WEED CONTROL IN PEAS

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SUMMARY

In the absence of weeds 1½lb. acid equivalent per acre of the sodium salt of MCPB reduced yields of several varieties of peas by 20 per cent. Under weedy conditions the increase in yield compared with unweeded controls varied from 20 to 100 per cent. MCPB controlled redroot and cress, but not the willow weed. The sodium salt of 2,4-DB gave better weed control, but was more toxic to peas. Under weedy conditions the earlier the weeds were sprayed with MCPB the better was the yield of peas. Ammonium salt of dinoseb gave better weed control and better yields than MCPB. MCPB up to 2lb. had no adverse effect on palatability.

In the Proceedings of the Ninth New Zealand Weed Control Conference three papers referred to the promising results obtained with MCPB for weed control in peas. In the discussion on one paper reference was made to a report of taint in peas sprayed with MCPB.

Since last Conference the Department of Agriculture has conducted several trials in which peas were sprayed with MCPB or 2,4-DB to obtain information on the resulting weed control and the effects of these materials on the yields. The effects on crops sown at different times, the tolerance of different varieties of peas, and the effect of spraying at various stages of growth were studied. Palatability tests were also conducted on samples of sprayed and unsprayed peas.

EXPERIMENTAL

In four trials conducted at Rukuhia Soil Research Station plots were each 20ft. long and contained five rows of peas, 14in. apart. The three centre rows only were harvested and yields of shelled peas were obtained from each plot. Maturometer tests were made on samples from each plot after picking. The treatments were replicated four or five times.

Comparison of MCPB, 2,4-DB, and DNBP

In trials A and B on Victory Freezer peas the treatments included the sodium salts of MCPB and 2,4-DB, each at 1lb. and 1½lb. acid equivalent per acre, and the ammonium salt of DNBP. The rate of DNBP was 0.75lb. phenol equivalent in trial A and 0.7lb. in trial B. The trials were otherwise similar, except one was on an early and the other on a mid-season crop. The differences between the two trials are indicated in the following tabulation:—

	Trial A	Trial B
Sown	17/9/56	31/10/56
Sprayed	17/10/56	21/11/56
Stage at spraying	5 node	4 node
Harvested	10/12/56	11/1/57
Sowing to harvest	84 days	72 days

Weed control: The dominant weeds in both trials were willow weed (*Polygonum persicaria*) and cress (*Coronopus didymus*). Both weeds were up to 2in. across at the time of spraying and the willow weed had up to 4 true leaves. The weeds were slightly smaller in trial B and better weed control was obtained with the hormones in this trial.

Before harvest the plots were pointed for degree of weed control. The most weedy plot in each replication was given 1 point and the least weedy

7 points. The average points for the 5 replications for each of the 7 treatments are given in Table 1. Weed infestation in the area was very bad and the unweeded control plots were either a mass of willow weed which topped the peas, or cress. The MCPB plots were also a mass of willow weed, but it was reduced compared with the unweeded plots, particularly when MCPB was applied at 1½lb. and in trial B. Control of cress by MCPB was unsatisfactory in trial A but good in trial B.

In both trials 2,4-DB gave satisfactory control of both weeds. However, flat weeds, particularly hawksbeard (*Crepis capillaris*) covered much of the bare ground resulting from the control of willow weed and cress. Consequently the 2,4-DB plots did not have as high a weed control rating as DNBP in trial A.

DNBP gave very good weed control in trial A, but in the second trial it failed to control willow weed and the results were very poor. The application rate was considered appropriate for the temperature (over 70 degrees), but apparently the fine weather before spraying had made the weeds too resistant.

Effect on peas: The visual evidence of hormone damage indicated that 1lb. of 2,4-DB affected the peas more than 1½lb. of MCPB.

The yields of shelled peas per acre are given in Table 1. The very poor crop particularly in trial A was due to bird damage and nitrogen deficiency owing to lack of nodulation. Urea was applied to the second trial to overcome this deficiency.

Both trials were so badly weed infested that the degree of weed control was the main factor influencing the yields of peas. The figures in Table 1 show that the yields from 2,4-DB were higher than those from MCPB (except for 1½lb. of MCPB in trial B) and that the yields from 1½lb. were greater than those from 1lb. for each material. The yield from DNBP was high or low according to the degree of weed control obtained. Thus the yields were practically in the same order as the figures for the degree of weed control.

The fact that in each trial the yields from all four hormone treatments do not differ significantly from one another in spite of big differences in weed control indicates that the beneficial effect of the more efficient weedkilling treatments has been counter-balanced by a corresponding increase in the toxic effect on the peas. For instance, the toxic effect of 2,4-DB prevented any appreciable increase in yield compared with MCPB that might have been expected in view of the better weed control.

Tolerance of Different Varieties to MCPB

In trial C four varieties, W. F. Massey, Victory Freezer, Greenfeast, and Onward, were each sprayed with the sodium salt of MCPB at 1lb. and 1½lb. when the peas were at the 6-node stage. Wet and windy weather prevented earlier spraying. The peas were sown on 7 December, sprayed on 3 January, and harvested during the period 27 January to 11 February.

The aim was to pick each variety when mature for canning or freezing, that is, about 220 maturometer reading. Because of unfamiliarity with some varieties and lack of facilities for doing day to day maturometer tests, three of the varieties were harvested several days too early or too late. The hot, dry weather in February hastened maturity.

Details of the relative yields of shelled peas and the maturometer readings are given in Table 2. The yield of the control of each variety is expressed as 100 and the yields of the treated plots are expressed relative to this.

The control was hoed once, but there were practically no weeds in the area. The yields therefore indicate the tolerances of the varieties to the treatments uncomplicated by the effects of weeds as in trials A and B.

The results show that 1lb. of MCPB had little effect on yields of any variety. When 1½lb. was applied the yields of Massey, Victory Freezer, and Greenfeast were reduced by about 20 per cent., whereas the reduction with Onward was negligible. It is possible that the greater tolerance of Onward was due to the fact that the crop was overmature at harvest.

Effect of Stage of Growth at Time of Treatment

Victory Freezer peas sown on 20 December were sprayed with 1lb. and 1½lb. of the sodium salt of MCPB at three different stages of growth as indicated in the following tabulation:—

Spraying	Date	Temp. Degrees	Peas		Redroot	Weeds	
			Nodes	Height in.		Cress	
Early	4/1/57	67	3	3 - 4	1in. across 2 leaves	1in. across	
Medium	14/1/57	76	6	5 - 6	3in. high 4 - 6 leaves	4in. across	
Late	23/1/57	80	8	8 - 10	3 - 7in. high 6 - 7 leaves	4 - 6in. across.	

The dominant weeds in this trial (trial D) were redroot (*Amaranthus retroflexus*) and cress. The early and medium sprayings gave very good kills of both weeds. The late sprayings severely affected the weeds, but as these treatments were applied only 3 weeks before the peas were picked, it was difficult to say whether the weeds had been killed. The degree of weed infestation at the time of harvest is indicated by the estimates of percentage bare ground given in Table 3. These refer to the area not occupied by peas. On the plots sprayed at the early stage some weeds appeared subsequent to the spraying. Though these late weeds reduced the amount of bare ground, they apparently did not affect the yields.

Many of the peas rotted in the ground, presumably as a result of a disease, and there were many gaps in the rows. The yields of shelled peas per acre in Table 3 are based on the weights per plot adjusted for the number of plants per plot after the relationship between yields and number of plants was established by a covariance analysis. The results show that the earlier the MCPB was applied the greater was the yield of peas. The increase in yield over the unweeded control was significant with the early and medium times of spraying, but not with the late spraying. The weeds on the plots sprayed at the late stage had smothered the peas so much before spraying that the crop was already retarded. The suppression of weeds at this stage was therefore too late to cause any appreciable increase in yields, which were little different from those of the unweeded plots. The beneficial effect of spraying at the early stage was due to the earlier removal of weed competition.

One end of the trial was very weedy and the other end relatively weed-free. In the less weedy portion the time of spraying made little difference to the yields.

There was very little effective rain from early January until after the crop was harvested on 15 February. In view of the hot, dry conditions at the time of the medium and late sprayings, it is possible that the peas were more resistant than normal and the results may not be typical for plants at these stages of growth.

Effect of the Sodium Salt of MCPB on Yields

The data from all the trials in which the effects of the sodium salt of MCPB applied to Victory Freezer peas can be compared with the hand-weeded control are summarised below. All the yields are expressed relative to the hand-weeded control, which is 100.

Unweeded Control	1lb. MCPB	1½lb. MCPB	Remarks
—	88	78	Trial C. Few weeds.
57	73	75	Trial D. Non-weedy portion.
36	74	70	Trial D. Weedy portion, early spraying. Good weed control.
45	81	84	Trial B. Very weedy. Good control.
51	66	71	Trial A. Very weedy. Poor control.
—	—	74	Milson Experimental Farm.
Average 47	76	75	

The figures show that there is an average loss of about 25 per cent. yield compared with the hand-weeded control. This is due to a combination of imperfect weed control and the toxic effect of MCPB on the peas. It is interesting to note that there is a general similarity in the results from these trials which were conducted under conditions varying from wet spring to hot, dry summer. The increase over the non-weeded control varies from 105 per cent. where good weed control was obtained, to 29 per cent., where the control was poor owing to the resistance of willow weed.

In a trial at Invermay Research Station in which the unweeded plots gave a yield of 4790lb. shelled peas per acre, applications of 1lb. and 2lb. sodium salt of MCPB gave increases of 22 per cent. and 23 per cent. respectively.

Palatability Tests

Samples of peas from each plot in each of the four replications of Greenfeast, Victory Freezer, and Onward peas in Trial C were tested for taint and palatability. A panel of five or six tasters made tests on both raw and cooked peas. Samples of Greenfeast and Victory Freezer were also blanched and canned at the New Zealand Packing Corporation's factory at Pukekohe. The canned peas were kept at room temperature for 4 months and then heated and tested by a panel of 14 members.

From all these tests it is concluded that there is no evidence that applications of 1lb. or 1½lb. of the sodium salt of MCPB had any adverse effect on the palatability of the peas. In tests on canned peas from a trial at Invermay Research Station there was no significant difference between the palatability of peas which had been sprayed with 2lb. of the sodium salt of MCPB and the unsprayed control.

SUMMARY AND CONCLUSIONS

From the data presented in the tables and from results of other trials not reported in detail it is concluded that:—

1. The sodium salt of MCPB at 1lb. and 1½lb. gave very good control of redroot and cress, but unsatisfactory control of willow weed. Corresponding rates of 2,4-DB gave better weed control, but were more toxic to the peas.

2. When weed infestation was negligible 1½lb. sodium MCPB reduced yields by 20 per cent. compared with the hand-weeded control. The effect of 1lb. was slight. The four varieties tested showed no great difference in tolerance.

3. In weedy areas the beneficial areas of the better weed control with 1½lb. of MCPB compared with 1lb. was largely offset by the greater toxicity to the peas of the higher rate and the differences in yield were not significant. In several trials the yields from both 1lb. and 1½lb. of MCPB averaged 25 per cent. less than the corresponding hand-weeded controls. The reduction in yield is attributed to the combined effect of the toxicity of the materials and imperfect weed control. Similarly there was no great difference between yields from 1lb. and 2lb. or from ½lb. and 1½lb. of MCPB. Also the yields from 2,4-DB were not significantly greater than those from MCPB.

4. Increase in yields over unweeded controls varied according to the degree of weed control obtained and this, in turn, depended on whether the dominant weeds were resistant (for example, willow weed) or susceptible (for example redroot).

5. When few weeds were present the stage of growth at the time of spraying had little effect on yields. Under weedy conditions earlier spraying gave better yields than late spraying.

6. Dinoseb at rates from 0.75lb. to 1.33lb. gave better weed control and higher yields than MCPB.

7. Excessive weed competition hastened maturity. With slight or no weed infestation MCPB both hastened and delayed maturity in different trials, and DNBP hastened maturity.

8. In weedy areas a small decrease in weeds may result in a big increase in yield, and in relatively clean areas a few weeds may cause a big drop in yield.

9. There was no evidence that applications of 1lb. or 1½lb. of the sodium salt of MCPB caused any taint or unpalatability in raw, cooked or canned peas. There was no significant undesirable flavour in canned peas which had been sprayed with 2lb. of MCPB.

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TABLE 1—EFFECT OF VARIOUS TREATMENTS ON YIELD OF VICTORY FREEZER PEAS, MATUROMETER READINGS, AND WEED CONTROL

Treatment	TRIAL A			TRIAL B		
	1lb. shelled peas/acre	Maturometer readings	Weed rating	1lb. shelled peas/acre	Maturometer readings	Weed rating
Unweeded control	1020§	269	1.3	1270§	325	1.2
MCPB 1lb.	1330§	255	1.7	2310†‡	286	2.7
MCPB 1½lb.	1430*§	241	3.3	2400†	248	4.2
2,4-DB 1lb.	1510*‡	228	4.5	2350†	270	5.2
2,4-DB 1½lb.	1520*‡	216	4.9	2360†	258	5.4
Dinoseb	2250†	232	5.9	2280†‡	278	2.5
Hand-weeded control	2020†	259	6.4	2860†	250	6.8

* Significantly more than the unweeded control at 5 per cent. level.

† Significantly more than the unweeded control at 1 per cent. level.

‡ Significantly less than the hand-weeded control at 5 per cent. level.

§ Significantly less than the hand-weeded control at 1 per cent. level.

TABLE 2—RELATIVE YIELDS AND MATUROMETER READINGS OF 4 VARIETIES OF PEAS WHEN SPRAYED WITH 2 RATES OF THE SODIUM SALT OF MCPB

Treatment	W. F. Massey		Victory Freezer		Greenfeast		Onward	
	Yield	Mat.	Yield	Mat.	Yield	Mat.	Yield	Mat.
Hand-weeded control	100	138	100	202	100	140	100	339
MCPB 1lb.	101	151	88§	194	93	131	89‡	335
MCPB 1½lb.	80§	155	78§	192	79§	128	94	336
Days from sowing to harvest	51 - 52		59		61		66	
lb./acre shelled peas, mean	1720		2440		2110		2480	

‡ Significantly less than the hand-weeded control at 5 per cent. level.

§ Significantly less than the hand-weeded control at 1 per cent. level.

Note: The W. F. Massey sprayed with 1½lb. sodium salt of MCPB was harvested 1 day before the other two treatments.

TABLE 3—EFFECT OF SPRAYING VICTORY FREEZER PEAS WITH THE SODIUM SALT OF MCPB AT 3, 6, and 8 NODES

Treatment	lb. shelled peas/acre	% bare ground	Maturometer readings
Unweeded control	980§	25	250
8-node stage			
MCPB 1lb.	1020§	44	246
MCPB 1½lb.	1140§	60	252
6-node stage			
MCPB 1lb.	1310*§	85	224
MCPB 1½lb.	1350†§	91	198
3-node stage			
MCPB 1lb.	1540†§	78	212
MCPB 1½lb.	1370*§	81	188
Hand-weeded control	1960†	95	223

* Significantly more than the unweeded control at 5 per cent. level.

† Significantly more than the unweeded control at 1 per cent. level.

§ Significantly less than the hand-weeded control at 1 per cent. level.

DISCUSSION

Q.—What difference in maturity did MCPB cause?

A.—One to 2 days later in early trials. Dinoseb plots matured 1 day earlier than hand-weeded controls.

Q.—What is the effect of MCPB on nightshade?

A.—Control has been achieved at very small stage.

Q.—Did MCPB cause any initial wilt in the crop?

A.—Yes, but then recovered to a large extent with more slight “scraggy” appearance.

Q.—Redroot (*Amaranthus retroflexus*) was stunted in some treatments; how was this weed control assessed?

A.—If a plant was dead, it was counted as dead; if alive still, counted as alive.