WEED CONTROL IN PEAS, CARROTS AND ONIONS

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Summary

The methylmercapto triazines gave very good broadleaf and grass control. Ametryne and simetryne were not toxic to peas at 2 lb a.i. per acre, but on carrots prometryne and particularly G34360 were damaging above 1.5 lb a.i. per acre. Onions tolerated no more than 1 lb a.i. per acre of simetryne, and were eliminated by 0.5 lb of prometryne. The chlorotriazines were excellent on broadleaves but poor on grassy weeds. Propazine and ipazine at 1 lb a.i. per acre slightly reduced pea yields. Propazine at 3 lb a.i. per acre and ipazine at 1 lb a.i. per acre cause no carrot damage, but 1.5 lb a.i. per acre of G34698 eliminated the crop. The mixture of SMCA 7.4 lb. a.i. per acre plus MCPB 0.75 lb a.i. per acre was applied too early to peas and significant yield reductions resulted, but dinoseb 0.75 lb a.i. per acre plus MCPB 1 lb a.i. per acre was satisfactory. In onions 8 lb a.i. per acre of DCPA was not toxic, but failed to control redroot, while CDAA-T gave very good weed control excepting grasses, but damaged the crop. Chlorpropham at 2 lb a.i. per acre plus SMCA 11 lb a.i. per acre was promising. In carrot and onion crops, supplementary weeding to chemical treatments greatly increased yields.

INTRODUCTION

IN PREVIOUS PUBLICATIONS (Patterson, 1960, 1961) the combination of a mixture of SMCA plus MCPB for post-em. weed control in peas was advocated, and in this paper some pre-em. chemicals of the triazine group are compared with such standard treatments. Following on the work of Thompson (1961) new materials, particularly of the triazine group, are discussed as to their effect and use for weed control in carrot and onion crops.

EXPERIMENTAL

The trials were conducted on Horotiu sandy loam at the Rukuhia Soil Research Station, and were of randomized block design with 4 to 5 replications. Yields were taken from the three centre rows of each plot. All materials were applied in 30 gal of water per acre by the Oxford precision sprayer at 30 lb/sq. in., and are expressed in this paper as lb active ingredient per acre. The crop varieties sown were Kelvedon Monarch (peas), Chatenay (carrots), and Pukekohe long-keeper (onions).

PEAS

The peas were sown into cultivated sandy loam soil on September 30, 1961. Immediately afterwards pre-em. applications were made with rates of 1 and 2 lb of both ametryne and simetryne, and also 1 lb of propazine and ipazine. The soil was dry, but fairly moist $\frac{1}{4}$ in. below the surface. No appreciable rain fell until 13 days later when 137 points fell. Eighteen days after sowing, when the peas had reached the 4 to 5 node stage and were $2\frac{1}{2}$ in. high, applications were made of mixtures containing SMCA 7.4 lb plus MCPB 0.75 lb, and dinoseb 0.75 lb plus MCPB 1 lb. The weeds present were mainly

redshank (*Polygonum persicaria*), redroot (*Amaranthus hybridus*), nightshade (*Solanum nigrum*), fathen (*Chenopodium album*), and cress (*Coronopus didymus*), generally having 1 to 3 leaves about 1 in. in diameter. The weather was fine and sunny, with a maximum temperature of 70° F at the time of spraying, with no rain for the following seven days.

WEED CONTROL

Table 1 shows the degree of control of the broadleafed weed species present.

TABLE 1: CONTROL OF WEEDS

<i>Treatment (lb)</i>	<i>Control</i>
Propazine 1	Excellent of all species.
Ipazine 1	Excellent of all species.
Ametryne 2	Excellent of all species.
Ametryne 1	Some of all species.
Simetryne 2	Very good of all species.
Simetryne 1	Unsatisfactory (particularly redshank, redroot)
SMCA 7.4 + MCPB 0.75	Very good to excellent on fathen, nightshade, redroot; good on redshank; fair on cress.
Dinoseb 0.75 + MCPB 1	Very good to excellent on cress, fathen, nightshade; fair on redshank, redroot.

There was little visual difference between the two post-em. treatments used, and the weed control was not as good as in previous years, so that in this trial they were inferior to higher rates of the triazines used. The relative effectiveness of the triazines used at the 1 lb rate for general broadleaf weed control is according to their solubility in water. Thus in decreasing order of merit (solubility in parentheses) they are: propazine (8.6 p.p.m.), ipazine (40), ametryne (185), and simetryne (450). Only simetryne at this 1 lb rate was unsatisfactory, but like ametryne was very much better at the 2 lb rate. Although there was only a light infestation of witchgrass (*Panicum capillare*) present, the 2-methylmercapto ("tryne") substituted triazines gave much better control of these grasses than did the 2-chloro ("zine") triazines.

YIELDS

The yields from this trial were not as good as that obtained in previous years, owing to an attack of mildew, the degree of which varied within the trial area, and consequently the coefficient of variation (C.V.) is higher than usual with no significant differences at the 1% level.

TABLE 2: YIELDS OF PEAS

<i>Treatment (lb)</i>	<i>Yield Bushels per acre</i>		
Hand-weeded	41.0	a	A
Ametryne 2	41.3	a	A
Ametryne 1	33.0	abc	A
Simetryne 2	39.9	ab	A
Simetryne 1	35.4	abc	A
Propazine 1	36.3	abc	A
Ipazine 1	33.9	abc	A
Dinoseb 0.75 + MCPB 1	37.5	abc	A
SMCA 7.4 + MCPB 0.75	27.9	bc	A
Unweeded control	26.9	c	A
C.V.	21.1%		

Owing to the attack of mildew, the yields quoted are only an indication of the true crop tolerance to the various treatments.

None of the triazines at the rates used caused any significant yield reductions, and appear to have some margin of selectivity. It appears that propazine and ipazine at 1 lb would be superior to ametryne 2 lb in non-grassy areas, although there may be small yield reductions due to toxicity from these "chloro" triazines. Although there was little difference in weed control between the two post-em. treatments, yet there was a significant reduction (5% level only) in yields with SMCA + MCPB, but not with the dinoseb-MCPB mixture. It appears that the application of the SMCA mixture applied at the 4 to 5 node stage had caused more pea damage than previously experienced, and although giving very good weed control was applied too early.

CARROTS

Carrots were sown on October 12, 1961, and sprayed two days later with a number of triazine materials which included propazine, ipazine, G34698, prometryne, G34360, and a mixture containing propazine plus chlorpropham. At the time of application the soil was dry and 105 points of rain fell during the next two days.

WEED CONTROL

The broadleaf weeds present were mainly redroot and some redshank, together with witchgrass and crabgrass (*Digitaria sanguinalis*).

TABLE 3: WEED CONTROL AND CARROT ESTABLISHMENT

Treatment (lb)	Broadleaf Weeds	Grasses	Hand- weeding time	Pointing	Crop
Prometryne 1.5	 G	VG	17 cd C	47	VG
Prometryne 3	 VG	VG	9 d C	30	FG
G34360 1.5	 Fair	VG	25 bc BC	33	FG
G34360 3	 FG	VG			Nil
Propazine 1.5	 EX	V. poor		25	G
Propazine 3	 EX	Poor	37 ab AB	25	G
Propazine 1.5 + chlorpropham 2	 EX	Poor	46 a A	27	G
Ipazine 1	 EX	V. poor		25	G
G34698 1.5	 EX	Poor			Nil
G34698 3	 EX	Fair			Nil
Hand-weeded	.....			48	VG
Control	.....		100		FG
C.V.	.....		36.8%		

This trial confirms the result of the pea trial, in that the chloro triazines (*e.g.*, propazine), give better broadleaved weed control but much inferior grass control than the methylmercapto analogues (*e.g.*, prometryne).

Supplementary Weeding

It had been noted in previous work that some treated plots that initially gave excellent weed control finished with a dominance of grasses, and it seemed that a chemical treatment plus a small amount of hand-weeding would be beneficial and economical. Unfortunately the hand-weeding was carried out about 2 to 3 weeks too late, when the weeds were a little too large, and so the relative times quoted in Table 3 are about five times too great. The time was taken to hand-weed half the plot of only the better treatments. This gives some measure of the degree of the weed infestation present. Prometryne and G34360 treated plots took significantly less time to weed than the propazine treated plots. This was largely due to the

presence of very many grasses, which were uncontrolled on these propazine plots. The addition of 2 lb of chlorpropham to propazine was insufficient to be of any advantage for the control of these grasses.

Pointing

The individual plots were pointed in order of merit, taking into consideration the overall weed control given as well as the crop growth and vigour, on a replicate basis. The maximum number of points possible is 50. Thus, as indicated in Table 3, prometryne and the low rate of G34360 are superior to all other treatments used, for a combination of satisfactory weed control with some margin of crop tolerance.

Crop Tolerance

From general observations, it was noted that there was some toxicity with prometryne and G34360 with increasing rates, but there was a greater margin of tolerance with propazine and ipazine. G34698 and high rates of G34360 are too toxic to be considered further for use in carrot crops.

YIELDS

The weeded as well as the unweeded portions of the plots were harvested, and yields are shown in Tables 4 and 5, respectively. The other treatments have either eliminated the crop or allowed the remaining weeds to smother it completely. Table 4 shows the yields of marketable carrots for the weeded portions only, with the total number of all harvested carrots per 10 ft row.

There were no marketable carrots from the untreated controls.

TABLE 4: YIELDS OF MARKETABLE CARROTS —
WEEDED (tons per acre)

Treatment (lb)	1st Grade	2nd Grade	Total	No. per 10ft row
Hand-weeded	2.4 c B	8.1	10.5 ab A	93
Prometryne 1.5	8.1 a A	5.8	13.9 a A	64
Prometryne 3	7.4 ab AB	1.8	9.2 b A	21
Propazine 3	5.9 abc AB	5.5	11.4 ab A	59
Propazine 1.5 + chlorpropham 2	3.4 bc AB	5.5	8.9 b A	55
G34360 1.5	6.1 abc AB	3.3	9.4 b A	28
C.V.	51.8%		26.1%	

The larger weight of second-grade carrots in the hand-weeded treatment was due to the crop not being thinned, and consequently the carrots were smaller. Conversely, the relatively large weight of first-grade carrots for prometryne 3 lb was the result of a chemical thinning action on the crop. Prometryne at 1.5 lb and propazine at 3 lb are superior to the other treatments used, but there may be less margin of selectivity with prometryne, as seen by the significant yield reduction and fewer carrots, from increasing the rate from 1.5 to 3 lb. The treatment of G34360 is more toxic than prometryne, and 1.5 lb is about equal to the 3 lb rate of prometryne.

TABLE 5: YIELDS OF MARKETABLE CARROTS —
UNWEEDED (tons per acre)

Treatment (lb)	Total
Prometryne 1.5	9.9 a A
Prometryne 3	4.1 b AB
Propazine 3	3.9 b AB
Propazine 1.5 + chlorpropham 2	1.7 b B
G34360 1.5	5.7 ab AB
C.V.	63.7%

The yields shown in Table 5 are a measure of the weed control given, and a decreasing order of yields for the various treatments is comparable to the order of the pointing shown in Table 3. The significant depressions in yields have been caused by toxicity at the 3 lb rate of prometryne, and competition from the heavy infestation of uncontrolled grasses on the propazine treated plots. The effect of supplementary hand-weeding is seen by the differences in yield between Tables 4 and 5. The increase is larger on the propazine plots as these had a greater weed infestation than either prometryne or G34360.

Thus prometryne at about 1 lb plus a small amount of weeding when necessary would be almost an ideal treatment.

ONIONS

Onions sown on October 11, 1961, were treated pre-em. three days later with prometryne, simetryne, DCPA, CDAA-T, and chlorpropham. The soil was dry, but 105 points of rain fell during the following two days. On November 3, 1961, the chlorpropham-treated plots were sprayed with SMCA at 11 lb post-em. when the dominant weed redroot was in the 2 to 3 leaf, ½ to 1 in. diameter stage. The onions were 2 in. high up to the "crook" stage. The weather was fine and sunny, with no rain for seven days.

WEED CONTROL

Table 6 shows the weed control given, with the relative time taken to hand-weed half the plot.

TABLE 6: WEED CONTROL AND ONION ESTABLISHMENT

<i>Treatment</i> (lb)		<i>Redroot</i>	<i>Redshank</i>	<i>Grasses</i>	<i>Hand-weeding</i> <i>time</i>	<i>Crop</i>
Prometryne 2	.....	VG-EX	EX	VG-EX		Nil
Prometryne 1	.....	G	FG	VG		Nil
Prometryne 0.5	.....	G	Fair	F. poor		Nil
Simetryne 4	.....	VG-EX	EX	VG-EX		Nil
Simetryne 2	.....	G	EX	VG-EX		Nil
Simetryne 1	.....	Poor	FG	G	35 a	FG
DCPA 8	.....	Poor	Fair	EX	54 a	FG
CDAA-T 8	.....	EX	EX	Poor	29 a	Fair
CDAA-T 4	.....	VG-EX	G	Poor		FG
Chlorpropham 2 + SMCA 11	.....	G	EX	F. poor	43 a	FG
Untreated	.....				100	
C.V.	.....				46.7%	

Broadleaved Weeds

The dominant weed was redroot, with some redshank. Prometryne was far superior to simetryne at equivalent rates. DCPA gave disappointing control of redroot. CDAA-T gave very good control of broadleaved weeds except possibly for *Chenopodium pumilio*, but poor control of the grasses. The application of SMCA generally gave good control of the broadleaved weeds left by chlorpropham, but the 2 lb rate of chlorpropham was too low for any grass control.

Grasses

The grasses present in the trial area were generally a mixture of witchgrass and crabgrass. The 8 lb rate of CDAA-T gave almost excellent control of the witchgrass, and little or none of the crabgrass, but the 4 lb rate gave poor control of both these grass species. Simetryne at 4 lb was the only other treatment to give unlike control of these two grasses; it giving slightly better control of crabgrass than witchgrass.

Supplementary Weeding

The procedure adopted in the carrot trial was also carried out here. The treatments that were hand-weeded were those where sufficient onions remained and it was considered worth while, and as before it was done too late. There were no significant differences between the times taken to weed the various treatments.

YIELDS

Table 7 shows the poor yields obtained from the weeded portions of the treated plots. Included is the total number of onions per 10 ft row. The CDAA-T treatment was not included in the statistical analysis.

TABLE 7: YIELDS OF ONIONS — WEEDED
(tons per acre)

Treatment	Large	(lb)		Total	No. per 10ft row
		Small			
Hand-weeded	0.9	0.9 a A	1.8 a	25 a A	
Chlorpropham 2 + SMCA 11	1.7	0.7 a AB	2.4 a	25 a A	
Simetryne 1	0.9	0.4 b B	1.3 a	16 b B	
DCPA 8	0.5	0.7 a AB	1.2 a	26 a A	
CDAA-T 8	0.3	0.3	0.6 a	9	
C.V.		29.3%	60.3%	24.8%	

There were virtually no harvestable onions from the control plots. There were no significant differences between the low yields obtained from the unweeded portions of the chemically treated plots.

As there is a fairly large variation within the trial, Table 7 can only be an indication of crop tolerance. However, there are significant reductions in the numbers of onions and thus simetryne and CDAA-T are somewhat toxic at the rates used. The reduction in yield for DCPA must be due to the redroot competition prior to the hand-weeding. There was little or no toxic effect from the chlorpropham/SMCA mixture, and although failing to control the grasses, this was the most promising treatment in the trial. Possibly a higher rate of chlorpropham is required for the grasses. Prometryne at rates as low as 0.5 lb virtually eliminated the crop, as did the rates of 2 and 4 lb of simetryne.

CONCLUSIONS

PEAS

- (1) The post-em. application of the mixture of dinoseb 0.75 lb plus MCPB 1 lb gave very good weed control and yields were not significantly lower than hand-weeded.
- (2) An application at the 4 to 5 pea node stage of the recommended SMCA 7.4 lb plus MCPB 0.75 lb mixture was too early and consequently caused a significant yield reduction, although giving very good weed control.
- (3) These post-em. treatments gave very good weed control, but in this trial were inferior to the triazines used.
- (4) Ametryne and simetryne each at 2 lb were not toxic and gave very good to excellent broadleaf weed control, but were unsatisfactory (particularly simetryne) at the 1 lb rate.
- (5) Propazine and ipazine each at 1 lb gave excellent broadleaf weed control but caused slight reductions in yields.
- (6) At the 1 lb rate, the less water soluble the triazine, the better the broadleaf weed control, and in descending order of merit they were propazine, ipazine, ametryne and simetryne.

CARROTS

- (7) In a dense weed population, prometryne at 1.5 lb gave effective and satisfactory control of both broadleaved weeds and grasses with little crop damage, and proved a most useful material. The 3 lb rate caused crop damage and yields were significantly lower.
- (8) Propazine at 1.5 and 3 lb gave no crop damage but failed to control the grasses, and consequently yields were low. Chlorpropham at 2 lb was of no advantage in combination with propazine for the control of these grasses.
- (9) There was little margin of tolerance with G34360, for the 1.5 lb rate gave some crop damage but good yields and satisfactory weed control, while the 3 lb rate eliminated the crop.
- (10) G34698 at 1.5 lb eliminated the carrot crop and broadleaves, but not the grasses.
- (11) Ipazine at 1 lb, although giving excellent broadleaf control, failed to control the grasses and thus yielded very poor.
- (12) The 2-methylmercapto substituted triazines give much superior grass control to that of the 2-chloro materials.

ONIONS

- (13) The most promising treatment was chlorpropham 2 lb pre-em. plus SMCA 11 lb post-em. which gave good weed control but not of the grasses, and was not toxic to the crop.
- (14) Although a minimum rate of 2 lb of simetryne was necessary for adequate control of broadleaves and grasses, this eliminated the crop.
- (15) Prometryne gave better weed control than simetryne, but even 0.5 lb eliminated the crop.
- (16) DCPA at 8 lb was not toxic to the crop, eliminated the grasses, but failed to control redroot.
- (17) In both carrots and onions, the addition of a small amount of supplementary hand-weeding to the chemical treatment was beneficial, and resulted in considerable increases in yields.

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