CONTRACT REPORT

No. AR/92/8

Bulb onions: Alternatives to chlorbufam + chloridazon (Alicep) for weed control in onions and leeks

Year 3 (1992)

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Part III - peaty soil

ADAS

ADAS - Food, Farming, Land & Leisure

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AUTHENTICATION

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

..... C.S.Speller ..... Date 9.2.93 .....

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Summary

Fourteen herbicide treatments were compared with Alicep (chlorbufam + chloridazon) when applied at early growth stages of spring-drilled onions grown on a peaty loam soil (23% organic matter) in 1992.

Products evaluated were Ashlade C.P., CIPC, Kerb, Magnum, Nortron, Portman, Propachlor, Pyramin, Stomp, Totril and Tribunil. These were applied either alone or in tank-mix to onions cv. Hysam at the late loop (9 April) and at first true leaf (13 May) stages of the crop.

Most herbicide treatments proved suitable as 'alternatives to Alicep'. All treatments, except CIPC at 1 l/ha applied at both growth stages, gave good weed control. Stomp (now marketed as Sovereign) in tank-mix with either Pyramin or Totril gave particularly good control of weeds.

Objective

To compare the crop safety and efficacy of a range of herbicides, as single or tank-mixed applications, with that of Alicep (chlorbufam + chloridazon) when used early post-emergence of spring drilled onions.

Introduction

Bulb onions are drilled into cold soils in early spring and emergence may take several weeks. Pre-emergence herbicides require post-emergence support sprays when the onions are very small and vulnerable, generally at the loop and/or post-crook growth stages. Alicep (chlorbufam + chloridazon) has fulfilled this function for many seasons. However, Alicep is unlikely to be commercially available after stocks of chlorbufam are used up. Therefore, the onion industry is in urgent need of an alternative to Alicep, the search for which is the commercial objective of this work. This trial, on an organic soil type, is part of a series of experiments undertaken also at Horticulture Research International (HRI),

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Kirton (glasshouse experiments, field work on both leeks and onions on a silt soil) and at HRI Wellesbourne (field work on leeks on a sandy soil type).

Materials and Methods

Site

The experiment was conducted on Drain Ground field at ADAS Arthur Rickwood on a peaty loam soil (30-66 cm) with 23% organic matter over sand and gravel (of Adventurers' Shallow series).

Treatments

1. Unweeded (control)
2. Hand-weeded (control)
3. Alicep 2.25 kg/ha (control)
4. Ashlade C.P. 5 l/ha
5. CIPC 1 l/ha
6. CIPC 4 l/ha
7. Kerb 1.25 kg/ha
8. Kerb 1.25 kg/ha + Nortron 3.5 l/ha
9. Kerb 1.25 kg/ha + Propachlor 4.25 l/ha
10. Magnum 2 l/ha
11. Portman trial chemical 6.4 l/ha
12. Pyramin 1.4 kg/ha
13. Pyramin 1.4 kg/ha + Stomp 2 l/ha
14. Pyramin 1.4 kg/ha + Stomp 4 l/ha
15. Stomp 4 l/ha
16. Totril 0.1 l/ha + Stomp 4 l/ha
17. Tribunil 2 kg/ha

Treatment application

* All treatments were applied in 250 l/ha water using an Oxford Precision Sprayer with Teejet 8002 nozzles at 2 bar pressure.
* All treatments were applied at both the late loop (9 April) and later post-crook to early first true leaf (13 May) growth stages, except for Tribunil (17) which was applied on 13 May only.
* All non-approved treatments were by experimental permit only and those onions destroyed.
* The active ingredients of the above products are given in Appendix I.

Husbandry

Onions cv. Hysam were drilled on 20 February 1992. They received normal commercial inputs (Appendix II) except herbicides during the growing season. A standard pre-emergence herbicide programme was applied on 16 March. The normal early post-emergence herbicide routine was replaced by the treatments which were applied on both 9 April and 13 May. The standard herbicide programme continued from 25 May. The hand-weeded plots were hoed on 9 May. The trial was harvested on 27 August, placed in bulk bins and dried in store at 30°C, cured at 27°C and at controlled relative humidity (55-65%), then held at ventilated ambient conditions until 4 January 1993 when the onions were removed for grading and assessment.

Assessments

Onion vigour scores (0-10, where 0 = dead and 10 = green, vigorous and healthy) were recorded on 9 April, and on 6, 19 and 27 May, and on 9 June. Weed control scores (0-10, where 0 = weedy and 10 = weed-free) were recorded on 21 April and on 6, 19 and 27 May, and on 9 June. Percentages of ground cover by weeds were recorded on 6 May and on 9 June. The onion plant populations were recorded on 9 and 24 April and at harvest. Onion yields in diameter size grades 40-50, 50-60, 60-80 mm were recorded.

Onion quality was assessed according to E.C. grading standards. Bulb characteristics were recorded. These comprised firmness (0-10, where 0 = soft, and 10 = hard), skin protection (0-10, where 0 = few, thin skins and 10 = many, thick skins), shape (0-10, where 0 = flat, 5 = globe, and 10 = elliptical), and shape uniformity (0-10, where 0 = variable in shape and 10 = very uniform).

Design and analysis

The trial was a randomised block with three replicates. Each plot was a 1.7 m bed width x 6 m in length with four rows per bed at 350-250-350 mm spacing to allow space for two rows of a barley shelter crop to be drilled on the bed between the inner and outer rows.

The data were subjected to analyses of variance.

Results

Crop vigour

The mean crop vigour score on 9 April, prior to the first treatment application, was 5.0 (out of 10), with some slight leaf tip necrosis possibly due to wind and frost (down to -5.7°C) damage. There were no significant differences between the treatments.

Crop vigour was assessed again on 6 May following the first treatment application (Table 1). There were no significant differences between the treatments. All treatments retained a similar level of vigour until the standard herbicide programme started again on 25 May. A final assessment of crop vigour was made on 9 June. The crop had begun to grow vigorously, with all treatments having a high vigour score. There were significant ($P<0.001$) differences between the treatments. Treatment 8 (Kerb 1.25 kg + Nortron 3.5 l/ha) appeared particularly safe to the crop.

Table 1. Onion vigour scores.

Treatment (/ha)	Onion vigour scores # 6 May	19 May	27 May	9 June
1. Unweeded (control)	5.0	6.0	5.7	8.0
2. Hand-weeded (control)	5.0	5.7	5.7	8.0
3. Alicep 2.25 kg (control)	5.3	6.0	5.7	8.3
4. Ashlade C.P. 5 l	5.3	6.0	5.7	8.3
5. CIPC 1 l	5.3	6.3	5.7	8.0
6. CIPC 4 l	5.0	6.3	5.7	7.7
7. Kerb 1.25 kg	4.7	6.0	5.7	8.7
8. Kerb 1.25 kg + Nortron 3.5 l	5.0	5.7	6.0	9.0
9. Kerb 1.25 kg + Propachlor 4.5 l	4.3	5.3	5.7	8.7
10. Magnum 2 l	5.0	6.0	5.7	8.3
11. Portman 6.4 l	5.3	5.3	6.0	7.7
12. Pyramin 1.4 kg	4.7	5.3	5.3	7.7
13. Pyramin 1.4 kg + Stomp 2 l	5.0	5.7	5.7	8.0
14. Pyramin 1.4 kg + Stomp 4 l	5.7	6.3	5.7	8.3
15. Stomp 4 l	4.7	6.0	5.7	8.7
16. Totril 0.1 l + Stomp 4 l	4.7	5.7	5.7	8.0
17. Tribunil 2 kg (post crook)	4.0	5.3	5.3	7.3
S.E.D. (46 d.f.)	0.51	0.40	0.28	0.46
CV%	12.9	8.5	6.1	7.0
L.S.D. (5%)	NS	NS	0.56	0.92

# 0 = dead
10 = vigorous, healthy, green.

Weed control

On 21 April, following the first treatment at the late loop stage, there were differences between the treatments (Table 2). All treatments had better ($P<0.05$) weed control scores for both established and newly emerging weeds than the unweeded control, except 13 (Pyramin 1.4 l + Stomp 2 l/ha).

Weeds began to develop during early May with, on average, 3% cover of the plots (Table 3). There were no significant differences between the unweeded control and the herbicide treatments. However, the hand-weeded

Table 2. Weed control scores.

Treatment	Weed control scores#			
	21 April	6 May	19 May	9 June
1. Unweeded (control)	4.0	5.3	3.7	4.7
2. Hand-weeded (control)	3.7	3.7	9.0	8.7
3. Alicep 2.25 kg (control)	6.0	6.3	7.0	9.3
4. Ashlade C.P. 5 l	6.3	6.3	7.0	8.0
5. CIPC 1 l	5.7	6.0	7.0	6.7
6. CIPC 4 l (c)	5.7	6.7	7.3	9.0
7. Kerb 1.25 kg	5.7	6.3	6.7	8.0
8. Kerb 1.25 kg + Nortron 3.5 l	5.7	7.0	7.0	8.3
9. Kerb 1.25 kg + Propachlor 4.5 l	6.3	7.7	7.3	8.7
10. Magnum 2 l	5.7	6.3	6.7	8.3
11. Portman 6.4 l	6.3	6.3	7.0	9.3
12. Pyramin 1.4 kg	5.7	6.0	6.0	8.3
13. Pyramin 1.4 kg + Stomp 2 l	5.3	7.7	7.7	9.7
14. Pyramin 1.4 kg + Stomp 4 l	6.7	7.0	8.0	9.7
15. Stomp 4 l	6.0	7.7	7.7	7.7
16. Totril 0.1 l + Stomp 4 l	6.0	7.7	7.3	9.7
17. Tribunil 2 kg (post crook)	7.3	8.0	9.0	9.3
S.E.D. (46 d.f.)	0.79	1.24	0.84	0.92
CV %	17	23	15	13
L.S.D. (5%)	1.60	2.51	1.70	1.86

\# 0 = very weedy
5 = fairly weedy
10 = weed free

Table 3. Percentage weed cover on 6 May and 9 June (data not transformed).

Treatment	% weed cover	
	6 May	9 June
1. Unweeded (control)	5.0	30.0
2. Hand-weeded (control)	6.0	4.3
3. Alicep 2.25 kg (control)	2.7	2.0
4. Ashlade C.P. 5 l	2.7	6.0
5. CIPC 1 l	3.7	19.3
6. CIPC 4 l (c)	2.7	3.7
7. Kerb 1.25 kg	2.7	9.7
8. Kerb 1.25 kg + Nortron 3.5 l	1.3	4.7
9. Kerb 1.25 kg + Propachlor 4.5 l	2.3	7.0
10. Magnum 2 l	4.3	4.0
11. Portman 6.4 l	1.0	1.7
12. Pyramin 1.4 kg	3.3	4.0
13. Pyramin 1.4 kg + Stomp 2 l	1.3	0.7
14. Pyramin 1.4 kg + Stomp 4 l	2.0	1.0
15. Stomp 4 l	1.7	8.7
16. Totril 0.1 l + Stomp 4 l	1.7	0.7
17. Tribunil 2 kg (post crook)	1.0	2.7
S.E.D. (46 d.f.)	2.03	5.26
CV %	88	104
L.S.D. (5%)	4.1	10.64

control was more weedy (prior to hoeing), such that several herbicide treatments (**8**, **11**, **13**, **15**, **16** and **17**) had a lower percentage of ground covered by weeds.

When assessed on 19 May, following the second treatment application there were significant ($P<0.001$) differences between the treatments in terms of weed control scores (Table 2). All treatments had better weed control than the unweeded control. Those treatments with particularly high weed control scores were **14** (Pyramin 1.4 l + Stomp 4 l/ha) and **17** (Tribunil 2 kg/ha at the late post-crook to early first true leaf stage only). Treatment **12** (Pyramin 1.4 kg alone) gave relatively poor weed control.

When the weed control scores were assessed on 9 June (Table 2) there were significant ($P<0.001$) differences between the treatments. All treatments gave significantly better weed control than the unweeded control. Weed control was particularly good for treatments **13** and **14** (both Pyramin + Stomp mixtures) and **16** (Totril + Stomp). Weed control was particularly poor for **5** (CIPC 1 l/ha), and **15** (Stomp 4 l/ha).

The percentage of ground covered by weeds on 9 June is shown in Table 3. There were significant ($P<0.001$) differences between the treatments. At that time, the treatment effects included overall sprays of 0.7 l/ha of Totril on 25 May and a tank mixture of 0.7 l/ha Totril + 0.7 l/ha Fortrol on 3 June. The cumulative effects of the experimental treatments and follow-up sprays show the value of good early weed control. Treatment **5** (CIPC 1 l/ha) gave particularly poor control of weeds.

The weed species surviving after each treatment application are shown in Appendix III. Treatment **14** (Pyramin 1.4 kg + Stomp 4 l) had no surviving weeds after the second herbicide application.

Onion plant populations

There were on average 62 plants/m^2 (slightly higher than the target of 55 plants/m^2)on 9 April before the treatments commenced, with no differences between treatments. By 24 April, there were 56 plants/m^2 but, again, there were no differences between treatments. At harvest, there were 48 plants/m^2 which was similar for all herbicide treatments. No treatment reduced plant population compared with the hand-weeded control.

Onion yield

The mean yields (Table 4) were similar to the average (eg 35 t/ha) for the site in spite of a particularly warm May and June (Appendix IV). Weeds on unweeded plots did not cause a yield loss compared with the hand-weeded control (Table 4). There were differences between treatments in both

total and marketable yields of onions over 50 mm in diameter. Treatments 8 (Kerb + Nortron) and 9 (Kerb + Propachlor) gave higher ($P<0.05$) yields than the hand-weeded control. No treatment gave a total yield or yield of over 50 mm diameter bulbs lower than the hand-weeded control. There were no overall differences in yield in individual size grades between treatments (Appendix V).

Defective bulbs

There were, on average, 1.6% rotten, 1.3% thicknecked, 1.0% mechanically damaged, 0.6% split and 0.5% poor quality bulbs, but with no differences between the herbicide treatments.

Bulb quality

The bulbs (cv. Hysam) were firm (mean score 8.3) with good skin protection (mean score 6.7), slightly flat in shape (mean score 4.3) with good shape uniformity (mean score 7.8). There were no differences between herbicide treatments.

Additional herbicide treatments

Six further herbicide treatments, not part of the contract, were evaluated for early post-emergence use. Crop vigour and weed control data were recorded on these plots, but not yield due to variable plant stands. Most of these herbicide treatments performed similarly to the standard Alicep.

However, a tank-mix of Totril + Fortrol (both products at 0.1 l/ha) gave particularly good control of weeds but at the expense of early crop vigour which was reduced ($P<0.05$) compared with all other treatments. Nortron, a sugar-beet herbicide, was safe and effective when used alone and in tank-mix with either Propachlor or Kerb. It could be potentially useful for early control of annual meadowgrass.

Table 4. Total yield (t/ha) and marketable yield (t/ha) of bulbs over 50 mm in diameter.

Treatment	Yield (t/ha)	
	Total	Over 50 mm
1. Unweeded (control)	35.2	23.5
2. Hand-weeded (control)	36.2	24.6
3. Alicep 2.25 kg (control)	36.7	25.8
4. Ashlade C.P. 5 l	35.8	23.3
5. CIPC 1 l	36.2	25.0
6. CIPC 4 l	38.8	27.4
7. Kerb 1.25 kg	36.0	26.2
8. Kerb 1.25 kg + Nortron 3.5 l	44.0	35.2
9. Kerb 1.25 kg + Propachlor 4.5 l	41.3	31.1
10. Magnum 2 l	37.5	25.4
11. Portman 6.4 l	35.3	22.4
12. Pyramin 1.4 kg	31.8	19.7
13. Pyramin 1.4 kg + Stomp 2 l	34.9	24.7
14. Pyramin 1.4 kg + Stomp 4 l	38.8	27.8
15. Stomp 4 l	35.9	24.0
16. Totril 0.1 l + Stomp 4 l	37.6	27.6
17. Tribunil 2 kg (post crook)	34.6	24.5
S.E.D. (34 d.f)	2.19	2.95
CV %	7	14
L.S.D. (5 %)	4.48	6.01

Discussion

Weeds developed slowly on the trial site due to residual activity of the pre-emergence herbicide mixture, in spite of it being applied during a period of dry soil conditions which was likely to reduce its effectiveness.

Usually, contact herbicides are required from the loop to post-crook stage of onions, and, therefore, the treatments were applied at these early growth stages to test their safety to the crop. In a commercial

situation, it is possible that application could have been delayed until the late post-crook stage. Weeds allowed to develop on unweeded control plots during the period of evaluation but subsequently suppressed by herbicides in late May and June did not give rise to either a reduction in crop vigour or yield compared with the hand-weeded control. Even so, in most seasons, weeds need to be controlled when small as they rapidly become too large to control with quantities of products which are safe to the crop.

Several herbicide treatments proved suitable as 'alternatives to Alicep' when used during early post-emergence growth stages of onions. The most effective combinations were Stomp with either Pyramin or Totril. Low rates of CIPC and Stomp alone gave poor control of weeds. Crop vigour was reduced using Portman CIPC at 4 l/ha, Pyramin alone, or Tribunil, but these onions plants apparently recovered and suffered no yield loss.

Conclusions

1. Control of emerging weeds during the loop to first true leaf stages of onions is possible using products other than Alicep.

2. Several products, particularly in tank-mixes, proved effective in this experiment.

3. Those which proved particularly, but not necessarily significantly better than other choices, were Stomp in tank-mix with either Pyramin or Totril.

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Recommendation

The most promising herbicide combinations should be evaluated further, particularly in situations of greater weed pressure on a range of soils.

Appendix I

Active ingredients of commercial products used in this experiment.

Commercial product (c.p.)	Active ingredient (a.i.)
Alicep	chlorbufam + chloridazon
Ashlade C.P.	chloridazon + propachlor
CIPC	chlorpropham
Kerb	propyzamide
Magnum	chloridazon + ethofumesate
Nortron	ethofumesate
Portman trial chemical	chloridazon + propachlor
Propachlor	propachlor
Pyramin	chloridazon
Stomp	pendimethalin
Totril	ioxynil
Tribunil	methabenzthiazuron

Appendix II

Management of the trial site

Previous cropping	1991	sugar beet
	1990	winter wheat
	1989	winter wheat

Crop diary

Cultivations	24 December 91	ploughed and furrow pressed
	20 February 92	power harrowed
	20 February 93	drilled with Stanhay Webb Mark II drill
Herbicides	16 March	4.32 kg/ha ai propachlor + 2.24 kg/ha ai chlorpropham + 0.6 kg/ha ai paraquat as 9 l/ha cp Ramrod Flo + 5.6 l/ha cp CIPC 40 + 3 l/ha cp Gramoxone 100 in 600 l/ha water
	9 April	first treatments applied
	13 May	second treatments applied
	25 May	0.16 kg/ha ai ioxynil as 0.7 l/ha cp Totril in 500 l/ha water
	3 June	0.16 g/ha ai ioxynil + 0.35 kg/ha ai cyanazine as 0.7 l/ha cp Totril + 0.7 l/ha cp Fortrol in 400 l/ha water
Fungicides	20 February	benomyl + thiram seed treatments
	23 July	1 kg/ha metalaxyl + 1.5 kg/ha ai chlorothalonil as 2 l/ha cp Folio in 200 l/ha water
Insecticides	20 February	2.8 kg/ha ai aldicarb as 28 kg/ha cp Temik (granules)
	23 June	0.96 kg/ha ai chlorpyrifos as 2 l/ha cp Dursban 4 in 1000 l/ha water (cutworm control)
Fertiliser	23 December 91	109 kg/ha Triple Superphosphate + 133 kg/ha muriate of potash
	25 April	40 kg/ha N
	1 June	40 kg/ha N
Trace elements	15 May	9 kg/ha $MnSO_4$ in 280 l/ha water
	9 June	manganese as above
	7 July	manganese as above
Irrigation	2 July	25 mm

Sprout suppressant	14 August	3.1 kg/ha ai maleic hydrazide as 17 l/ha cp Maleic Hydrazide (18%) in 500 l/ha water
Harvest	27 August	
Graded out of store	4 January 93	

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Appendix III

Weeds surviving on at least two replicates after treatment application.

Treatment	First application Assessed 6.5.92	Second application 19.5.92
1. Unweeded (control)	hempnettle, mayweed, redshank	bindweed, chickweed, hempnettle, mayweed, knotgrass, pansy
2. Hand-weeded (control)	-	-
3. Alicep 2.25 kg (control)	-	bindweed, hempnettle, mayweed
4. Ashlade C.P. 5 l	-	bindweed, knotgrass, field pansy
5. CIPC 1 l	cleaver	mayweed
6. CIPC 4 l	hempnettle	hempnettle, mayweed
7. Kerb 1.25 kg	cleaver, redshank	bindweed, cleaver, hempnettle, mayweed
8. Kerb 1.25 kg + Nortron 3.5 l	mayweed	hempnettle, knotgrass, mayweed
9. Kerb 1.25 kg + Propachlor 4.5 l	mayweed	knotgrass, mayweed
10. Magnum 2 l	-	knotgrass, mayweed, pansy
11. Portman 6.4 l	-	bindweed, mayweed
12. Pyramin 1.4 kg	hempnettle, mayweed	cleaver, knotgrass, mayweed, pansy
13. Pyramin 1.4 kg + Stomp 2 l	-	mayweed
14. Pyramin 1.4 kg + Stomp 4 l	-	-
15. Stomp 4 l	mayweed, potatoes	mayweed
16. Totril 0.1 l + Stomp 4 l	-	mayweed
17. Tribunil 2 kg	-	mayweed

Appendix IV

Weather records 1992.

	TEMPERATURES (°C)						DAILY SUNSHINE (HOURS)		RAINFALL (mm)	
	EXTREMES			ACCUMULATED DAY DEGREES ABOVE 6°C		MEAN SOIL TEMP				
	AIR		GRASS				CURRENT YEAR	25 YEAR MEAN	CURRENT YEAR	25 YEAR MEAN
	Max.	Min.	Min.	CURRENT YEAR	25 YEAR MEAN	AT 10 cm				
JAN	12.4	-5.6	-10.4	24	24	3.4	1.8	1.7	48.8	42.1
FEB	15.0	-3.4	-5.4	24	20	4.2	2.0	2.4	9.6	30.4
MAR	16.4	-0.8	-4.2	72	77	6.5	2.2	3.2	9.5	41.1
APR	17.9	-0.7	-5.7	116	129	8.5	4.1	4.7	39.0	37.6
MAY	27.7	1.3	-1.2	262	173	14.8	8.6	6.1	48.6	48.0
JUN	30.0	5.1	2.0	313	257	18.2	6.8	6.3	26.2	51.7
JUL	27.7	7.5	2.6	357	329	18.4	5.3	6.0	87.5	43.5
AUG	25.8	5.6	1.4	333	327	16.9	5.8	6.3	66.4	49.2
SEP	24.0	2.8	1.0	249	255	13.2	4.6	4.7	76.3	39.8
TOTAL MAR-AUG				1453	1292				277.2	271.1

Notes: For the purposes of this table:

1. Readings taken at 0900 hours GMT.
2. A temperature of at least 6°C (42°F) is normally considered necessary for plant growth. Accumulated temperatures (day degrees) above 6°C are a measure of plant growth during the month.

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Appendix V

Marketable yield (t/ha) over 40 mm diameter and yield (t/ha) in size grades.

Treatment	(t/ha) Marketable over 40 mm	40-50 mm	50-60 mm	60-80 mm
1. Unweeded (control)	32.9	9.4	15.4	8.1
2. Hand-weeded (control)	34.3	9.8	15.5	9.1
3. Alicep 2.25 kg (control)	34.4	8.6	15.3	10.5
4. Ashlade C.P. 5 l	33.5	10.2	15.5	7.8
5. CIPC 1 l	34.3	9.3	16.0	9.0
6. CIPC 4 l	36.8	9.4	16.0	11.2
7. Kerb 1.25 kg	33.7	7.5	15.2	10.9
8. Kerb 1.25 kg + Nortron 3.5 l	43.0	7.7	21.0	14.2
9. Kerb 1.25 kg + Propachlor 4.5 l	40.2	9.0	17.2	13.9
10. Magnum 2 l	35.5	10.1	17.6	7.8
11. Portman 6.4 l	33.0	10.6	16.2	6.2
12. Pyramin 1.4 kg	29.3	9.6	14.4	5.4
13. Pyramin 1.4 kg + Stomp 2 l	33.0	8.3	14.5	10.1
14. Pyramin 1.4 kg + Stomp 4 l	36.9	9.2	18.5	9.2
15. Stomp 4 l	33.7	9.7	15.8	8.2
16. Totril 0.1 l + Stomp 4 l	35.9	8.3	14.1	13.4
17. Tribunil 2 kg (post crook)	32.9	8.4	15.9	8.6
S.E.D. (34 d.f.)	2.40	1.69	2.26	3.01
CV %	8	23	17	38
L.S.D. (5%)	4.90	3.45	4.61	6.15

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