EVALUATION OF HERBICIDES FOR BROAD BEANS

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Summary

Pre- and post-emergence herbicide treatments were tested over five seasons. Simazine provided broad-spectrum weed control although twin cress (*Coronopus didymus*) control was unacceptable on soils with high organic matter (5-7%). Linuron, metribuzin and a lower rate of metribuzin in combination with linuron, diuron or methabenzthiazuron provided excellent control of twin cress and other weeds with safety in the crop. Simazine reduced crop vigour and yield in one trial sited on a sandy loam soil with low organic matter (2.3%). Dinoseb acetate and bentazone provided post-emergence control of twin cress and several other weeds.

INTRODUCTION

Although the area of broad beans (*Vicia faba*) grown for processing in New Zealand is relatively small, it is an important part of the processors range. The crop must be kept free of pests, diseases and nutritional disorders and unless weeds are controlled both crop yields and harvesting efficiency will be reduced. Control of the cruciferous weed, twin cress, is particularly important as it grows up the broad bean plants and can taint the beans during harvesting.

Work in New Zealand by Boyce (1962) demonstrated that several triazine herbicides provided selective weed control in broad beans. Since then simazine has been the standard treatment. Whilst simazine is an economical treatment and has generally given effective weed control, there are some problems associated with its use. It has given unacceptable control of twin cress in a number of Hawkes Bay crops grown on heavy soil types. Both E.G.R. Wallace (unpublished) and King (1978) report considerable yield reductions when simazine was used under some conditions. For example, during a wet growing season the material can be quickly washed down the soil profile and taken up by the crop roots. King (1978) states that crops grown on light soils or sown shallowly are especially prone to damage. Boyce (1962) demonstrated that simazine residues remained in the soil after crop harvest. In Hawkes Bay, snap bean (*Phaseolus vulgaris*), carrot (*Daucus carota*) and red beet (*Beta vulgaris*) crops which have followed broad beans in the rotation, have often been severely damaged by simazine residues. King (1978) discusses the danger of simazine residues affecting succeeding crops in Britain.

During the period 1974-78 eight pre-emergence and four post-emergence herbicide trials were conducted in Hawkes Bay. The trials were designed to find safer alternatives to simazine which would give better control of twin cress.

METHOD

In the earlier trials a range of pre-emergence herbicides were tested, but many of them did not provide adequate control of twin cress. More

Crop Weeds

detailed work was carried out with simazine, linuron, metribuzin and a lower rate of metribuzin in combination with other herbicides. Dinoseb acetate and bentazone were evaluated as post-emergence possibilities.

Earlier trials were of a randomised block design with four replicates and later trials used a 5 x 5 latin square. All trials were conducted in commercial crops using the broad bean variety Extra Early Seville. Pre-emergence treatments were applied 1-6 days after sowing. In two trials monolinuron was sprayed approximately 3 weeks after sowing and just prior to crop emergence. Post-emergence treatments were applied 6-10 weeks after crop emergence when the broad beans were 20-40cm tall. Speedwell (*Veronica arvensis*) and the cruciferous species twin cress and shepherd's purse (*Capsella bursa-pastoris*) were the main weeds encountered. Nettle (*Urtica urens*), poa annua (*Poa annua*) and Chickweed (*Stellaria media*) were also present at several sites.

Weed control was assessed by sampling three 0.25 m² quadrats in each plot. Effects on the crop were assessed when required by counting plant numbers and visually scoring plant vigour. Yields were recorded from selected trials by harvesting a 4-6 metre length of row when the beans were at the correct stage for freezing.

RESULTS

Herbicides discarded after early evaluation

Those not safe enough in the crop.

Metribuzin at 0.7 and 1.0 kg/ha pre-emergence reduced crop stand and vigour. Monolinuron (1.25 kg/ha) applied just prior to crop emergence and post-emergence applications of monolinuron (1.0 - 1.5 kg/ha), linuron (1.0 - 1.5 kg/ha), metribuzin (0.18 - 0.35 kg/ha) and terbutryn (1.0 kg/ha) severely reduced crop vigour and yield.

Discontinued in favour of more promising alternatives.

Pre-emergence applications of methabenzthiazuron (2.1 kg/ha), terbutryn (1.25 kg/ha) metobromuron (1.5 kg/ha), chlormethazole (1.5 kg/ha), diuron (1.0 kg/ha), monolinuron (1.5 kg/ha) and a proprietary mixture containing linuron and monolinuron both at 0.625 kg/ha gave satisfactory weed control and crop safety. They did not, however, provide the high level of twin cress control given by the treatments taken on for further evaluations.

Herbicides further evaluated

It was evident in the early trials that pre-emergence applications of simazine, linuron, metribuzin and metribuzin in combination with several other herbicides provided very good control of twin cress with safety to the crop. Dinoseb acetate and bentazone, both post-emergence, also gave very good control of twin cress.

Table 1 details weed control and crop selectivity information.

Pre-emergence treatments

Simazine did not give commercially acceptable control of the problem weed twin cress when applied to soils with high organic matter (5-7%). The other treatments, including simazine applications to soils with lower organic matter, provided very good control of twin cress.

All treatments gave excellent control of shepherd's purse, chickweed and nettle. Except for linuron, they gave excellent control of speedwell. Best control of poa annua was provided by simazine, metribuzin and metribuzin in combination with diuron.

None of the treatments reduced crop stands. Simazine significantly reduced crop vigour and yield in one trial sited on a sandy loam soil with

Table 1. Weed control and crop selectivity information.

Treatment	Rate (kg/ha)	twin cress (12)*	Weed Susceptibilities shepherds purse (10)	speed- well (6)	chick- weed (3)	nettle (2)	poa annua (2)	No. trials Yield taken
Pre-emergence treatments								
simazine	1.2	MS	S	S	S	S	S	5**
linuron	1.25	S	S	MR	S	S	MS	5
metribuzin	0.35	S	S	S	S	S	S	5
metribuzin + linuron	0.21 0.75	S	S	S	S	S	MS	4
metribuzin + methabenzthiazuron	0.21 1.05	S	S	S	S	S	MS	4
metribuzin + diuron	0.21 0.8	S	S	S	S	S	S	2
Post-emergence treatments								
dinoseb acetate	1.5	S	S	MS	S	S	R	3
bentazone	1.5	S	S	MR	MS	S	R	3

* Weed susceptibilities S = susceptible, MS = moderately susceptible, MR = moderately resistant, R = resistant.

** Number trials weeds present at a density greater than 30/m²

Yield significantly below hand weeded control in one trial.

Crop Weeds

low organic matter (2.3%). In the same trial there was an indication only that linuron reduced crop yield. There was also an indication that metribuzin (0.35 kg/ha) reduced yields in two trials conducted during the 1976 season.

Post-emergence treatments

Dinoseb acetate and bentazone provided very good control of twin cress, shepherd's purse and nettle at the 4-6 leaf stage. In one trial commercially acceptable control of twin cress at an advanced stage was obtained. Dinoseb acetate provided the best overall weed control although *poa annua* was resistant to both materials.

Dinoseb acetate, in particular, and bentazone scorched the lower leaves of the crop, but in none of the three trials harvested were yields reduced. Damage symptoms were more noticeable if applications were made after spring growth had commenced or if the crop had been stressed by wet soil conditions.

DISCUSSION

As anticipated the standard simazine treatment provided broad-spectrum weed control but did not give commercially acceptable control of twin cress on soils with high organic matter (5-7%). Several other pre-emergence herbicide treatments did give a high level of twin cress control on all soils. Metribuzin (0.35 kg/ha) and metribuzin (0.21 kg/ha) in combination with diuron (0.8 kg/ha) provided the most effective overall weed control.

Simazine reduced crop vigour and yield in a trial sited on a sandy loam soil with low organic matter (2.3%). King (1978) states that on sandy soils simazine can move quickly down through the soil profile and be taken up by the roots, thereby adversely affecting the crop. Wallace (unpublished) found that simazine reduced crop yields by up to 30% during wet growing seasons. There was some indication that linuron reduced yields in this trial also and that metribuzin reduced yields in two other trials. Results from field scale trials on light soil types show that lower rates of simazine, linuron and metribuzin still provide very good weed control and these may be safer in the crop.

Both dinoseb acetate and bentazone provided effective post-emergence control of twin cress. Dinoseb acetate gave the best overall weed control.

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