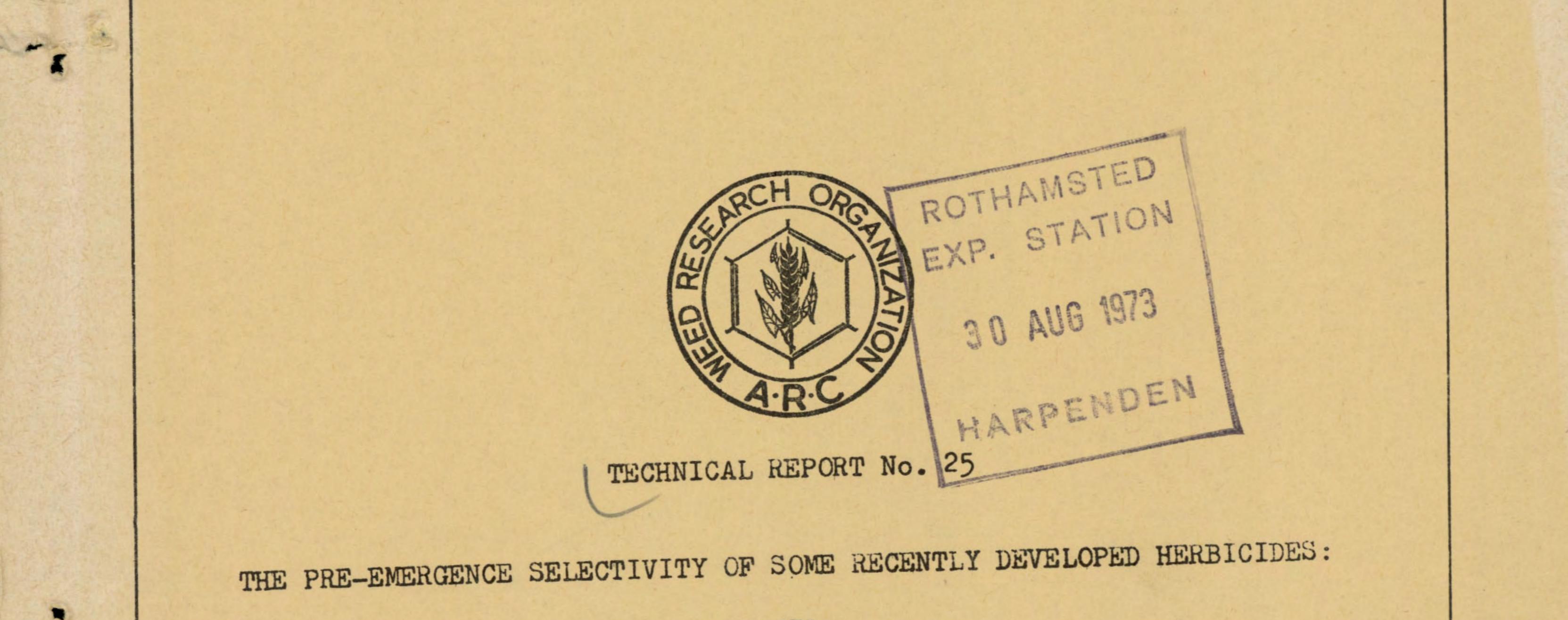
STORE 1106

TO REMAIN ON BIGPLAY MACR. CHTTL

AGRICULTURAL RESEARCH COUNCIL

WEED RESEARCH ORGANIZATION



LENACIL RU 12068 METRIBUZIN CYPRAZINE EMD-IT 5914 BENTHIOCARB

W.G. Richardson and M.L. Dean

EMD-IT 5914 is difunon, RU 12068 is 3-(2-tetrahydropyranyl)-5,6-trimethyleneuracil (Procida) August 1973

Price

U.K. and overseas surface mail - £1.75 - \$2.20 Overseas airmail

*

BEGBROKE HILL, YARNTON, OXFORD



9/11/65

With Compliments

INSTITUTE OF GRASSLAND & ENVIRONMENTAL RESEARCH

Plas Gogerddan, Aberystwyth, Ceredigion SY23 3EB. UK. Tel: 01970 - 823000 Fax: 01970 - 828357

Many thanks for the ban of this item



LENACIL

RESULTS

METHODS AND MATERIALS

INTRODUCTION

SUMMARY

Page

2

11

11

17

CONTENTS

3-cyclohexyl-6,7-dihydro-1H-cyclopentapyrimidine-2,4-(3H,5H)dione

RU 12068

3-(2-tetrahydropyranyl)-0,7-dihydro-1H-cyclopentapyrimidine-2,4-(3H,5H)dione

METRIBUZIN

4-amino-o-t-buty1-3-methy1thio-1,2,4-triazin-5-one

33

25

CYPRAZINE

2-chloro-4-cyclopropylamino-6-isopropylamino-1,3,5-triazine

49

57

57

11111-11))14

Confidential

BENTHIOCARB

.

1

4

S-(4-chlorobenzyl)-N, N-diethylthiolcarbamate

ACKNOWLEDGEMENTS

REFERENCES

NOTE

The content of this publication, in whole or in part, may be quoted or reproduced provided the authors and the ARC Weed Research Organization are fully acknowledged. The correct bibliographical reference is:-

Richardson, W.G. and Dean, M.L. The pre-emergence selectivity of some recently developed herbicides: lenacil, RU 12068, metribuzin, cyprazine, EMD-IT 5914 and benthiocarb. Tech. Rep. agric. Res. Coun. Weed Res. Orgn, 1973, (25), pp 57. THE PRE-EMERGENCE SELECTIVITY OF SOME RECENTLY DEVELOPED HERBICIDES: LENACIL, RU 12068, METRIBUZIN, CYPRAZINE, EMD-IT 5914 and BENTHIOCARB

W.G. Richardson* and M.L. Dean**

ARC Weed Research Organization, Begbroke Hill, Yarnton, Oxford OX5 1PF

SUMMARY

.

₩.

*

Five newly developed herbicides were tested on six species for their soil and foliar activity and on a range of 32 temperate and 17 tropical crop and weed species for their pre-emergence selectivity following incorporation into soil at three doses. The persistence of biological activity in the soil was also examined. The established compound, lenacil, was included for comparison with the related RU 12008.

RU 12068 exhibited a similar type of activity to lenacil but the levels of activity were greater. At higher doses lenacil showed some selectivity in sorghum and groundnut in addition to sugar beet while selectivities with RU 12068 were only apparent at 0.30 kg/ha when white clover was the only tolerant temperate crop. However, selective weed control by RU 12068 showed no advantages over present treatments and no tropical weeds were controlled in tolerant crops.

Metribuzin was found to be a highly active compound similar to other triazines. Good control of annual grass and broad-leaved species was achieved at levels up to 0.30 kg/ha. Crops were not outstandingly tolerant and selectivities tended to be marginal. <u>Tussilago farfara</u>, <u>Convolvulus</u> <u>arvensis</u> were particularly resistant as were both <u>Cyperus</u> spp to a lesser degree. Soil persistence at 1.20 kg/ha was detectable up to 40 weeks.

The activity of cyprazine resembled atrazine and simazine very closely. Maize exhibited outstanding tolerance of this compound and many of the larger seeded crops showed useful tolerance. Slight to severe effects were apparent on perennial species. Persistence of the compound in the soil was not so long as with atrazine and simazine.

EMD-IT 5914 proved to be an active compound. Control of a range of broad-leaved and monocotyledonous weed species was achieved including some perennials. Selectivities were few and tended to be marginal but cotton achieved outstanding tolerance.

Good control of grass weeds was obtained with benthiocarb while broad-leaved and perennial species were highly resistant. The majority of crop species showed good tolerance but selectivities were not outstanding. The distinct lack of activity on broad-leaved weed species was a disadvantage of this compound.

INTRODUCTION

The Herbicide Evaluation Section and Tropical Weeds Group of the Weed Research Organization investigate the selectivity of new herbicides which

* Herbicide Evaluation Section ** ODA Tropical Weeds Group are in the process of commercial development by industry. This involves application, both pre-emergence and post-emergence, to a wide range of crop and weed species grown in pots, as a preliminary stage of this process. The objectives are to discover selectivities additional to those pinpointed by the firm which originally discovered the herbicidal properties of the chemical; to obtain experience of the type of effects produced by the chemical; and to provide a source of information on the relative susceptibility of plant species. The latter may subsequently prove useful in considering problems such as the cropping of land contaminated with the

- 2 -

herbicide. Essentially the main value of this experimentation is as a guide in the planning of further experiments both in pots and in the field.

Attention is drawn particularly to the fact that the experiment described here is only a preliminary guide to the relative resistance or susceptibility of the species included. Pot experiments of this sort are not a reliable guide to the dose levels needed to produce the same effects in the field. Further, the experiments are conducted on only one widely grown variety of each crop plant or on weed material from one readily available source. Large variations in response can occur between different varieties of the same crop, or between different strains or clones of weed species. In a few instances a cultivar attributed to the same species as the weed has been used for ease of propagation and there are a number of cases where a species has been included which is a crop in some circumstances and a weed in others. The experiments are conducted on one soil type only. All these important variables can have a profound effect on response and for this reason it must be emphasised that the data reported should be regarded primarily as a source of ideas for further work.

The Weed Research Organization only accepts herbicides for inclusion in its research programme if the chemical nature is disclosed. However, in some cases this disclosure is confidential for a limited period of time. Hence there may be occasional instances in these reports where the chemical composition of a herbicide is not stated but marked as confidential. In general, recipients of these reports will find that information on this point becomes available from other sources in a relatively short period of time.

.

The present report gives data on five new compounds plus lenacil, which was included for comparison with RU 12068. We have also included data from Initial Activity Tests, another form of preliminary experiment, which provides some indication of the mode, type and levels of activity of these compounds.

METHODS AND MATERIALS

a) Initial Activity Tests (IAT 1, 2 and 3)

This is the first routine test when a new herbicide is received. This provides information on levels of phytotoxicity, mode and type of action and whether the activity is associated with uptake by the roots or foliage of the plant. Herbicides are applied by four different methods to six selected species, four being raised from seeds and perennial species from one node rhizome fragments (see Table 1 for species data).

foliar spray, post-emergence i)

Plants were raised in 8.9 cm plastic disposable pots and thinned to constant number before treatment. The herbicide was applied from a Teejet fan nozzle moving at constant speed 30 cm above level of maximum foliage. The stage of growth at spraying is given in Table 1. The soil surface was protected from herbicideal spray with a layer of perlite to intercept any spray which might reach the soil surface. After careful removal of the perlite, following spraying, the plants were transferred to fibre-glass beds in the glasshouse and sub-irrigated until assessment. The foliage was not washed-off after 24 hours.

ii) soil drench, post-emergence

- 3 -

Plants were raised as for the foliar spraying but herbicides were applied by pipette to the soil surface in 10 ml water per pot. Care was taken to spread the liquid evenly over the soil surface and contact with the stem at soil level was avoided as far as possible. Following treatment pots were transferred to the glasshouse and watered individually overhead in foil dishes until assessment.

iii) surface spray, pre-emergence

Test species were planted in untreated soil in 8.9 cm plastic disposable pots (see Table 1 for numbers and depths of planting). The herbicide was applied from a Teejet fan nozzle moving at a constant speed over the smoothed soil surface. Pots were transferred to foil dishes in the glasshouse and watered overhead with a boom until emergence. Subsequent watering was individually from overhead.

iv) soil incorporated, pre-emergence

The method for this portion of the test follows the main preemergence experiment identically.

Pre-emergence treatments were assessed some 4-5 weeks after planting and post-emergence treatments about two weeks following treatment (see Table 1). Assessments for number of survivors and plant vigour were made as in the pre-emergence selectivity experiments and are subsequently presented in the same manner (see page 10). Spraying dates, assessment dates and soil and environmental conditions are given in Table 2 for all the tests.

b) Pre-emergence selectivity test

*

The techniques used for the pre-emergence experiment resembled those in previous pre-emergence selectivity experiments (Richardson and Dean 1972). Six herbicides were tested, each compound being applied at three doses and fully incorporated into the soil before planting. Incorporation was not necessarily required to secure the maximum effect from the herbicide, but the intention was to assess the inherent selectivity when the herbicide was distributed throughout the growing medium.

Tin plate containers 19.0 x 13.7 x 7.6 cm deep were filled to a depth of 6.5 cm with a sandy loam topsoil from a field at Begbroke Hill. Soil conditions are summarised in Table 2. The herbicides were used in the formulation supplied by the manufacturer for field experimentation. These were sprayed on to the soil surface using a laboratory sprayer embodying a Teejet fan nozzle moving at constant speed over a spray bench.

Table 1. Plant data for Initial Activity Tests

主張情情為高

	Cultivar /Source	No. pe at spr		Depth of planting (cm)	Stage of growth at spraying	Stage of growth at assessment
Dwarf bean Phaseolus vulgaris)	The Prince	3	2	1.8	10-15 cm 2 unifoliates	11-2 trifoliates
Kale Brassica oleracea acephala)	Green Marrow- stem	12	5	0.6	11-2 true leaves	3-5 true leaves
<u>Avena fatua</u>	Boxworth 1967	8	8	1.2	2-3 leaves	6월-10월 leaves
Polygonum amphibium	WRO Clone 1	6	6	1.2	31~51 leaves	4-6 leaves tillering
Perennial ryegrass (Lolium perenne)	S 23	10	10	0.6	1월-2 leaves	312-7 leaves tillering
Agropyron repens	WRO Clone 31	6	6	1.2	2-3 leaves	4-6 leaves tillering

- 4 -

Shortly after spraying, the soil was passed six times through a large polythene funnel to incorporate the herbicide evenly through the soil. The treated soil was then used to fill a series of 8.9 cm diameter disposable plastic pots to a depth of 6.5 cm in which the plants were subsequently grown.

Pots were allocated to individual species and a specified number of seeds sown at the appropriate depth (see Table 3). For the perennial weed species small portions of underground systems were planted, as indicated in Table 3, and all pots were replicated twice.

With certain species, plant material was pre-treated to improve establishment. Chenopodium album seeds were rubbed with sandpaper until the seed coat was pierced. Polygonum aviculare seeds were kept moist at 2°C for a period of at least six weeks before planting as were seeds of Veronica persica. Tubers of Cyperus esculentus were stored moist at 4°C for 23 days prior to planting to break dormancy. Rottboellia exaltata seeds were soaked for 48-72 hours in water and those which sank were lightly crushed before planting.

Table 2. Soil and Environmental Conditions

					and the second sec
Experiment number, type and herbicide	IAT 1 RU 12068 cyprazine	IAT 2 metribuzin	<u>IAT 3</u> EMD-IT 5914 benthiocarb	pre-em lenacil RU 12068 cyprazine	ergence metribuzin EMD-IT 5914 benthiocarb
Date of spraying	23.6.71	17.8.71	8.10.71	24.	11.71
Date of main assessment post-em. pre-em.	13.7.71 18.7.71	1.9.71 13.9.71	27.10.71 11.11.71	22.	2.72
Soil moisture at spraying (%)				13	
Organic matter (%)	2.8	2.8	2.8	2.8	
Clay content (%)	16.0	16.0	16.0	1	6.0
pH	7.7	7.7	7.7	7.7	
J.I. Base Fertiliser	4.0 g/kg	4.0 g/kg	2.0 g/kg	1.0	g/kg
DDT (5% dust)	-	0.5 g/kg	-	0.5	g/kg
Fritted Trace Elements	-	-	-	0.3	g/kg
Temperature (°C) Mean	23	20	17	Temperate 18	Tropical 24
Maximum	32	28	26	24	31
Minimum	14	13	10	11	10
Relative Humidity (%) Mean	50-55	45-55	50-55	55-60 55-65	
Maximum	80	78	78	78	95
Minimum	27	18	22	30	28

- 5 -

The spraying of the soil, its subsequent transfer to pots and planting of the various species commenced on 24th November 1971. The pots were then placed in aluminium foil dishes in the glasshouses at 15° C until completion of spraying, the whole procedure taking $1\frac{1}{2}$ days. The temperatures were then raised to the desired values for the temperate and tropical species respectively. Initial watering until emergence was from overhead using a boom with fan nozzles to give uniform treatment to all pots. After emergence of the majority of the species pots were watered individually from overhead according to need, using a small rose and avoiding contact with the plants as far as possible. Conditions during the experimental periods are summarised in Table 2 and normal daylight was supplemented with a 14 hour photoperiod using warm white fluorescent tubes or mercury vapour lamps. During the experimental

*

.

period an interrupted electrical supply was experienced and this led to lower temperatures than normal on several occasions. These were for only short periods (not more than 2-3 hours) however. Supplementary lighting was also reduced and completely lost for 2 weeks during which time some of the tropical species especially did suffer a loss of vigour.

- 6 -

Table 3. Species, abbreviations, varieties and stage of growth at assessment

Designation and Cultivar No. of growth at computer or per plant- assessment

*

.

.

.

5 10 11

	computer serial number	or source	per pot	plant- ing (cm)	(untreated controls)
Temperate species					
Wheat (Triticum aestivum)	WHEAT (1)	Kolibri	8	1.2	3늘 leaves
Barley (Hordeum vulgare)	BARLEY (2)	Sultan	8	1.2	$3\frac{1}{2}-4$ leaves
Oat (Avena sativa)	OAT (3)	Condor	8	1.2	3늘 leaves
Perennial ryegrass (Lolium perenne)	PER RYGR (4)	S23	15	0.6	5 leaves, tillering
Onion (Allium cepa)	ONION (8)	Rijnsburger	15	0.6	2-3 leaves
Dwarf bean (Phaseolus vulgaris)	DWF BEAN (9)	The Prince	3	1.8	1-1 trifoliates
Field bean (Vicia faba)	FLD BEAN (10)	Maris Bead	4	1.8	5늘 pairs leaves
Pea (Pisum sativum)	PEA (11)	Dark skinned perfection	4	1.8	7 pairs leaves
White clover (Trifolium repens)	W CLOVER (12)	S100	20	0.6	3 trifoliates
Kale (<u>Brassica oleracea</u> acephala)	KALE (15)	Marrowstem	10	0.6	$3\frac{1}{2}-4$ true leaves

Swede (Brassica napus)	SWEDE (17)	Lord Derby	10	0.6	3늘 true leaves
Carrot (Daucus carota)	CARROT (18)	Chantenay Red Core	10	0.6	2늘 true leaves
Lettuce (Lactuca sativa)	LETTUCE (20)	Borough Wonder	15	0.6	5 true leaves
Sugar beet (Beta vulgaris)	SUG BEET (21)	'Klein E' monogerm	15	1.2	2-2 ¹ true leaves

mahlo 3 ((continued)	
Table 3 (concinueu)	

- 7 -

	Designa- tion and computer serial number	Cultivar or source	No. per pot	Depth of plant- ing (cm)	Stage of growth at assessment (untreated controls)
Avena fatua	AVE FATU (26)	Boxworth	8	1.2	$3-3\frac{1}{2}$ leaves
<u>Alopecurus</u> myosuroides	ALO MYOS (27)	Rothamsted	30	0.6	4-5 leaves, tillering
Poa annua	POA ANN (28)	WRO 1966	25	0.6	$4\frac{1}{2}$ -5 leaves
<u>Sinapis arvensis</u>	SIN ARV (30)	WRO 1967	15	0.6	2 true leaves
Raphanus raphanistrum	RAPH RAP (31)	Red White Tipped	10	0.6	2 true leaves
<u>Tripleurospermum</u> maritimum	TRIP MAR (33)	WRO 1967	25	Surface	no germination
<u>Senecio vulgaris</u>	SEN VULG (34)	WRO 1967	25	0.6	no germination
Polygonum lapathifolium	POL LAPA (35)	WRO 1966	15	0.6	no germination

lapathiloiium	()))				
Polygonum aviculare	POL AVIC (36)	WRC 1968	30	0.6	no germination
Galium aparine	GAL APAR (38)	WRO 1970	12	0.6	3늘 rosettes
Chenopodium album	CHEN ALB (39)	Wytham 1971	25	0.6	3 true leaves
<u>Stellaria media</u>	STEL MED (40)	WRO 1970	20	0.6	6 pairs true leaves
Veronica persica	VER PERS (42)	WRO 1970	25	0.6	Diseased
Agropyron repens	AG REPEN (47)	WRO Clone 31	67	1.2	4월 leaves

Allium vineale

.

.

.

.

Cirsium arvense

Tussilago farfara

Convolvulus arvensis

1-1월 leaves 1.2 6* WRO 1971 ALL VIN (49) 44 5-6 leaves 1.2 WRO Clone 1 CIRS ARV (50) 44 1.8 4-5 leaves WRO Clone 1 TUS FARF (51) 4# 1.2 10 leaves WRO Clone 1 CONV ARV (52)

Table 3 (continued)

- 8 -

	Designa- tion and computer serial number	Cultivar or source	No. per pot	Depth of plant- ing (cm)	Stage of growth at assessment (untreated controls)	
"Tropical" species	(grown under hi	gher of tempe	rature r	egimes)		
Maize (Zea mays)	MAIZE I (58)	nra 200	6	1.8	4출-5 leaves	

٠

.

.

.

æ

Sorghum (Sorghum vulgare)	SORGHUM (59)	Fetereita	8	1.2	4월 leaves
Rice (Oryza sativa)	RICE (60)	Kogbandi	10	1.2	2-2½ leaves
Groundnut (Arachis hypogea)	GRNDNUT (64)	Natal Common	4	1.8	42-5 trifoliates
Soyabean (<u>Glycine max</u>)	SOYABEAN (65)	Merit	6	1.2	2 trifoliates
Cotton (<u>Gossypium hirsutum</u>)	COTTON (66)	Samaru 26J	6	1.8	2-3 true leaves
Jute (<u>Corchorus olitorius</u>)	JUTE (67)	Egypt 1971	20	0.6	2-3½ true leaves

Kenaf (Hibiscus cannabinus)	KENAF (68)	Thai Native	10	0.6	1-2 ¹ / ₂ true leaves
Sesamum (Sesamum indicum)	SESAMUM (70)	Addis Ababa 1970	10	0.6	2-4 true leaves
Eleusine indica	ELEU IND (74)	WRO 1964	15	0.6	$3\frac{1}{2}-4\frac{1}{2}$ leaves
Echinochloa crus- galli	ECH CRUS (75)	WRO 1969	15	0.6	$4-4\frac{1}{2}$ leaves
Rottboellia exaltata	ROTT EXA (76)	Rhodesia 1971	30	0.6	3 ¹ ₂ -4 leaves
<u>Digitaria sanguinalis</u>	DIG SANG (77)	WRO 1968	20	0.6	4월-5월 leaves
Amaranthus retroflexus	AMAR RET (78)	WRO 1968	15	0.3	4-7 true leaves
Cyperus esculentus	CYP ESCU (85)	WRO Clone 2 (South Africa)	5**	1.8	3-4 leaves
Cyperus rotundus	CYP ROTU (86)	WRO Clone 1 (Rhodesia)	5**	1.8	$4-6\frac{1}{2}$ leaves
Oxalis latifolia	OXAL LAT (87)	WRO Clone 2 (ex Cornwall)	12 bulbs	1.2	2-4월 leaves
4 one node rhizome 4 4 cm root fragme	erial bu abers	lbils			

. .

c) Assessment and processing of results (pre-emergence experiment)

- 9 -

The main assessment was made directly on to punch cards 4-6 weeks after spraying. The numbers of survivors and their vigour, expressed on a 0-7 subjective scoring scale, were recorded for each treatment. Scale points were defined as follows:

0 = completely dead
1 = moribund but not all tissue dead
2 = alive, with some green tissue, but unlikely to make much

further growth
3 = very stunted, but apparently still making some growth
4 = considerable inhibition of growth
5 = readily distinguishable inhibition of growth
6 = some detectable adverse effect as compared with control colour difference, morphological abnormality, epinasty or very
 slight reduction in growth
7 = indistinguishable from control

The punched cards were processed by ORICN computer and these results give rise to the histograms which form the main diagrammatic presentation of the data and are given separately for each herbicide. Each histogram indicates the herbicide used, dose applied and species tested, abbreviations for the latter being summarised in Table 3. For individual species at each dose of herbicide there is a pair of figures; the upper figure represents mean plant survival as a percentage of untreated controls and the lower figure shows mean vigour score as a percentage of untreated controls. Directly to the right of each figure is the same information presented as a horizontal histogram where each 'x' represents a 5% increment in the value being plotted. A '+' indicates a value in excess of 100%; an 'r' indicates a result based on one replicate only and an 'M' represents a missing treatment.

For a variety of reasons it was not possible to record the final assessment on to punch cards with certain species. Both <u>Polygonum</u> <u>lapathifolium</u> and <u>Polygonum aviculare</u> failed to germinate as did <u>Senecio</u> <u>vulgaris</u> and <u>Tripleurospermum maritimum</u>. <u>Veronica persica</u> germinated successfully but nearly all the plants died back from the cotyledon leaf stage because of a "damping off" type of disease. <u>Rottboellia exaltata</u> and <u>Oxalis latifolia</u> both exhibited erratic development but some indications of susceptibility or resistance were observed and are referred to where relevant.

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

Throughout the interpretation of the results arbitrary levels of vigour reduction of 15% or less compared with control in respect of crops, and number or vigour reduction of 70% or more as compared with control in respect of weeds have been taken as the criteria of selectivity. A summary table of observed selectivities and a series of individual comments have been made on the results to highlight salient points for each herbicide.

Persistence of herbicides in soil

.

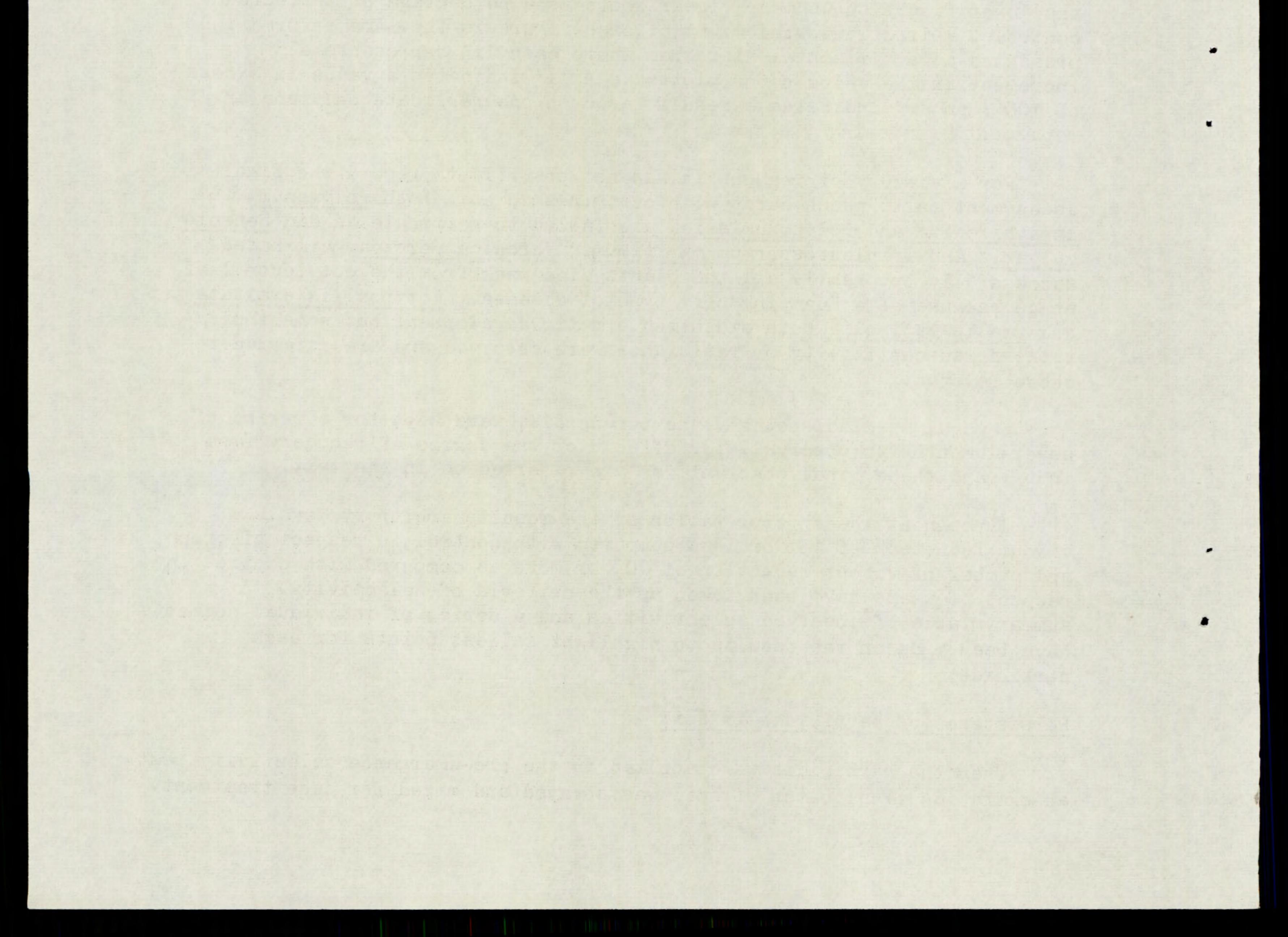
.

•

.

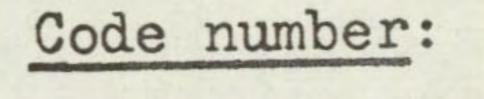
When the herbicides were applied in the pre-emergence selectivity test an extra identical batch of soil was sprayed and mixed for each treatment. This soil was used to obtain preliminary information on the rate of disappearance, or persistence of the herbicides. The moist soil was stored in screw-top jars in the dark at a constant temperature of 23°C, together with jars containing samples of the same untreated control soil as used in the experiments. An air space was left above the soil in the jar which was ventilated every 3-4 weeks. The moisture level of the soil was determined at the start of the experiment and checked periodically. Adjustments were made to keep the level constant. At six week intervals the soil was remixed, a subsample drawn and a sensitive test species sown into it. Plants were raised under normal temperate glasshouse conditions. When control plants had reached a defined growth stage (3-4 leaves) the number of plants per pot and their freshweight was recorded. The initial bioassay was run in the same week as the setting up of the experiments and tests were repeated for up to one year where necessary.

- 10 -



LENACIL

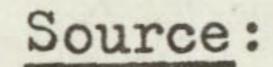
- 11 -



Du Pont 634

Trade name: Venzar

Chemical name:



3-cyclohexyl-6,7-dihydro-1H-cyclopentapyrimidine-2, 4-(3H,5H)dione

Du Pont Co (UK) Ltd Du Pont House 18 Bream's Buildings

Fetter Lane London EC4

Information available and suggested uses:

Well-established herbicide for pre-emergence weed control in sugar beet at 0.90 to 2.24 kg/ha depending on soil type. It is also useful in high organic matter soils e.g. fen soils, when incorporated. Weed control in strawberries and bulbs post planting and in herbaceous and hardwood nursery stock.

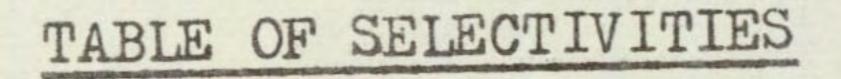
Formulation used: 80% w/w a.i. wettable powder

Spray volume:

for selectivity experiment 352 1/ha (31.3 gal/ac)

RESULTS

.



RATE (kg/ha)	CROPS: vigour reduced by less than 15%	WEEDS: number or vigour reduced by more than 70%
1.20	sorghum groundnut	Avena fatua Alopecurus myosuroides Poa annua Raphanus raphanistrum Galium aparine Eleusine indica Digitaria sanguinalis + species below
0.30	species above + onion dwarf bean field bean pea white clover carrot sugar beet maize soyabean cotton kenaf sesamum	<u>Sinapis arvensis</u> <u>Chenopodium album</u> <u>Stellaria media</u>
0.075	None listed as no weeds controlled	None

Comments on results

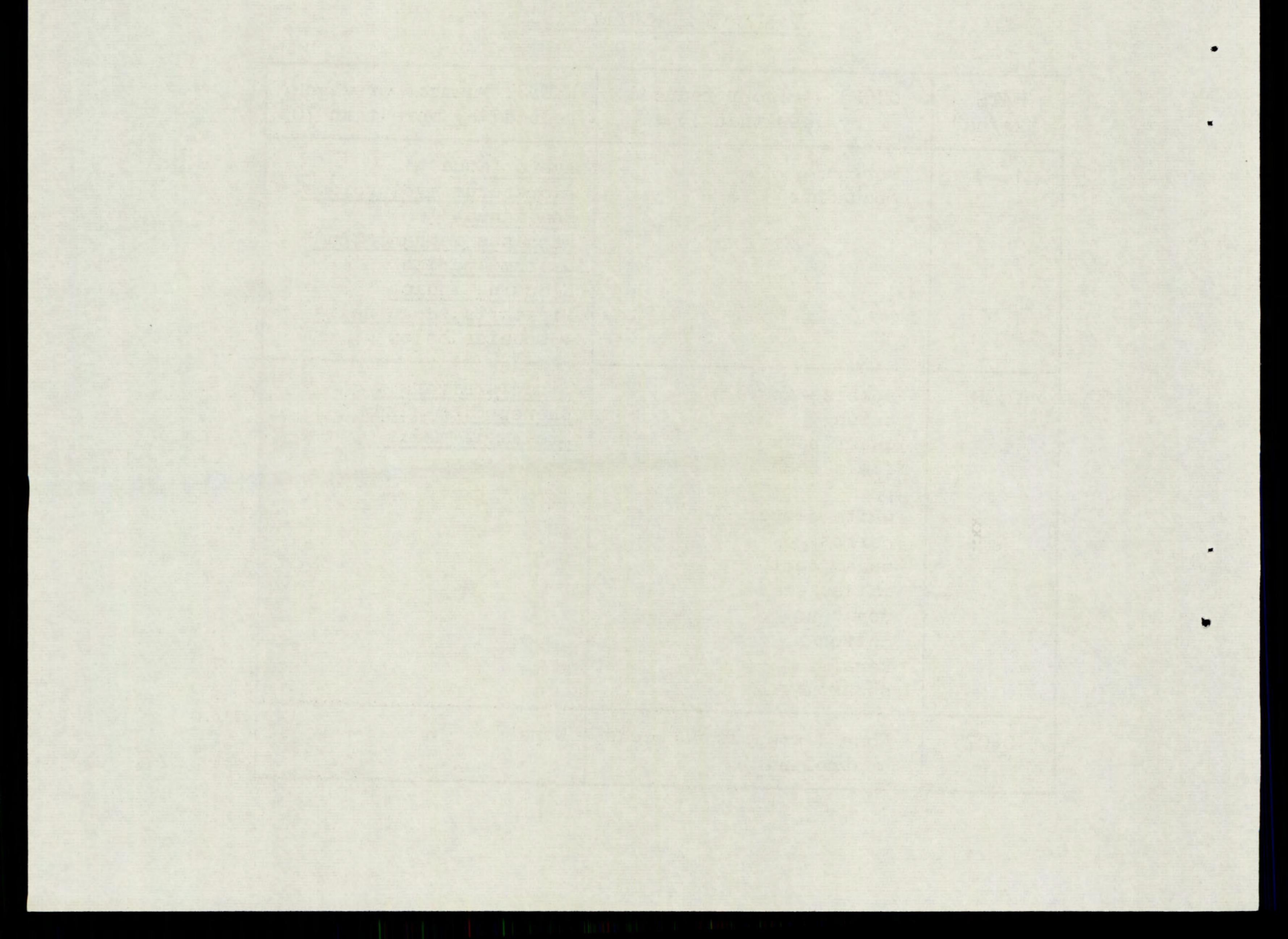
Lenacil was included in this experiment as a standard for comparison with the chemically related RU 12068 and both herbicides are referred to in greater detail in the section on RU 12068.

- 12 -

Only three broad-leaved weeds were controlled at 0.30 kg/ha, while a further seven broad-leaved and grass weeds were controlled at 1.20 kg/ha. Only the tropical crops, sorghum and groundnut were completely tolerant at this dose, but sugar beet and cotton showed some resistance also. Many

further crops were tolerant at 0.30 kg/ha.

No initial activity test results are available for this compound.



0.075 KG/HA

WHEAT	98	XXXXXXX
(1)	100	XXXXXXX
BARLEY	79	XXXXXXX
(2)	100	XXXXXXX
OAT		XXXXXX
(3)	100	XXXXXXX
PER RYGR		XXXXXX
(4)	100	XXXXXX
ONION		XXXXXX
(8)	100	XXXXXX
DWF BEAN	100	XXXXXX
(9)	93	XXXXXX
FLD BEAN	100	XXXXXX
(10)	100	XXXXXX
PEA	100	XXXXXX
(11)	86	XXXXXXX
W CLOVER	112	XXXXXX
(12)	100	XXXXXX
KALE	83	XXXXXX
(15)	86	XXXXXX
SWEDE	91	XXXXXX
(17)	100	XXXXXX
CARROT	104	XXXXXX
(18)	100	XXXXX
LETTUCE	94	XXXXX
(20)	100	XXXXX

.

.

0.30 KG/HA

.

.

XXXXXXXXXXXXX	91	XXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	43	XXXXXXXX
XXXXXXXXXX	81	XXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX
XXXXXXXXXXX	107	XXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	87	XXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	50	XXXXXXXXXX
XXXXXXXXXXXXXXXX	81	XXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	86	XXXXXXXXXXXX
************	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	86	XXXXXXXXXXX
XXXXXXXXXXXXXXX	100	XXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXX
XXXXXXXXXXXXXXXX	117	XXXXXXXXXX
XXXXXXXXXXXX	86	XXXXXXXXXX
XXXXXXXXXXXXXXXXX	66	XXXXXXXXXX
XXXXXXXXXXXXXXXXXX	100	XXXXXXXXXX
	30	XXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	21	XXXX
XXXXXXXXXXXXX	13	XXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	14	XXX
XXXXXXXXXXXXXXXX	98	XXXXXXXXXX
XXXXXXXXXXXXXXXXX	86	XXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	22	XXXX
XXXXXXXXXXXXXXXXX	43	XXXXXXXXX

1.20 KG/HA

.

.

XXXXXXX	46	XXXXXXXXX
	7	x
	0	
XXXXXXX		
	0	
xxxxxxxxx+	0	
XXXX	0	
AAAA		
XXXXXXX	0	
	0	
XXXXXX	40	XXXXXXXX
XXXXXXX	21	XXXX
	00	
XXXXXXXXXXX	83	XXXXXXXXXXXXXXXX
XXXXXXX	14	XXX
	00	
XXXXXXXXXX	29	XXXXXX
XXXXXXXXXXX	7	X
	83	XXXXXXXXXXXXXXXXX
XXXXXXXXXX+		XXXXXXXXXXX
XXXXXXXX	50	XXXXXXXXXX
	7	x
XXXX		XXX
XXXXXXXXXX	T T	42.42.42
	0	
	0	
	13	XXX
	7	х
XXXXXXXXXX	0	
XXXXXXXX	0	
	0	
<	0	

XXXX

LENACIL

PRE-

EMERGENCE

TEST

2

XXXX

.

0.075 KG/HA

CILC DEET	95	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	118	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		XXXXXXXXXXXXXXXXX
SUG BEET (21)		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	79	XXXXXXXXXXXXXXXXXXX
			01	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	35	XXXXXXX
AVE FATU	105	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	14	XXX
(26)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXX		
ALO MYOS	113	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	113	XXXXXXXXXXXXXXXXXXXXXXXX	17	XXX
(27)		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	43	XXXXXXXXX	21	XXXX
			93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	32	XXXXXX
POA ANN		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		XXXXXXXXXXXXX	14	XXX
(28)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	2.0	LAAAAAAAAAAAAAAAA		
SIN ARV	126	XXXXXXXXXXXXXXXXXXXXXXXX	0		0	
(30)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0		0	
			101	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0	
RAPH RAP	78	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX			0	
(31)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	57	XXXXXXXXXXX		
GAL APAR	96	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	78	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	72	XXXXXXXXXXXXXX
	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	21	XXXX
(38)	100	ALALALALALALALALALALALALALALALALALALAL				
CHEN ALB	68	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	15	XXX	0	
(39)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	13	XXXXXXXXX	0	
			7	X	0	
STEL MED	60	XXXXXXXXXXXX	64		0	
(40)	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0 x	AP 4 P 4 P 4 P 4 P 4 P 4 P 4 P 4 P 4 P 4		
AG REPEN	92	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	92	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	92	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	36	XXXXXXX
(47)	700					
ALL VIN	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXX
	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXX
(49)	100					
CIRS ARV	106	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	106	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	106	
(50)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
	200				100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
TUS FARF	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	
(51)	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXXXX

.

.

.

.

0.30 KG/HA

-

1.20 KG/HA

XXXXXX X

LENACIL

.

PRE-EMERGENCE TEST

8

14

2

XXXX

XXXXXXX XXXXXXX

XXXXXXX+ XXXXXXX

XXXXXXX

.

.

CONV ARV (52) MAIZE (58) SORGHUM (59) RICE (60) GRNDNUT (64) SOYABEAN (65) COTTON (66) JUTE (67) KENAF (68) SESAMUM (70) ELEU IND (74) ECH CRUS (75)

DIG SANG (77)

XXXXXXX XXXXXXX XXXXXXX XXXXXX

.

126

100

93

104

93

70

93

48

89

100

100

۰.

79 102 XXXXXXX 100 XXXXXXX 102 XXXXXXX 100 XXXXXX

> XXXXXX XXXXXX

XXXXXX XXXXXX

XXXXXX XXXXXXX

XXXXXX XXXXXXX

100 XXXXXX 93 XXXXXX

80 XXXXXXX 100 xxxxxx

114 XXXXXXX 100 xxxxxx

105 xxxxxx 100 xxxxxx 120 XXXXXXX

100 xxxxxx

0.075 KG/HA

.

.

xxxxxxxxxxxxx+	111	xxxxxxxxxxxxxxxxxxxx	126	XXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXX
XXXXXXXXXXXXX	114	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	114	XXXXXXXXXXXXXXX
XXXXXXXXXX	86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX	102	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	102	XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	86	XXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	108	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	6	x
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	36	XXXXXXX
XXXXXXXXXXXXXXXX	91	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	91	XXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXX
XXXXXXXXX	70	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	70	XXXXXXXXXXXXXXX
XXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	14	XXX
XXXXX	72	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	84	XXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXX	7	x	0	
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX	0	
XXXXXXXXXXXXXXXXX	95	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	10	XX
XXXXXXXXXXXXX	86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	14	XXX
XXXXXXXXXXX	110	XXXXXXXXXXXXXXXXXXXXXXXX	88	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	64	XXXXXXXXXXXXXX
XXXXXXXXXXXXXXX	103	XXXXXXXXXXXXXXXXXXXXXXXXXX	21	XXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	36	XXXXXXX
XXXXXXXXXXXXXXX+	82	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	35	XXXXXXX
XXXXXXXXXXXXXXXXX	64	XXXXXXXXXXXXX	13	XXXXXXXXX
XXXXXXXXXXXXXXXX+	70	XXXXXXXXXXXXX	10	хх
XXXXXXXXXXXXXXXXX	64	XXXXXXXXXXXX	14	XXX

0.30 KG/HA

1.20 KG/HA

.

XXXXXXX+ XXXXXX

.

XXXXXXX+

XXXXXXX XXXX

XXXXX XXXXXX

Х

XXXX XXX

LENACIL

PRE-EMERGENCE TEST

15

XXXXXX

* 1

AMAR RET (78)	81 100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	86 100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71 50	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CYP ESCU (85)	84 100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	84 100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	84 79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
CYP ROTU (86)	113 93	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	122 100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	103 93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

.

.

0.075 KG/HA

.

.

0.30 KG/HA

) .

1.20 KG/HA

XXXX XXX

XXXXXXX+ XXXXXX

LENACIL

PRE

EMERGENCE

TEST

16

RU 12068

- 17 -

Code number:

Source:

.

Chemical name:

3-(2-tetrahydropyrany1)-6,7-dihydro-1H-cyclopentapyrimidine-2,4-(3H,5H)dione

Trade name:

- 花花 小田田

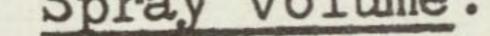
Procida Department de Biologie Appliquee 5 Rue Bellini 99 Puteaux France

Information available and suggested uses:

RU 12068

Manufacturer's data received in 1970 details pre- and post-emergence activity on a wide range of weed species. Small seeded annuals are controlled at 2.0 kg/ha but higher rates are required for control of less susceptible and perennial species. No selectivity in cereals was reported then but the possibility for use as a total herbicide was suggested: later Bertin et al (1972) reported promising results in cereals from pre- and post-emergence applications of 0.5 kg/ha with tolerance at higher doses in groundnut, potatoes, woody and plantation species pre-emergence and cotton post-emergence.

50% w/w a.i. wettable powder Formulation used: for selectivity experiment 352 1/ha (31.3 gal/ac) for initial activity test 392 1/ha (34.9 gal/ac) Spray volume:



RESULTS

TABLE OF SELECTIVITIES

RATE (kg/ha)	CROPS: vigour reduced by less than 15%	WEEDS: number or vigour reduced by more than 70%
1.20	None	None listed as no crops tolerant
0.30	white clover maize sorghum groundnut cotton	<u>Sinapis arvensis</u> <u>Raphanus raphanistrum</u> <u>Chenopodium album</u> <u>Stellaria media</u>
0.075	None listed as no weeds controlled	None

Comments on results

General

The Initial Activity Test showed that the level and type of phytotoxicity of RU 12068 was similar to other uracils such as bromacil and terbacil. Broad-leaved species were susceptible to the foliar spray but most phytotoxicity occurred following soil treatments. Post-emergence soil drenches usually were as effective as pre-emergence applications. In the latter, no differences were found between surface and incorporated treatments. In a leaching study, RU 12068 was found to be very mobile, comparable to bromacil and terbacil, while lenacil and pyrazone were of much lower mobility.

.

- 18 -

The pre-emergence selectivity test was carried out at much lower doses than the initial activity test. The activity of RU 12068 was found to be greater than that of lenacil but selectivity was reduced. The pattern of activity of both compounds was similar.

Symptoms

Both RU 12068 and lenacil caused similar symptoms and these were typical of photosynthetic inhibitors. Germination was unaffected, but seedlings died back from an early growth stage, preceded by a severe chlorosis. Symptoms developed slightly more rapidly with RU 12068 than with lenacil.

Temperate weeds and crops

In addition to the three broad-leaved weeds controlled at 0.30 kg/ha by lenacil, i.e. Stellaria media, Chenopodium album and Sinapis arvensis. RU 12068 also controlled Raphanus raphanistrum. A higher rate of both herbicides was required for control of grass weeds. Perennial weeds, notably Convolvulus arvensis, were resistant to both compounds.

White clover was the only crop tolerant to RU 12068 at 0.30 kg/ha. With lenacil at the same dose, onion, dwarf bean, field bean, pea, carrot and sugar beet were tolerant. There was no tolerance of cereals or brassica crops to either herbicide.

Although RU 12068 selectively controlled four broad-leaved weeds in white clover, there are no apparent advantages over herbicides currently used for weed control in this crop. Sugar beet was reduced in vigour by only 29% with 0.30 kg/ha of RU 12068, but the margin of selectivity is very much less than with lenacil (vigour reduction of only 21% at 1.20 kg/ha). [In a recent post-emergence selectivity test, white clover and sugar beet were tolerant to 0.29 kg/ha while six weeds, including some grasses, were controlled. As with lenacil, a serious disadvantage in the weed control spectrum of RU 12068 was found to be the resistance of Veronica persica.

Tropical weeds and crops

Tropical annual weed species were only controlled at 1.20 kg/ha although some reduction of Echinochloa crus-galli and Digitaria sanguinalis was achieved at 0.30 kg/ha. These results were slightly superior to comparable rates of lenacil. The greatest difference between the two compounds was the increased susceptibility of Amaranthus retroflexus to RU 12068 at 1.20 kg/ha. Neither herbicide was effective against Cyperus rotundus or

Cyperus esculentus; both species recovered three months after treatment. At 1.20 kg/ha RU 12068 reduced the vigour of Rottboellia exaltata to 43% compared with 64% with lenacil. Oxalis latifolia suffered from variable germination and development but eight weeks after treatment minor symptoms were visible at 0.30 kg/ha of lenacil and severe stunting and/or death at 1.20 kg/ha was apparent. Symptoms were more severe at comparable rates of RU 12068 where complete foliage kill and death of bulbs followed emergence at 1.20 kg/ha.

- 19 -

Large differences in crop tolerance were noted between RU 12068 and lenacil but the tendency was for large seeded species to exhibit the greater tolerance to both compounds.

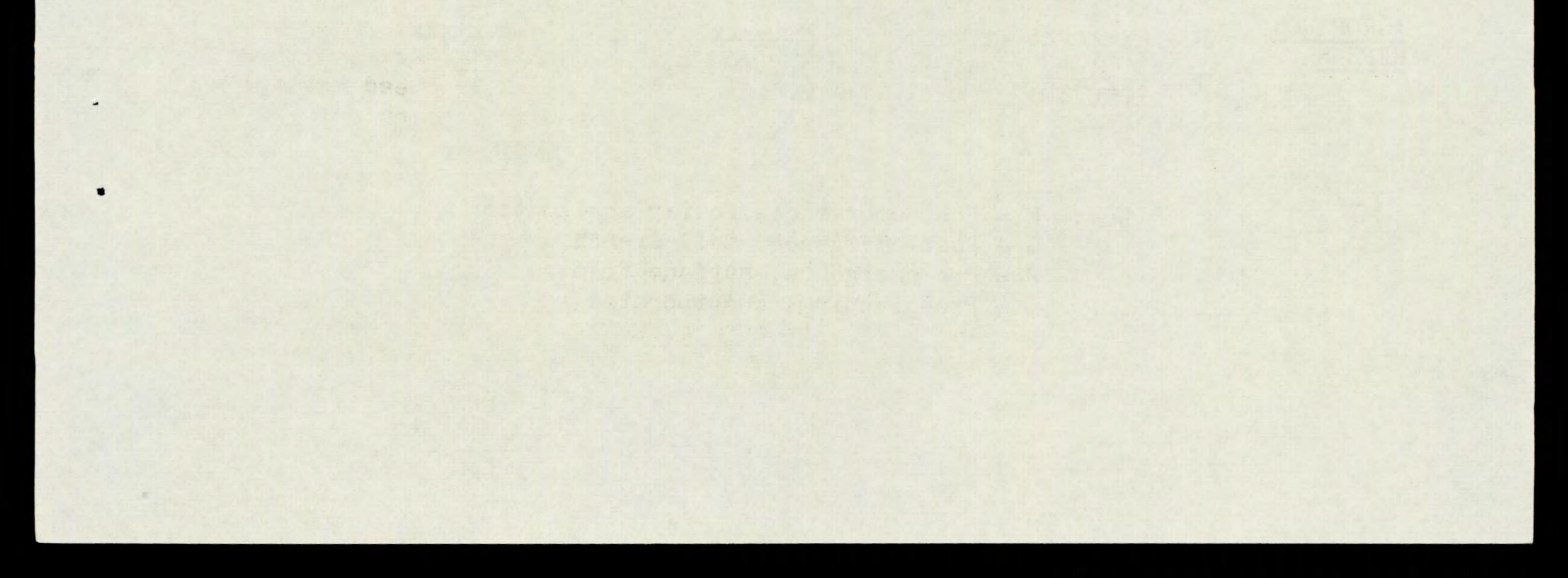
No tropical weeds were selectively controlled in the associated crops with RU 12068. [This was also the case in a recent post-emergence experiment where crops appeared more susceptible to this compound while weed susceptibility was similar]. RU 12068 and lenacil, which only selectively controlled two annual grass species in sorghum and groundnut, exhibited no distinct advantage in these crops.

Soil persistence

Using turnip as the sensitive test species (susceptibility similar to that of swede in the selectivity experiment), 0.075 kg/ha was not detected 6 weeks after application. 0.30 kg/ha of both RU 12068 and lenacil exhibited no phytotoxicity 27 weeks after treatment. RU 12068 proved to be more persistent at 1.20 kg/ha, however, still being detectable 50 weeks after treatment whereas the same concentration of lenacil produced no symptoms at 46 weeks.

Possible uses and further testing

RU 12068 has more in common with terbacil and bromacil of the uracil group than the more selective lenacil and pyrazone. Consequently it may be worth testing in situations where terbacil and bromacil are in use. Its long period of persistence at higher rates could prove advantageous in these and in total weed control situations.



- 20 -

INITIAL ACTIVITY TEST

RU 12068

2.28 kg/ha(S 2.00 kg/ha) 0.76 kg/ha(S 0.67 kg/ha)

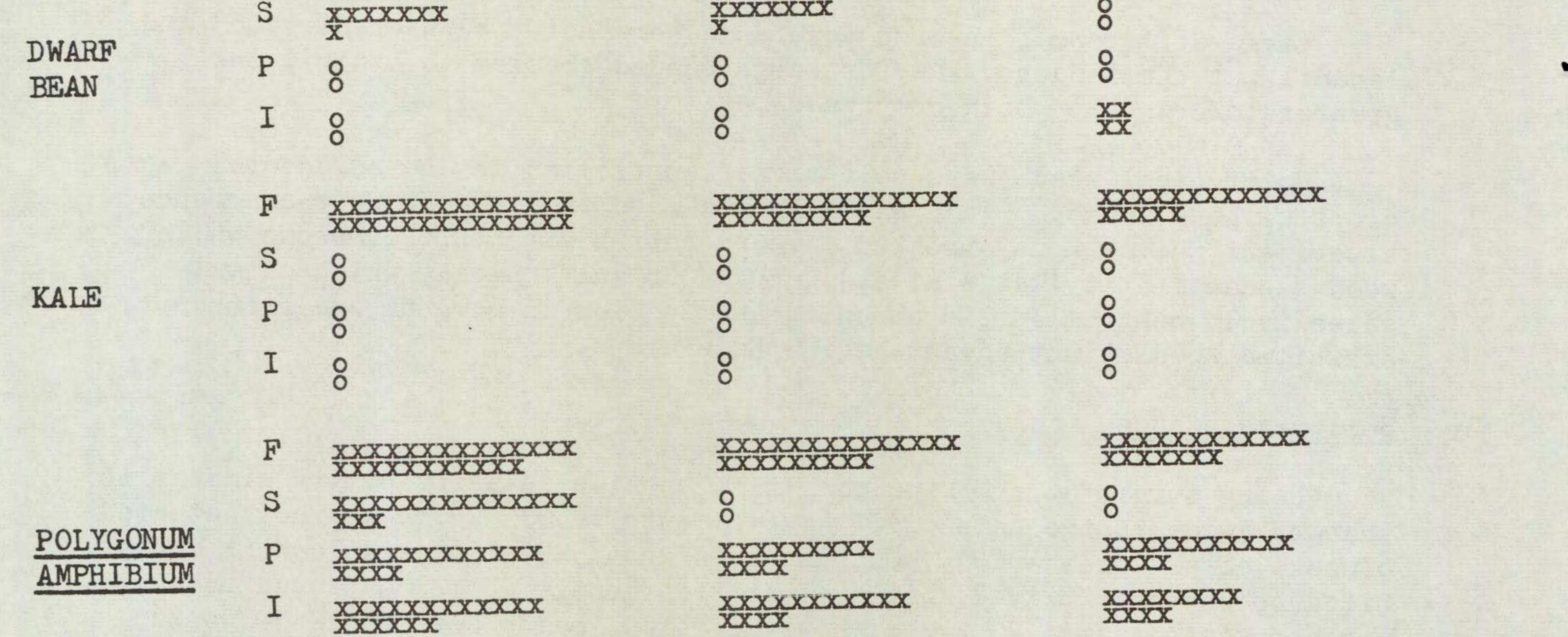
F

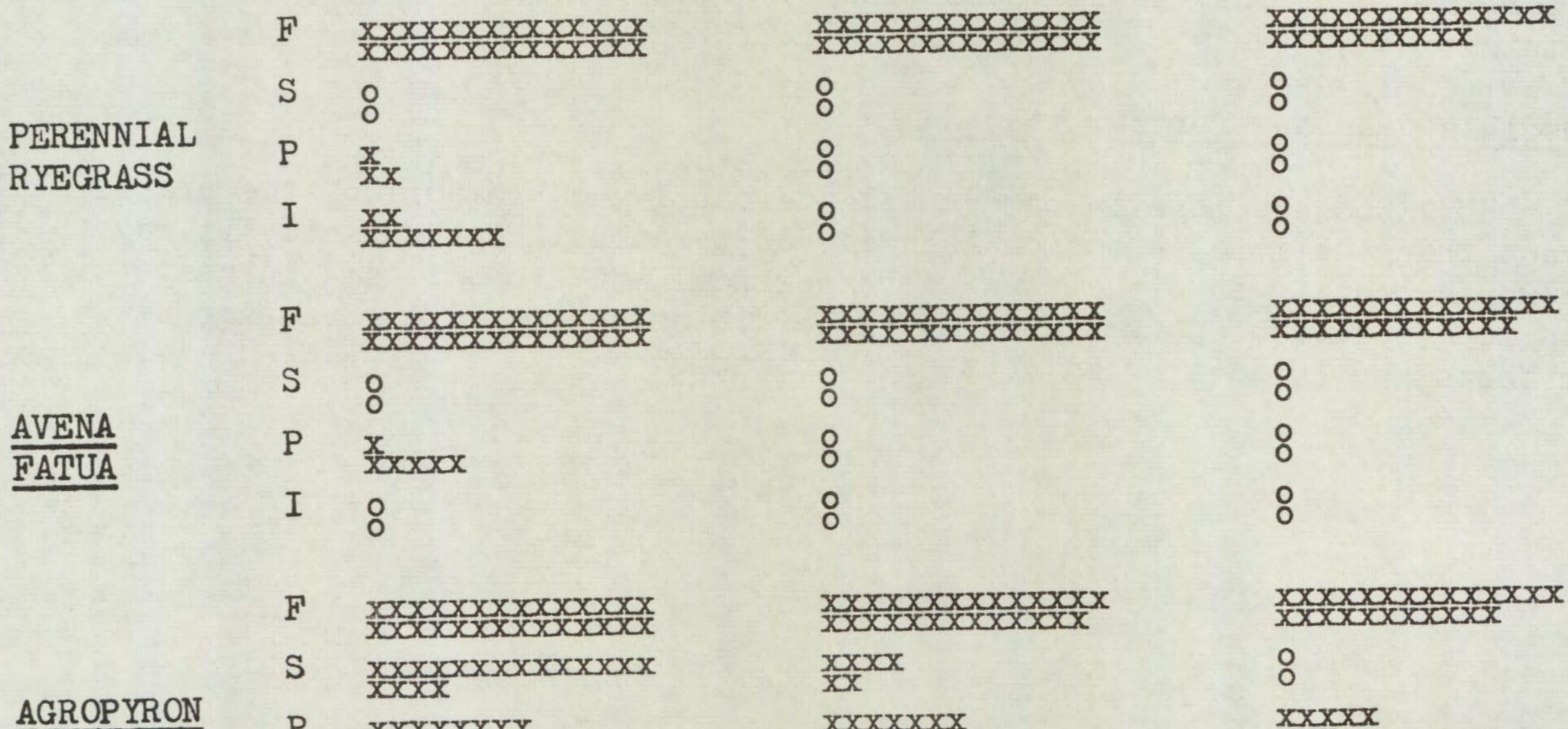
XXXXXXX

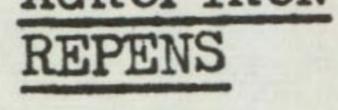
6.84 kg/ha(S 6.00 kg/ha)

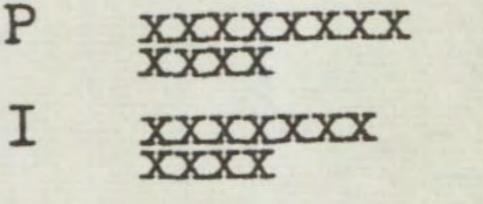
-

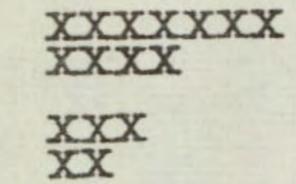
.

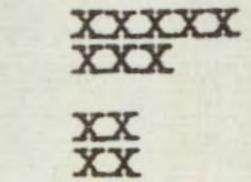












F = Post-emergence, foliar application Key: S = Post-emergence, soil drench P = Pre-emergence, surface film I = Pre-planting, incorporated

WHEAT

(1)

(2)

OAT (3)

PER RYGR (4)

ONION (8)

DWF BEAN (9)

FLD BEAN (10)

PEA (11)

W CLOVER

(12)

KALE (15)

SWEDE (17)

CARROT (18)

LETTUCE

(20)

BARLEY

.

1.

•

91	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	98	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	39	XXXXXXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX	14	XXX
74	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	58	XXXXXXXXXXX	0	
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX	0	
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	40	XXXXXXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	57	XXXXXXXXXX	14	XXX
101	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	84	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	17	XXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	43	XXXXXXXX	29	XXXXXX
104	xxxxxxxxxxxxxxxxxxxx	81	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	35	XXXXXXX
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	57	XXXXXXXXXX	21	XXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	50	XXXXXXXXXX
71	XXXXXXXXXXXXX	36	XXXXXXX	7	X
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	114	XXXXXXXXXXXXXXXXXXXXXXX		XXX
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	7	X
133	xxxxxxxxxxxxxxxxxxxx	133	XXXXXXXXXXXXXXXXXXXXXXXX	133	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX
91	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	80	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0	
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0	
90	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	53	XXXXXXXXXXX	0	
71	XXXXXXXXXXXXX	21	XXXX	0	
104	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	20	XXXX		x
36	XXXXXXX	14	XXX	7	x
92	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	104	xxxxxxxxxxxxxxxxxxxx	0	
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	43	XXXXXXXXX	0	
101	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	7	x	0	
71	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX	0	

0.075 KG/HA

0.30 KG/HA

.

.

1.20 KG/HA

.

.

XXXXX+

RU 12068

PRE EMERGENCE TEST

21 1

SUG BEET (21)

AVE FATU (26)

ALO MYOS (27)

POA ANN (28)

SIN ARV (30)

. .

RAPH RAP (31)

GAL APAR (38)

CHEN ALB (39)

STEL MED (40)

AG REPEN (47)

ALL VIN (19)

CIRS ARV (50)

TUS FARF (51)

.

.

76	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	95	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	4	x
76 93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	14	XXX
00	AAAAAAAAAAA				
91	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	70	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	7	x
93	xxxxxxxxxxxxxxxxx	36	XXXXXXX	14	XXX
				1	x
148	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	18	XXXXXXXXXX	7	x
86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	36	XXXXXXX		
174	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	65	XXXXXXXXXXXXX	12	XX
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	57	XXXXXXXXXXX	21	XXXX
20	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA				
63	XXXXXXXXXXXX	0		0	
57	XXXXXXXXXXX	0		0	
98	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	20	XXXX	0	
79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	14	XXX	0	
84	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	96	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	84	xxxxxxxxxxxxxxx
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	57	XXXXXXXXXX	21	XXXX
75	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	23	XXXXX	0	
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	11	XXX	0	
		27		0	
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	27.	XXXXX	0	
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX		
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	92	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	61	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	13	XXXXXXXX
100	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA				
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	83	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXX
				106	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
71	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	141	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	64	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	10	
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
100 100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	36	XXXXXXX
100					

.

0.075 KG/HA

0.30 KG/HA

XX

RU 12068

PRE EMERGENCE TEST

1

22

1993.

XXXXXX

XXXXX+

XXXXXX

.

.

.

CONV ARV (52) MAIZE (58) SORGHUM (59) RICE (60) GRNDNUT (64) SOYABEAN (65) COTTON (66) JUTE (67) KENAF (68) SESAMUM (70) ELEU IND (74) ECH CRUS (75)

DIG SANG (77)

XXXXXXX 111 XXXXXXX 100 103 XXXXXX 86 XXXXXX 102 XXXXXX 100 XXXXXX 108 xxxxxx XXXXXX 100 104 XXXXXX 79 XXXXXX 98 XXXXXX 93 XXXXXX XXXXXX 96 100 XXXXXX 27 XXXXX 43 XXXXXX 95 XXXXXX XXXXXX 100 95r xxxxxx 85r xxxxxx 97 XXXXXX 100 xxxxxx 90 XXXXX 100 xxxxx 115 XXXXXX 100 XXXXXX

0.075 KG/HA

.

111	xxxxxxxxxxxxxxxxxxxx	111	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
103	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	103	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	57	XXXXXXXXXXX
102	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	38	XXXXXXXX
93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	36	XXXXXXX
00	VVVVVVVVVVXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	18	XXXX
		7	x
31	AAAAAAAAAAA		
91	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	104	XXXXXXXXXXXXXXX
	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	71	XXXXXXXXXXXXXX
70	XXXXXXXXXXXXXX	98	XXXXXXXXXXXXXXX
61	XXXXXXXXXXXXX	21	XXXX
96	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	132	XXXXXXXXXXXXXXXXXX
		79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
~~~			
0		0	
0		0	
100	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		XXXXXXXXXX
79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	21	XXXX
15	XXX	0	
7	x	0	
107	XXXXXXXXXXXXXXXXXXXXXXXXXX	21	XXXX
79	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	29	XXXXXX
82	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	4	x
57	XXXXXXXXXXX	14	XXX
00	VVVVVVVVVVVVVVVVV	5	X
			XXX
50	XXXXXXXXXXX		
	100 103 86 102 93 90 57 91 86 70 64 96 93 0 0 0 100 79 15 7 107 79 82	100       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	111       XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

0.30 KG/HA

1.20 KG/HA

*

.

XXXXXXX+ XXXXXX

XXXXXXX+

XXXXXXX+

XXXXXXX

XXXXXXX+ XXXX

RU 12068

PRE EMERGENCE TEST

23

AMAR RET	51	XXXXXXXXX
(78)	100	XXXXXXXXXX
CYP ESCU	108	XXXXXXXXXX
(85)	100	XXXXXXXXXX
CYP ROTU	103	XXXXXXXXX
(86)	100	XXXXXXXXX

1

- - -

0.075 KG/HA

# 0.30 KG/HA

.

.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	92 93	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	0 0	
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	72 86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	96 71	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	91 86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	91 86	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

#### 1.20 KG/HA

XXX

XXX X

RU 12068

PRE EMERGENCE TEST

745

149.4

24

# METRIBUZIN Trade name: BAY 94337

- 25 -

Code number:

Sencor, Sencorex

Chemical name:

4-amino-6-t-buty1-3-methylthio-1,2,4-triazin-5-one

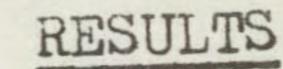
Source:

Bayer Agrochemicals Eastern Way Bury St Edmunds Suffolk

Information available and suggested uses:

Now in use for selective pre- and post-emergence control of annual broad-leaved and grass weeds in potatoes at 0.84 to 1.40 kg product/ha. Manufacturer's literature from 1972 also suggests selectivity in flax, tomatoes, maize, beans, peas, soyabeans, lupins and asparagus at 0.5 to 1.5 kg product/ha and pineapples up to 2.0 kg product/ha; also in carrots post-emergence at 0.5 kg product/ha.

70% w/w a.i. wettable powder (BAY 6159H) Formulation used: for selectivity experiment 352 1/ha (31.3 gal/ac) for initial activity test 395 1/ha (35.2 gal/ac) Spray volume:



# TABLE OF SELECTIVITIES

RATE (kg/ha)	CROPS: vigour reduced by less than 15%	WEEDS: number or vigour reduced by more than 70%
1.20	None	None listed as no crops tolerant
0.30	field bean pea maize	Avena fatua Alopecurus myosuroides Poa annua Eleusine indica Echinochloa crus-galli Digitaria sanguinalis + species below
0.075	species above +	Sinapis arvensis

0.015

-

species above wheat barley onion dwarf bean carrot sorghum rice groundnut soyabean

Raphanus raphanistrum Chenopodium album Stellaria media Amaranthus retroflexus

# Comments on results

#### General

The type and level of activity found in the Initial Activity Test with metribuzin was similar to other triazines. More effects were found with the foliar spray than would be expected from simazine or atrazine, possibly due to the higher water solubility of this herbicide. Most activity occurred with the soil treatments, there being little difference in the degree of activity between post-emergence soil drench and preemergence surface of incorporated treatments. A leaching study showed that metribuzin had a high mobility in the soil as compared with simazine and atrazine.

- 26 -

In the pre-emergence selectivity test, metribuzin exhibited good activity at only 0.075 kg/ha and only certain resistant weeds tolerated 1.20 kg/ha. Crop tolerance was somewhat limited however.

#### Symptoms

Symptoms were typical of those caused by other photosynthetic inhibitors. Germination was normal but seedlings developed a severe chlorosis after reaching the cotyledon stage, before die-back occurred.

Temperate weeds and crops

With the notable exception of Galium aparine, which was resistant at

1.20 kg/ha, all annual broad-leaved weeds were controlled at 0.075 kg/ha. 0.30 kg/ha achieved control of annual grass weeds. Of the perennial weeds, <u>Cirsium arvense</u>, <u>Allium vineale</u> and <u>Agropyron repens</u> showed some sensitivity, the latter eventually being killed at 1.20 kg/ha. <u>Tussilago farfara</u> and <u>Convolvulus arvensis</u> were extremely resistant. [Unfortunately no information on polygonaceous and composite weeds is available from this test due to bad germination. However, in a post-emergence test representative weeds of these two families were controlled at 0.29 kg/ha i.e. <u>Polygonum aviculare</u>, <u>Polygonum lapathifolium</u>, <u>Tripleurospermum maritimum</u> and <u>Senecio vulgaris</u>. In fact, <u>Galium aparine</u> was the only resistant species of eighteen weeds tested at 0.29 kg/ha.]

The cereals, wheat and barley were tolerant at 0.075 kg/ha. Of the small seeded species, onion and carrot were also tolerant at this dose. The large seeded leguminous crops, field bean and more notably pea, were tolerant to 0.30 kg/ha while dwarf bean was tolerant at 0.075 kg/ha only. [Field bean was sensitive to 0.29 kg/ha post-emergence while pea was tolerant.]

The selective control in peas, at 0.30 kg/ha of all annual weeds, with the exception of <u>Galium aparine</u> was most interesting. Of the crops tolerant at 0.075 kg/ha the most interesting selectivities were with carrots and onions. [Carrot proved even more tolerant in the post-emergence test.]

#### Tropical weeds and crops

Excellent control of small seeded annual weeds was achieved at 0.30 kg/ha and plant number of <u>Amaranthus retroflexus</u> was reduced to 15% of untreated at 0.075 kg/ha. Little significant effect was observed on <u>Rottboellia exaltata and vigour was reduced to only 57% of untreated at 1.20 kg/ha. Oxalis latifolia showed some adverse symptoms at the initial assessment especially at higher doses. One month later at 1.20 kg/ha all</u>

plant material was dead and bulbs were rotting. Severe symptoms were apparent at lower doses and bulbs from these treatments were also rotting. Both <u>Cyperus</u> spp. showed minor adverse effects at 1.20 kg/ha at the initial assessment. After one month <u>C. rotundus</u> was recovering and, although still showing symptoms, recovery of <u>C. esculentus</u> was a possibility. This was verified after a further month.

- 27 -

Metribuzin severely affected all tropical crops at 0.30 kg/ha with the exception of maize which was tolerant at this dose. The larger seeded species including rice, but with the exception of cotton, all tolerated 0.075 kg/ha. Surprisingly sesamum also exhibited some resistance at this dose where vigour was reduced by only 21% of untreated.

Good selective control of the annual grass weeds <u>Echinochloa crus-galli</u>, <u>Digitaria sanguinalis</u> and <u>Eleusine indica</u> was achieved in maize at 0.30 kg/ha. It may be that levels of selectivity could be increased by achieving control at a slightly reduced dose. <u>Amaranthus retroflexus</u> was selectively controlled in sorghum, rice, groundnut and soyabean but this was not outstanding and would not offer any advantages over established practices.

#### Soil persistence

.

Using turnip as the sensitive test species (susceptibility similar to that of swede in the selectivity experiment), doses of 0.075, 0.30 and 1.20 kg/ha were not detected at 5, 10 and 40 weeks respectively. These time periods are slightly shorter than would be expected for simazine and atrazine.

# Possible uses and further testing

The results obtained in this test have shown that this herbicide has potential use as a selective herbicide in certain crops such as peas, beans and possibly carrots. Maize would seem to be another possible situation for metribuzin although from other data it would appear that rate, method of application and planting depth would play an important part in degree of selectivity (Dean and Parker 1973). Although solanaceous crops were not represented in this test good weed control has been reported elsewhere in potatoes and tomatoes. The period of persistence in the soil is not likely to cause damage to a succeeding crop, but it may be sufficiently long for control of late germinating weeds.

