WEED CONTROL IN BROAD BEANS AND POTATOES AT LEVIN — 1962

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Summary

Simazine and ipazine were tested at 0.75, 1.25 and 1.75 lb active ingredient per acre on two varieties of broad beans. Even at the lowest rate simazine severely reduced the yield of both varieties of beans. Ipazine reduced the yield of Exhibition Long Pod only at the highest rate, but all rates reduced Cole's Early Dwarf by comparison with hand-weeded controls.

On early crop Sebago potatoes prometryne gave very good weed control and no reduction in yield. Simazine reduced yields, severely at 2.0 lb active ingredient per acre, and gave very good weed control. "Solan" was less effective for weed control and also gave some reduction in yield.

INTRODUCTION

NINE TRIAZINE HERBICIDES were tested on broad beans at Levin in 1961 and results were reported at the Fifteenth N.Z. Weed Control Conference. In that year simazine and ipazine had given good weed control and no reduction in yield at rates of 0.5 and 1.0 lb (all rates given in lb active ingredient per acre); at 2.0 lb simazine considerably reduced the yield of Exhibition Long Pod beans, the only variety tested, and ipazine at the same rate reduced yields significantly but to a lesser extent. Simazine was selected for more thorough testing in 1962, because it was the most promising triazine then available commercially and ipazine because of its greater selectivity and possible availability. (It is now known that ipazine will not become a commercial product.)

Early potato crops require weed-free conditions if high early yields and good quality potatoes are to be obtained. Weeds are normally suppressed by intensive cultivation which includes several mouldings, harrowing of the ridges and scarifying between the rows until the crop is sufficiently advanced to suppress serious weed competition. In addition hand-weeding may also be done after the shoots emerge, and this alone can cost £5 0s. 0d. per acre for each weeding. Growers are interested in chemical weed control, to reduce the cost of hand and mechanical weeding and to secure cleaner crops. Herbicides, the use of which involves no risk of reducing yields, are needed.

EXPERIMENTAL

The trials described were set down at Levin Horticultural Research Station on Levin silt loam.

Herbicide applications were made with the Horticultural Research Station plot sprayer fitted with Spraying Systems 8001E Band Fan Nozzles set 9 in. above ground level for broad beans and 14 in. for potatoes. The nozzles were operated at a pressure of 20 lb/sq. in. and a delivery of 30 gal/ac.

Quantities of chemicals applied are recorded in terms of active ingredient per acre.

Crop tolerance ratings are given on a 0 to 5 scale in which 0 = all plants killed and 5 = plants unaffected, very vigorous.

There was higher than normal rainfall at Levin during the growing period of the crops.

BROAD BEANS

Simazine and ipazine at three rates shown in Tables 1 and 2 were applied to Exhibition Long Pod and Cole's Early Dwarf broad beans. The plot size used was 18 ft × 12 ft with four rows of beans spaced 3 ft apart; beans were 3 in. apart in the rows. A randomized block split plot design was used with the two varieties as main plots.

Seed was sown on May 24, 1962, and herbicides were applied on May 30. The soil was moist and in very good condition when the herbicides were applied. Rainfall of 1.3 in. was recorded in four days after sowing. Abnormally high rainfall was recorded during the growth of the crop. From May 24 to October 10, 1962, the rainfall was 24 in. compared with 17 in. during the same period in 1961.

TABLE 1: YIELDS OF BROAD BEANS

Treatments (lb)	Whole Pods (cwt/ac)
HWC	108 a A
Ipazine 0.75	95 ab AB
Ipazine 1.25	103 a A
Ipazine 1.75	79 bc BC
Simazine 0.75	66 c C
Simazine 1.25	Eliminated
Simazine 1.75	Eliminated
C.V.	19.9%

TABLE 2: INTERACTION BETWEEN VARIETIES

Treatments (lb)	Cole's Early Dwarf	Exhibition Long Pod
HWC	98	118
Ipazine 0.75	75	115
Ipazine 1.25	86	120
Ipazine 1.75	67	91
Simazine 0.75	66	66

VARIETIES

Cole's Early Dwarf	79*
Exhibition Long Pod	102*

* Variety difference is non-significant but is inadequately tested.

The interaction was not significant as a whole. However, the reduction from hand-weeded control was significant for all rates of ipazine on Cole's Early Dwarf, but only for the highest rate, 1.75 lb, on Exhibition Long Pod.

Even the lowest rate of simazine 0.75 lb caused highly significant reductions in both varieties. The highest rates of simazine 1.25 and 1.75 so severely damaged the crop that yields were not recorded. Cole's Early Dwarf was almost entirely eliminated, and Exhibition Long Pod was severely reduced in number of plants and vigour.

WEED CONTROL

All herbicide treatments gave adequate weed control of annual weeds. The two higher rates of ipazine and simazine were almost weed-free for the duration of the trial. Good control was obtained of *Poa annua* plants which had not been eliminated by the initial cultivation and tended to re-establish.

Weeds recorded in order of frequency of occurrence were *Poa annua*, (re-growth) *Agropyron repens*, (re-growth) *Rumex obtusifolius*, (re-growth) *Coronopus didymus*, *Veronica arvensis*, *Sonchus* sp., *Stellaria media*, *Rumex* sp. (seedlings), *Trifolium* sp., *Senecio vulgaris*.

CROP TOLERANCE

Assessments of crop tolerance and vigour made on July 9, 40 days after herbicide application, showed that only the highest rate of simazine 1.75 lb was having a marked effect on the crop. Records made 90 days after herbicide application showed crop tolerance and vigour ratings as follows:

				<i>Herbicide Rates (lb)</i>			
				<i>0.0</i>	<i>0.75</i>	<i>1.25</i>	<i>1.75</i>
Simazine				..	3.4	1.9	1.1
Ipazine				..	4.8	4.4	4.0
HWC				5.0	..	..	..

Simazine, even at the low rate of 0.75 lb, caused a severe reduction in yield in 1962, whereas in 1961 season 1.0 lb caused no reduction on Exhibition Long Pod, the only variety tested in that year. Ipazine reduced the yield of Exhibition Long Pod at 1.75 lb in 1962 whereas in 1961 2.0 lb did not reduce the yield.

A marked varietal difference in tolerance of weedicide treatments was observed. Cole's Early Dwarf was much more susceptible to damage than Exhibition Long Pod. Ipazine only at the highest rate reduced the yield of Exhibition Long Pod, but all rates reduced the yield of Cole's Early Dwarf.

POTATOES

Simazine and prometryne were applied pre-emergence and "Solan" post-emergence at two rates to Sebago potatoes planted on August 22, 1962, and compared with hand-weeded controls. Herbicides were applied to plots which were fully and finally moulded immediately after the potatoes were planted and the ridges were raked to smooth them equivalent to a light saddle back harrowing after moulding. Two hand-weeding treatments were used:

- (a) plant, mould, rake, mould, rake, final mould, and
- (b) plant, full mould, rake, rake, rake.

The rakings were timed to coincide with a new emergence of weeds and were intended to be equivalent to ridge harrowing before and shortly after the emergence of the potatoes.

Plot size was 24 ft × 7 ft 6 in. with rows 30 in. apart and potato sets 12 in. apart in the row. There were three rows to each plot, two treated rows and one guard row between each plot which was part sprayed with one treatment and part by the treatment of the adjacent plot. There were two replications of treatments in randomized blocks.

The Horticultural Research Station plot sprayer was set up with wheels 5 ft apart and with five Spraying Systems 8001E nozzles mounted on the boom 14 in. above ground level, and over the ridges.

Pre-emergence herbicides were applied on August 27 and the post-emergence treatment on October 1.

The soil was in good condition for soil moisture and tilth when weedcides were applied, and 0.41 in. of rain fell in five days following the application of pre-em. herbicides. "Solan" was applied to weeds about 1½ in. high in warm cloudy weather.

Potatoes were dug on December 7 and sorted into two sizes, under and over 1¾ in. diameter.

Yields were not analysed statistically.

TABLE 3: YIELDS OF POTATOES

Treatments (lb)	Yields from 4 × 24 ft rows (lb)		
	Under 1¾ in. diam.	Over 1¾ in. diam.	Total
Simazine 1.0	38.5	80.0	118.5
Simazine 2.0	26.0	34.0	60.0
Prometryne 1.0	47.5	109.0	156.5
Prometryne 2.0	40.5	115.5	156.0
"Solan" 3.0	43.5	85.5	129.0
"Solan" 6.0	42.5	73.0	115.5
Hand-weed (a)	44.5	89.0	133.5
Hand-weed (b)	45.0	101.0	146.0

Not too much importance should be attached to yields obtained in this initial screening trial. At the same time the consistently high yields from hand-weed plots and even higher yields from both rates of prometryne do provide a basis of comparison for the other herbicide treatments. In particular the marked reduction in yield with simazine applied at 2.0 lb should be noted and taken as a caution. The extent of this reduction was not fully apparent from the growth of the tops. Initially there was marginal yellowing of some leaves on simazine-treated plots but the plots appeared to recover. "Solan" treatments also retarded growth initially but the plants recovered well.

Prometryne and simazine gave excellent weed control at both 1 and 2 lb rates for the duration of the crop. The lower rate of "Solan" did not control *Poa annua*, *Coronopus didymus* and *Senecio vulgaris* satisfactorily and with the higher rate much *P. annua* and *S. vulgaris* was still present.

Hand-weeding treatment (a) was much more heavily weed infested than treatment (b). The full initial moulding followed by several rakings was more effective in controlling weeds than repeated mouldings.

The principal weeds present were *Coronopus didymus*, *Veronica arvensis*, *Poa annua*, *Polygonum persicaria*, *Solanum nigrum*, *Sisymbrium officinale*, *Senecio vulgaris*, *Chenopodium album*, and the perennials *Rumex obtusifolius* and *Oxalis latifolia*.

Prometryne appears to be a promising herbicide and further trials, preferably yield trials, with this herbicide are warranted. The safe upper limit for the use of simazine would appear to be 1 lb but even at this rate yield trials are needed as a further check on its performance.

CONCLUSIONS

Simazine at 0.75 lb severely reduced the yield of broad beans under high rainfall on Levin silt loam. Cole's Early Dwarf was much more susceptible to damage than Exhibition Long Pod, though rates of simazine of 1.25 lb and higher virtually eliminated both varieties. Ipazine at rates of 0.75 lb and 1.25 lb had satisfactory selectivity on Exhibition Long Pod but 1.75 lb reduced the yield of this variety. All rates of ipazine reduced the yields of Cole's Early Dwarf. Simazine cannot now be considered safe to use on broad beans at 0.75 lb or higher and because ipazine is not to be commercially available, other herbicides must be sought for broad beans. Where satisfactory selectivity can be obtained pre-emergence weedicides give good winter weed control on broad beans.

On early potatoes prometryne applied as a pre-emergence herbicide to ridges fully and finally moulded immediately after planting

gave good weed control until the crop was lifted and no reduction in yield. Simazine used in the same way also gave good weed control but showed evidence of severe reductions in yield, the extent of which was not apparent in the growth of the haulms. "Solan" was less effective than prometryne in controlling weeds, caused some initial damage to potato shoots and gave yields below prometryne and hand-weeded controls. In one hand-weeded treatment a high and final moulding immediately after sowing followed by several rakings to suppress weeds, gave as good results as repeated mouldings, and better weed control.

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