SELECTIVE CONTROL OF WEEDS IN BROAD BEANS

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SUMMARY

Field trials were conducted to evaluate a number of herbicides and their combinations for weed control in broad beans *(Vicia faba)* planted in winter or spring. Simazine, chlorpropham + diuron, trifluralin with metribuzin or linuron and methabenzthiazuron with metribuzin all provided good weed control with safety in the winter sown crop. However, when used in spring, many of these treatments failed mainly due to poor control of a heavy grass infestation, with trifluralin combinations being the most promising of those tested. Alachlor and the high rate of terbumeton + terbuthylazine were damaging to broad beans.

INTRODUCTION

In New Zealand broad beans are grown on a small scale but they form an important part of the vegetable processing industry. Dried field beans are used as a substitute for soya bean meal in livestock rations because of their high protein value (Marquardt and Campbell 1975). Whilst broad beans favour fairly cool conditions and can withstand frost, they can also be grown with considerable success in warm climates.

Broad beans are not a commercial crop in the Waikato but with the advent of a small vegetable freezing industry in the region, there is now a suitable outlet for the product. Prices in the Japanese markets for the fresh crop are quite high, with the highest being offered around December and the lowest around June.

The trials reported here were initiated to evaluate the potential of broad beans planted in winter or in spring and to test a number of herbicides for weed control in this crop on the high organic matter volcanic soils of the Waikato region.

MATERIALS AND METHODS

Two field trials were conducted on the Horotiu sandy loam soil near Hamilton over 1982 and 1983. Trial 1 was planted on 10 October 1982 and received a total of 63 and 96 mm rainfall in the 2 and 4 weeks following planting. The corresponding rainfall figures for Trial 2 planted on 12 July 1983 were 3 and 17 mm respectively. The soil for Trial 1 had 51% sand, 17% clay, 17.1% organic matter and a pH of 5.3. The site 2 soil with a very similar texture had 16.3% organic matter and a pH of 5.5.

A randomised block design with four replications was used for both trials. Individual plots were 8 x 2 m in which broad beans cv. 'Exhibition Longpod' were planted in rows 45 cm apart by a Nodet Gougis precision seeder.

The herbicides were applied in a spray volume of 300 litres/ha at a pressure of 210 kPa. Immediately after application the pre-plant soil-incorporated treatment of trifluralin was raked into the soil to a depth of 5 cm. All the pre-emergence treatments were applied 2 days after planting and the post-emergence treatment of dinoseb acetate (Aretit) was sprayed 25 days after the sowing date.

The number of broad bean plants in the two harvest rows was counted 5 weeks after sowing. Dry matter weights of the weeds were determined from duplicate 0.1 m^2 samples from each plot. Crop yields were recorded by harvesting two middle rows from each plot as a single harvest in January in Trial 1 and over a 4-week period in November in Trial 2. Visual ratings on the growth and vigour of the crop and on weed control were also recorded several times during the growing season.

RESULTS AND DISCUSSION

The weed spectrum of Trial 1 included willow weed *(Polygonum persicaria)*, black nightshade *(Solanum nigrum)*, narrow-leaved plantain *(Plantago lanceolata)*, redroot *(Amaranthus powellii)*, summer grass *(Digitaria sanguinalis)* and smooth witchgrass *(Panicum dichotomiflorum)*. Trial 2 planted in the winter had mainly chickweed *(Stellaria media)*, narrow-leaved plantain, black nightshade, poa annua *(Poa annua)*, willow weed and later in the year smooth witchgrass in some plots.

In Trial 2 during the winter all herbicide treatments except prometryn (Gesagard) provided good control of weeds as shown by the weed scores 10 weeks after application (Table 1). By November, when the crop was nearly mature, moderate to heavy infestations of smooth witchgrass, narrow-leaved plantain and black nightshade were present in several treatments. However, late weed competition is likely to have little effect on the yield of broad beans (Glasgow *et al* 1976). Both rates of terbumeton + terbuthylazine (Caragard) provided excellent weed control but the crop tolerance was marginal.

TABLE 1: Effect of herbicide treatments on weeds and pod yield of broad beans.

Treatment	Rate (kg ai/ha)	Trial 1		Trial 2		
		Weed DM (t/ha) 6.12.82	Pod yield t/ha 14.1.83	Weed score* 19.9.83	Weed DM (t/ha) 6.11.83	Pod yield (t/ha) Nov.1983
alachlor	2.0	-	-	0	1.66 a	8.1 bc
alachlor + linuron	2.0 1.0	0.13 c	5.9 bc	1	0.77 b	5.5 c
chlorproham + diuron	2.0 1.0	0.98 ab	6.7 bc	0	0.38 bc	12.0 a
methabenzthiazuron + metribuzin**	2.0 0.5	0.57 b	7.5 ab	0.5	0.30 bc	10.0 ab
prometryn	1.0	-	-	2.5	1.88 a	9.2 bc
simazine	1.0	1.64 a	4.7 c	1.0	0.46 bc	11.5 a
simazine	2.0	1.02 ab	4.1 c	0.5	0.23 bc	9.9 ab
terbumeton + terbuthylazine	0.75 0.75	-	-	0.5	0.12 bc	9.7 ab
terbumeton + terbuthylazine	1.5 1.5	-	-	0	0.01 c	8.2 bc
trifluralin + linuron	1.0 2.0	0.02 c	10.1 a	0	0.30 bc	9.7 ab
trifluralin + metribuzin	1.0 0.5	0.01 c	9.4 ab	0.5	0.40 bc	9.9 ab
handweeded	-	0	9.3 ab	0	0	10.6 ab
CV%		18.2	12.7		26.7	11.6

* 0 = no weeds present; 10 = very weedy

** The 1982 treatment was methabenzthiazuron (2.0) + dinoseb acetate (1.5)

\- Treatment not included

Only the mixtures with alachlor (Lasso) and trifluralin (Treflan) provided acceptable weed control for the duration of Trial 1 where chemicals were applied in spring. Both simazine (Simazol 4 A) and chlorpropham + diuron (Winstones CIPC + Karmex) treatments were heavily infested with smooth witchgrass and summergrass. Simazine also failed to completely control willow weed later in the season.

The total pod yields were slightly higher overall from the winter crop (Trial 2) than that planted in spring (Trial 1). The yields from several treatments were low in Trial 1 due to lack of weed control and/or crop injury. The two combinations of trifluralin provided the best pod yields in this trial (Table 1). The highest yields in Trial 2 came

from plots treated with chlorpropham + diuron and the low rate of simazine. The other treatments except for alachlor and its combinations and the high rate of terbumeton + terbuthylazine also provided good yields.

Data on crop damage, plant numbers and pod yields showed that alachlor at 2 kg ai/ha was not tolerated by the crop. The damage symptoms included crinkling and blackening of leaves and reduction in the height and vigour of plants. Some plants treated with metribuzin (Sencor) in spring (Trial 1) showed blackened leaf margins in the early stages of growth, but no such damage was noted from winter application (Trial 2). Injury by metribuzin has also been noted by some other workers but Betts and Morrison (1979) showed in both field and growth room studies that trifluralin reduced the injury to broad beans from metribuzin. Like metribuzin, the chlorpropham + diuron treatment reduced the height and vigour of young plants by about 15% in Trial 1 but no damage was observed in Trial 2 where this was one of the best treatments. Trifluralin, prometryn and the low rate of simazine exhibited excellent crop safety. The 2 kg ai/ha rate of simazine produced slightly lower yields than the low rate, although the differences were not significant. This suggests that the tolerance to 2 kg ai/ha may be marginal. King (1978) and Stevenson (1979) found that simazine reduced crop vigour and yield on very light or very low organic matter soils, but Stevenson (1979) found that 1.2 kg ai/ha was safe on soils with organic matter levels of 5 to 7%. Excellent crop tolerance to 1.4 kg ai/ha of simazine was also reported by Butler *et al* (1980).

Based on both crop yield and weed control data simazine, chlorpropham + diuron, trifluralin with metribuzin or linuron, and methabenzthiazuron + metribuzin all gave good results on broad beans planted in the winter. The low rate of terbumeton + terbuthylazine was also promising and warrants further testing. Due to major grass weed problems in the spring planting, trifluralin with linuron or metribuzin were the only promising treatments of the various combinations tested.

The limited amount of work reported here suggests that it is feasible to plant broad beans in the Waikato region both as a winter or spring crop, but the chances of achieving good yields are better in the winter season. Good weed control is particularly difficult in the spring crop as many herbicides which are satisfactory for the winter sown crop are either damaging or provide poor weed control. Thus the choice of chemicals is limited for the crop planted in the spring.

ACKNOWLEDGEMENTS

Thank are due to J. Mortimer and B. Burney for technical assistance and to Ruakura Soil Testing Laboratory for the soil analyses.

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