CONTRACT REPORT

No. AR/92/10

Lettuce: Timing of Herbicides

HDC FV118

Part II - organic soil site

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 ..... 7.1.93 .....

Colin Speller, Contract Manager

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Summary

Sixteen herbicide programmes were applied to a crop of lettuce (cv. Saladin for "Iceberg" presentation which was transplanted on 11 June 1992 into a loamy peat soil on a grower's holding in Cambridgeshire. The range of products comprised Ramrod Flo (propachlor), Kerb Flo (propyzamide), CIPC (chlorpropham), Tribunil (methabenzthiazuron), and Stomp (pendimethalin).

None of the herbicide programmes deleteriously affected either early crop vigour or the yield at harvest on 4-5 August.

Pre-planting applications of Ramrod Flo alone gave relatively poor weed control. Weed control was improved by the sequential use of pre- and post-planting applications of Ramrod Flo. Weed control was improved further by the use of post-planting applications of Ramrod Flo, either in programmes or in tank-mix with Kerb Flo, CIPC or Stomp. The best overall treatment was a combination of Stomp, applied immediately pre-planting, followed by a tank mixture of Ramrod Flo and CIPC applied four days after planting.

Band-sprayed herbicides looked promising for reducing the overall quantity of active ingredient applied per hectare.

Objective

To compare a range of herbicide rates and combinations for a transplanted crop of lettuce on a peaty soil.

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Materials and Methods

Site

This experiment was conducted at G S Shropshires and Sons Ltd., Barway, Ely, Cambridgeshire in 1992. The soil type was a loamy peat with approximately 35% organic matter content overlying fen clay.

Treatments

a. Untreated control

Single chemical treatments

b. Ramrod Flo at 6 l/ha pre-planting
c. Ramrod Flo at 3 l/ha pre-planting
d. Ramrod Flo at 6 l/ha post-planting
e. Ramrod Flo at 4 l/ha post-planting
f. Ramrod Flo at 6 l/ha post-planting as an inter-row band
g. Ramrod Flo at 3 l/ha pre-planting and 2 l/ha post-planting
h. Kerb Flo at 3.5 l/ha post-planting
i. Kerb Flo at 1.8 l/ha post-planting
j. Kerb Flo at 3.5 l/ha post-planting and irrigated within 3 hours (10 mm)
k. CIPC at 6 l/ha post-planting
l. CIPC at 4 l/ha post-planting
m. CIPC at 6 l/ha post-planting as an inter-row band
n. Tribunil at 0.5 l/ha pre-planting

Chemical combination treatments

o. Ramrod Flo at 3 l/ha + Kerb Flo at 1.75 l/ha post-planting
p. CIPC at 3 l/ha + Kerb Flo at 1.75 l/ha post-planting
q. Stomp at 5.6 l/ha pre-planting, then + Ramrod Flo at 2 l/ha + CIPC at 4 l/ha as a tank mixture post-planting.

Certain treatments were not approved (see Appendix I), and were applied by experimental permit only. The lettuces from these plots were destroyed.

Treatment application

All treatments were applied in 500 l/ha water using an Oxford Precision Sprayer at 2 bar pressure, using 11003 nozzles.

Husbandry

Lettuce (cv. Saladin) in 38 mm^3 peat blocks, supplied by a commercial propagator , was planted by machine into the trial area on 11 June 1992 following the application of a range of pre-planting herbicide treatments. Four days later, the post-planting herbicide treatments were applied. The trial was sited within a commercial crop of lettuce and was given the normal husbandry inputs other than herbicides (Appendix II). The trial was harvested on 4-5 August when the rest of the field was also cut. The lettuces were trimmed to "Iceberg" standard of presentation, but only sent to market where an approved herbicide regime had been used.

Assessments

Early crop vigour was assessed on 15 and 23 June by recording an overall score (0-10) per plot. Further vigour scores were made by assessing ten plants per plot on 2, 9 and 15 July. The total number of weeds per plot was counted on 9 and 15 July. Assessments of overall weed control (score 0-10) were made on 2, 9 and 15 July and on 4 August. A single harvest was taken on 4 August for replicates 1 and 2, and on 5 August for replicate 3, when thirty plants per plot were cut, trimmed and weighed, then graded as either 'Iceberg' (if they weighed at least 500 g and had an attractive round head) or as 'crisp' (still saleable but either loose or with a slightly poor head shape). Weather data were recorded at approximately eight miles away from the trial site (Appendix III).

Design and analysis

The trial design was a randomised block with three replicates. Each plot was a 2.08 m bed width by 6 m in length, with four rows per bed at 41-50-41 cm spacing, and an in-row spacing of 27 cm (to give 7.3 plants/m^2).

The data were subjected to analyses of variance, which included angular transformations where appropriate.

Results and Discussion

Plant establishment and vigour

There was a full stand of lettuce on each plot following gapping-up on 12 June, and no further plant loss occurred before harvest. The plants established quickly with irrigation and showed no signs of loss of vigour from any of the herbicide treatments.

Yield and quality

The yield results are given in Table 1 and shown in Figure 1. There were, on average 61 % of Iceberg lettuce (Class I, mean head weight 900 g), and 29 % of crisp (Class II, mean head weight 716 g). The reasons for down-grading from Iceberg to crisp were for poor head quality or looseness. Treatments d, h, l, m and q had significantly ($P<0.05$) more marketable lettuce (as Total Class I + II) than the untreated control (Table 1).

Defective lettuce

There were, on average, 4.8 % of rotten lettuce, comprising 2.1 % with bacterial soft rot and 2.7 % with tipburn. The remainder of the non-marketable lettuce were small (less than 500 g) with no significant differences between the treatments.

Table 1. Percentage of Iceberg (Class I over 500 g), Crisp (Class II over 500 g) and Total Classes I and II over 500 g. Angular transformed data, with actual percentages in parentheses.

Herbicide	Rate (l/ha)	Timing (pre- or post-planting)	Iceberg Class I	Crisp Class II	Total I + II
a. Untreated			44 (47)	36 (36)	66 (83)
b. Ramrod Flo	6	pre	45 (50)	34 (31)	64 (81)
c. Ramrod Flo	3	pre	48 (54)	35 (33)	70 (88)
d. Ramrod Flo	6	post	60 (76)	27 (21)	82 (97)
e. Ramrod Flo	4	post	53 (63)	31 (28)	74 (91)
f. Ramrod Flo	6	post (inter-row)	57 (69)	23 (17)	68 (86)
g. Ramrod Flo	3 + 2	pre + post	51 (59)	33 (31)	72 (90)
h. Kerb Flo	3.5	post	58 (71)	28 (22)	79 (93)
i. Kerb Flo	1.8	post	52 (61)	28 (23)	67 (84)
j. Kerb Flo	3.5	post + irrigation	50 (58)	31 (27)	67 (84)
k. CIPC	6	post	49 (57)	34 (33)	72 (90)
l. CIPC	4	post	53 (63)	33 (31)	79 (94)
m. CIPC	6	post (inter-row)	49 (58)	39 (39)	78 (97)
n. Tribunil	0.5	pre	52 (62)	32 (29)	72 (90)
o. Ramrod Flo + Kerb	3 + 1.75	post	58 (70)	28 (22)	77 (92)
p. CIPC + Kerb	3 + 1.75	post	45 (50)	40 (42)	74 (92)
q. Stomp, Ramrod + CIPC	5.6, 2+4	pre + post	56 (68)	31 (27)	79 (94)
Mean			52 (61)	32 (29)	73 (90)
L.S.D. (32 d.f.) of angular transformed data			13.2	11.8	12.0

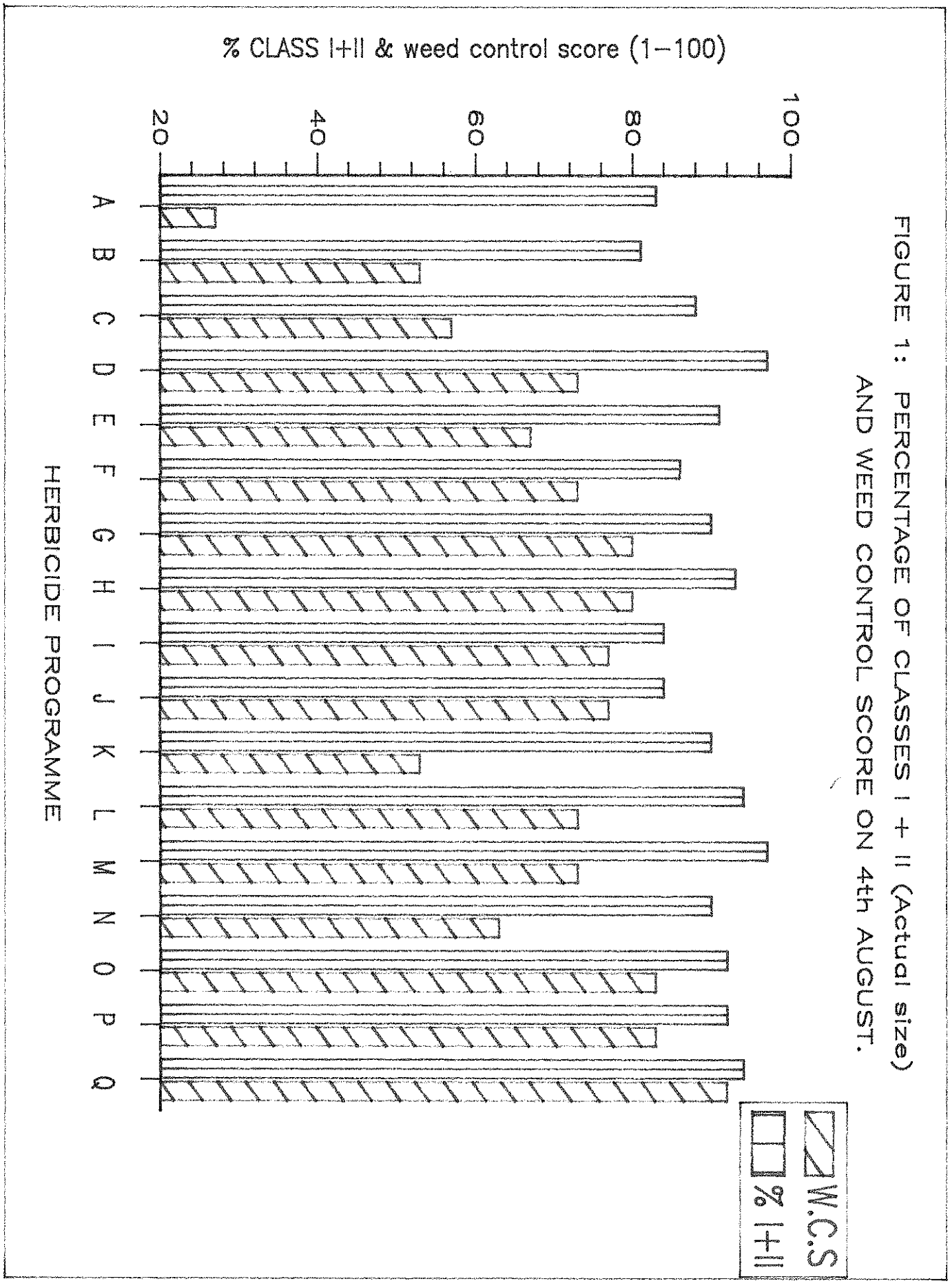

FIGURE 1: PERCENTAGE OF CLASSES I + II (Actual size) AND WEED CONTROL SCORE ON 4th AUGUST.

Weed control

The first assessment of weed control was made on 2 July. At that time weed control over the whole site, and on the adjacent commercial crop, was fairly good. Weed control was mediocre on the untreated plots but better on treatments j, l, m, p, o and q. By 9 July, the weeds had begun to develop on the untreated plots with treatments f, g, h, o, p and q better than the control. On 15 July, weed numbers on the untreated plots were very high (i.e. >10/m^2 with all treatments, better ($P<0.05$) than the control (Table 2). The results for the final assessment on 4 August are also shown in Table 2 and in Figure 1. The best programme was the combination of Stomp applied pre-planting followed by the tank mixture of Ramrod Flo and CIPC (treatment q). The other herbicide combinations of Ramrod Flo and Kerb Flo (treatment o) or CIPC and Kerb Flo (treatment p) as post-planting tank mixed applications also proved particularly effective.

The use of pre-planting applications of Ramrod Flo according to the off-label approval appeared less effective than the other treatments and did not adequately control chickweed or groundsel. The post-planting use of Ramrod Flo gave good control of groundsel where it had been applied at either 6 l/ha or 3 l/ha pre-planting and 2 l/ha post-planting.

There appeared to be little merit in irrigating within three hours of applying Kerb Flo, against a background of adequate soil moisture and irrigation within 24 hours of planting the crop.

Table 2. Number of weeds/m² on 15 July and weed control score on 4 August.

Herbicide	Rate (l/ha)	Timing (pre-or post-planting)	weeds/m²	weed control score #
a. Untreated			10.8	2.7
b. Ramrod Flo	6	pre	5.7	5.3
c. Ramrod Flo	3	pre	4.8	5.7
d. Ramrod Flo	6	post	4.5	7.3
e. Ramrod Flo	4	post	3.4	6.7
f. Ramrod Flo	6	post (inter-row)	1.8	7.3
g. Ramrod Flo	3 + 2	pre + post	3.0	8.0
h. Kerb Flo	3.5	post	3.2	8.0
i. Kerb Flo	1.8	post	2.1	7.7
j. Kerb Flo	3.5	post	4.3	7.7
k. CIPC	6	post	5.3	5.3
l. CIPC	4	post	3.5	7.3
m. CIPC	6	post (inter-row)	1.6	7.3
n. Tribunil	0.5	pre	5.6	6.3
o. Ramrod Flo + Kerb	3 + 1.75	post	2.2	8.3
p. CIPC + Kerb	3 + 1.75	post	1.7	8.3
q. Stomp, Ramrod Flo + CIPC	5.6, 2 + 4	pre + post	1.4	9.2
Mean			3.8	7.0
L.S.D. (32 d.f.)			3.96	2.57

0 = poor, weedy; 10 = very good, weed free.

The use of the inter-row band applications of herbicides (f and m), which used approximately 60 % of the herbicide, appeared quite promising for a low-input system of production. There were a few weeds present within the row but these had been partially suppressed by the close in-row spacing plants.

Overall, the weed numbers did not hinder the harvesting operation nor affect quality in this season except for the untreated control. A list of species present for each treatment is given in Appendix IV.

Conclusions

1. None of the herbicide programmes had a deleterious effect upon either crop vigour or yield.

2. The combinations or tank mixtures of products appeared to give better weed control than the single chemical treatments when assessed on 15 July and 4 August.

3. The use of a post-planting application of Ramrod Flo looked promising, either in conjunction with an earlier pre-planting spray of Ramrod Flo (treatment g), or in a tank mixture with Kerb Flo (treatment o), or in a programme with Stomp at pre-planting and CIPC post-planting. The post-planting use of Ramrod Flo gave superior control of groundsel, but poor control of chickweed.

4. The best overall programme was treatment q, where Stomp was applied immediately pre-planting and Ramrod Flo and CIPC were applied as a tank mixture four days after planting.

5. The inter-row band-spraying of herbicides (treatments f and m) looked promising for reducing the overall herbicide requirement whilst maintaining adequate weed control.

6. The use of irrigation within three hours of applying Kerb Flo (treatment j) did not prove beneficial in this season.

Recommendations

1. A wider range of herbicide combinations and tank mixtures of the products initially tested in this experiment should be evaluated.

2. The experiment should be repeated on further sites, and both early and later in the season, to ensure the evaluation of herbicides against a background of intense weed pressure.

3. The most promising herbicide combinations could be evaluated on minor salad crops of the lettuce and chicory types.

Acknowledgements

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Appendix I

Status of chemicals

a.
b. approved (off label)
c. approved (off label)
d. not approved
e. not approved
f. not approved
g. not approved
h. approved
i. approved
j. approved
k. not approved (CIPC at 3 l/ha post-planting is approved)
l. not approved
m. not approved
n. not approved
o. not approved
p. approved
q. not approved (Stomp has an OLA).

Appendix II

Management of the trial site

Site: A loamy peat with approximately 35 % organic matter content overlaying fen clay.

Crop diary

Cultivations

10 June	formation of beds
11 June	planted by machine
12 June	gapped plants

Herbicides

11 June	pre-planting herbicide treatments applied
15 June	post-planting herbicide treatments applied

Insecticides

23 June	Pirimor 100 g/200 l/ha (for lettuce root aphid control)
27 June	Pirimor
30 June	Pirimor
4 July	Pirimor
10 July	Pirimor
14 July	Pirimor
20 July	Pirimor
24 July	Pirimor
29 July	Pirimor

Fungicides

27 June	Zineb 2 kg/ha in 200 l/ha
14 July	Rovral 50 g in 100 l/ha
20 July	Zineb 2 kg/ha in 200 l/ha

Fertiliser

11 June	100 kg/ha N

Irrigation

12 June	20 mm (3/4")
16 June	20 mm (3/4")
29 June	20 mm (3/4")

Harvest

4 August (replicates 1 and 2)

5 August (replicate 3)

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Appendix III

Temperature (°C) and Rainfall (mm) from 11 June to 4 August at ADAS Arthur Rickwood (approximately 8 miles from trial site)

Week beginning	Temperature extremes (°C) Air max.	Air min.	Grass min.	Rainfall (mm)
11 June	26.8	9.4	4.8	0
18 June	21.2	5.1	2.0	8.6
25 June	30.0	8.5	4.4	5.3
2 July	21.2	9.3	8.0	13.1
9 July	22.5	10.3	3.8	37.2
16 July	25.2	8.7	4.9	30.2
23 July	26.1	7.5	2.6	3.4
30 July	27.7	10.1	8.4	0.5

Appendix IV

Weed species present on 15 July (# present; * dominance)

Herbicide	Weed species													
	AMG	BBW	BNS	CW	FH	GF	GS	KG	MW	PP	RS	ST	TT	WH
a. Untreated	#	#	#	#	*	#	#	#	#	#	#	#	#	#
b. Ramrod Flo			#	#	*	#	*		#		#	#	#	#
c. Ramrod Flo			#		*	#			#		*	#	#	#
d. Ramrod Flo			*	#	#			#			*	#		#
e. Ramrod Flo		#	#	*	*	#	*		*		*	#	*	#
f. Ramrod Flo		#	#	*	#						*	#	*	
g. Ramrod Flo			#		*	#	#				*	#	*	*
h. Kerb Flo		#	#	#	*	#	#		#			*	#	#
i. Kerb Flo		#	#	*	*	#	*			#	#	*	#	#
j. Kerb Flo		#	#	#	*	#						*	*	#
k. CIPC		*	#		*	#			#		*	*	*	
l. CIPC	#	#	#		*	*	#				*	*	*	
m. CIPC	#		#		#	#	#		#		*	*	*	
n. Tribunil		#	#	#	#	*			#		*	#	*	#
o. Ramrod Flo + Kerb		#	#	#	*	#	*		#		#	*	#	#
p. CIPC + Kerb		#	*		*		#		#			*	#	#
q. Stomp, Ramrod Flo + CIPC					*		*				#	*	#	

Key

AMG = Annual meadow grass **BBW** = Black bindweed **BNS** = Black nightshade

CW = Chickweed **FH** = Fat Hen **GF** = Goosefoot

GS = Groundsel **KG** = Knot grass **MW** = Mayweed

PP = Poppy **RS** = Redshank **ST** = Sowthistle

TT = Thistle **WH** = Willowherb

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