HORTICULTURE RESEARCH INTERNATIONAL

STOCKBRIDGE HOUSE

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LETTUCE: EVALUATION OF HERBICIDES AND THEIR OPTIMAL TIMING (FV118)

PART 1

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Summary

A range of herbicides was evaluated on crisp lettuce at different rates and timings for their effect on crop vigour, weed control and crop quality. The treatments included a comparison between Ramrod Flo applied pre-planting and post-planting either on its own or in combination with Kerb, Treflan or in a programme with CIPC.

The trial was planted on 22 May following the pre-planting applications, but delayed for one day where CIPC had been used. The post-planting applications were made on 28 May.

Early crop vigour was reduced where Ramrod Flo had been used pre-planting. Applications of Ramrod Flo after planting appeared safer and generally gave better weed control. The use of Ramrod Flo with Treflan and Kerb or in a programme with CIPC enhanced weed control.

The pre-planting treatment with Ramrod Flo delayed crop maturity as did the use of CIPC. The number of Class I heads was reduced where Ramrod Flo had been used pre-planting but where it had been applied post-planting there was no reduction in quality. The number of marketable heads was similar for all treatments.

Introduction

Weed control in lettuce is limited by the small number of products currently approved for use on the crop. The number of options for the transplanted crop is greater than that for the drilled crop but there is an increased risk of scorch when using herbicides post-planting.

There is at present a Specific Off-Label Approval (0518/88) for the pre-planting use of Ramrod Flo at 6 l/ha. This is an important addition to the herbicide range due to its control of a wide range of weeds, including Groundsel, which are otherwise difficult to control. Use of this pre-planting application has the disadvantage that the herbicide layer is disturbed during transplanting and this can result in reduced residual activity. This trial evaluated the post-planting use of Ramrod on its own at various rates, in a programme with CIPC and in combination with Treflan and Kerb.

A similar trial is also being carried out on a peaty soil in Cambridgeshire and will be reported separately.

Objective

To assess a range of herbicides on lettuce at various rates and timings for their effect on weed control, crop maturity and crop quality. The trial will be carried out on both mineral and peaty soil types.

Materials and Methods

Site

HRI Stockbridge House, Cawood, Selby, North Yorkshire YO8 0TZ.

Soil Type

Sandy loam of the Quorndon Series.

Design

The experimental design was a randomised block with four replicates. Each plot consisted of four rows at 37.5 cm per 1.83 m bed with 20 plants per row spaced at 30 cm. Each plot was 11 m^2.

Statistical Analysis

Data were subjected to analysis of variance. Where appropriate the data has been angularly transformed to improve the validity of the analysis. The least significant differences (LSDs) are provided where the differences between treatments were significant at the 5% level. Where the differences were not significant then this is indicated by NS (not significant) and this indicates that results were similar for all treatments.

Specific contrasts were made between the use of Ramrod Flo pre-planting and post-planting and between CIPC and CIPC plus Ramrod Flo treatments.

Treatments

1. Untreated control.

2. Ramrod Flo @ 6 l/ha pre-planting (off-label approval).

3. Ramrod Flo @ 6 l/ha + Treflan @ 1.2 l/ha incorporated pre-planting.

4. Ramrod Flo @ 2 l/ha post-planting.

5. Ramrod Flo @ 4 l/ha post-planting.

6. Ramrod Flo @ 6 l/ha post-planting.

7. CIPC @ 2.8 l/ha pre-planting.

8. CIPC @ 2.8 l/ha pre-planting + Ramrod Flo @ 2 l/ha post-planting.

9. Ramrod Flo @ 3 l/ha + Kerb @ 1.1 kg/ha post-planting.

10. Ramrod Flo @ 3 l/ha pre-planting + 2 l/ha post-planting.

11. Ramrod Flo @ 6 l/ha post-planting as an inter-row band treatment.

12. Tribunil @ 0.5 kg/ha pre-planting (experimental permit).

All herbicides were applied in 500 l/ha water using a hand held Oxford Precision Sprayer operated at a pressure of 2 bar using 11003T jet nozzles.

Records

1. Crop vigour on 8 and 23 June (10 plants/plot).

2. Number of each weed species on 6 July.

3. Yield and quality at harvest (30 plants/plot).

Husbandry

Lettuce, cultivar Saladin, were sown on 20 April in an unheated glasshouse. Half of the trial area was irrigated on 21 May to determine the effect of soil moisture level on herbicide efficacy. The pre-planting herbicide treatments were applied on 22 May. The trial was planted by hand on 22 May except the CIPC treatments which were delayed by one day. The post-planting applications were made on 28 May. All crop husbandry details are given in Appendix I.

Results and Discussion

The trial established well in late May aided by irrigation after planting. By the end of May the plants which had received Ramrod Flo at 6 l/ha pre-planting looked less vigorous than all the other treatments.

The crop vigour was assessed on 8 and 23 June (Table 1).

Table 1: Crop Vigour on 8 and 23 June.

Treatment	Vigour on 8 June	Vigour on 23 June
1. Control	8.6	8.5
2. Ramrod 6 l pre-planting	8.0	7.9
3. Ramrod 6 l + Treflan	8.1	8.2
4. Ramrod 2 l post-planting	8.6	8.5
5. Ramrod 4 l post-planting	8.6	8.7
6. Ramrod 6 l post-planting	8.8	8.5
7. CIPC pre-planting	8.2	8.0
8. CIPC pre-planting + Ramrod 2 l post-planting	7.8	8.0
9. Ramrod 3 l + Kerb 1.1 kg post-planting	8.6	8.4
10. Ramrod 3 l pre + 2 l post-planting	8.0	7.9
11. Ramrod 6 l band post-planting	8.5	8.4
12. Tribunil pre-planting	8.6	8.3
SED (33 df) for comparing all treatments	0.25	0.26
LSD (5%)	0.5	0.5

Note: 1 = Poor growth, stunted and yellow
9 = Excellent growth, dark green foliage

Overall the vigour of the lettuce was good in early June. The use of Ramrod Flo at 6 l/ha pre-planting reduced the vigour of the lettuce plants compared to where Ramrod Flo had been used post-planting. The use of Ramrod Flo both pre and post-planting also lowered crop vigour.

By late June the earlier differences in vigour were still visible. Vigour was still reduced in the pre-planting Ramrod Flo treatment compared with the post-planting application.

The number of each weed species on each plot is summarised in Table 2. None of the data has been statistically analysed due to the low number of weeds within the trial area, even on the untreated control.

Table 2: Number of each weed species on 6 July (based on 11 m^2)

Treatment		CC	FH	GS	KG	MW	RS	SP
1.	Control	37	5	14	1	1	1	2
2.	Ramrod 6 l pre-planting	23	8	1	1	1	1	1
3.	Ramrod 6 l + Treflan	3	1	9	0	1	1	2
4.	Ramrod 2 l post-planting	31	2	2	1	1	1	1
5.	Ramrod 4 l post-planting	8	5	3	1	0	1	1
6.	Ramrod 6 l post-planting	10	4	1	1	1	1	1
7.	CIPC pre-planting	5	2	13	0	2	0	2
8.	CIPC pre-planting + Ramrod 2 l post-planting	4	1	3	0	1	0	1
9.	Ramrod 3 l + Kerb 1.1 kg post-planting	5	1	4	0	1	0	0
10.	Ramrod 3 l pre + 2 l post-planting	15	1	1	1	0	1	1
11.	Ramrod 6 l band post-planting	11	6	1	1	0	1	0
12.	Tribunil pre-planting	30	2	5	1	1	2	2

Key: CC Common Chickweed
FH Fat Hen
GS Groundsel
KG Knotgrass
MW Mayweed
RS Redshank
SP Shepherds Purse

The main weeds on the control plots were Common Chickweed, Fat Hen and Groundsel. The use of Ramrod pre-planting gave poor control of Common Chickweed and Fat Hen with better weed control achieved with a post-planting application of Ramrod Flo at 4 or 6 l/ha. The tank mix

combination of Ramrod Flo plus Kerb, and the programme of CIPC and Ramrod Flo improved the control of both Groundsel and Common Chickweed.

The irrigation treatment applied to two replicates prior to herbicide application appeared to enhance the control of Chickweed where Ramrod Flo was used either pre-planting or post-planting. The performance of the other herbicides on the control of Chickweed were superior and appeared unaffected by this irrigation. The control of the other weed species appeared unaffected by the soil moisture levels (Appendix II).

At harvest heads were cut when they reached the required density and then trimmed to remove the outer leaves. The heads were weighed and graded according to quality. Class I heads were dense, and weighed a minimum of 500 g, Class II heads were less dense or of a slightly poorer shape and weighed a minimum of 500 g.

Table 3: Date of 50% harvest and number of heads in each quality grade - angle transformation (actual percentages in brackets).

Treatment		50% Harvest Date	Class I (%)	Class II (%)	Marketable (%)
1.	Control	8 Jul	34 (32)	53 (63)	79 (95)
2.	Ramrod 6 l pre-planting	11 Jul	24 (17)	55 (68)	67 (84)
3.	Ramrod 6 l + Treflan	10 Jul	20 (16)	59 (73)	72 (89)
4.	Ramrod 2 l post-planting	9 Jul	34 (32)	52 (62)	77 (93)
5.	Ramrod 4 l post-planting	8 Jul	42 (45)	40 (42)	70 (87)
6.	Ramrod 6 l post-planting	9 Jul	35 (34)	48 (54)	71 (88)
7.	CIPC pre-planting	11 Jul	31 (27)	54 (66)	75 (93)
8.	CIPC pre planting + Ramrod 2 l post-planting	12 Jul	35 (34)	51 (59)	77 (93)
9.	Ramrod 3 l + Kerb 1.1 kg post-planting	9 Jul	33 (31)	51 (59)	73 (90)
10.	Ramrod 3 l pre + 2 l post-planting	10 Jul	28 (23)	54 (65)	71 (88)
11.	Ramrod 6 l band post-planting	10 Jul	38 (38)	47 (54)	76 (92)
12.	Tribunil pre-planting	10 Jul	34 (32)	49 (58)	73 (89)
SED (33 df) for comparing all treatments		1.3	6.0	5.5	5.9
LSD (5%)		3	12	11	12

The date of 50% harvest was delayed where Ramrod Flo at 6 l/ha had been used pre-planting and where CIPC had been applied both on its own or with a follow up spray of Ramrod Flo at 2 l/ha post-planting.

The number of Class I heads (iceberg quality) was reduced where Ramrod Flo at 6 l/ha had been used pre-planting according to the off-label approval. The use of Ramrod Flo post-planting did not appear to affect crop quality except where it had also been applied pre-planting.

The number of Class II heads (crisp quality) was related to the number of Class I heads. The only significant difference in the number of marketable heads was between the control and the Ramrod Flo applied to 6 l/ha pre-planting where there was a significant reduction.

The mean weight of marketable heads was similar for all treatments except for the pre-planting application of Ramrod Flo at 6 l/ha compared to where Ramrod Flo had been used post-planting (Appendix III).

Crop quality was very good with only negligible numbers of poorly shaped heads.

Conclusions

1. Ramrod Flo when used according to the current Specific Off-Label Approval (SOLA) adversely affected early crop vigour, gave only intermediate weed control and reduced crop quality at harvest.

2. Ramrod Flo when used at 2, 4 or 6 l/ha post-planting appeared safer to the crop and provided good control of weeds, particularly Groundsel at the two higher rates. At harvest there was no delay in crop maturity and a high proportion of Class I heads were produced.

3. The use of Ramrod Flo both pre and post-planting appeared to have a greater detrimental affect on crop quality at harvest than a single application made post-planting.

4. The use of CIPC pre-planting followed by Ramrod Flo at 2 l/ha post-planting enhanced the control of Groundsel compared to where CIPC had been used alone with no adverse affect on crop quality.

5. The post-planting use of Ramrod Flo at 3 l/ha and Kerb at 1.1 kg/ha appeared safe to the crop with no adverse affect on crop maturity or yield.

6. Tribunil at 0.5 l/ha had no detrimental affect on crop quality at harvest but gave poor control of Common Chickweed and Groundsel.

7. The application of Ramrod Flo at the higher rates to a moist seedbed appeared to improve the control of Common Chickweed compared to where no irrigation had been applied.

8. Weed growth within the trial area was low and so the effect of the treatments on yield and quality has been more fully tested than the efficacy of the products.

Recommendations

1. The trial should be repeated in 1993 due to the good results achieved using Ramrod Flo after planting.

2. Tribunil should be included again but at higher rates.

3. The effect of soil moisture on herbicide efficacy requires further study.

APPENDIX I: CROP DIARY (Field E)

20 April	Saladin sown in 37 mm peat blocks (B2).
19 May	125 kg/ha N; 250 kg/ha P_2O_5; 125 kg/ha K_2O.
21 May	Fertiliser incorporated. Irrigation (15 mm) to Replicates I and IV.
22 May	Pre-planting herbicides applied. Trial planted. Irrigation 10 mm.
23 May	Planted CIPC treated plots. Irrigated 10 mm.
28 May	Post-planting herbicides applied.
8 June	Rovral @ 380 g/760 l/ha water.
10 June	Metasystox @ 420 g/1000 l/ha water.
12 June	Irrigated 15 mm.
14 June	Favour @ 1.5 l/760 l/ha water.
17 June	Pirimor @ 500 g/600 l/ha water. Ambush @ 250 ml/600 l/ha water (cutworm control). Top dressed 40 kg/ha N.
21 June	Irrigated 15 mm.
25 June	Irrigated 15 mm.
7 July	Harvest
10 July	Harvest
14 July	Harvest
16 July	Harvest

APPENDIX II:

Table A: Number of Chickweed plants per plot (11 m^2)

Treatment		Number of Chickweed Plants			
		Replicate I	Replicate II	Replicate III	Replicate IV
1.	Control	45	25	38	38
2.	Ramrod 6 l pre-planting	6	30	40	14
3.	Ramrod 6 l + Treflan	1	2	5	5
4.	Ramrod 2 l post-planting	10	24	44	47
5.	Ramrod 4 l post-planting	2	8	20	1
6.	Ramrod 6 l post-planting	2	13	19	7
7.	CIPC pre-planting	1	4	7	6
8.	CIPC pre-planting + Ramrod 2 l post-planting	3	4	2	7
9.	Ramrod 3 l + Kerb 1.1 kg post-planting	2	1	0	18
10.	Ramrod 3 l pre + 2 l post-planting	12	22	20	7
11.	Ramrod 6 l band post-planting	7	11	23	2
12.	Tribunil pre-planting	17	32	42	28

Note: Irrigation 15 mm was applied on 21 May to Replicates I and IV only.

APPENDIX III

Table B: Mean head weight (g) and number of Class I heads over 600 (g) - angle transformation (actual percentage in brackets).

Treatment	Mean Head Weight (g)	Class I Heads (over 600 g) (%)
1. Control	598	22 (18)
2. Ramrod 6 l pre-planting	535	16 (8)
3. Ramrod 6 l + Treflan	567	15 (9)
4. Ramrod 2 l post-planting	610	26 (22)
5. Ramrod 4 l post-planting	618	32 (30)
6. Ramrod 6 l post-planting	591	25 (18)
7. CIPC pre-planting	576	20 (13)
8. CIPC pre-planting + Ramrod 2 l post-planting	565	25 (20)
9. Ramrod 3 l + Kerb 1.1 kg post-planting	563	21 (14)
10. Ramrod 3 l pre + 2 l post-planting	558	17 (9)
11. Ramrod 6 l band post-planting	595	24 (18)
12. Tribunil pre-planting	570	21 (13)
SED (33 df) for comparing all treatments	27.6	6.9
LSD (5%)	56.3	14.1

There were significant differences between the use of Ramrod Flo pre-planting and where Ramrod Flo had been applied post-planting.