



**HORTICULTURE RESEARCH INTERNATIONAL**

KIRTON

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CONTRACT REPORT  
FV103A  
ALTERNATIVES TO CHLORBUFAM  
AND CHLORIDAZON (ALICEP) FOR  
WEED CONTROL IN ONIONS AND LEEKS  
YEAR 2

PART I - ONIONS/SILT SOIL  
PART II - LEEKS/SILT SOIL

PRINCIPAL WORKERS

M J Leatherland BSc, MIHort

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.

*M. J. Leatherland*  
.....  
(signature)

M J Leatherland  
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Date *18 Dec 1992*.....

Report authorised by:

*M B Wood*  
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## DISCLAIMER

The products and rates used in this work are not necessarily approved for use on onions or leeks and references to them in this report should in no way be taken as recommendations. Before using a herbicide, the product label should always be consulted and the instructions followed. In the event of doubt, the chemical supplier or local adviser should be consulted.

## SUMMARY

A range of herbicide treatments was chosen based on field trials in 1991 and on spray race evaluations in the glasshouse in the autumn of 1991. Treatments were applied to onions and leeks at either the loop or post crook stages of growth. Levels of weed growth were generally low but untreated plots of onions reached 90% covered with weeds by June. Sovereign (pendimethalin) alone gave good control of weeds until June but was improved by the addition of Pyramin (chloridazon). Pyramin alone was much less effective but the main problem weed, fumitory, is not one of which pyramin gives good control. The best all round treatment for onions and leeks was a combination of Sovereign and Pyramin for which off label approval has been sought.

The presently approved Ashlade C P did a reasonable job but was not as good as Pyramin plus Sovereign. Tribunil (methabenzthiazuron) gave the best control of weeds in the leek trial and good control in the onions. Unfortunately it did damage to the leeks which was carried through to a reduction in yield at harvest.

Work should be repeated with promising treatments in a more normal (wetter) season.

## INTRODUCTION

Good weed control is essential during the early stages of growth in drilled allium crops as the spindly erect habit is not competitive and is easily swamped by vigorous low growing and bushy weed species.

Following intensive work by ADAS in the seventies the onion herbicide strategy advocated was to sow as early as possible and apply residual herbicides just prior to emergence when the first flush of weeds was burnt off with a paraquat formulation applied in combination with residual herbicides such as propachlor plus chlorthal dimethyl (Ramrod and Dacthal) or more recently, propachlor plus pendimethalin (Ramrod plus Sovereign). This late application of residual herbicides to a cleaned up seedbed, effected weed control until the first true leaf of the onion crop was well grown when a number of herbicides could be used.

The above strategy depended upon growers monitoring large acreages pre-emergence and applying at the right time. Spraying windows in Lincolnshire, especially in March, come few and far between and so the normal strategy shifted to applying residuals plus paraquat, if needed, as soon as possible after drilling. However this meant that the effect of the residual broke down not long after emergence. Alicep could then be applied at the loop and post crook stages thus effecting good weed control until the first true leaf stage when more powerful herbicides could be used.

In March 1991 it became known that manufacture of chlorbufam, one of the components of Alicep, was to cease. Therefore a substitute for Alicep was urgently needed. It was decided, with HDC funding, to tackle the problem in two ways. Firstly to set up an immediate field trial looking at reduced rates of presently used herbicides and herbicide mixtures which are normally used later in the crops life and secondly using a spray race to screen a much larger selection of herbicide mixtures to cheaply and speedily select promising candidates for inclusion in the 1992 trial.

Results in the 1991 field trial showed that Alicep was not the best material and the most promising treatment was a combination of Pyramin and Stomp. The active ingredient of these chemicals are already approved in different formulations on onions. The active ingredients of Pyramin is chloridazon which was found in Alicep. Pendimethalin found in Stomp is approved for pre-emergence use. This combination not only gave good weed control but also gave some of the best yields at harvest. The work was carried out on a late sown crop of onions shortly after the withdrawal of Alicep was announced.

In the autumn of 1991 a screening trial was carried out with tray raised onions under glass. These were treated using an accurately calibrated spray race giving around 30 different combinations of herbicide. A number were eliminated and the information was used to choose treatments for 1992.

In 1992 the work was continued using a similar range of chemicals on a crop sown at the normal time. It was also carried out on leeks. Trials were also repeated on other sites, onions at ADAS Arthur Rickwood and leeks at HRI Wellesbourne. A summary of the Kirton data is presented here for onions and leeks. Results from the other sites are presented separately. The 1991 results have already been presented to HDC and are available elsewhere.

## MATERIALS AND METHODS

### Treatments

#### Onions

##### Chemical:-

##### Product & rates:-

1. hand weeded	-
2. chlorbufam + chloridazon	Alicep 1 kg + 1 kg loop and post crook
3. chloridazon + pendimethalin	Pyramin DF 1.4 kg + Sovereign 2 l
4. chloridazon + pendimethalin	Pyramin DF 1.4 kg + Sovereign 4 l
5. chloridazon + ethofumesate	Magnum 2 l
6. propyzamide	Kerb 1250 g
7. chloridazon + propachlor	Ashlade c.p. 5 l
8. chloridazon + propachlor	Portman trial chemical
9. propyzamide + propachlor	Kerb 1250 g + Portman Propachlor 4.5 l
10. propyzamide + ethofumesate	Kerb 1250 g + Nortron 3.5 l
11. ioxynil + pendimethalin	Totril 100 ml + Stomp 4 l
12. chloridazon	Pyramin DF 1.4 kg
13. methabenzthiazuron	Tribunil 2 kg (post crook)
14. pendimethalin	Sovereign 4 l
15. chlorpropham	CIPC 1 l

Treatments were applied at late loop stage on 28 April or at post crook stage on 13 May. The Alicep treatment was split as in normal commercial practice and applied at loop and post crook.

#### Leeks

##### Chemical:-

##### Product and rates:-

1. hand weeded	-
2. chlorburam + chloridazon	Alicep 1 kg loop and post crook
3. chloridazon + pendimethalin	Pyramin DF 1.4 kg + Sovereign 2 l
4. chloridazon + pendimethalin	Pyramin DF 1.4 kg + Sovereign 4 l
5. propyzamide	Kerb 1250 g
6. chloridazon + propachlor	Ashlade C.P. 5 l
7. chloridazon + propachlor	Portman trial chemical
8. propyzaimde + propachlor	Kerb 1250 g + Propachlor 4.5 l

9. fluazifop-p-butyl	Fusilade 500 ml
10. chloridazon	Pyramin DF 1.4 kg
11. methabenzthiazuron	Tribunil 2 kg (post crook)
12. pendimethalin	Sovereign 4 l
13. chlorpropham	CIPC 1 l

Treatments were applied at late loop stage on 13 May or at post crook stage on 20 May. The Alicep treatment was split as for onions.

### Cultural details

#### Onions

Sowing date:	18 March 1992
Cultivar:	Caribo
Soil type:	silt
Site:	Land at Kirton End known as 'New land' field 1
Previous cropping:	1991 grass
Soil analysis:	pH = 7.3, P <sub>2</sub> O <sub>5</sub> index = 4, K <sub>2</sub> O index = 2, Mg index = 3
Fertiliser:	Base dressing of 90 kg/ha N applied at compound (15:8:24)
Cultivation:	prepared with one pass of 'Lely Roterra' on 18 March.
Drilling:	Precision drilled using a Stanhay seed drill equipped with applicator for aldicarb granules as Temik at 51 g per 100 m row.
Spacing:	Drilled in rows 300 mm apart with five rows per 1.8 metre wide bed.
Soil conditions:	Moist at drilling but dry post germination and during weed assessments. Periods of heavy rain from July to harvest.
Pre-emergence herbicide:	25 March: propachlor as Portman propachlor at 9 l/ha plus pendimethalin as Sovereign at 1 l/ha.
Other herbicides:	2 June ioxynil as 1.4 l/ha Totril.
Weeding:	Control plots hand weeded on 9 June. Remainder of trial on 19 June.
Insecticides:	24 June deltamethrin as 300 ml/ha Decis in 600 l/ha water.
Fungicides:	27 July chlorothalonil as 2 l/ha Bravo 500 in 450 l/ha water.
Irrigation:	none

Harvest: 19 August

leeks

Sowing date: 13 April 1992  
Cultivar: Verina  
Soil type: silt  
Site: land at Kirton end known at 'New land' field 1.  
Previous cropping: 1991 grass  
Soil analysis: pH = 7.3, P<sub>2</sub>O<sub>5</sub> index = 4, K<sub>2</sub>O index = 2, Mg index = 3  
Fertiliser: Base dressing of 90 kg/ha N applied as compound (15:8:24) plus on 3 June a top dressing of 60 kg applied as Nitram (34%N)  
Cultivation: prepared with one pass of 'Lely Roterra' on 13 April 1992  
Drilling: Precision drilled at a rate of 23 seeds per metre run of drill, using a Stanhay drill.  
Row spacing: Three rows of 550 mm per 1.83 m bed.  
Soil conditions: Dry until July then periods of heavy rain to harvest.  
Pre-emergence herbicide: 21 April, propachlor as 9 l/ha Portman propachlor plus pendimethalin as 1 l/ha Sovereign.  
Other herbicides: 23 July, aziprotryne as 4 kg/ha Brasoran 50 wp in 400 l/ha water.  
Insecticides: 24 June, 6 and 21 August, delthamethin as 300 ml/ha Decis in 600 litres/ha water.  
Fungicides: From 12 August, three weekly sprays of fenpropimorph as 1 l/ha corbel in 500 l/ha water for control of rust  
Irrigation: none  
Harvest: 14 October 1992.

#### Experimental design

Both trials were designed with three randomized blocks giving three replicates.



### Harvesting procedure

Onions were harvested taking the middle three rows of a five row bed. They were cured in a store using heat when necessary until grading at the end of September. Grading took place over a normal commercial grading line using normal standards for size and quality.

Leeks were lifted and had their roots removed in the field and their flag leaves trimmed to 75 mm. They were then transported indoors where they were further cleaned and graded according to normal practice.

### Records

#### Onions

1. Assessments were made on 27 May and 16 June of weed and onion vigour as follows.

27 May:                   - percent weed cover  
                             - number of weeds per m<sup>2</sup>  
                             - species found  
                             - weight of 25 plant sample

16 June:                   As for 27 May but height of 10 plants instead of weight sample.

2. Time of 50% die down was recorded.
3. At grading:               - number and weight by grade, 25-40 mm (picklers), 40-50 mm, 50-60 mm, 60-70 mm, 70-80 mm, >80 mm, diam.  
                             - number of thick necks and bolters  
                             - number of other waste
4. A score for quality attributes of, colour, skin thickness, shape, uniformity, and firmness were made after grading.

#### Leeks

1. Assessment made on 17 June of:  
                             - percent weed cover  
                             - number of weeds per plot  
                             - species found  
                             - weight of 15 plants
2. At harvest:               - number and weight of, class I, class II, small (< 10 mm), split and rots.

## RESULTS

### Onions

A summary of results is presented in Table 1. Weed levels were generally low with the pre-emergence residuals doing a good job. Conditions were also dry initially which did not encourage strong weed growth. The main weeds found on the site which survived pre-emergence treatments were as follows:

fumitory	( <i>Fumaria officinalis</i> )	mayweed	( <i>Matricaria perforata</i> )
shepherds purse	( <i>Capsella bursa-pastoris</i> )	groundsel	( <i>Senecio vulgaris</i> )
speedwell	( <i>Veronica persica</i> )	redshank	( <i>Polygonum persicaria</i> )
chickweed	( <i>Stellaria media</i> )	shotgrass	( <i>Polygonum aviculare</i> )
annual nettle	( <i>Urtica urens</i> )	couchgrass	( <i>Agropyron repens</i> )

On the 27 May the Pyramin plus Sovereign at 4 l consistently gave the cleanest plots with very small seedling weeds of annual nettle and speedwell just beginning to show through. Most other plots had four or more species showing at various stages of growth. The four dominant weeds were fumitory, annual nettle, shepherds purse and speedwell. Fumitory was particularly noticeable on the control plots and on the Pyramin only plot. The control plots had up to 20% weed cover with some species notably fumitory and shepherds purse in flower. Most of the treated plots gave good control up to this point with no more than 6% ground cover.

From then on control began to break down. The control plots were weeded on 8 June to reduce interference with the crop but other plots were not cleared up until 19 June. An assessment on 16 June showed weed cover as high as 90% on the Pyramin only plots mostly as a result of fumitory spreading out over the plots. Good fumitory control is not claimed for Pyramin (see Appendix 1) nor is it controlled effectively by propachlor used pre-emergence. The combination of Pyramin and Sovereign however still held weed levels to less than 2% at this time although when the 2l rate of Sovereign was used control had broken down at this point. The use of Sovereign alone gave good weed control but previous experience suggests that with a wider weed spectrum this would not have been the case and a complementary chemical such as Pyramin needs to be used in combination with it. Tribunil also gave good and persistent weed control but there was visible damage to plants after application.

Although weight samples on 27 May showed that some treatments had checked growth, notably Pyramin plus Sovereign at 4 l, Kerb, Pyramin and Tribunil, there were no indications that this was carried on to harvest and measurements of height made on 16 June showed no significant differences between treatments.

The hand weeded plots gave lower yields than most other treatments as weeds were allowed to remain in the crop longer than would normally have been desirable. This was to provide a comparison with other treatments for demonstration purposes. It is interesting to note however that the final yield from the Alicep treatment was not significantly better. Both of the Pyramin plus Sovereign comparisons gave marketable yields considerably higher than either the control or the Alicep.

The Sovereign treatment alone gave the highest yield. The Pyramin treatment alone appeared to give a lower marketable yield but this can be accounted for by a higher than average level of waste due to white rot found on these plots. If the waste figures are added back in, yield is still depressed but is no longer significant compared to the hand weeded control or the Alicep.

The Ashlade c.p which has existing off label approval only yielded moderately well as did the equivalent Portman product.

None of the quality characteristics assessed were affected by any of the treatments. The time to 80% die-down was also not affected.

#### Leeks

A summary of the leek results is shown in Table 2. The weeds found in the trial were similar to those in the onions but again levels overall were relatively low.

Tribunil gave the best weed control but damaged the seedlings significantly resulting in a yield loss at harvest. Sovereign alone gave good control of weeds with no significant depression in yield but the best all round results were again with a combination of Pyramin and Sovereign.

Table 1. Summary of results - onions

Treatment	27 May		16 June		Per cent weed cover		Total marketable yield t/ha	Total yield t/ha	Plants /m <sup>2</sup> at harvest
	wt 25 seedlings (g)	Height (mm)	weed cover 27 May	weed cover 16 June	16 June	16 June			
Hand weeded	26.3	39.2	16.7	0.0	0.0	49.0	53.4	54	
Alicepe 1kg + 1kg	24.5	39.8	2.3	12.6	12.6	50.9	58.9	54	
Pyramin 1.4kg + Sovereign 2l	25.6	38.2	0.7	15.0	15.0	61.5	64.6	58	
Pyramin 1.4kg + Sovereign 4l	15.3	36.1	0.4	1.3	1.3	60.0	65.0	59	
Magnum 2l	26.0	39.4	1.5	33.3	33.3	60.1	61.9	63	
Kerb 1250g	18.5	41.0	2.7	20.0	20.0	57.2	60.9	59	
Ashlade c.p 5l	24.4	38.6	2.7	21.7	21.7	54.3	58.3	55	
Portman Pyramin + Propachlor	22.3	38.2	0.8	6.8	6.8	51.9	58.3	55	
Kerb 1250g + Propachlor 4.5l	21.1	37.3	2.3	16.7	16.7	52.4	61.1	51	
Kerb 1250g + Nortron 3.5l	21.2	40.0	0.8	9.7	9.7	59.5	62.2	55	
Totril 100ml + Sovereign 4l	26.2	40.1	0.4	2.7	2.7	62.9	66.3	65	
Pyramin 1.4kg	18.8	40.2	5.7	61.7	61.7	42.3	48.1	56	
Tribunil 2kg	17.4	37.6	0.5	2.0	2.0	61.6	65.3	64	
Sovereign 4l	26.3	41.6	0.4	4.3	4.3	64.1	66.9	63	
CIPC 1l	27.5	40.0	1.3	16.7	16.7	63.4	66.4	61	
SED (excl. Alicepe) (31 df)	3.65	2.08	1.90	10.85	10.85	6.36	4.81	3.9	
SED (incl. Alicepe) (31 df)	3.16	1.80	1.65	9.40	9.40	5.51	4.17	4.5	

NB Comparisons with Alicepe have a lower SED as this treatment was duplicated. To obtain least significant differences at p=5% multiply SED by 2.04.

Table 2 Summary of results - leeks

Treatment	Leeks/m <sup>2</sup>	Weight 15 plants	% weed cover	Marketable	Plants/m <sup>2</sup>
	17 June	17 June (g)	17 June (g)	yield t/ha	harvest
Hand weeded	20.2	30.3	13.3	43.2	24.3
Alicepe 1kg + 1kg	21.9	20.9	5.3	36.7	21.1
Pyramin 1.4kg + Sovereign 2l	21.3	17.8	1.7	40.4	19.7
Pyramin 1.4kg + Sovereign 4l	15.3	27.4	0.7	40.6	22.2
Kerb 1250g	23.5	20.4	4.3	38.0	20.7
Ashlade c.p 5l	18.0	24.3	6.0	44.4	20.8
Portman Pyramin + Propachlor	20.8	23.8	2.8	38.0	22.9
Kerb 1250g + Propachlor 4.5l	21.3	21.5	3.3	39.8	23.0
Fusilade 500ml	17.5	21.9	11.7	39.9	20.3
Pyramin 1.4kg	17.5	23.8	7.7	40.7	20.4
Tribunil 2kg	10.4	10.5	0.3	32.5	15.7
Sovereign 4l	21.9	23.3	2.0	35.7	20.2
CIPC 1l	13.7	24.1	8.0	37.7	20.3
SED (excl. Alicepe) (27 df)	4.77	4.98	3.38	4.37	2.94
SED (incl. Alicepe) (27 df)	4.13	4.31	2.93	3.78	2.55

NB Comparisons with Alicepe have a lower SED as this treatment was duplicated.  
To obtain least significant difference at p=5% multiply SED by 2.05

### Residue data

Samples of onions were taken at grading for residue analysis. The treatments sampled were:

1. hand weeded control (Sovereign pre-emergence)
3. Pyramin 1.4 kg/ha plus Sovereign 2 l/ha
4. Pyramin 1.4 kg/ha plus Sovereign 4 l/ha

No residues of chloridazon or pendimethalin were found in any of these samples. Copies of the certificates of analysis are shown in Appendix 2.

### **CONCLUSION**

The best all round post emergence weed control using chemicals already approved in other forms for use on onions and leeks was obtained using combinations of Pyramin and Sovereign. Any seedling damage caused by using Sovereign at the higher rate did not affect final yield.

### **RECOMMENDATIONS FOR FURTHER WORK**

Applications have been made for off label approval use of Pyramin DF and Sovereign in combination for post germination control of weeds in onions. These applications were based on the findings of two years experimental data. Further work on split applications of lower doses would be useful to establish effective control strategies. It would also be desirable to repeat the work in a wet spring with a broader spectrum of weeds and more weed growth possibly coupled with less use of pre-emergence herbicide to simulate a crop with failed early weed control. There should also be an opportunity for herbicides to wash down further into the soil so any risk of phytotoxicity can be fully assessed.

### **ACKNOWLEDGEMENTS**

Mr Gary Steele for his technical assistance in the field and Mr Andrew Mead of HRI Wellesbourne for his assistance with statistical analysis and interpretation.

Appendix 1

Comparative weed spectra - claimed

Weed	pendimethalin	pyramin	propachlor	main weeds in trial
AMG	*	*	*	
Black bindweed		*		
Black nightshade		*	?	
Charlock		*		
Cleavers		*	*	*
Chickweed	*	*	*	*
Couch				*
Fumitory	?	?		
Hemp nettle	*	*	*	
Poppy	*	*		
Fat hen	*	*		
Field pansy	*	*		
Field penny-cross		*		
Groundsel		?	*	*
Knotgrass	*	*		
Mayweed		*	*	*
Red dead nettle	*	*	*	
Redshank		*		
Scarlet pimpernel	*	?		
Shepherds purse	?	*	*	*
Small nettle	*	*	*	*
Sow thistle	*	*	?	
Speedwell	*	*	*	*
Spurrey		*	*	
Cereals		*		
Wild oat		*		
Orach	*	*		
Parsley piert	*	*		
Forget-me-knot	*	*		
OSR	*	*		

MJL6.REP



# ASPLAND & JAMES LTD.

Independent Analytical Consultancy

Unique Lab. Ref 68274  
 Customer Ref Horti

Data Input Ref  
 Order Number 4160

## CERTIFICATE OF PESTICIDE RESIDUE ANALYSIS

Source of Supply/Client.

Produce Marketing Organisation.

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 Kirton  
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Fax:

Tel: 0205 723477

Fax:

Produce Description Onions  
 Country of Origin  
 Product Reference TRT C - HRI Kirton 8/10

Date Sample Received 16.10.92  
 Date Sample Tested 19.10.92  
 Date of Reporting 22.10.92

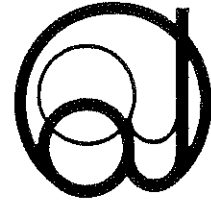
Compounds Analysed	Trade Name	Residue mg/kg	Codex MRL mg/kg	Rec %	Method Ref	Limit of Determination mg/kg
Chloridazon		ND	None	80	AM/R/110	0.1
Dimethalin		ND	None	87	AM/R/110	0.1

ND = Not detected

Rec = Recovery efficiency of analytical method

Analysed by: Mike Housden *M Housden*  
 Section Head (Pesticide Residues)





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Lab. Customer Ref Horti

Data Input Ref  
Order Number 4160

## CERTIFICATE OF PESTICIDE RESIDUE ANALYSIS

Source of Supply/Client.

Produce Marketing Organisation.

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Tel: Fax:

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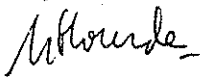
Produce Description Onions  
Country of Origin  
Product Reference TRT D - HRI Kirton 8/10

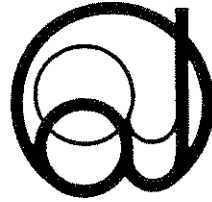
Date Sample Received 16.10.92  
Date Sample Tested 19.10.92  
Date of Reporting 22.10.92

Compounds Analysed	Trade Name	Residue mg/kg	Codex MRL mg/kg	Rec %	Method Ref	Limit of Determination mg/kg
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Pendimethalin		ND	None	87	AM/R/110	0.1

ND = Not detected

Rec = Recovery efficiency of analytical method

Signed : Mike Housden   
Section Head (Pesticide Residues)



# ASPLAND & JAMES LTD.

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Sample Lab. Ref 68273  
 Customer Ref Horti

Data Input Ref  
 Order Number 4160

## CERTIFICATE OF PESTICIDE RESIDUE ANALYSIS

Source of Supply/Client.

Produce Marketing Organisation.

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Fax:

Tel: 0205 723477 Fax:

Produce Description Onions  
 Country of Origin  
 Product Reference TRT A - HRI Kirton 8/10

Date Sample Received 16.10.92  
 Date Sample Tested 19.10.92  
 Date of Reporting 22.10.92

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dimethalin		ND	None	87	AM/R/110	0.1

= Not detected

= Recovery efficiency of analytical method

Analysed by: Mike Housden *M Housden*  
 Section Head (Pesticide Residues)