WEED CONTROL TRIALS IN VEGETABLES AT LEVIN 1961-62

W. R. BOYCE

Horticultural Research Station, Levin

Summary

Experiments on carrots, cauliflower, french beans and sweet corn carried out at Levin during the 1961-62 season are reported. Special attention was paid to the testing of the substituted triazine group of chemicals as pre-emergence herbicides in screening trials and yield trials. Factors affecting the action of these chemicals are listed and results are shown in terms of yields, crop tolerances and herbicidal activity in relation to specific weeds.

INTRODUCTION

THE EXPERIMENTS reported here, part of the programme of weed control research on vegetables carried out during the 1961-62 season, were all laid down at Levin Horticultural Research Station on Levin silt loam.

Screening trials consisted of two replications of a large number of herbicide treatments, and yield trials had six or more replications of fewer treatments and randomized block designs were used in all cases.

Standard plot sizes of 12 ft × 6 ft were used except for sweet corn and cauliflower which had larger plots.

Herbicides were applied the day after sowing whenever possible. A special plot sprayer Horticultural Research Station Mk. II, fitted with 6 "Spraying Systems" 8001E band fan nozzles set 9 in. above ground level was used for all spraying work. The pressure used was 20 lb/sq. in. and the delivery was approximately 30 gal/ac.

Assessments of herbicidal activity and crop tolerance and vigour were made by scoring on 0 to 5 scales, in which 0 = no weeds and 5 = complete weed cover in weed control ratings, and 0 = all plants killed and 5 = plants unaffected in a crop tolerance and vigour rating.

Weed scores are the means of the plot scores in a treatment and have not been statistically analysed.

Quantities of chemicals used are expressed in terms of active ingredient per acre.

CARROTS SCREENING TRIAL

Variety Chantenay Red Core. Sown September 25, 1961. Sprayed September 26 pre-em.; November 1 post-em. with DCMA. Harvested March, 1962. Rows 12 in., seed sown ¼ to ½ in. deep, carrots thinned to 2 in.

The soil was moist to wet at the time of spray application; 0.45 in. of rain fell on the night of September 26 and 0.63 in. the following ten days. No rain fell for four days after the post-em. applications of DCMA on November 4.

This trial area compacted hard and later cracked in dry weather which prevailed during November. Growth and development of carrots was retarded over the whole trial in the early stages.

RESULTS

Weed Control

The best weed control was given by propazine 1.5, ametryne 1.5, prometryne 1.5, and amiben at 6 lb.

TABLE 1: YIELDS AND WEED CONTROL RATINGS

Treatments (lb)		Yields of Carrots including tops (tons/ac.)	Weed Control Rating Dec. 28, 1961	Crop Tol- erance Vigour Dec. 28, 1961
1. Ametryne	0.75	25.7 abcd	4.5	4.0
2. Ametryne	1.50	33.2 ab	2.0	3.5
3. Prometryne	0.75	11.3 ef	5.0	2.5
4. Prometryne	1.50	31.7 ab	2.5	4.0
5. G34698	0.75	17.2 de	4.0	2.5
6. G34698	1.50	17.5 de	4.0	3.0
7. G34361	0.75	11.4 ef	5.0	2.0
8. G34361	1.50	23.4 bcd	5.0	2.0
9. Amiben	3.0	26.1 abcd	4.5	4.0
10. Amiben	6.0	31.3 ab	2.5	3.5
11. DMPA	8.8	4.6 f	5.0	1.5
12. DMPA	17.6	7.1 ef	5.0	1.5
13. DCMA	3.2	18.8 cde	5.0	2.5
14. DCMA	6.4	17.0 de	4.5	2.0
15. Propazine	0.75	30.2 abc	3.5	3.0
16. Propazine	1.50	36.8 a	1.0	3.5
17. HWC*		31.0 ab	1.25	5.0
C.V.		22.7%		

* Mean yield based on four plots. All other means on two plots.

The weed control rating in Table 1 is according to the grading where 1 = very good to 5 = poor.

Ametryne at 0.75, prometryne at 0.75, G34361 0.75 and 1.5, DMPA at 8.8 and 17.6, and DCMA 3.2 and 6.4 lb all gave very poor weed control.

DCMA induced a dominant weed cover of *Plantago major*, and DMPA a smother of twin cress (*Coronopus didymus*). The weeds reduced the yields of carrots very considerably. In addition to these two weeds, *Polygonum persicaria*, *Chenopodium album*, *Rumex obtusifolius*, *Spergula arvensis*, *Solanum nigrum*, *Sisymbrium officinale* and *Brassica oleracea* were the most common weeds.

Crop Tolerance

No specific damage by herbicides was noted apart from retardation of growth by poor soil conditions and weed competition.

CONCLUSION

Propazine 0.75 and 1.5 lb, ametryne and prometryne at 1.5 lb and amiben at 6 lb are the most promising treatments.

CARROTS YIELD TRIAL

Variety Chantenay Red Core. Sown September 25, 1961. Sprayed September 26, 1961; all pre-em. Harvested March, 1962. Other details as for the screening trial which was sown at the same time on an adjoining area. Poor soil conditions retarded the crop, and probably caused the high proportion of reject roots.

RESULTS

Weed Control

Propazine and ipazine at all rates were very much better than chlorpropham which gave very poor weed control, especially of twin cress.

Ipazine was more active than propazine at 0.5 lb and is more effective than propazine on twin cress. On the other hand, ipazine is less effective than propazine on groundsel (*Senecio vulgaris*).

TABLE 2: YIELDS OF CARROTS
(tons/ac)

	<i>Treatment (lb)</i>		<i>Saleable Roots</i>		<i>Reject Roots</i>		<i>Total Roots + Tops</i>
1.	Chlorpropham	4.0	10.9 c B		8.3 d B		27.2 c B
2.	Propazine	0.5	15.1 b A		12.9 c A		38.7 b A
3.	Propazine	1.0	17.3 ab A		14.8 abc A		44.1 a A
4.	Propazine	2.0	17.9 ab A		15.4 ab A		45.5 a A
5.	Ipazine	0.5	17.7 ab A		15.3 ab A		44.9 a A
6.	Ipazine	1.0	15.9 b A		13.3 bc A		40.5 ab A
7.	Ipazine	2.0	17.0 ab A		15.9 a A		44.8 a A
8.	HWC		19.1 a A		14.3 abc A		44.2 a A
	C.V.		16.6%		14.8%		11.6%

Crop Tolerance

No damage to carrots by herbicides was noted apart from weed competition effects.

CONCLUSION

In yield of marketable roots, hand-weeding gave the best results but it was not significantly higher than propazine at 1 and 2 lb and ipazine at 0.5 and 2 lb. The slightly lower yield obtained with ipazine at 1 lb by comparison with the 0.5 lb rate is most probably a chance effect.

The low yield from chlorpropham treatments was almost certainly due to poor weed control and weed competition. Failure to control twin cress was the main shortcoming.

The greater effectiveness of ipazine at the lowest rate, particularly against twin cress, is worth noting, as also is its lack of effectiveness against groundsel, by comparison with propazine.

FRENCH BEANS SCREENING TRIAL

Variety Topcrop. Sown November 3, 1961. Rows 18 in., seed 2 in. apart, 1½ to 2 in. deep. Sprayed November 7, 1961, soil dry and dusty, temperature 62° to 63°F. After spraying rainfall + 10 days 0.93 in. Evaporation + 10 days 1.18 in. Harvested January 10 and 18, 1962.

RESULTS

TABLE 3: YIELD OF BEANS

	<i>Treatments (lb)</i>		<i>Saleable beans (tons/ac.)</i>
1.	Ametryne	0.75	7.9 abc A
2.	Ametryne	1.50	9.2 ab A
3.	Propazine	0.75	9.4 a A
4.	Propazine	1.50	9.5 a A
5.	Prometryne	0.75	6.9 c A
6.	Prometryne	1.50	9.2 ab A
7.	G34698	0.75	8.8 abc A
8.	G34698	1.50	9.3 ab A
9.	2,6-DBN	2.00	7.2 bc A
10.	2,6-DBN	4.00	6.8 c A
11.	HWC*		8.7 abc A
	C.V.		10.7%

* Mean yields based on four plots. Other treatment means on two plots.

Weed Control

Propazine gave good weed control at 1.5 and fair weed control at 0.75 lb.

Ametryne, prometryne and G34698 gave very poor weed control at 0.75 lb but it was better at 1.5 lb, particularly in the case of G34698. The trend to lower yields with ametryne and prometryne at the lower rate is almost certainly due to the effects of weed competition and inadequate weed control.

Crop Tolerance

At 4 lb 2,6-DBN severely injured the beans and there were many losses in this plot. At 2 lb there was retardation in growth and a few losses.

This material was applied to the surface and lightly raked in immediately after sowing.

No other herbicides showed signs of severe injury though there was some evidence of minor effects.

CONCLUSIONS

Propazine 0.75 and 1.5, ametryne 1.5, G34698 1.5, and prometryne 1.5 lb gave the best results for yields, crop tolerance and weed control. Weed control was better with propazine.

FRENCH BEANS YIELD TRIAL

Variety Topcrop. Sown November 3, 1961. Rows 18 in. apart, seed 2 in. apart in row, and 1½ to 2 in. deep. Sprayed November 7, 1961. Soil dry and dusty. Rainfall + 10 days 0.93 in. Evaporation 1.18 in. Harvested January 10 and 18, 1962.

RESULTS

TABLE 4: YIELD OF BEANS

Treatments (lb)		Saleable Beans (tons/ac.)		
1. Simazine	0.5	.....	.....	7.6 b B
2. Simazine	1.0	.....	.....	9.4 a A
3. Simazine	2.0	.....	.....	9.4 a A
4. Ipazine	0.5	.....	.....	7.9 b B
5. Ipazine	1.0	.....	.....	9.2 a A
6. Ipazine	2.0	.....	.....	9.7 a A
7. Amiben	1.0	.....	.....	6.9 b B
8. HWC	.....	.....	.....	9.5 a A
C.V.				10.2%

Weed Control

Amiben at 1 lb gave very poor weed control. The weeds overtopped the beans and made harvesting difficult. Simazine at 0.5 lb gave poor weed control, at 1 lb good and at 2 lb very good weed control. Ipazine at 0.5 lb was poor to very poor, at 1 lb fair and at 2 lb good to very good. Groundsel, and to a lesser extent *Solanum nigrum*, were resistant to ipazine. Purslane (*Portulaca oleracea*) was an aggressive weed on hand-weeded control plots.

It should be noted that the dry conditions which prevailed at the time of application of these herbicides and for ten days afterwards were detrimental to the activity of these soil-applied pre-em. herbicides.

Crop Tolerance

Simazine at 2 lb appeared to have some depressing effect on the growth of beans and ipazine at 2 lb a slight effect, but this was not apparent in the final yields. In fact, the yield from ipazine at 2 lb was higher but not significantly better than hand-weed control.

CONCLUSION

Simazine at 1 and 2 lb and ipazine 1 and 2 lb gave the best results. There was evidence of a slight depression in growth with simazine at 2 lb. With ipazine at the same rate this was less marked. In neither case were the yields reduced, but, had rainfall and soil moisture conditions been more favourable to triazine activity, simazine might have depressed growth more severely.

SWEET CORN

Variety Golden Cross Bantam. Sown October 26, 1961, and germinated by November 6. Sprayed October 31; all herbicides pre-em. Harvested in three picks, February 7, 14, 21, 1962.

Plots 18 ft × 12 ft rows, 3 ft apart, plants 12 in. Seed sown 2 in. deep. Rain fell prior to sowing on October 5. The soil was in good condition when sprayed and temperatures at 1 in. depth ranged from 69 to 73°F during the day. Two points (0.02 in.) of rain fell ten days after spraying. Hand-weeding was done on control plots on December 5, 1961.

RESULTS

TABLE 5: YIELD OF SWEET CORN

Treatments (lb)			(a) No. per plot	Yield* (b) tons per ac.	(c) 10-cob weight (lb)
1. Simazine	1.0	.....	179 bcd AB	9.2 bcd ABC	3.9 b A
2. Simazine	2.0	.....	216 ab A	10.9 ab AB	4.0 ab A
3. Atrazine	1.0	.....	206 abc AB	10.7 ab AB	4.1 ab A
4. Atrazine	2.0	.....	220 a A	11.5 a A	4.2 a A
5. Ametryne	1.0	.....	171 cd AB	8.0 d C	4.1 ab A
6. Ametryne	2.0	.....	215 ab A	10.6 ab AB	4.0 ab A
7. Prometryne	1.0	.....	162 d B	8.5 cd BC	3.9 b A
8. Prometryne	2.0	.....	191 abcd AB	9.6 bcd ABC	4.0 ab A
9. HWC†	.....	.....	192 abcd AB	10.1 abc ABC	4.2 a A
C.V.	.....	.....	14.7%	14.5%	5.0%

† Hand-weeded control means are based on 12 plots. All other means are on six plots.

* Key to Yields

(a) Marketable sweet corn, numbers of heads.

(b) Marketable sweet corn, weight of cobs plus sheaths.

(c) Weight of marketable cobs stripped of sheaths.

Weight of three 10-cob samples and mean result expressed in lb.

TABLE 6: WEED CONTROL SHORTLY BEFORE HARVEST—
SWEET CORN

Treatment (lb)			All weeds	Rating
Ametryne	1	.....	3.6	Fair to poor
Ametryne	2	.....	2.6	Fair to good
Atrazine	1	.....	1.6	Good to very good
Atrazine	2	.....	0.0	Excellent
Prometryne	1	.....	4.2	Poor
Prometryne	2	.....	2.3	Fair to good
Simazine	1	.....	2.4	Fair to good
Simazine	2	.....	0.8	Very good
HWC	.....	.....	1.2	Very good
HWC	.....	.....	1.0	Very good

Weed Control

Atrazine at 2 lb gave excellent weed control of all annual weeds for the duration of the trial. Simazine at 2 lb gave very good control

for the same period. Atrazine at 1 lb gave good to very good control while simazine at the same rate gave fair to good control. Ametryne and prometryne at 1 lb gave poor control and prometryne was not as good as ametryne.

It is noticeable that yields follow the pattern of weed control—the better the degree of weed control, the higher the yields in weight and numbers of cobs, and weight of cobs stripped of sheaths as shown by the mean sample weights in Table 5. Weed control ratings made before harvest are shown in Table 6.

Crop Tolerances

Neither simazine nor atrazine showed the slightest effect on the sweet corn which is known to be very tolerant of these herbicides, nor was there any definite and lasting effect from the methylmercapto triazines ametryne and prometryne. The poorer weed control given by the 1 lb rate of these materials did give a marked reduction in vigour in the sweet corn.

CONCLUSION

Atrazine at 2 lb was the best material, and simazine at 2 lb and atrazine at 1 lb were about equal.

CAULIFLOWER SCREENING TRIAL

Variety Phenomenal Four Months. Sown October 3, 1961, in seedbed. Planted November 23, 1961. Sprayed post planting pre-em. November 24, 1961, treatments 1 to 15. Post planting post-em. December 18, 1961, treatments 16 to 18. Irrigated December 16, 1961 = ½ in. January 5, 1962 = 1 in. Harvested from January 31 to March 19, 1962. Plot size 20 ft by 6 ft, with 3 rows 2 ft apart and cauliflower plants 2 ft in the row.

The soil was dry at the time of planting as indicated by a soil moisture tension reading of 31.0 cm at the Station's meteorological installation (S.M.T. at field capacity—5 cm, wilting point 60 cm).

Soil temperatures on November 24, 1961, at 1 in. ranged from 62 to 70°F while spraying was in progress.

TABLE 7: YIELD OF CAULIFLOWER

Treatments (lb)		Yields	
		Marketable heads Plus hand-weed	heads (tons per acre) No hand-weeding
1. Simetryne	1.50	4.3 ab	3.3 cdef
2. Simetryne	3.0	6.4 a	3.5 cde
3. Ametryne	0.75	5.4 ab	3.5 cde
4. Ametryne	1.50	5.6 ab	5.2 abc
5. Prometryne	0.75	4.8 ab	1.2 fg
6. Prometryne	1.50	4.6 ab	4.6 abcd
7. G34360	0.75	4.4 ab	2.5 defg
8. G34360	1.50	5.9 a	3.9 cde
9. Simazine	0.75	6.1 a	4.0 bcde
10. Simazine	1.50	5.7 ab	5.1 abc
11. Propazine	0.75	4.6 ab	4.3 bcde
12. Propazine	1.50	4.9 ab	3.7 cde
13. Ipazine	0.75	4.9 ab	6.2 ab
14. Ipazine	1.50	4.5 ab	6.6 a
15. CDEC	6.0	5.9 a	2.1 efg
16. SMCA	15.0	5.5 ab	2.9 cdefg
17. DCMA	3.0	3.7 ab	0.9 g
18. DCMA	6.0	3.1 b	0.8 g
19. HWC*		5.1	
C.V.		22.7%	26.6%

* Based on four main plots: not included in the analyses. Other means based on two sub-plots only.

Rainfall for 10 days following weedicide application was 0.97 in. and evaporation 1.62 in.

For the post-em. applications on December 18, 1961, the weather was bright and sunny with wind force 1, and air temperatures of 78°F.

Supplementary hand-weeding was carried out on one randomly chosen half of each plot during the trial to test the effect of a follow-up hand-weeding to augment the weed control obtained with herbicide treatments.

RESULTS

Yields

Without a supplementary hand-weeding, ipazine at 0.75 and 1.5 lb, and ametryne, simazine and prometryne at 1.5 lb, in that order, gave the highest yields which did not differ significantly among these treatments. Both ipazine treatments were significantly better than all other treatments except the ones listed in the group above, which gave yields as good as, or almost as good, as hand-weeded plots.

Without supplementary hand-weeding there were no significant differences among all the treatments with the exception of DCMA at 6 lb which had a lower yield. This was due to the severe setback to the plants caused by this treatment.

There are interesting comparisons between the treatments with and without the supplementary hand-weeding.

With follow-up hand-weeding, CDEC and SMCA particularly gave very much better results than without it and it is probably an indication of the low herbicidal activity of these materials against a number of weeds or a few specific weeds. Similar trends can be noted with prometryne at 0.75 lb; there are less marked differences with several other treatments.

Without follow-up hand-weeding, ipazine at both rates gave a higher yield than with the hand-weeding, although the difference is not a significant one. The explanation may be that ipazine alone gives effective weed control and follow-up cultivations merely lessen the residual effect of the weedicide. This point requires further examination.

Weed Control

Weeds present on plots at the time of the post-em. treatments were: *Polygonum persicaria*, *Coronopus didymus*, *Spergula arvensis*, *Veronica persica*, *Solanum nigrum*, *Capsella bursa-pastoris*, *Brassica* sp., *Fumaria muralis*, *Agropyron repens*, *Oxalis latifolia*.

Detailed weed scores were not taken in this trial.

As indicated by the yields in the herbicide alone treated plots, ipazine, simazine and propazine were the most active materials, and ametryne and prometryne at 1.5 lb rate gave results comparable with the lower rates of simazine and propazine.

Crop Tolerance

DCMA severely retarded the growth of the cauliflowers.

CONCLUSION

Ipazine at 0.75 and 1.5 lb was the most promising herbicide for weed control and crop tolerance. Simazine at 0.75 and 1.5 lb may warrant further testing and also ametryne and prometryne at 1.5 lb and higher rates. CDEC and SMCA were of little value without follow-up hand-weeding.

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