CONTROL OF CALIFORNIAN THISTLE AND YARROW IN ASPARAGUS WITH CLOPYRALID

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SUMMARY

In field trials, 34 growers applied clopyralid at rates of 0.15 to 0.30 kg ai/ha over emerging spears of asparagus (*Asparagus officinalis*) to control dense infestations of Californian thistle (*Cirsium arvense*) and yarrow (*Achillea millefolium*). At all but two sites, clopyralid had virtually no effects on spears. One to three applications of clopyralid reduced the average cover of Californian thistle from 66% in the first year to 17% the next. In small plot trials speed of thistle knockdown increased with increased rate of clopyralid but final kill was largely independent of rate. Bolting thistles were more susceptible than rosette or early flower stages. Yarrow was controlled with 0.3 kg ai/ha while in full leaf.

INTRODUCTION

Californian thistle and yarrow are two of the worst perennial weeds in asparagus in New Zealand. Californian thistle has the same growth pattern as asparagus and its thorn-covered leaves hinder picking; yarrow rhizome fragments form a dense mat in the mounded beds and deprive the crop of moisture.

Clopyralid, whose activity against these two weeds has been well established (Naish 1975; Field and Jayaweera 1985), has until recently only been available in mixture with phenoxy herbicides for use in cereals (Rutherford and Lobb 1979) and pasture (Meeklah and Mitchell 1984) and this has precluded its use in asparagus.

In 1984 a 300 g ai/litre formulation of clopyralid (Versatill) was released and in the same year Rahman and Sanders (1984) reported its use in asparagus. This paper reports the results of two years extensive field assessment of clopyralid with asparagus growers throughout the North Island, and rate and mixture responses observed in small plot studies.

MATERIALS AND METHODS

Small plot trials

Eleven trials were conducted on Californian thistle patches in asparagus blocks in the Waikato and Hawkes Bay regions during the 1983-85 picking seasons. Each trial had three replicates and plot sizes were usually 4 m x 5 m arranged in a randomised complete block design. Clopyralid was applied at four rates (Table 1) to Californian thistle at the rosette, bolting and early flower stages. Treatments were applied with a back-pack precision sprayer and hand-held 2 m boom fitted with Teejet 730 154 fan tips operated at 200 kPa delivering 200 litres/hectare. Control of the sprayed thistle herbage was rated visually at regular intervals for up to 13 weeks after spraying.

Grower assessments

Growers who wanted to use clopyralid on their asparagus blocks in 1984 and 1985 were instructed in its use before application. The recommendations included use rates of 0.15 – 0.21 kg ai/ha clopyralid for Californian thistle in the rosette stage (October to mid-November) and 0.21-0.3 kg ai/ha at the bolting (mid-November—early December) to early flowering stage (December). If application was made during picking, growers were advised to take a “hard pick” prior to spraying, which meant cutting spears down to 100 mm long. Chemical residue levels required a three day withholding period before picking could start again. For yarrow and any other susceptible weeds 0.3 kg ai/ha was used at closure after picking stopped.

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TABLE 1: Percent control of three growth stages of Californian thistle with clopyralid in small plot trials in asparagus.

Growth Stage	clopyralid (kg ai/ha)	Weeks after treatment			
		3	5	9	13
Rosette	0.15	61	70	78	90
	0.21	72	83	88	93
	0.30	82	92	91	98
	0.60	70	100	100	100
Bolting	0.15	48	84	94	-
	0.21	66	90	97	-
	0.30	82	99	98	-
Early Flower	0.15	39	69	80	-
	0.21	47	71	89	-
	0.30	61	81	97	-
	0.60	55	95	100	-

Clopyralid was applied in almost all instances on its own as a broadcast spray over the entire block in 200-300 litres water/ha either by the grower or a spray contractor. The authors recorded growth stage and visually assessed density (as % ground cover) of the weeds at the time of spraying; the percent control of sprayed plants after about six weeks; and the percent cover of shoots which re-emerged the following season. Effects on the asparagus were recorded as excellent = no effect; good = some spears bent; poor = many spears bent and some twisted.

RESULTS AND DISCUSSION

Small plot trials

The results of the small plot trials in Table 1 in which each figure is a mean of at least nine trials, show that all rates of clopyralid from 0.15 to 0.60 kg ai/ha gave an acceptable level (90%) of Californian thistle control in the rosette to bolting stages. However, the speed of thistle knockdown increased with increased rates of clopyralid. Thus, the time taken to achieve 90 percent control or greater was 13 weeks at 0.15 kg ai/ha, but only about five weeks for 0.6 kg ai/ha.

TABLE 2: Initial weed cover, percent weed control 6 weeks after treatment (WAT) and next year with clopyralid and crop tolerance in growers' asparagus blocks.

clopyralid (kg ai/ha)	No. of growers	Asparagus Area ha	% Weed cover initially	% Weed control (6 WAT)	% Weed cover next year	Asparagus tolerance
Californian thistle						
0.21	17	165	67 (40-95)	91 (80-100)	20 (0-40)	14E 2G 1P
0.30	13	70	64 (30-90)	98 (95-100)	14 (1-40)	11E 1G 1P
untreated	3	0.5	80 (70-90)	0	85 (75-95)	
yarrow						
0.30	4	24	47 (10-80)	80 (70-90)	17 (0-30)	4E

* E = Excellent, G = Good, P = Poor

Thistles were most susceptible during the bolting stage when they were growing most actively, followed by the rosette stage. The early flowering stage took the longest time to die down but as this usually occurred at the end of the season it did not hinder pickers greatly.

In one trial the addition of 0.4 kg ai/ha amitrole (Weedazol 4L) appeared to increase the long term control of Californian thistle. In two other trials the addition of glyphosate (Roundup), although doubling the speed of brown-out, decreased the long term level of control by 40% (Steiffel; Harris; pers. comm.).

Grower assessments

As the results of the grower assessments in Table 2 show, Californian thistle was by far the most predominant weed. Of the 34 asparagus growers who applied clopyralid, 30 had moderate to very severe infestations of Californian thistle which often covered the whole block, smothering the crop. A total of 235 ha was treated and without exception the growers considered being able to use clopyralid during the picking season a considerable advantage.

Virtually all emerged thistle shoots died within the six weeks of treatment (Table 2) which allowed pickers to continue unhindered. One exception was thistles treated in the flower bud stage which took 8-10 weeks to collapse. There was no obvious difference between the two most common rates used viz. 0.21 and 0.3 kg ai/ha, but the 0.15 kg ai/ha rate appeared to give a slower kill as it did in the small plot trials. Thistles treated in early flower with the highest clopyralid rate appeared to have the least regrowth.

The number of new shoots which emerged after treatment varied greatly from site to site. Thistles which were treated at the rosette stage early in the season were the most likely to show more new shoots later in the same season but resulted in the clearest field for the pickers. It was common to treat this regrowth again at closure.

The amount of regrowth which occurred in the following year also varied from site to site and was largely independent of the clopyralid rate used. In some instances a bad infestation was eliminated with one application; in other instances repeat sprays over two or three seasons were required. Nevertheless, all of the growers who used clopyralid for two or more years in succession now have thistle infestations covering less than 15% of their total area. The thistles that are present are quite low in density and no grower now considers Californian thistle to be hindering asparagus production.

The results with yarrow have been similar. Two blocks which had bad infestations covering 80% of the area have had yarrow virtually eradicated after two applications of 0.3 kg ai/ha clopyralid, a season apart. Areas where the rhizomes had been chopped up and moulded high were hardest to control. There were also two instances when the activity of clopyralid on yarrow appeared to be reduced when it was applied in mixture with terbumeton/terbuthylazine or atrazine.

Overall, crop tolerance was excellent. Twenty-nine growers reported no effect; three growers had a few bent spears for the first pick after spraying and two growers, one of whom did not cut hard before spraying had a more prolonged effect lasting about 10 days. Two growers who treated open-headed spears observed severe twisting. Mature fern sprayed with clopyralid turned brown. No plant loss or crop yield loss was reported.

CONCLUSION

Clopyralid applied as a broadcast spray over emerging spears of asparagus during the picking season gave good control of Californian thistle and yarrow. This offers growers a valuable additional aid to improving productivity.

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REFERENCES

- Field, R.J. and Jayaweera, C.S., 1985. The influence of clopyralid and glyphosate on yarrow rhizome regeneration. *Proc. 38th N.Z. Weed and Pest Control Conf.*: 106-109.

- Meeklah, F.A. and Mitchell R.B., 1984. Evaluation of herbicides for control of Californian thistle. *Proc. 37th N.Z. Weed and Pest Control Conf.*: 20-23.
- Rahman, A. and Sanders, P., 1984. Selective control of Californian thistle in asparagus. *Proc. 37th N.Z. Weed and Pest Control Conf.*: 146-150.
- Naish, R.W., 1975. Dowco 290 — A new growth regulator herbicide. *Proc. 28th N.Z. Weed and Pest Control Conf.*: 177-180.
- Rutherford, G.R. and Lobb, P.G., 1979. The use of 3, 6-dichloropicolinic and mixtures for broadleaf weed control in cereal crops. *Proc. 32nd N.Z. Weed and Pest Control Conf.*: 139-143.