Click here for previous

HOE 22870 is clofop acid, HOE 23408 is diclofop-methyl



| SPECIES | FLAMPROP-METHYL 0.33 kg/ha | | FLAMPROP-METHYL 1.0 kg/ha | | FLAMPROP-METHYL 3.0 kg/ha | |
|---|---|---|---|---|---|---|
| JUTE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 67 ) | 100 | xxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| KENAF | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 68 ) | 86 | xxxxxxxxxxxxxxxx | 57 | xxxxxxxxxx | 43 | xxxxxxxxx |
| TOBACCO | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 69 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| SESAMUM | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 70 ) | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxxx | 57 | xxxxxxxxxx |
| TOMATO | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 71 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxx |
| OR PUNCT | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 73 ) | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| ELEU IND | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 74 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ECH CRUS | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 75 ) | 93 | xxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| ROTT EXA | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 76 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| DIG SANG | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 77 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| AMAR RET | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 78 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

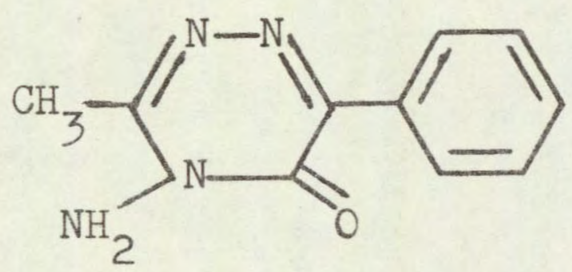
| SPECIES | FLAMPROP-METHYL 0.33 kg/ha | | FLAMPROP-METHYL 1.0 kg/ha | | FLAMPROP-METHYL 3.0 kg/ha | |
|---|---|---|---|---|---|---|
| PORT OLE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 79 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| SOL NIG | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 81 ) | 71 | xxxxxxxxxxxxxx | 64 | xxxxxxxxxxxx | 50 | xxxxxxxxxx |
| SNOW POL | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 83 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxxx |
| SNOW POL | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 84 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| CYP ESCU | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 85 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx. |
| CYP ROTU | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 86 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| OXAL LAT | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 87 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx. | 100 | xxxxxxxxxxxxxxxxxxxx |

METAMITRON

Code number BAYER 6676, DRW 1139 Trade name Goltix

Chemical name 4-amino-3-methyl-6-phenyl-1,2,4-triazin-5-one

Structure



Source

Bayer Agrochemicals Ltd
Eastern Way
Bury St Edmunds
Suffolk

Information available and suggested uses

Preliminary investigations in the UK in 1973 showed safety to 4 sugar beet cultivars up to 10 kg/ha pre- and post-emergence. It controls a broad spectrum of weeds but is less effective against Mercurialis and Polygonum spp. It is recommended at 4 to 5 kg/ha pre-drilling, pre-emergence or post-emergence up to the 1 true leaf stage. If applied when weeds are larger the rate should be 7 kg/ha. Some pre-emergence work at 2 kg/ha has been successful.

Formulation used 70% w/w a.i. wettable powder

Spray volume for activity experiment 305 l/ha
for selectivity experiment 200 l/ha

RESULTS

Full histogram results are presented on pages 36-41 and potential selectivities are summaiised 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 |
|---|---|---|
| 8.0 | sugar beet | Alopecurus myosuroides<br>Galium aparine<br>Eleusine indica<br>Snowdenia polystachya<br>Cyperus esculentus<br><br>+ species below |
| 4.0 | species above + | Avena fatua<br>Sinapis arvensis<br>Raphanus raphanistrum<br>Polygonum aviculare<br>Stellaria media<br>Spergula arvensis |

(Table continued overleaf)

| RATE kg a.i./ha | CROPS: vigour reduced by 15% or less | WEEDS: number or vigour reduced by 70% or more |
|---|---|---|
| 4.0 | species above + | Rumex obtusifolius<br>Agropyron repens<br>Agrostis stolonifera<br>Oryza punctata<br>Amaranthus retroflexus<br>Portulaca oleracea<br><br>+ species below |
| 2.0 | species above +<br><br>onion<br>pea<br>rape<br>maize<br>sorghum<br>rice<br>soyabean | Poa annua<br>Poa trivialis<br>Tripleurospermum maritimum<br>Senecio vulgaris<br>Polygonum lapathifolium<br>Chenopodium album<br>Veronica persica<br>Solanum nigrum |

Comments on results

Activity experiment results for metamitron were the subject of a previous report (Richardson et al., 1976) when the symptoms and type of effects were found to be very similar to those of photosynthetic inhibitors. Phytotoxicity was due largely to uptake via the soil, there being very little foliar activity. This fact should be appreciated when considering the results of the present test, where uptake via the roots as well as through the foliage was possible.

Selectivity among temperate species

At the high dose, all weeds were completely killed except Agropyron repens which had only one very weak survivor. At 4.0 kg/ha all weeds were killed or controlled with the exception of Galium aparine. Even at 2.0 kg/ha 8 annual weeds were either killed or controlled while 7 more were reduced in vigour by approximately 50%.

The complete tolerance of sugar beet is the outstanding result of this test. When plants were harvested, 6 weeks after spraying, the fresh weight of shoots was in excess of that of the untreated controls, especially the treatment at the high dose of 8.0 kg/ha. This parallels the result found in a recent pre-emergence selectivity test, when sugar beet was tolerant to 6.125 kg/ha (Richardson et al., 1976). Onion, rape and pea were the only other tolerant crops and then only at the low dose of 2.0 kg/ha. However pea was reduced in vigour by only 21% at 4.0 kg/ha.

Metamitron undoubtedly has great potential for weed control in sugar beet and should prove a strong competitor for herbicides currently used in this crop, such as pyrazon, lenacil, phenmedipham and ethofumesate. Furthermore the tolerance level for metamitron would seem to be higher than with these other herbicides while the weed spectrum does not appear to have any

conspicuous weakness, as most of the others do. Its moderate period of persistence could prove useful against late germinating weeds, e.g. Chenopodium album. Some further investigation in peas would seem worthwhile in view of the results obtained here. Although perennial ryegrass did not quite satisfy the criteria of selectivity, it was only reduced in vigour by 21% at 2.0 kg/ha and later observation showed that plants were making good recovery. Poa species were controlled at this dose, however, while Rumex obtusifolius was reduced in vigour by more than 50%, these weeds being some of the most prevalent in perennial ryegrass and the most difficult to control.

Selectivity among tropical species

This compound had varied activity on tropical species, the Solanaceae and sesamum being particularly sensitive. At a low dose of about 2 kg/ha, Solanum nigrum would be controlled in the cereal crops and soyabean, and other solanaceous weeds might also be expected to be susceptible. At the higher dose of 4 kg/ha two of the annual grasses, Eleusine and Oryza punctata were susceptible, along with all three of the broad-leaved annual weeds. Unfortunately other grass weeds were relatively resistant and no tropical crop had adequate tolerance at this dose, but some selectivity against the wild rice in rice was indicated and this possibility is receiving further attention. The usefulness of this compound as a post-emergence treatment in sugar beet under 'tropical' cnnditions would appear to be limited by the resistance of Echinochloa and Digitaria. These species were, however, better controlled by pre-emergence treatments (Richardson et al., 1976).

| SPECIES | | METAMITRON 2.0 kg/ha | | METAMITRON 4.0 kg/ha | | METAMITRON 8.0 kg/ha |
|---|---|---|---|---|---|---|
| WHEAT | 87 | xxxxxxxxxxxxxxxxx | 87 | xxxxxxxxxxxxxxxxx | 12 | xx |
| ( 1 ) | 36 | xxxxxxx | 36 | xxxxxxx | 14 | xxx |
| BARLEY | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 62 | xxxxxxxxxxxx |
| ( 2 ) | 79 | xxxxxxxxxxxxxxx | 43 | xxxxxxxxx | 29 | xxxxxx |
| OAT | 100 | xxxxxxxxxxxxxxxxxxx | 75 | xxxxxxxxxxxxxxx | 0 | |
| ( 3 ) | 71 | xxxxxxxxxxxxxx | 50 | xxxxxxxxxx | 0 | |
| PER RYGR | 94 | xxxxxxxxxxxxxxxxxx | 87 | xxxxxxxxxxxxxxxxx | 6 | x |
| ( 4 ) | 79 | xxxxxxxxxxxxxxx | 50 | xxxxxxxxxx | 14 | xxx |
| ONION | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 25 | xxxxx |
| ( 8 ) | 86 | xxxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 29 | xxxxxx |
| DWF BEAN | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 9 ) | 43 | xxxxxxxxx | 36 | xxxxxxx | 14 | xxx |
| FLD BEAN | 50 | xxxxxxxxxx | 0 | | 0 | |
| ( 10 ) | 21 | xxxx | 0 | | 0 | |
| PEA | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 75 | xxxxxxxxxxxxxxx |
| ( 11 ) | 100 | xxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx | 43 | xxxxxxxxx |
| W CLOVER | 12 | xx | 0 | | 0 | |
| ( 12 ) | 36 | xxxxxxx | 0 | | 0 | |
| RAPE | 100 | xxxxxxxxxxxxxxxxxxx | 0 | | 0 | |
| ( 14 ) | 86 | xxxxxxxxxxxxxxxxx | 0 | | 0 | |
| KALE | 100 | xxxxxxxxxxxxxxxxxxx | 40 | xxxxxxxx | 0 | |
| ( 15 ) | 71 | xxxxxxxxxxxxxx | 21 | xxxx | 0 | |

| SPECIES | | METAMITRON 2.0 kg/ha | | METAMITRON 4.0 kg/ha | | METAMITRON 8.0 kg/ha |
|---|---|---|---|---|---|---|
| CABBAGE | 80 | xxxxxxxxxxxxxxxx | 0 | | 0 | |
| ( 16 ) | 43 | xxxxxxxxx | 0 | | 0 | |
| SWEDE | 20 | xxxx | 0 | | 0 | |
| ( 17 ) | 14 | xxx | 0 | | 0 | |
| CARROT | 83 | xxxxxxxxxxxxxxxx | 67 | xxxxxxxxxxxx | 0 | |
| ( 18 ) | 64 | xxxxxxxxxxxxx | 43 | xxxxxxxxx | 0 | |
| PARSNIP | 90 | xxxxxxxxxxxxxxxxx | 20 | xxxx | 0 | |
| ( 19 ) | 57 | xxxxxxxxxxx | 21 | xxxx | 0 | |
| LETTUCE | 0 | | 0 | | 0 | |
| ( 20 ) | 0 | | 0 | | 0 | |
| SUG BEET | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 21 ) | 100 | xxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| AVE FATU | 100 | xxxxxxxxxxxxxxxxxx | 25 | xxxxx | 0 | |
| ( 26 ) | 71 | xxxxxxxxxxxxxx | 29 | xxxxxx | 0 | |
| ALO MYOS | 100 | xxxxxxxxxxxxxxxxxx | 62 | xxxxxxxxxxx | 0 | |
| ( 27 ) | 50 | xxxxxxxxxx | 36 | xxxxxxx | 0 | |
| POA ANN | 31 | xxxxxx | 0 | | 0 | |
| ( 28 ) | 7 | x | 0 | | 0 | |
| POA TRIV | 0 | | 0 | | 0 | |
| ( 29 ) | 0 | | 0 | | 0 | |
| SIN ARV | 100 | xxxxxxxxxxxxxxxxx | 25 | xxxxx | 0 | |
| ( 30 ) | 57 | xxxxxxxxxx | 21 | xxxx | 0 | |

| SPECIES | | METAMITRON 2.0 kg/ha | | METAMITRON 4.0 kg/ha | METAMITRON 8.0 kg/ha |
|---|---|---|---|---|---|
| RAPH RAP | 100 | xxxxxxxxxxxxxxxxxxxx | 20 | xxxx | 0 |
| ( 31 ) | 71 | xxxxxxxxxxxxxx | 14 | xxx | 0 |
| TRIP MAR | 0 | | 0 | | 0 |
| ( 33 ) | 0 | | 0 | | 0 |
| SEN VULG | 0 | | 0 | | 0 |
| ( 34 ) | 0 | | 0 | | 0 |
| POL LAPA | 0 | | 0 | | 0 |
| ( 35 ) | 0 | | 0 | | 0 |
| POL AVIC | 94 | xxxxxxxxxxxxxxxxxxx | 69 | xxxxxxxxxxxxxx | 0 |
| ( 36 ) | 50 | xxxxxxxxxx | 29 | xxxxxx | 0 |
| GAL APAR | 92 | xxxxxxxxxxxxxxxxxx | 58 | xxxxxxxxxxxx | 0 |
| ( 38 ) | 57 | xxxxxxxxxxx | 57 | xxxxxxxxxxx | 0 |
| CHEN ALB | 0 | | 0 | | 0 |
| ( 39 ) | 0 | | 0 | | 0 |
| STEL MED | 81 | xxxxxxxxxxxxxxxx | 6 | x | 0 |
| ( 40 ) | 43 | xxxxxxxxx | 7 | x | 0 |
| SPER ARV | 100 | xxxxxxxxxxxxxxxxxxxx | 0 | | 0 |
| ( 41 ) | 79 | xxxxxxxxxxxxxxxx | 0 | | 0 |
| VER PERS | 20 | xxxx | 0 | | 0 |
| ( 42 ) | 43 | xxxxxxxxx | 0 | | 0 |
| RUM OBTU | 100 | xxxxxxxxxxxxxxxxxxx | 0 | | 0 |
| ( 44 ) | 43 | xxxxxxxxx | 0 | | 0 |

| SPECIES | | METAMITRON 2.0 kg/ha | | METAMITRON 4.0 kg/ha | | METAMITRON 8.0 kg/ha |
|---|---|---|---|---|---|---|
| AG REPEN | 100 | xxxxxxxxxxxxxxxxxxxx | 80 | xxxxxxxxxxxxxxxx | 20 | xxxx |
| ( 47 ) | 86 | xxxxxxxxxxxxxxxxx | 29 | xxxxxx | 21 | xxxx |
| AG STOLO | 100 | xxxxxxxxxxxxxxxxxxx | 0 | | 0 | |
| ( 48 ) | 71 | xxxxxxxxxxxxxx | 0 | | 0 | |
| MAIZE | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 58 ) | 93 | xxxxxxxxxxxxxxxxxx | 50 | xxxxxxxxxx | 36 | xxxxxxx |
| SORGHUM | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 59 ) | 86 | xxxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxx | 43 | xxxxxxxxx |
| RICE | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 60 ) | 86 | xxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxx | 50 | xxxxxxxxxx |
| PIGEON P | 100 | xxxxxxxxxxxxxxxxxxx | 62 | xxxxxxxxxxxx | 25 | xxxxx |
| ( 61 ) | 57 | xxxxxxxxxx | 50 | xxxxxxxxxx | 14 | xxx |
| COWPEA | 100 | xxxxxxxxxxxxxxxxxxx | 50 | xxxxxxxxxx | 0 | |
| ( 62 ) | 50 | xxxxxxxxx | 14 | xxx | 0 | |
| CHICKPEA | 0 | | 0 | | 0 | |
| ( 63 ) | 0 | | 0 | | 0 | |
| GRNDNUT | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 64 ) | 64 | xxxxxxxxxxxxx | 29 | xxxxxx | 14 | xxx |
| SOYABEAN | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 65 ) | 100 | xxxxxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx |
| COTTON | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 66 ) | 79 | xxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx | 57 | xxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | METAMITRON 2.0 kg/ha | | METAMITRON 4.0 kg/ha | | METAMITRON 8.0 kg/ha |
|---|---|---|---|---|---|---|
| JUTE | 100 | xxxxxxxxxxxxxxxxxxxx | 83 | xxxxxxxxxxxxxxxxx | 33 | xxxxxxx |
| ( 67 ) | 64 | xxxxxxxxxxxxx | 36 | xxxxxxx | 14 | xxx |
| KENAF | 87 | xxxxxxxxxxxxxxxx | 25 | xxxxx | 0 | |
| ( 68 ) | 21 | xxxx | 7 | x | 0 | |
| TOBACCO | 10 | xx | 0 | | 0 | |
| ( 69 ) | 21 | xxxx | 0 | | 0 | |
| SESAMUM | 0 | | 12 | xx | 0 | |
| ( 70 ) | 0 | | 14 | xxx | 0 | |
| TOMATO | 0 | | 0 | | 0 | |
| ( 71 ) | 0 | | 0 | | 0 | |
| OR PUNCT | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 91 | xxxxxxxxxxxxxxxxxx |
| ( 73 ) | 43 | xxxxxxxxx | 29 | xxxxxx | 29 | xxxxxx |
| ELEU IND | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 6 | x |
| ( 74 ) | 57 | xxxxxxxxxxx | 36 | xxxxxxx | 14 | xxx |
| ECH CRUS | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 75 ) | 93 | xxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| ROTT EXA | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 76 ) | 100 | xxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxx |
| DIG SANG | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 77 ) | 100 | xxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| AMAR RET | 100 | xxxxxxxxxxxxxxxxxxx | 0 | | 0 | |
| ( 78 ) | 79 | xxxxxxxxxxxxxxxx | 0 | | 0 | |

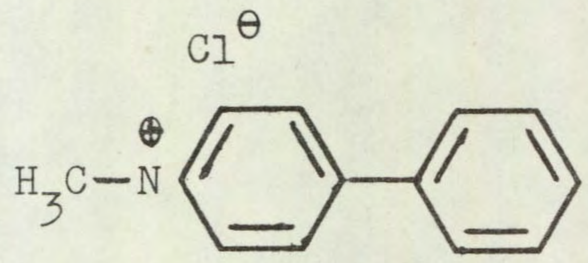
| SPECIES | | METAMITRON 2.0 kg/ha | | METAMITRON 4.0 kg/ha | | METAMITRON 8.0 kg/ha |
|---|---|---|---|---|---|---|
| PORT OLE | 100 | xxxxxxxxxxxxxxxxxxxx | 83 | xxxxxxxxxxxxxxxxx | 8 | xx |
| ( 79 ) | 43 | xxxxxxxxx | 29 | xxxxxx | 7 | x |
| SOL NIG | 0 | | 0 | | 0 | |
| ( 81 ) | 0 | | 0 | | 0 | |
| SNOW POL | 100 | xxxxxxxxxxxxxxxxxxx | 92 | xxxxxxxxxxxxxxxxxx | 8 | xx |
| ( 83 ) | 79 | xxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx | 36 | xxxxxxx |
| SNOW POL | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 84 ) | 93 | xxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxx |
| CYP ESCU | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 85 ) | 64 | xxxxxxxxxxxxx | 43 | xxxxxxxxx | 29 | xxxxxx |
| CYP ROTU | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 86 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| OXAL LAT | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 87 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 57 | xxxxxxxxxx |

CYPERQUAT

Code number S-21634 Trade name -

Chemical name 1-methyl-4-phenylpyridinium chloride

Structure



Source

Gulf Oil Corporation
9009 West 67th Street
Merriam
Kansas 66202
USA

Information available and suggested uses

Suggested for post-emergence control of Cyperus spp. (C. rotundus and C. esculentus) at 2.24 to 4.48 kg a.i./ha. The most tolerant crops are peanuts, soyabeans, rice, potatoes, onions, strawberries and turf grasses and possibly as a directed spray in cotton and maize. The volume rate should be not less than 20 gal/ac and the Cyperus spp. should be actively growing with 6 to 9 leaves. Effectiveness can be improved with herbicides or growth regulators that translocate downwards to the tubers e.g., 2,4-D, 2,4-DB and silvex. Some control of polygonaceous weeds has been reported. (Gulf Technical Data Sheet, 1974 and Schwartzbeck, 1974).

Formulation used 36% w/v a.i. liquid concentrate

Spray volume for activity experiment 305 l/ha
for selectivity experiment 200 l/ha

RESULTS

Full histogram results are presented on pages 45-51 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 |
|---|---|---|
| 8.0 | wheat<br>barley<br>oat<br>perennial ryegrass<br>onion<br>dwarf bean<br>field bean<br>white clover<br>rape<br>kale<br>cabbage | species below |

(Table continued overleaf)

| RATE kg a.i./ha | CROPS: vigour reduced by 15% or less | WEEDS: number or vigour reduced by 70% or more |
|---|---|---|
| 8.0 | swede<br>parsnip<br>sugar beet<br>rice<br>chickpea<br>groundnut | species below |
| 4.0 | species above +<br><br>pea<br>carrot<br>maize<br>sorghum<br>pigeon pea<br>soyabean<br>tomato | * (Polygonum lapathifolium) |

* controlled at later assessment, see text

Comments on results

Activity experiment

Full histogram results for this test are presented on page 45. Effects due to the foliar spray were found on the broad-leaved species but these only proved lethal on some plants of Polygonum amphibium several weeks after treatment and then only at the high dose. This species showed some susceptibility to pre-emergence treatments. The only other activity through the soil occurred with the surface pre-emergence treatment to kale but only at the high dose. (A reduction in the number of plants of dwarf bean occurred at the higher doses in the pre-plant incorporated treatment but this was not believed to be a direct result of the herbicide.) Grasses were resistant to all four methods of application.

Symptoms

Symptoms on broad-leaved species as a result of the foliar spray were seen as a chlorosis or yellowing of leaves accompanied by very mild scorch symptoms. With P. amphibium, necrosis developed very slowly after the initial chlorosis. In the pre-emergence treatments, this species showed a retardation of growth, plants having shortened internodes with an overall yellowing or chlorosis of leaves. Plants remained in this state before either recovery or necrosis developed. Roots also were very slow to develop.

Selectivity among temperate species

Polygonum lapathifolium was the only weed to show any appreciable susceptibility and was eventually killed at 4.0 kg/ha. Several species, including Spergula arvensis, Tripleurospermum maritimum, Stellaria media, Rumex obtusifolius and Polygonum aviculare were all reduced in vigour by approximately 50% but all eventually recovered. Other weeds, including all the grasses were resistant.

Several crops were tolerant, including the 3 cereals and also perennial ryegrass and onion. Lettuce was the most susceptible crop, 4.0 kg/ha causing damage. Pea and carrot were the only others to show any susceptibility but only at the high dose of 8.0 kg/ha.

There would appear to be little potential for use of this herbicide in the temperate situation in view of the limited weed control spectrum. Some further work to see if the control of Polygonum and Rumex species could be extended may be worthwhile in view of the importance of these weeds in certain situations e.g. Polygonum aviculare in legumes and Rumex species in grassland. One other pot test has shown that a better effect on the annuals, P. aviculare and P. lapathifolium can be obtained if the surfactant Agral is included in the spray. A pot experiment on the established perennials, Rumex obtusifolius, Rumex acetosella and Polygonum amphibium showed these to be fairly resistant to cyperquat even when this surfactant was used together with 2,4-D amine and other additives.

Selectivity among tropical species

Cyperquat did not in this experiment give quite the degree of control of Cyperus species that was anticipated but suppression of C. rotundus was good at 4 and 8 kg/ha, and experience in other pot experiments at WRO has been that 4 kg/ha gives very good suppression for at least 1-2 months although tubers are not killed and there is eventual regrowth. Cyperus esculentus was very slightly less susceptible in this test but is reported well controlled in the field, in recent reports from USA. No other tropical weed species were usefully controlled in this test. All crop species showed at least some mild symptoms even at the lowest dose of 2 kg/ha. These symptoms included a chlorotic speckling of young growth in the cereals and slight bronzing or crinkling of leaves in the broad-leaved crops, but in most cases there was little or no check to growth from 4 kg/ha. Overall spraying of the cereals, especially rice would appear feasible for selective control of Cyperus spp. Chickpea, soyabean, tomato and pigeon pea could also be sprayed overall but in cotton, tobacco and cowpea, damage is more serious and a directed spray would probably be necessary. Safety in jute would be doubtful even with a directed spray and kenaf is particularly sensitive and could probably not be treated at all.

Control of Cyperus in other vegetable crops is also of interest and the tolerance of onions in this experiment is particularly encouraging. The onions were, however, grown outdoors under a temperate regime and selectivity will need to be confirmed under the high temperatures at which C. rotundus occurs.

# ACTIVITY EXPERIMENT

## CYPERQUAT

| | | 0.5 kg/ha | 2.00 kg/ha | 8.00 kg/ha |
|---|---|---|---|---|
| DWARF BEAN | F | R | | |
| | S | | | |
| | P | + | | |
| | I | + | | |
| KALE | F | | | |
| | S | | | |
| | P | + | + | + |
| | I | | | |
| POLYGONUM AMPHIBIUM | F | + | + | + |
| | S | | | |
| | P | | | |
| | I | | | + |
| PERENNIAL RYEGRASS | F | | | |
| | S | | | |
| | P | | + | + |
| | I | + | + | + |
| AVENA FATUA | F | | | |
| | S | | | |
| | P | | | |
| | I | | + | |
| AGROPYRON REPENS | F | | | |
| | S | | | |
| | P | | | |
| | I | | | |

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

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | CYPERQUAT 2.0 kg/ha | | CYPERQUAT 4.0 kg/ha | | CYPERQUAT 8.0 kg/ha |
|---|---|---|---|---|---|---|
| WHEAT | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 1 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx |
| BARLEY | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 2 ) | 100 | xxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxx |
| OAT | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 3 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| PER RYGR | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 4 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ONION | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 8 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| DWF BEAN | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 9 ) | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| FLD BEAN | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 10 ) | 100 | xxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| PEA | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 11 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| W CLOVER | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 12 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxx |
| RAPE | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 14 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| KALE | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 15 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | CYPERQUAT 2.0 kg/ha | | CYPERQUAT 4.0 kg/ha | | CYPERQUAT 8.0 kg/ha |
|---|---|---|---|---|---|---|
| CABBAGE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 16 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| SWEDE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 17 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx |
| CARROT | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 18 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxxx |
| PARSNIP | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 19 ) | 93 | xxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx |
| LETTUCE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 20 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx |
| SUG BEET | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 21 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| AVE FATU | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 26 ) | 93 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxxx |
| ALO MYOS | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 27 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| POA ANN | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 28 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| POA TRIV | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 29 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| SIN ARV | 92 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 30 ) | 86 | xxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | CYPERQUAT 2.0 kg/ha | | CYPERQUAT 4.0 kg/ha | | CYPERQUAT 8.0 kg/ha |
|---|---|---|---|---|---|---|
| RAPH RAP | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 31 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx |
| TRIP MAR | 100 | xxxxxxxxxxxxxxxxxxx | 69 | xxxxxxxxxxxxxx | 75 | xxxxxxxxxxxxxxx |
| ( 33 ) | 71 | xxxxxxxxxxxxxx | 50 | xxxxxxxxxx | 43 | xxxxxxxxx |
| SEN VULG | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 34 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxxx |
| POL LAPA | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 75 | xxxxxxxxxxxxxxx |
| ( 35 ) | 71 | xxxxxxxxxxxxxx | 57 | xxxxxxxxxxx | 36 | xxxxxxx |
| POL AVIC | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 36 ) | 100 | xxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 57 | xxxxxxxxxx |
| GAL APAR | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 38 ) | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| CHEN ALB | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 39 ) | 79 | xxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxx | 71 | xxxxxxxxxxxxx |
| STEL MED | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 40 ) | 100 | xxxxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx | 50 | xxxxxxxxxx |
| SPER ARV | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 41 ) | 64 | xxxxxxxxxxxxx | 50 | xxxxxxxxxx | 43 | xxxxxxxxx |
| VER PERS | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 42 ) | 100 | xxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| RUM OBTU | 90 | xxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 44 ) | 57 | xxxxxxxxxxx | 57 | xxxxxxxxxxx | 57 | xxxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | CYPERQUAT 2.0 kg/ha | | CYPERQUAT 4.0 kg/ha | | CYPERQUAT 8.0 kg/ha |
|---|---|---|---|---|---|---|
| AG REPEN | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 47 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| AG STOLO | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 48 ) | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 93 | xxxxxxxxxxxxxxxxxx |
| MAIZE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 58 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| SORGHUM | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 59 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx |
| RICE | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 60 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx |
| PIGEON P | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 61 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| COWPEA | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 62 ) | 71 | xxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 64 | xxxxxxxxxxxx |
| CHICKPEA | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 63 ) | 86 | xxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx |
| GRNDNUT | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 64 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| SOYABEAN | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 65 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| COTTON | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxxx |
| ( 66 ) | 79 | xxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | CYPERQUAT 2.0 kg/ha | | CYPERQUAT 4.0 kg/ha | | CYPERQUAT 8.0 kg/ha |
|---|---|---|---|---|---|---|
| JUTE | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 67 ) | 64 | xxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx |
| KENAF | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 68 ) | 57 | xxxxxxxxxxx | 43 | xxxxxxxxx | 36 | xxxxxxx |
| TOBACCO | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 69 ) | 64 | xxxxxxxxxxxxx | 57 | xxxxxxxxxxx | 57 | xxxxxxxxxxx |
| SESAMUM | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 70 ) | 79 | xxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 57 | xxxxxxxxxxx |
| TOMATO | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 71 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| OR PUNCT | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 73 ) | 86 | xxxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx |
| ELEU IND | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 74 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx |
| ECH CRUS | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 75 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| ROTT EXA | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 76 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx |
| DIG SANG | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 77 ) | 86 | xxxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 79 | xxxxxxxxxxxxxxx |
| AMAR RET | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 78 ) | 79 | xxxxxxxxxxxxxxx | 64 | xxxxxxxxxxxxx | 50 | xxxxxxxxxx |

POST-EMERGENCE SELECTIVITY EXPERIMENT

| SPECIES | | CYPERQUAT 2.0 kg/ha | | CYPERQUAT 4.0 kg/ha | | CYPERQUAT 8.0 kg/ha |
|---|---|---|---|---|---|---|
| PORT OLE | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxxx |
| ( 79 ) | 86 | xxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |
| SOL NIG | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 81 ) | 64 | xxxxxxxxxxxx | 71 | xxxxxxxxxxxxx | 64 | xxxxxxxxxxxx |
| SNOW POL | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 83 ) | 79 | xxxxxxxxxxxxxx | 57 | xxxxxxxxxx | 57 | xxxxxxxxxx |
| SNOW POL | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 84 ) | 57 | xxxxxxxxxx | 57 | xxxxxxxxxx | 57 | xxxxxxxxxx |
| CYP ESCU | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 85 ) | 57 | xxxxxxxxxx | 43 | xxxxxxxx | 36 | xxxxxx |
| CYP ROTU | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 86 ) | 50 | xxxxxxxxxx | 36 | xxxxxx | 36 | xxxxxx |
| OXAL LAT | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx | 100 | xxxxxxxxxxxxxxxxxx |
| ( 87 ) | 86 | xxxxxxxxxxxxxxxx | 71 | xxxxxxxxxxxxx | 86 | xxxxxxxxxxxxxxxx |

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Appendix 1. Species, abbreviations, varieties and stages of growth at spraying and assessment for post-emergence selectivity test

| | Designation and computer serial number | Cultivar or source | Stage of growth at spraying | Stage of growth at assessment (untreated controls) |
|---|---|---|---|---|
| | | | (leaf numbers exclusive of cotyledons) | |
| **Temperate species** | | | | |
| Wheat (*Triticum aestivum*) | WHEAT (1) | Maris Dove | 3 leaves | 7 leaves, tillering |
| Barley (*Hordeum vulgare*) | BARLEY (2) | Maris Mink | 2½-3 leaves | 6 leaves tillering |
| Oat (*Avena sativa*) | OAT (3) | Condor | 3 leaves | 6 leaves, tillering |
| Perennial ryegrass (*Lolium perenne*) | PER RYGR (4) | S 23 | 2½-3 leaves | 6 leaves, tillering |
| Onion (*Allium cepa*) | ONION (8) | Robusta | 2 leaves | 2½-3 leaves |
| Dwarf bean (*Phaseolus vulgaris*) | DWF BEAN (9) | The Prince | 2 unifoliate leaves | 2-3 trifoliate leaves |
| Field bean (*Vicia faba*) | FLD BEAN (10) | Maris Bead | 3½ leaves | 6½-7½ leaves |
| Pea (*Pisum sativum*) | PEA (11) | Dark Skinned Perfection | 3½-4 leaves | 8 leaves |
| White clover (*Trifolium repens*) | W CLOVER (12) | S 100 | 1½ leaves | 4-5 trifoliate leaves |
| Rape (*Brassica napus oleifera*) | RAPE (14) | Victor | 2½-3 leaves | 4½ leaves |
| Kale (*Brassica oleracea acephala*) | KALE (15) | Marrowstem | 2½ leaves | 3½ leaves |
| Cabbage (*Brassica oleracea capitata*) | CABBAGE (16) | Primo | 2½ leaves | 4 leaves |
| Swede (*Brassica napus*) | SWEDE (17) | Lord Derby | 2½ leaves | 3½-4½ leaves |
| Carrot (*Daucus carota*) | CARROT (18) | Chantenay Red Core | 2 leaves | 4½ leaves |

| | Designation and computer serial number | Cultivar or source | Stage of growth at spraying | Stage of growth at assessment (untreated controls) |
|---|---|---|---|---|
| | | | (leaf numbers exclusive of cotyledons) | |
| Parsnip (Pastinaca sativa) | PARSNIP (19) | Avonresister | 2 leaves | 4 leaves |
| Lettuce (Lactuca sativa) | LETTUCE (20) | Borough Wonder | 4 leaves | 8 leaves |
| Sugar beet (Beta vulgaris) | SUG BEET (21) | Klein E monogerm | 2½-3 leaves | 8 leaves |
| Avena fatua | AVE FATU (26) | B and S supplies 1972 | 3 leaves | 6-7 leaves, tillering |
| Alopecurus myosuroides | ALO MYOS (27) | WRO 1972 | 3 leaves | 12 leaves, tillering |
| Poa annua | POA ANN (28) | WRO 1972 | 3 leaves | 15 leaves, tillering |
| Poa trivialis | POA TRIV (29) | Watts Ltd 1972 | 2 leaves | 15 leaves, tillering |
| Sinapis arvensis | SIN ARV (30) | WRO 1965 | 4 leaves | 5 leaves, tillering |
| Raphanus raphanistrum | RAPH RAP (31) | Black Spanish | 2½-3 leaves | 4½ leaves |
| Tripleurospermum maritimum | TRIP MAR (33) | WRO 1971 | 6 leaves | 10 leaves |
| Senecio vulgaris | SEN VULG (34) | WRO 1972 | 4 leaves | 9 leaves, flowering |
| Polygonum lapathifolium | POL LAPA (35) | WRO 1971 | 4-5 leaves | - |
| Polygonum aviculare | POL AVIC (36) | WRO 1971 | 3½ leaves | 10 leaves |
| Galium aparine | GAL APAR (38) | WRO 1972 | 2 whorls | 12 whorls |
| Chenopodium album | CHEN ALB (39) | WRO 1972 | 4 leaves | 10 leaves |
| Stellaria media | STEL MED (40) | WRO 1972 | 4-6 leaves | 20 leaves |
| Spergula arvensis | SPER ARV (41) | WRO 1964 | 1½ whorls | 8 whorls |

| | Designation and computer serial number | Cultivar or source | Stage of growth at spraying | Stage of growth at assessment (untreated controls) |
|---|---|---|---|---|
| | | | (leaf numbers exclusive of cotyledons) | |
| Veronica persica | VER PERS (42) | WRO 1972 | 6 leaves | 10 leaves, flowering |
| Rumex obtusifolius | RUM OBTU (44) | WRO 1969 | 2½-3 leaves | - |
| Agropyron repens | AG REPEN (47) | WRO Clone 31† | 3 leaves | 7 leaves, tillering |
| Agrostis stolonifera | AG STOLO (48) | B and S supplies 1975 | 3 leaves | 15 leaves, tillering |
| Tropical species (grown under higher temperature regime) | | | | |
| Maize (Zea mays) | MAIZE (58) | Caldera | 3½-4 leaves | 6½-7 leaves |
| Sorghum (Sorghum bicolor) | SORGHUM (59) | YE 90L | 3½-4 leaves | 7-7½ leaves |
| Rice (Oryza sativa) | RICE (60) | IR 5 | 4-5 leaves | 6 leaves |
| Pigeon pea (Cajanus cajan) | PIGEON P (61) | Jamaica 1974 | 0-¼ trifoliate leaf | 5-6½ trifoliate leaves |
| Cowpea (Vigna unguiculata) | COWPEA (62) | Nigeria 1974 | ½-1 trifoliate leaf | 3 trifoliate leaves |
| Chickpea (Cicer arietinum) | CHICKPEA (63) | Addis Market | 8½-9½ pinnate leaves | 18-21 pinnate leaves |
| Groundnut (Arachis hypogea) | GRNDNUT (64) | Barberton, Sudan 1971 | 3-3½ pinnate leaves | 8 pinnate leaves |
| Soyabean (Glycine max) | SOYABEAN (65) | Amsoy | 1-1½ trifoliates | 4½ trifoliate leaves |
| Cotton (Gossypium hirsutum) | COTTON (66) | 26 J | 1-1½ leaves | 3-3½ leaves |
| Jute (Corchorus olitorius) | JUTE (67) | Egypt 1971 | 3½-4 leaves | 9½-10½ leaves |
| Kenaf (Hibiscus cannabinus) | KENAF (68) | Thai Native | 1 trifoliate leaf | 4-4½ leaves |
| Tobacco (Nicotiana tabacum) | TOBACCO (69) | Yellow Mammoth | 3½ leaves | 6½-8 leaves |

† one node rhizome pieces

| | Designation and computer serial number | Cultivar or source | Stage of growth at spraying | Stage of growth at assessment (untreated controls) |
|---|---|---|---|---|
| | | | (leaf numbers exclusive of cotyledons) | |
| Sesamum (Sesamum indicum) | SESAMUM (70) | var S. Uganda 1972 | 2 leaves | 6-7 leaves |
| Tomato (Lycopersicum esculentum) | TOMATO (71) | Ailsa Craig | 3-3½ pinnate leaves | 4½-5 pinnate leaves |
| Oryza punctata | OR PUNCT (73) | Swaziland 1973 | 4 leaves | 5-5½ leaves |
| Eleusine indica | ELEU IND (74) | Mount Makulu 1961 | 4-5 leaves | 8-8½ leaves |
| Echinochloa crus-galli | ECH CRUS (75) | WRO 1968 | 4½ leaves | 7 leaves |
| Rottboellia exaltata | ROT EXAL (76) | Rhodesia 1971 | 4 leaves | 6 leaves |
| Digitaria sanguinalis | DIG SANG (77) | WRO 1971 | 5½ leaves | 8-9 leaves |
| Amaranthus retroflexus | AMAR RET (78) | WRO 1972 | 4½-5 leaves | 11-12½ leaves |
| Portulaca oleracea | PORT OLE (79) | Swaziland | 11-13 leaves | 15 leaves |
| Solanum nigrum | SOL NIG (81) | B and S supplies, 1973 | 5-5½ leaves | 8½-9½ leaves |
| Snowdenia polystachya[1] | SNOW POL (83) | Ethiopia 1974 | 4½-6 leaves | 7½-12 leaves |
| Snowdenia polystachya[2] | SNOW POL (84) | Ethiopia 1974 | 10-12 leaves | 15-17 leaves |
| Cyperus esculentus | CYP ESCU (85) | WRO Clone 2* (ex South Africa) | 4-6½ leaves | 9 leaves |
| Cyperus rotundus | CYP ROTU (86) | WRO Clone 1* (ex Rhodesia) | 5½-6 leaves | 3-14½ leaves |
| Oxalis latifolia | OXAL LAT (87) | WRO Clone 2†† (ex Cornwall) | 4½-9 trifoliates | 45-75 trifoliate leaves |

†† bulbs * 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 × time product | ct | inch | in. |
| concentration required to kill 50% test animals | LC50 | infra red | i.r. |
| cubic centimetre* | $cm^3$ | kilogramme | kg |
| cubic foot* | $ft^3$ | kilo ($\times 10^3$) | k |
| cubic inch* | $in^3$ | less than | < |
| cubic metre* | $m^3$ | litre | l. |
| cubic yard* | $yd^3$ | low volume | LV |
| cultivar(s) | cv. | maximum | max. |
| curie* | Ci | median lethal dose | LD50 |
| degree Celsius* | $^oC$ | medium volume | MV |
| degree centigrade* | $^oC$ | melting point | m.p. |
| degree Fahrenheit* | $^oF$ | metre | m |
| diameter | diam. | micro ($\times 10^{-6}$) | µ |
| diameter at breast height | d.b.h. | microgramme* | µg |
| divided by* | ÷ or / | micromicro (pico: $\times 10^{-12}$)* | µµ |
| dry matter | d.m. | micrometre (micron)* | µm (or µ) |
| emulsifiable concentrate | e.c. | micron (micrometre)*× | µm (or µ) |
| equal to* | = | miles per hour* | mile/h |
| fluid | fl. | milli ($\times 10^{-3}$) | m |
| foot | ft | milliequivalent* | m.equiv. |
| | | milligramme* | mg |
| | | millilitre | ml |

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

| | |
|---|---|
| millimetre* | mm |
| millimicro* (nano: $\times 10^{-9}$) | n or mμ |
| minimum | min. |
| minus | - |
| minute | min |
| molar concentration* | M (small cap) |
| molecule, molecular | mol. |
| more than | > |
| multiplied by* | × |
| 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: $\times 10^{-12}$) | 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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