 48% w/v a.i. aqueous concentrate, sodium salt.

Spray volume for activity experiment 394 l/ha
for pre-emergence selectivity experiment 437 l/ha

RESULTS

Full histogram results are presented on pages 49-55 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
1.6	pea chickpea groundnut * soyabean	Poa trivialis Polygonum lapathifolium Rumex obtusifolius Holcus lanatus Allium vineale Oryza punctata Digitaria sanguinalis Snowdenia polystachya Phalaris minor + species below

0.4	species above +	Raphanus raphanistrum
	barley	Tripleurospermum maritimum
	field bean	Polygonum aviculare
	maize	Cirsium arvense
	maize + antidote	Convolvulus arvensis
	cowpea	Eleusine indica
	cotton	+ species below

0.1	species above +	Sinapis arvensis
	wheat	Senecio vulgaris
	oat	Veronica persica
	perennial ryegrass	Amaranthus retroflexus
	lettuce	
	rice	

* stand reduction, not due to herbicide

Comments on results

Activity experiment

The foliar spray caused moderate to severe scorch on all species, usually within a day or so of spraying, but lethal effects resulted only at the high dose with kale and P. amphibium. All species were affected by soil treatments at the higher doses, with pre-emergence sprays being generally more toxic than post-emergence soil drenches. Surface pre-emergence sprays were more active than when incorporated on the small seeded kale and perennial ryegrass. Dwarf bean however was more sensitive to incorporated, rather than surface, pre-emergence sprays, while differences were minimal with the two perennials and A. fatua. Thus, acifluorfen shows some features in its pattern of activity which correspond with other dinitrophenyl ether herbicides, e.g. nitrofen.

Symptoms

These were typical of dinitrophenyl-ether herbicides, e.g. nitrofen, A severe and rapid scorch resulted from the foliar spray but plants usually made a good recovery except for kale and P. amphibium.Observations, particularly on P. amphibium, would suggest that, as with other dinitrophenyl-ether herbicides, the effect is not translocated. Thus the main shoot, leaves and petioles of this species were often killed except for the basal axillary buds which usually succeeded in producing new healthy shoots and leaves, enabling the plant to re-establish. Soil drenches to broad-leaved species often caused retarded growth with chlorosis developing along the veins and midribs usually followed by necrosis in these regions. Smaller seeded species often failed to emerge. Where leaves did develop they were often trapped, and consequently deformed, while leaf surfaces were shiny and darker green in appearance. Also the newly developing leaves of grasses were often thinner. Localised necrotic patches were evident on old and new leaves.

Root development and nodulation was adversely affected in field bean and to some extent in peas.

Soil persistence

Results are presented in the graph on page 55 . Veronica persica

was used as the sensitive test species and this showed that although the doses of 0.1 and 0.4 kg/ha were undetectable 4 and 28 weeks after spraying respectively, 1.6 kg/ha was still killing plants 48 weeks after spraying.

Pre-emergence selectivity among temperate species

A useful spectrum of broad-leaved weed control was found with the cruciferous species (Sinapis arvensis and Raphanus raphanistrum), composite species (Senecio vulgaris, Tripleurospermum maritimum) and polygonaceous species (Polygonum aviculare, Polygonum lapathifolium, Rumex obtusifolius) being susceptible to 1.6 kg/ha. Veronica persica was killed at the lowest dose. Certain perennial weeds were also susceptible, especially Cirsium arvense and Convolvulus arvensis , controlled at 0.4 kg/ha,while Allium vineale was controlled at the high dose. Galium aparine and notably Stellaria media were resistant. Grass weed control was generally poor, Holcus lanatus and Poa trivialis being the only weeds controlled by the high dose.

Pea was the only crop to tolerate the highest dose although some moderate effects were noted on root development and nodulation as mentioned above. Barley was the most tolerant cereal, withstanding 0.4 kg/ha. Field bean was the only other tolerant crop at this dose, but some adverse effect occurred on root development and nodulation. At 0.1 kg/ha wheat, oat, perennial ryegrass and notably lettuce were tolerant. White clover, sugar beet and brassicae (rape, kale, radish) were sensitive.

Although acifluorfen can control some important weeds in pea, barley and field bean, gaps are also apparent in the weed spectrum, such as Stellaria media and some important annual grass weeds. Consideration will have to be given to its use in mixture with other herbicides to control these other weeds. The control of Senecio vulgaris in lettuce is noteworthy, suggesting the possibility of a mixture with for example propyzamide and other herbicides used in this crop which are known to be weak against this and other composite weeds.

Selectivity among tropical species

The pre-emergence use of this compound is likely to be of less interest than its post-emergence activity, but small-seeded broad-leaved species (including S. nigrum) were selectively controlled at 0.1 or 0.4 kg/ha indicating distinct selectivity in most of the legumes (particularly chickpea, but not pigeon pea), cotton and maize. Both maize and sorghum were somewhat protected by their respective safeners. Oxalis latifolia was not completely controlled evan at 1.6 kg/ha.

ACTIVITY EXPERIMENT

ACIFLUORFEN

		0.10 kg/ha	0.50 kg/ha	2.50 kg/ha
DWARF BEAN	F	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxx
	P	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxx
	I	xxxxxxxxxxxxxx + xxxxxxxxx	xxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxx
KALE	F	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxxx	xxxxxxx xx
	S	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxx	xxxxxxx xxxxx
	P	xxxxxx xxxxxxxxx	xxx xxx	o o
	I	xxxxxxxxxxxxxx + xxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxxxxx	o o
POLYGONUM AMPHIBIUM	F	xxxxxxxxxxxxxx xxxxxxxxxx	xxxxxxxxxxxxxx xxxxxx	xx xx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxx xxxxxxxxxxx	xxxxxxxxx xxxxx
	P	xxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx + xxxx
	I	xxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxx + xxxx
PERENNIAL RYEGRASS	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxx
	P	xxxxxxxxxxxxxx + xxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxx	xx xxxx
	I	xxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxx xxxxxxxxx
AVENA FATUA	F	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxx
	P	xxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxx xxxxxx
	I	xxxxxxxxxxxxxx + xxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxx
AGROPYRON REPENS	F	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx
	S	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxx xxxxxxxx
	P	xxxxxxxxxxxxxx + xxxxxxxxxxx	xxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxx + xxxxxxxxxx
	I	xxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxx xxxxxxxxxx

Key: F = Post-emergence; foliar application
S = Post-emergence, soil drench
P = Pre-emergence, surface film
I = Pre-planting, incorporated

PRE-EMERGENCE SELECTIVITY EXPERIMENT

ACIFLUORFEN

SPECIES	0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha	
WHEAT	100	xxxxxxxxxxxxxxxxxxx	115	xxxxxxxxxxxxxxxxxxx+	92	xxxxxxxxxxxxxxxxx
(1)	93	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
BARLEY	105	xxxxxxxxxxxxxxxxxxx+	126	xxxxxxxxxxxxxxxxxxx+	91	xxxxxxxxxxxxxxxxx
(2)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	36	xxxxxxx
OAT	106	xxxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxxx	88	xxxxxxxxxxxxxxxxx
(3)	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	36	xxxxxxx
PER RYGR	98	xxxxxxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxx	76	xxxxxxxxxxxxxxx
(4)	93	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx	29	xxxxxx
ONION	86	xxxxxxxxxxxxxxxx	21	xxxx	0	
(8)	71	xxxxxxxxxxxxxx	43	xxxxxxxxx	0	
FLD BEAN	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	114	xxxxxxxxxxxxxxxxxxx+
(10)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
PEA	117	xxxxxxxxxxxxxxxxxxx+	67	xxxxxxxxxxxxx	117	xxxxxxxxxxxxxxxxxxx+
(11)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
W CLOVER	9	xx	0		0	
(12)	36	xxxxxxx	0		0	
RAPE	70	xxxxxxxxxxxxxx	23	xxxxx	0	
(14)	71	xxxxxxxxxxxxxx	36	xxxxxxx	0	
KALE	63	xxxxxxxxxxxxx	4	x	0	
(15)	57	xxxxxxxxxxx	7	x	0	
CARROT	100	xxxxxxxxxxxxxxxxxxx	14	xxx	0	
(18)	64	xxxxxxxxxxxxx	14	xxx	0	
LETTUCE	84	xxxxxxxxxxxxxxxxx	34	xxxxxxx	0	
(20)	86	xxxxxxxxxxxxxxxxx	14	xxx	0	

ACIFLUORFEN

SPECIES		0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha
SUG BEET	45	xxxxxxxxx	0		0	
(21)	50	xxxxxxxxxx	0		0	
BROM STE	110	xxxxxxxxxxxxxxxxxxx+	139	xxxxxxxxxxxxxxxxxxx+	124	xxxxxxxxxxxxxxxxxxx+
(24)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	43	xxxxxxxxx
AVE FATU	73	xxxxxxxxxxxxxxx	80	xxxxxxxxxxxxxxx	67	xxxxxxxxxxxx
(26)	93	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	43	xxxxxxxxx
ALO MYOS	122	xxxxxxxxxxxxxxxxxxx+	122	xxxxxxxxxxxxxxxxxxx+	114	xxxxxxxxxxxxxxxxxxx+
(27)	100	xxxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	57	xxxxxxxxxx
POA ANN	132	xxxxxxxxxxxxxxxxxxx+	106	xxxxxxxxxxxxxxxxxxx+	88	xxxxxxxxxxxxxxxxx
(28)	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	57	xxxxxxxxxx
POA TRIV	90	xxxxxxxxxxxxxxxxx	88	xxxxxxxxxxxxxxxxx	43	xxxxxxxxx
(29)	86	xxxxxxxxxxxxxxxx	50	xxxxxxxxxx	21	xxxx
SIN ARV	17	xxx	0		0	
(30)	29	xxxxxx	0		0	
RAPH RAP	96	xxxxxxxxxxxxxxxxxx	11	xx	0	
(31)	64	xxxxxxxxxxxxx	29	xxxxxx	0	
TRIP MAR	60	xxxxxxxxxxxx	10	xx	0	
(33)	43	xxxxxxxxx	7	x	0	
SEN VULG	0		0		0	
(34)	0		0		0	
POL LAPA	175	xxxxxxxxxxxxxxxxxxx+	125	xxxxxxxxxxxxxxxxxxx+	0	
(35)	93	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	0	
POL AVIC	83	xxxxxxxxxxxxxxxx	21	xxxx	10	xx
(36)	100	xxxxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	29	xxxxxx

PRE-EMERGENCE SELECTIVITY TEST

ACIFLUORFEN

SPECIES	0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha	
GAL APAR	107	xxxxxxxxxxxxxxxxxxx+	90	xxxxxxxxxxxxxxxxx	58	xxxxxxxxxxx
(38)	100	xxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	43	xxxxxxxxx
STEL MED	94	xxxxxxxxxxxxxxxxxx	120	xxxxxxxxxxxxxxxxxx+	96	xxxxxxxxxxxxxxxxxx
(40)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxx
VER PERS	0		0		0	
(42)	0		0		0	
RUM OBTU	112	xxxxxxxxxxxxxxxxxx+	62	xxxxxxxxxxx	12	xx
(44)	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxx	21	xxxx
HOLC LAN	66	xxxxxxxxxxxx	53	xxxxxxxxxx	26	xxxxx
(45)	86	xxxxxxxxxxxxxxx	36	xxxxxx	21	xxxx
AG REPEN	91	xxxxxxxxxxxxxxxx	91	xxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxx+
(47)	93	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxx	36	xxxxxxx
ALL VIN	98	xxxxxxxxxxxxxxxxxx	104	xxxxxxxxxxxxxxxxx+	20	xxxx
(49)	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxx	14	xxx
CIRS ARV	117	xxxxxxxxxxxxxxxxxx+	117	xxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxx
(50)	79	xxxxxxxxxxxxxx	29	xxxxxx	21	xxxx
TUS FARF	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+
(51)	86	xxxxxxxxxxxxxxx	43	xxxxxxxxx	36	xxxxxxx
CONV ARV	37	xxxxxxx	37	xxxxxxx	25	xxxxx
(52)	43	xxxxxxxxx	29	xxxxxx	36	xxxxxxx
MILLET	75	xxxxxxxxxxxxxx	48	xxxxxxxxx	5	x
(55)	64	xxxxxxxxxxxx	36	xxxxxxx	7	x
MAIZE + A	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxxx+
(56)	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxx

PRE-EMERGENCE SELECTIVITY TEST

ACIFLUORFEN

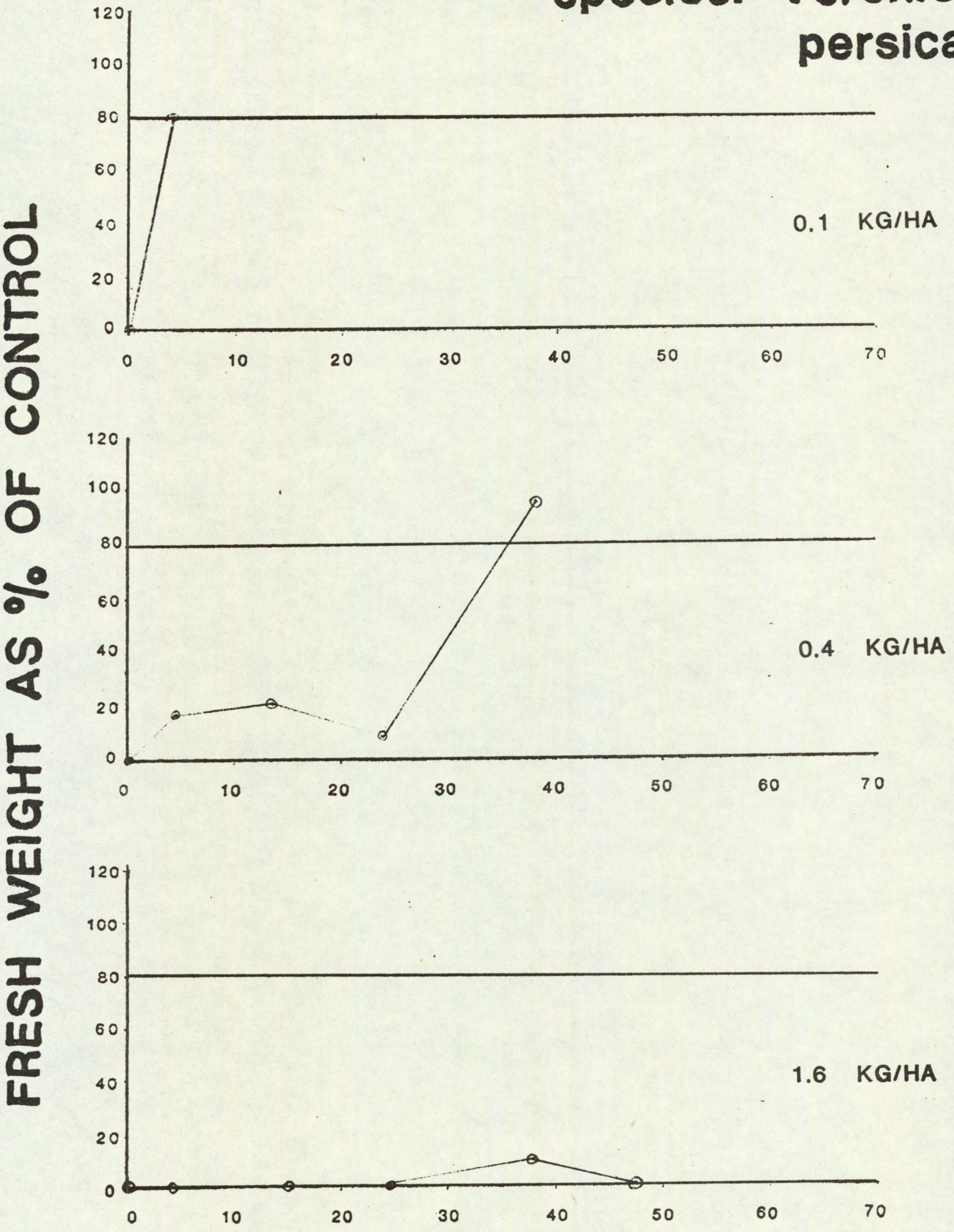
SPECIES		0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha
MAIZE	103	xxxxxxxxxxxxxxxxxxxx+	103	xxxxxxxxxxxxxxxxxxxx+	94	xxxxxxxxxxxxxxxxxx
(57)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxxx	50	xxxxxxxxxx
SORG + A	100	xxxxxxxxxxxxxxxxxxx	107	xxxxxxxxxxxxxxxxxxx+	40	xxxxxxxx
(58)	57	xxxxxxxxxxx	36	xxxxxxx	29	xxxxxx
SORGHUM	107	xxxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxxx	20	xxxx
(59)	57	xxxxxxxxxxx	36	xxxxxxx	29	xxxxxx
RICE	108	xxxxxxxxxxxxxxxxxxx+	98	xxxxxxxxxxxxxxxxxxx	84	xxxxxxxxxxxxxxxxx
(60)	93	xxxxxxxxxxxxxxxxxx	57	xxxxxxxxxx	29	xxxxxx
PIGEON P	55	xxxxxxxxxx	9	xx	0	
(61)	79	xxxxxxxxxxxxxx	43	xxxxxxxx	0	
COWPEA	88	xxxxxxxxxxxxxxxxx	88	xxxxxxxxxxxxxxxxx	35	xxxxxxx
(62)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	43	xxxxxxxxx
CHICKPEA	122	xxxxxxxxxxxxxxxxxxx+	111	xxxxxxxxxxxxxxxxxxx+	111	xxxxxxxxxxxxxxxxxxx+
(63)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx
GRNDNUT	41	xxxxxxxx	68	xxxxxxxxxxxxx	55	xxxxxxxxxx
(64)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxxx
SOYABEAN	100	xxxxxxxxxxxxxxxxxxx	92	xxxxxxxxxxxxxxxxx	92	xxxxxxxxxxxxxxxxx
(65)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
COTTON	120	xxxxxxxxxxxxxxxxxxx+	110	xxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxx
(66)	100	xxxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx
JUTE	0		0		0	
(67)	0		0		0	
KENAF	65	xxxxxxxxxxxxx	88	xxxxxxxxxxxxxxxx	53	xxxxxxxxxx
(68)	79	xxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	57	xxxxxxxxxx

ACIFLUROFEN

SPECIES		0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha
SESAMUM	4	x	0		0	
(70)	7	x	0		0	
TOMATO	83	xxxxxxxxxxxxxxxxx	0		0	
(71)	64	xxxxxxxxxxxxx	0		0	
OR PUNCT	103	xxxxxxxxxxxxxxxxxxxx+	116	xxxxxxxxxxxxxxxxxxxx+	116	xxxxxxxxxxxxxxxxxxxx+
(73)	50	xxxxxxxxxx	36	xxxxxxx	29	xxxxxx
ELEU IND	109	xxxxxxxxxxxxxxxxxxx+	53	xxxxxxxxxx	16	xxx
(74)	71	xxxxxxxxxxxxxx	29	xxxxxx	7	x
ECH CRUS	79	xxxxxxxxxxxxxxxx	99	xxxxxxxxxxxxxxxxxxx	51	xxxxxxxxxx
(75)	79	xxxxxxxxxxxxxxxx	57	xxxxxxxxxx	36	xxxxxxx
ROTT EXA	103	xxxxxxxxxxxxxxxxxxx+	108	xxxxxxxxxxxxxxxxxxx+	59	xxxxxxxxxxxx
(76)	100	xxxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
DIG SANG	101	xxxxxxxxxxxxxxxxxxx	101	xxxxxxxxxxxxxxxxxxx	23	xxxxx
(77)	43	xxxxxxxxx	36	xxxxxxx	29	xxxxxx
AMAR RET	20	xxxx	0		0	
(78)	43	xxxxxxxxx	0		0	
SNOW POL	96	xxxxxxxxxxxxxxxxxx	63	xxxxxxxxxxxx	26	xxxxx
(83)	100	xxxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
PHAL MIN	62	xxxxxxxxxxx	66	xxxxxxxxxxxx	25	xxxxx
(84)	100	xxxxxxxxxxxxxxxxxxx	43	xxxxxxxxx	21	xxxx
CYP ROTU	103	xxxxxxxxxxxxxxxxxxx+	94	xxxxxxxxxxxxxxxxxx	94	xxxxxxxxxxxxxxxxxx
(86)	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx
BROM PEC	104	xxxxxxxxxxxxxxxxxxx+	99	xxxxxxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxxx+
(88)	100	xxxxxxxxxxxxxxxxxx	79	xxxxxxxxxxxxxxx	57	xxxxxxxxxx

PERSISTENCE OF ACIFLUORFEN

species: Veronica persica



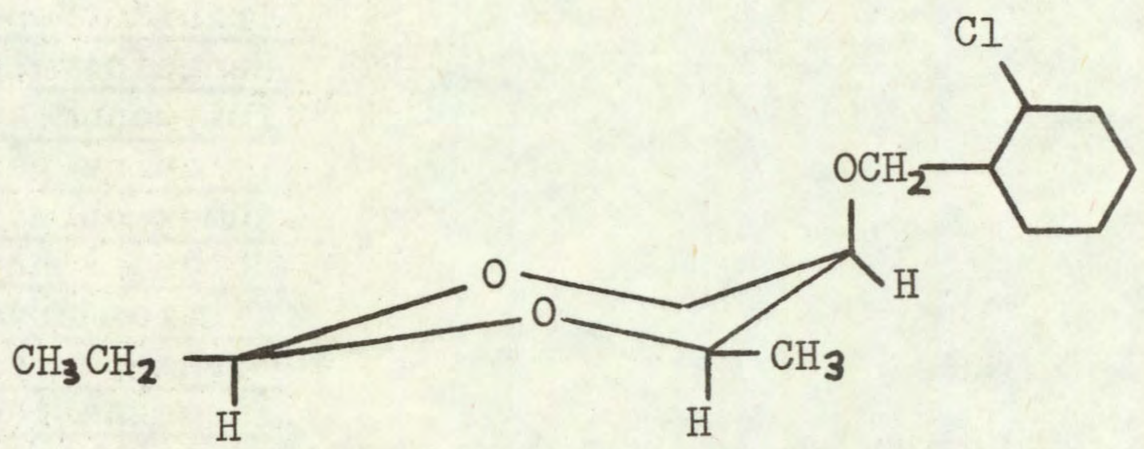
NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

FMC 39821

Code number FMC 39821

Chemical name c-5-(2-chlorobenzyloxy)-r-2-ethyl-c-4-methyl-1,3-dioxane

Structure



Source

FMC Corporation
Agricultural Chemical Division
Box 8
Princeton
New Jersey 08540
USA

Information available and suggested uses

This herbicide has been suggested for pre-emergence control of annual grass and some broad-leaved weeds at 0.5 to 1.5 kg/ha in soybeans, peanuts, sugar beet, wheat, cotton, tomatoes, potatoes, tobacco.

Formulation used 48% w/v a.i. emulsifiable concentrate.

Spray volume for activity experiment 394 l/ha
for pre-emergence selectivity experiment 437 l/ha

RESULTS

Full histogram results are presented on pages 59-65 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
1.6	groundnut	Cyperus rotundus + species below
0.4	species above + pigeon pea cowpea* cotton kenaf	Galium aparine Stellaria media Agropyron repens Sinapis arvensis Rottboelia exaltata + species below

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

0.1	species above +	Bromus sterilis
	radish	Avena fatua
	soyabean	Alopecurus myosuroides
	tomato	Poa annua
		Poa trivialis
		Tripleurospermum maritimum
		Senecio vulgaris
		Polygonum aviculare
		Veronica persica
		Rumex obtusifolius
		Holcus lanatus
		Cirsium arvense
		Oryza punctata
		Eleusine indica
		Echinochloa crus-galli
		Digitaria sanguinalis
		Amaranthus retroflexus
		Snowdenia polystachya
		Phalaris minor
		Bromus pectinatus

* some stand reduction, not due to herbicide

Comments on results

Activity experiment

FMC 39821 was very active when applied to the soil, particularly pre-emergence. Incorporation increased efficacy still further as compared to surface sprays with the possible exception of perennial ryegrass and Avena fatua, both these species being very sensitive even at the lowest dose. Foliar sprays were relatively inactive.

Symptoms

The foliar spray caused contact damage on perennial ryegrass and all three broad-leaved species within a day or so of spraying but there was a good recovery except with Polygonum amphibium. Here, a growth regulatory effect was observed at the low dose when axillary buds near the stem bases were stimulated to produce new branches. At the high dose growth of the main shoot was severely retarded. New leaves failed to develop normally and were 'strap-like' in appearance. Chlorosis and necrosis developed along the mid-rib. Soil drenches caused a severe retardation or even cessation of growth accompanied by chlorosis and later necrosis near the vascular regions. With the grasses, the newest leaf became white or almost albinoid. In pre-emergence treatments many of the smaller seeded species failed to emerge. Where seedlings did emerge, they were often severely stunted and showed chlorosis, necrosis and eventually died. Where true leaves were produced, these were severely deformed, in the case of the brassica/crucifer species, appearing 'strap-like', not unlike the effect produced by phenoxyalkanoic herbicides such as 2,4-D. Various colour changes were noted, from pale to dark green, and even an increased red/purple pigmentation in certain broad-leaved species, e.g. Senecio vulgaris, Veronica persica and carrot. Severe root inhibition was found with many species e.g. A. fatua and Agropyron repens and legumes. Nodulation of peas was adversely affected.

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

Soil persistence

Results are presented in the graph on page 65. Perennial ryegrass used as the sensitive test species indicated that a long period of persistence in the soil occurs with FMC 39821. All three doses were still severely affecting or killing plants 48 weeks after spraying.

Pre-emergence selectivity among temperate species

FMC 39821 was highly active, about 60% of the weed species tested being susceptible to the lowest dose of 0.1 kg/ha. All annual grasses were killed or controlled at this dose, being somewhat more susceptible than broad-leaved weeds. The highest dose of 1.6 kg/ha killed or controlled all species except three perennial weeds, Allium vineale, Tussilago farfara and Convolvulus arvensis, the latter showing a high degree of resistance.

Radish was the only crop to tolerate 0.1 kg/ha, all others being very sensitive.

Unfortunately the high degree of activity on weeds was accompanied by a corresponding high sensitivity of crop species and use as a selective herbicide is unlikely, as has already been indicated by the decision of the manufacturers to discontinue development.

Pre-emergence selectivity among tropical species

This highly active compound had interesting selectivity against mainly grass weeds (including Rottboellia) in most legumes, cotton and kenaf. Solanum nigrum was relatively tolerant. Maize and sorghum were slightly protected by safeners but still seriously damaged. Cyperus rotundus and Oxalis latifolia were severely damaged by 1.6 kg/ha, but there was eventual recovery after several months.

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

ACTIVITY EXPERIMENT

FMC 39821

		0.25 kg/ha	1.00 kg/ha	4.0 kg/ha
DWARF BEAN	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxx
	P	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxx xxxxxxxxx	xxxxxxxxx xxxxxxxxx
	I	xxxxxxxxxxxxxxx + xxxxxxxx	xxxxxx xxxxxx	xxxxxxxx xxxx
KALE	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxx	xxxxxxxxxxxxxxx xxxxx
	P	xxxxxxxxxxx xxxxxxxxxxx	xxxxxxxxxxxxx xxxxxx	xxxxxxxxxx xxxx
	I	xxxxxxxxxxxxxxx + xxxxxx	xxxxxxxxxxxxxxx + xxxx	xxxxxxxxxxxxx xxxx
POLYGONUM AMPHIBIUM	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxx	xxxxxxxxxxxxxxx xxxxx
	P	xxxxxxxxxxxxxxx xxxxxx	xxxxxxxxx xxx	o o
	I	x xx	o o	o o
PERENNIAL RYEGRASS	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxx	xxxxxxxxxxxxxxx xxxxxx	xxxxxxxxxxxxxxx xxxx
	P	o o	o o	o o
	I	o o	o o	o o
AVENA FATUA	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxx	xxxxxxxxxxxxxxx xxxx	xxxxxxxxxxxxxxx xxx
	P	xxxxxxx xxxx	o o	o o
	I	xxxxxxx xxxxxx	o o	o o
AGROPYRON REPENS	F	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxxx	xxxxxxxxxxxxxxx xxxxxxxxxxxxxx
	S	xxxxxxxxxxxxxxx xxxxxxxxx	xxxxxxxxxxxxxxx xxxxxx	xxxxxxxxxxxxxxx xxxxxx
	P	xxxxxxxxxxxxxxx + xxxxxxxxx	xxxxxxx xxxx	o o
	I	xxxxxxxxxxxxxxx xxxxxx	o o	o o

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

FMC 39821

SPECIES		0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha
WHEAT	85	xxxxxxxxxxxxxxxxx	31	xxxxxx	0	
(1)	29	xxxxxx	21	xxxx	0	
BARLEY	98	xxxxxxxxxxxxxxxxxxxx	35	xxxxxxx	0	
(2)	29	xxxxxx	7	x	0	
OAT	94	xxxxxxxxxxxxxxxxxxx	12	xx	0	
(3)	36	xxxxxxx	7	x	0	
PER RYGR	0		0		0	
(4)	0		0		0	
ONION	107	xxxxxxxxxxxxxxxxxxx+	81	xxxxxxxxxxxxxxxx	64	xxxxxxxxxxxxx
(8)	57	xxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
FLD BEAN	100	xxxxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	43	xxxxxxxxx
(10)	29	xxxxxx	29	xxxxxx	14	xxx
PEA	117	xxxxxxxxxxxxxxxxxxx+	67	xxxxxxxxxxxxx	0	
(11)	71	xxxxxxxxxxxxxx	14	xxx	0	
W CLOVER	124	xxxxxxxxxxxxxxxxxxx+	120	xxxxxxxxxxxxxxxxxxx+	94	xxxxxxxxxxxxxxxxxx
(12)	29	xxxxxx	29	xxxxxx	14	xxx
RAPE	102	xxxxxxxxxxxxxxxxxxx	102	xxxxxxxxxxxxxxxxxxx	96	xxxxxxxxxxxxxxxxxx
(14)	57	xxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
KALE	110	xxxxxxxxxxxxxxxxxxx+	89	xxxxxxxxxxxxxxxxx	135	xxxxxxxxxxxxxxxxxx+
(15)	71	xxxxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
CARROT	71	xxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	29	xxxxxx
(18)	50	xxxxxxxxxx	29	xxxxxx	29	xxxxxx
LETTUCE	91	xxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxx	110	xxxxxxxxxxxxxxxxxx+
(20)	36	xxxxxxx	29	xxxxxx	29	xxxxxx

FMC 39821

SPECIES	0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha	
SUG BEET	131	xxxxxxxxxxxxxxxxxxxx+	114	xxxxxxxxxxxxxxxxxxx+	86	xxxxxxxxxxxxxxxxx
(21)	71	xxxxxxxxxxxxxx	43	xxxxxxxxx	29	xxxxxx
BROM STE	22	xxxx	0		0	
(24)	21	xxxx	0		0	
AVE FATU	102	xxxxxxxxxxxxxxxxxxx	41	xxxxxxxx	0	
(29)	29	xxxxxx	21	xxxx	0	
ALO MYOS	4	x	0		0	
(27)	7	x	0		0	
POA ANN	0		0		0	
(28)	0		0		0	
POA TRIV	0		0		0	
(29)	0		0		0	
SIN ARV	103	xxxxxxxxxxxxxxxxxxx+	86	xxxxxxxxxxxxxxxxx	75	xxxxxxxxxxxxxxx
(30)	43	xxxxxxxxx	29	xxxxxx	21	xxxx
RAPH RAP	102	xxxxxxxxxxxxxxxxxxx	112	xxxxxxxxxxxxxxxxxxx+	86	xxxxxxxxxxxxxxxxx
(31)	86	xxxxxxxxxxxxxxxxx	57	xxxxxxxxxxx	36	xxxxxxx
TRIP MAR	96	xxxxxxxxxxxxxxxxxxx	103	xxxxxxxxxxxxxxxxxxx+	89	xxxxxxxxxxxxxxxxxx
(33)	29	xxxxxx	14	xxx	14	xxx
SEN VULG	89	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	78	xxxxxxxxxxxxxxx
(34)	14	xxx	14	xxx	14	xxx
POL LAPA	275	xxxxxxxxxxxxxxxxxxx+	225	xxxxxxxxxxxxxxxxxx+	150	xxxxxxxxxxxxxxxxxx+
(35)	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	36	xxxxxxx
POL AVIC	124	xxxxxxxxxxxxxxxxxxx+	93	xxxxxxxxxxxxxxxxx	72	xxxxxxxxxxxxx
(36)	29	xxxxxx	29	xxxxxx	29	xxxxxx

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

PRE-EMERGENCE SELECTIVITY EXPERIMENT

FMC 39821

SPECIES	0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha	
GAL APAR	63	xxxxxxxxxxxxx	0		0	
(38)	36	xxxxxxx	0		0	
STEL MED	89	xxxxxxxxxxxxxxxxx	110	xxxxxxxxxxxxxxxxxxxxxx+	98	xxxxxxxxxxxxxxxxxxx
(40)	43	xxxxxxxxx	29	xxxxxx	29	xxxxxx
VER PERS	95	xxxxxxxxxxxxxxxxxx	73	xxxxxxxxxxxxxx	46	xxxxxxxxx
(42)	29	xxxxxx	29	xxxxxx	29	xxxxxx
RUM OBTU	75	xxxxxxxxxxxxxx	137	xxxxxxxxxxxxxxxxxxxx+	112	xxxxxxxxxxxxxxxxxxx+
(44)	29	xxxxxx	21	xxxx	14	xxx
HOLC LAN	0		0		0	
(45)	0		0		0	
AG REPEN	82	xxxxxxxxxxxxxxx	36	xxxxxxx	0	
(47)	43	xxxxxxxxx	29	xxxxxx	0	
ALL VIN	124	xxxxxxxxxxxxxxxxxx+	98	xxxxxxxxxxxxxxxxxx	98	xxxxxxxxxxxxxxxxxx
(49)	71	xxxxxxxxxxxxx	57	xxxxxxxxxx	43	xxxxxxxxx
CIRS ARV	67	xxxxxxxxxxxx	0		0	
(50)	29	xxxxxx	0		0	
TUS FARF	109	xxxxxxxxxxxxxxxxx+	95	xxxxxxxxxxxxxxxxx	95	xxxxxxxxxxxxxxxxx
(51)	64	xxxxxxxxxxxx	50	xxxxxxxxxx	43	xxxxxxxxx
CONV ARV	100	xxxxxxxxxxxxxxxxxx	112	xxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxx
(52)	93	xxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	93	xxxxxxxxxxxxxxxxx
MILLET	0		0		0	
(55)	0		0		0	
MAIZE + A	109	xxxxxxxxxxxxxxxxx+	109	xxxxxxxxxxxxxxxxx+	27	xxxxx
(56)	43	xxxxxxxxx	21	xxxx	14	xxx

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

FMC 39821

SPECIES	0.1 Kg/ha		0.4 kg/ha		1.6 Kg/ha	
MAIZE	69	xxxxxxxxxxxxxx	43	xxxxxxxxx	0	
(57)	29	xxxxxx	21	xxxx	0	
SORG + A	107	xxxxxxxxxxxxxxxxxxxx+	60	xxxxxxxxxxxx	0	
(58)	43	xxxxxxxxx	14	xxx	0	
SORGHUM	107	xxxxxxxxxxxxxxxxxxxx+	107	xxxxxxxxxxxxxxxxxxxx+	60	xxxxxxxxxxxx
(58)	29	xxxxxx	14	xxx	14	xxx
RICE	0		0		0	
(60)	0		0		0	
PIGEON P	82	xxxxxxxxxxxxxxx	91	xxxxxxxxxxxxxxxxx	55	xxxxxxxxxx
(61)	79	xxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	50	xxxxxxxxxx
COWPEA	106	xxxxxxxxxxxxxxxxxxx+	62	xxxxxxxxxxx	26	xxxxx
(62)	100	xxxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	36	xxxxxxx
CHICKPEA	89	xxxxxxxxxxxxxxxxx	122	xxxxxxxxxxxxxxxxxxx+	100	xxxxxxxxxxxxxxxxxxx
(63)	71	xxxxxxxxxxxxxx	64	xxxxxxxxxxxx	57	xxxxxxxxxx
GRNDNUT	82	xxxxxxxxxxxxxxx	109	xxxxxxxxxxxxxxxxxx+	82	xxxxxxxxxxxxxxx
(64)	86	xxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx
SOYABEAN	100	xxxxxxxxxxxxxxxxxx	100	xxxxxxxxxxxxxxxxxx	92	xxxxxxxxxxxxxxxxx
(65)	93	xxxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx	50	xxxxxxxxx
COTTON	90	xxxxxxxxxxxxxxxx	120	xxxxxxxxxxxxxxxxxx+	80	xxxxxxxxxxxxxxx
(66)	93	xxxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxx	64	xxxxxxxxxxx
JUTE	57	xxxxxxxxxx	57	xxxxxxxxx	59	xxxxxxxxxx
(67)	29	xxxxxx	29	xxxxx	29	xxxxxx
KENAF	71	xxxxxxxxxxxxx	106	xxxxxxxxxxxxxxxxx+	94	xxxxxxxxxxxxxxxxx
(68)	86	xxxxxxxxxxxxxxxx	86	xxxxxxxxxxxxxxxx	71	xxxxxxxxxxxxx

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

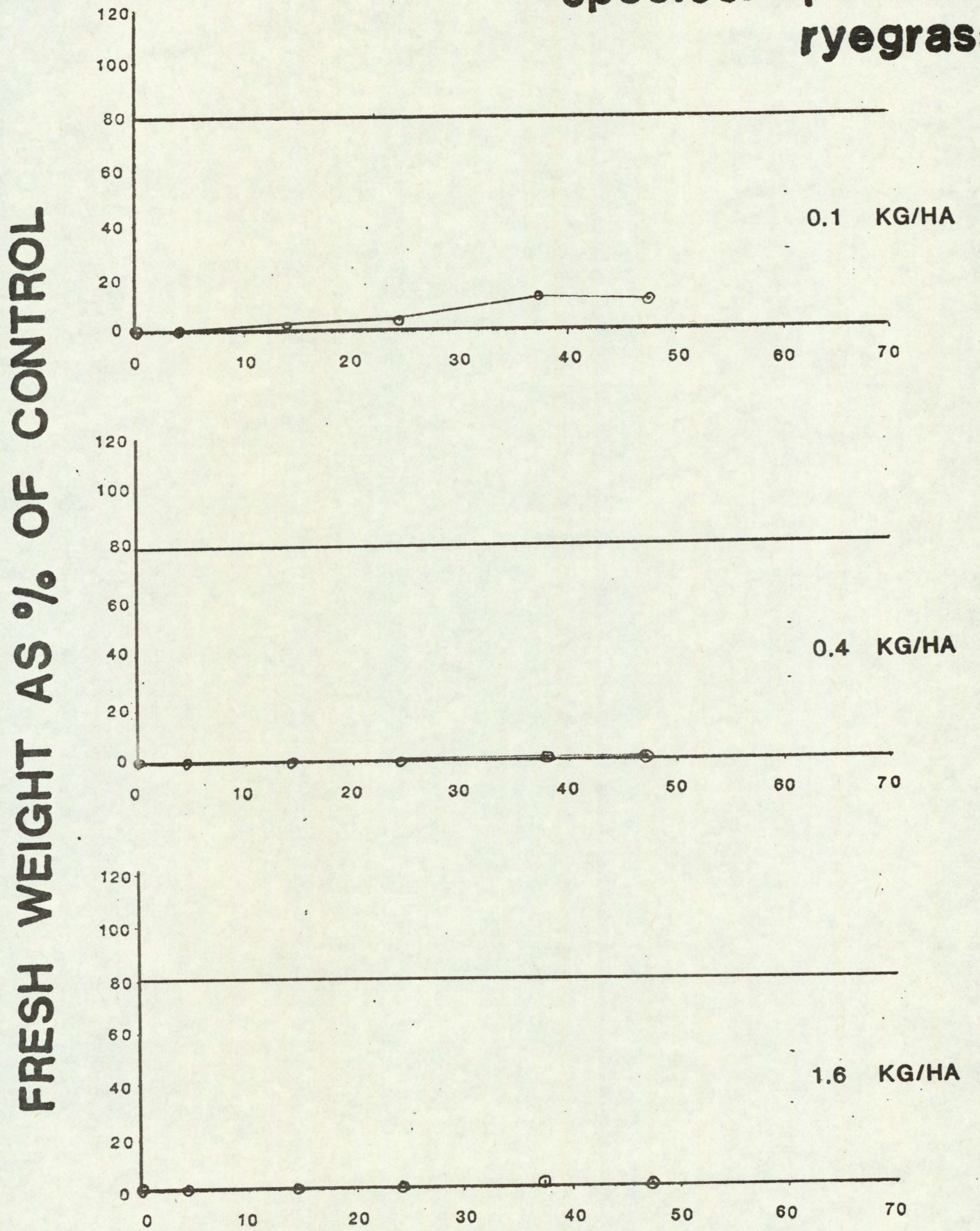
FMC 39821

SPECIES	0.1 Kg/ha		0.4 Kg/ha		1.6 Kg/ha	
SESAMUM	83	xxxxxxxxxxxxxxxxx	87	xxxxxxxxxxxxxxxxx	104	xxxxxxxxxxxxxxxxxxx+
(70)	71	xxxxxxxxxxxxxx	71	xxxxxxxxxxxxxx	57	xxxxxxxxxx
TOMATO	93	xxxxxxxxxxxxxxxxxx	114	xxxxxxxxxxxxxxxxxx+	93	xxxxxxxxxxxxxxxxxx
(71)	93	xxxxxxxxxxxxxxxxxx	50	xxxxxxxxxx	29	xxxxxx
OR PUNCT	0		0		0	
(73)	0		0		0	
ELEU IND	0		0		0	
(74)	0		0		0	
ECH CRUS	12	xx	0		0	
(75)	14	xxx	0		0	
ROTT EXA	67	xxxxxxxxxxxx	21	xxxx	10	xx
(76)	50	xxxxxxxxxx	29	xxxxxx	14	xxx
DIG SANG	0		0		0	
(77)	0		0		0	
AMAR RET	111	xxxxxxxxxxxxxxxxxx+	143	xxxxxxxxxxxxxxxxxx+	33	xxxxxxx
(78)	29	xxxxxx	29	xxxxxx	21	xxxx
SNOW POL	0		0		0	
(83)	0		0		0	
PHAL MIN	8	xx	0		0	
(84)	29	xxxxxx	0		0	
CYP ROTU	94	xxxxxxxxxxxxxxxxx	56	xxxxxxxxxx	0	
(86)	64	xxxxxxxxxxxxx	57	xxxxxxxxxx	0	
BROM PEC	10	xx	0		0	
(88)	29	xxxxxx	0		0	

NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone

PERSISTENCE OF FMC 39821

species: perennial ryegrass



TIME OF SOWING
weeks after treatment

ACKNOWLEDGEMENTS

We are grateful to the joint Letcombe/WRO Statistics Section for processing the experimental data; to Miss F Hutchison, Miss D Stringer and Messrs R H Webster, R M Porteous and A Grace for technical and practical assistance; to the Microbiology Section for nodulation and root assessments of the temperate legumes; to Mrs L Gawne for the preparation and typing of this report and to the commercial firms who provided the herbicides and relevant data.

The work of theODA Tropical Weeds Group was carried out under Research Scheme R3029 financed by HM Overseas Development Administration.

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Appendix 1. Species, abbreviations, cultivars and stage of growth at assessment

	Designation and computer serial number	Cultivar or source	No. per pot	Depth of planting (cm)	Stage of growth at assessment (untreated controls, leaf numbers exclusive of cotyledons)
Temperate species					
Wheat (Triticum aestivum)	WHEAT (1)	Maris Huntsman	8	1.0	4½-5 leaves, tillering
Barley (Hordeum vulgare)	BARLEY (2)	Maris Mink	8	1.0	4½ leaves, tillering
Oat (Avena sativa)	OAT (3)	Peniarth	8	1.0	3-3½ leaves
Perennial ryegrass (Lolium perenne)	PER RYGR (4)	S 23	15	0.5	4-4½ leaves, tillering
Onion (Allium cepa)	ONION	Robusta	15	0.5	1-2 leaves
Dwarf bean* (Phaseolus vulgaris)	DWF BEAN (9)	The Prince	3	2.0	2 trifoliate leaves
Field bean (Vicia faba)	FLD BEAN (10)	Maris Bead	4	2.0	4 leaves
Pea (Pisum sativum)	PEA (11)	Dark Skinned Perfection	4	2.0	6 leaves
White Clover (Trifolium repens)	W CLOVER (12)	S 100	20	0.5	2½ trifoliate leaves
Rape (Brassica napus oleifera)	RAPE (14)	Rapora	20	0.5	2½-3 leaves
Kale (Brassica oleracea acephala)	KALE (15)	Marrowstem	15	0.5	2½ leaves
Carrot (Daucus carota)	CARROT (18)	Chantenay Red Core	10	0.5	2 leaves
Lettuce (Lactuca sativa)	LETTUCE (20)	Borough Wonder (Unrivalled)	15	0.5	5 leaves
Sugar beet (Beta vulgaris)	SUG BEET (21)	Monotri	10	1.0	2½ leaves

* raised with tropical species under the higher temperature regime.

Appendix 1. (cont'd)

	Designation and computer serial number	Cultivar or source	No. per pot	Depth of planting (cm)	Stage of growth at assessment (untreated controls, leaf numbers exclusive of cotyledons)
Bromus sterilis	BROM STE (24)	Milton, 1977	10	0.5	5-7½ leaves, tillering
Avena fatua	AVE FATU (26)	Bourton on the water 1973	20	1.0	4-5 leaves, some tillering
Alopecurus myosuroides	ALO MYOS (27)	B and S Supplies, 1974	30	0.25	3-5 leaves, tillering
Poa annua	POA ANN (28)	WRO 1977	25	0.5	5-8 leaves, tillering
Poa trivialis	POA TRIV (29)	B and S Supplies, 1976	30	0.25	4½-5½ leaves, tillering
Sinapis arvenis	SIN ARV (30)	WRO 1971	30	0.5	4 leaves
Raphanus raphanistrum	RAPH RAP (31)	Long Black Spanish	12	0.5	2½-3 leaves
Tripleurospermum maritium	TRIP MAR (33)	WRO 1975	25	surface	5 leaves
Senecio vulgaris	SEN VULG (34)	WRO 1977	35	0.25	4-5 leaves
Polygonum lapathifolium	POL LAPA (35)	WRO 1974	20	0.5	2½-3 leaves
Polygonum aviculare	POL AVIC (36)	B and S Supplies, 1976	40	0.5	1-5 leaves
Galium aparine	GAL APAR (38)	B and S Supplies, 1977	12	1.0	2 whorls
Chenopodium album	CHEN ALB (39)	B and S Supplies, 1977	40	0.5	0-4 leaves
Stellaria media	STEL MED (40)	B and S Supplies, 1976	40	0.5	14 leaves
Veronica persica	VER PERS (42)	WRO 1977	25	0.5	4-6 leaves

Appendix 1. (cont'd)

	Designation and computer serial number	Cultivar or source	No. per pot	Depth of planting (cm)	Stage of growth at assessment (untreated controls, leaf numbers exclusive of cotyledons)
Rumex obtusifolius	RUM OBTU (44)	B and S Supplies, 1977	15	0.25	3 leaves
Holcus lanatus	HOLC LAN (45)	WRO 1976	20	0.5	4-6 leaves, tillering
Agropyron repens	AG REPEN (47)	WRO Clone 31	6/	1.0	4-4½ leaves
Allium vineale	ALL VIN (49)	WRO 1977	12+	1.0	2½-3½ leaves
Cirsium arvense	CIRS ARV (50)	WRO Clone 1	4//	1.0	5-6 leaves
Tussilago farfara	TUS FARF (51)	WRO Clone 1	4/	1.0	3-3½ leaves
Convolulus arvensis	CONV ARV (52)	Ex Deal, WRO	6//	1.0	3-7 leaves
Tropical species (grown under higher temperature regime)					
Millet (Pennisetum americanum)	MILLET (55)	ICRISAT 1977	10	0.5	3-3½ leaves
Maize + antidote (Zea mays)	MAIZE + A (56)	Julia	6	2.0	4-4½ leaves
Maize (Zea mays)	MAIZE (57)	Julia	6	2.0	4-4½ leaves
Sorghum + antidote (Sorghum vulgare)	SORG + A (58)	Funk	8	1.0	3½-4 leaves
Sorghum (Sorghum vulgare)	SORGHUM (59)	Funk	8	1.0	3½-4 leaves
Rice (Oryza sativa)	RICE (60)	IR 298	10	1.0	3½ leaves
Pigeon pea (Cajanus cajan)	PIGEON P (61)	ICRISAT 1 G 1977	6	1.0	2 trifoliate leaves
Cowpea (Vigna unguiculata)	COWPEA (62)	ICRISAT S7 1977	6	1.0	1½ trifoliate leaves
Chickpea (Cicer arietinum)	CHICKPEA (63)	G 62404	6	1.0	7-9 pinnate leaves

Appendix 1. (cont'd)

	Designation and computer serial number	Cultivar or source	No. per pot	Depth of planting (cm)	Stage of growth at assessment (untreated controls, leaf numbers exclusive of cotyledons)
Groundnut (Arachis hypogaea)	GRNDNUT (64)	S 38	4	2.0	5 pinnate leaves
Soyabean (Glycine max)	SOYABEAN (65)	Fiskby V.	8	1.0	1-2 trifoliate leaves
Cotton (Gossypium hirsutum)	COTTON (66)	S 71	6	1.0	2-4 leaves
Jute (Corchorus olitorius)	JUTE (67)	UAR 1971	20	0.5	3-4 leaves
Kenaf (Hibiscus cannabinus)	KENAF (68)	Ghana A 63-440	10	0.5	3-5 leaves
Sesamum (Sesamum indicum)	SESAMUM (70)	ICRISAT 1977 E 8	25	0.5	4 leaves
Tomato (Lycopersicum esculentum)	TOMATO (71)	Ailsa Craig	6	0.5	$2\frac{1}{2}$-$3\frac{1}{2}$ leaves
Oryza punctata	OR PUNCT (73)	Swaziland 1974	30	1.0	1-2 leaves
Eleusine indica	ELEU IND (74)	Rhodesia 1967	15	0.5	$2\frac{1}{2}$-$3\frac{1}{2}$ leaves
Echinochloa crus-galli	ECH CRUS (75)	WRO 1971	15	0.5	3-$3\frac{1}{2}$ leaves
Rottboellia exaltata	ROTT EXA (76)	Ex Ciba-Geigy 1974	30	0.5	$3\frac{1}{2}$-4 leaves
Digitaria sanguinalis	DIG SANG (77)	WRO 1973	20	Nil	3-4 leaves
Amaranthus retroflexus	AMAR RET (78)	WRO 1972	30	0.25	4-6 leaves
Solanum nigrum	SOL NIG (81)	WRO 1977	40	0.25	2-4 leaves
Snowdenia polystachya	SNO POL (83)	Ethiopia 1978	30	0.25	3-$5\frac{1}{2}$ leaves

Appendix 1. (cont'd)

	Designation and computer serial number	Cultivar or source	No. per pot	Depth of planting (cm)	Stage of growth at assessment (untreated controls, leaf numbers exclusive of cotyledons)
Phalaris minor*	PHAL MIN (84)	Jordan 1977	20	0.25	2-2½ leaves
Cyperus esculentus	CYP ESCU (85)	WRO Clone 2 (ex South Africa)	7**	2.0	-
Cyperus rotundus	CYP ROTU (86)	WRO Clone 1 (Rhodesia)	5**	2.0	4-6 leaves/ shoot
Oxalis latifolia	OXAL LAT (87)	WRO Clone 2 (Cornwall)	15 bulbs	2.0	2-30 trifoliate leaves
Bromus pectinatus	BROM PEC (88)	Tanzania 1978	35	0.5	2-2½ leaves

* raised as a temperate species under the lower temperature regime

≠ one node rhizome fragments + aerial bulbils

≠≠ 4 cm root fragments ** tubers

ABBREVIATIONS

ångström	Å	freezing point	f.p.
Abstract	Abs.	from summary	F.s.
acid equivalent*	a.e.	gallon	gal
acre	ac	gallons per hour	gal/h
active ingredient*	a.i.	gallons per acre	gal/ac
approximately equal to*	≃	gas liquid chromatography	GLC
aqueous concentrate	a.c.	gramme	g
bibliography	bibl.	hectare	ha
boiling point	b.p.	hectokilogram	hkg
bushel	bu	high volume	HV
centigrade	C	horse power	hp
centimetre*	cm	hour	h
concentrated	concd	hundredweight*	cwt
concentration	concn	hydrogen ion concentration*	pH
concentration x time product	ct	inch	in.
concentration required to kill 50% test animals	LC50	infra red	i.r.
		kilogramme	kg
cubic centimetre*	cm^3	kilo ($x10^3$)	k
cubic foot*	ft^3	less than	<
cubic inch*	in^3	litre	l.
cubic metre*	m^3	low volume	LV
cubic yard*	yd^3	maximum	max.
cultivar(s)	cv.	median lethal dose	LD50
curie*	Ci	medium volume	MV
degree Celsius*	^oC	melting point	m.p.
degree centigrade	^oC	metre	m
degree Fahrenheit*	^oF	micro ($x10^{-6}$)	µ
diameter	diam.	microgramme*	µg
diameter at breast height	d.b.h.	micromicro (pico: $x10^{-12}$)*	µµ
divided by*	÷ or /	micrometre (micron)*	µm (or µ)
dry matter	d.m.	micron (micrometre)*†	µm (or µ)
emulsifiable concentrate	e.c.	miles per hour*	mile/h
		milli ($x10^{-3}$)	m
equal to*	=	milliequivalent*	m.equiv.
fluid	fl.	milligramme	mg
foot	ft	millilitre	ml

† The name micrometre is preferred to micron and µm is preferred to µ.

millimetre*	mm
millimicro* (nano: $x10^{-9}$)	n or mμ
minimum	min.
minus	-
minute	min
molar concentration*	M (small cap)
molecule, molecular	mol.
more than	>
multiplied by*	x
normal concentration*	N (small cap)
not dated	n.d.
oil miscible concentrate	o.m.c. (tables only)
organic matter	o.m.
ounce	oz
ounces per gallon	oz/gal
page	p.
pages	pp.
parts per million	ppm
parts per million by volume	ppmv
parts per million by weight	ppmw
percent(age)	%
pico (micromicro: $x10^{-12}$)	p or μμ
pint	pint
pints per acre	pints/ac
plus or minus*	±
post-emergence	post-em
pound	lb
pound per acre*	lb/ac
pounds per minute	lb/min
pound per square inch*	lb/in^2
powder for dry application	p. (tables only)
power take off	p.t.o.
precipitate (noun)	ppt.
pre-emergence	pre-em.
quart	quart
relative humidity	r.h.
revolution per minute*	rev/min
second	s
soluble concentrate	s.c.
soluble powder	s.p.
solution	soln
species (singular)	sp.
species (plural)	spp.
specific gravity	sp. gr.
square foot*	ft^2
square inch	in^2
square metre*	m^2
square root of*	$\sqrt{\ }$
sub-species*	ssp.
summary	s.
temperature	temp.
ton	ton
tonne	t
ultra-low volume	ULV
ultra violet	u.v.
vapour density	v.d.
vapour pressure	v.p.
varietas	var.
volt	V
volume	vol.
volume per volume	v/v
water soluble powder	w.s.p. (tables only)
watt	W
weight	wt
weight per volume*	w/v
weight per weight*	w/w
wettable powder	w.p.
yard	yd
yards per minute	yd/min

* Those marked * should normally be used in the text as well as in tables etc.

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NB: AC 206784 is xylachlor, FMC 39821 is 5-(2-chlorobenzyloxy)-2-ethyl-4-methyl-1,3-dioxane (FMC), R 40244 is flurochloridone