3,6-DICHLOROPICOLINIC ACID/MCPB FOR CONTROL OF NODDING THISTLE IN PASTURE

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SUMMARY

A mixture of 3,6-dichloropicolinic acid (3,6-DCPA)/MCPB at 0.022/0.75 to 0.03/1.0 kg/ha achieved a significantly higher level of thistle control than the standard herbicides, MCPA salt or 2,4-D ester, in 157 plot and field trials. The mixture gave a greater reliability of control and an extension of the season of application to August-September. While there was some suppression of white clover (*Trifolium repens*) damage was not significantly different from the standard herbicides except with 3,6-DCPA/MCPB at a dosage of 0.03/1.0 kg/ha. Full clover recovery occurred within four to five months with all herbicide treatments.

INTRODUCTION

The level of nodding thistle (*Carduus nutans*) control with broadcast applications of MCPB, MCPA and 2,4-D is not always satisfactory. Daniel (1977) and Matthews (1977), reported the poor activity of these herbicides on large rooted thistles or under climatic stress. Generally the phenoxy herbicides were less effective in the late winter-spring than the autumn-early winter periods (Delahunty 1960, Matthews 1977).

The activity of 3,6-DCPA on composite weeds was first described in New Zealand by Naish (1975). Since then, various formulations have been evaluated for control of annual and biennial thistles and hard-to-kill broadleaf weeds in pasture. This paper reports the performance of a new pasture herbicide formulation containing 3,6-DCPA and MCPB in 40 replicated trials and 117 field assessment trials conducted during 1979 and 1980 throughout New Zealand.

FORMULATION

The 3,6-DCPA plus MCPB formulation used throughout the trial series contained 15 g 3,6-DCPA as the amine salt and 500 g MCPB as the butyl ester per litre of product and was applied at rates of 1.0, 1.5 and 2.0 litres product/ha. These three rates were compared to 2,4-D butyl ester 1.44 kg/ha and MCPA salt at 1.2 and 1.6 kg/ha.

METHOD

In the replicated small plot trials treatments were applied using a precision sprayer with a 2 m hand held boom fitted with either 8003 or 730-154 fan nozzles operated at 200 kPa applying 200 litres/ha. Plot sizes ranged from 20 m² to 40 m² and each treatment was replicated three or four times. Nodding and other thistles (when present) were at all growth stages from seedlings to mature plants with root crowns up to and sometimes exceeding 50 mm in diameter at treatment. Trials were established throughout the period from May to October.

Visual assessment of nodding thistle control was made by at least two independent observers and expressed as a numerical 0-10 scale (0 being no effect and 10 complete thistle control). Similarly, the effect of each treatment on the clover content of the pasture was made visually on a 10-0 scale (10 indicating clover content as untreated and 0 indicating complete clover removal). Data from each trial was used as a replicate for

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the statistical analysis of the summarised data in Tables 1 and 2.

In order to quantify herbicide effect on white clover production, pasture in eight replicated trials was harvested at various times (Table 3) and clover dry matter (DM) production determined. As initial clover content and total pasture production DM varied from site to site (and month of application) clover DM production data was expressed as a percentage of the clover yield from untreated in the same trial. Each trial was used as a replicate for statistical analysis of the summarised North and South Island data presented in Table 3.

The field assessment trials were applied by contractor or farmer using conventional equipment and were supervised by an Ivon Watkins-Dow Limited representative.

Field assessment trials usually contained only one rate of 3,6-DCPA/MCPB and there was not always a comparison with 2,4-D or MCPA in the same paddock. Of the 38 trials that did contain a comparison, 31 were with MCPA, six with 2,4-D ester and one with MCPB. Thistle control was rated as either poor or no control, satisfactory, very good or excellent. Similarly, the clover tolerance was rated as unacceptable, satisfactory, very good or excellent.

RESULTS AND DISCUSSION

Summarised visual assessment data of nodding thistle control and of white and subterranean clover (*Trifolium subterraneum*) tolerance are presented in Table 1.

TABLE 1: Summary of nodding thistle control and clover tolerance (visual assessments)

Response rated		Mean thistle control			Mean clover tolerance		
No. of trials	Weeks after treatment	13	12	11	White	Subterranean	
					5	4	3
Treatment	kg/ha	►8	►8	►14	►14	►14	►14
MCPA salt	1.6	7.8	-	8.7	-	9.0	-
2,4-D ester	1.44	-	7.5	-	8.3	-	6.9
3,6-DCPA/MCPB	0.015/0.5	7.7	7.6	9.1	8.1	9.1	8.7
3,6-DCPA/MCPB	0.022/0.75	9.3**	9.1**	8.3	7.3	7.2	5.9
3,6-DCPA/MCPB	0.03/1.0	9.6**	9.4**	7.3*	6.9*	5.8*	3.8**
untreated		0	0	10	10	10	10
LSD 5%		0.56	0.79	0.93	1.15	2.35	1.67
1%		0.75	1.06	1.25	1.59	3.29	2.43
CV%		8.3	11.3	12.5	10.6	18.6	12.6

* ** Significantly different from standard herbicide at $P \leq 0.05$ and $P \leq 0.01$.

As MCPA and 2,4-D were not both included in every trial, those with 2,4-D as the reference herbicide (North Island trials) are presented separately from those with MCPA as the reference herbicide (South Island trials). The data show a very high level of nodding thistle control was achieved by the 3,6-DCPA/MCPB formulation (0.022/0.75 — 0.03/1.0 kg/ha) irrespective of growth stage at treatment, and over the trial series was significantly higher than the level of control achieved by MCPA and 2,4-D. Tolerance of white and subterranean clovers to the 3,6-DCPA/MCPB formulation at dosages up to 0.022/0.75 kg/ha was not significantly different from the reference herbicides, though the amount of subterranean clover in the 3,6-DCPA/MCPBA (0.022/0.75 kg/ha) and 2,4-D treatments were significantly lower than untreated. At the highest rate of 3,6-DCPA/MCPB both white and subterranean clover were significantly reduced.

Table 2 summarises nodding thistle control data obtained with different months of application of herbicides.

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TABLE 2: Summary of nodding thistle control at different application times.

Month of application		May	June	July	Aug	Sept
No. of trials		4	4	1	4	5
Treatment	kg/ha	Mean thistle control				
MCPA salt	1.6	8.6	-	-	-	7.1
2,4-D ester	1.44	-	7.8	5.4	6.7	-
3,6-DCPA/MCPB	0.015/0.5	8.1	8.7	7.6	5.7	7.0
3,6-DCPA/MCPB	0.022/0.75	9.1	9.8	9.3	7.8*	8.9**
3,6-DCPA/MCPB	0.03/1.0	9.6	9.9	9.9	8.3**	9.3**
LSD 5%		NS	NS	NA†	0.92	1.0
LSD 1%					1.4	1.3

* ** significantly different from standard herbicide at $P \leq 0.05$ and $P \leq 0.01$.

† NA = not analysed.

Again the very high level of thistle control with 3,6-DCPA/MCPB at a dosage of 0.022/0.75 — 0.03/1.0 kg/ha was demonstrated. Although the level of control was not significantly different with application from May to July, the 3,6-DCPA/MCPB formulation achieved a significantly higher level of control than the reference herbicide in August and September when thistle size and climatic conditions did not favour optimum performance with the conventional phenoxy herbicides.

Table 3 summarises white clover DM production from eight trials. Clover DM in untreated is also shown as a percentage of total herbage to indicate total pasture composition.

TABLE 3: White clover dry matter production as percentage of untreated.

Harvested weeks after treatment		North Island (4 trials)		South Island (4 trials)	
		9	24-26	6-19	23-36
Treatment	kg/ha				
2,4-D ester	1.44	39 bcB	86	-	-
MCPA salt	1.6	-	-	93	110
3,6-DCPA/MCPB	0.015/0.5	47 bB	96	104	115
3,6-DCPA/MCPB	0.022/0.75	42 bcB	88	91	114
3,6-DCPA/MCPB	0.03/1.0	29 cB	71	52	83
untreated	-	100 aA	100	100	100
			NS	NS	NS
% clover in untreated		27	11	45	72
CV%		26.0	51.6	38.6	23.7

The clover production data show no significant difference in yield with any of the dosages of the 3,6-DCPA formulation relative to the reference herbicides. However, there was a strong trend in both the North Island and South Island trial series for decreased production for up to 19 weeks with the highest rate of the 3,6-DCPA/MCPB formulation. All herbicide treatments decreased clover yield compared to untreated in the North island trials for up to 9 weeks post-treatment. By 24 or more weeks post-treatment, white clover had recovered from all herbicide treatment effects in both the North and South Island trials and there was no significant differences in yields. There was some indication from individual trial results that the application of 3,6-DCPA/MCPB at or about the onset of active growth in spring, resulted in less clover suppression and a more rapid recovery to normal production.

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Results from 89 of the 117 field assessment trials support the replicated small plot trials with 94 and 96% of the 3,6-DCPA/MCPB treatments at dosages of 0.015/0.5 and 0.03/1.0 kg/ha respectively, showing satisfactory nodding thistle control compared to MCPA and 2,4-D with 49% satisfactory control. The few 3,6-DCPA/MCPB assessments which failed to provide adequate thistle control were all due to an insufficient dosage being applied relative to the size of thistles treated. Of the remaining field assessments 16 included winged thistle (*Carduus tenuiflorus*), eight included Scotch thistle (*Cirsium vulgare*) and four included welshed thistle (*Carduus crispus*). Winged thistle and welshed thistle were well controlled by 0.022/0.75 and 0.03/1.0 kg/ha of 3,6-DCPA/MCPB. Scotch thistle was well controlled with 0.015/0.5 and 0.022/0.75 kg/ha of 3,6-DCPA/MCPB. Clover tolerance in all of the field assessment trials was rated satisfactory, good or excellent with all three dosages of the 3,6-DCPA/MCPB formulation.

CONCLUSIONS

Superior control of nodding thistle has been obtained with 3,6-DCPA/MCPB at 0.022/0.75 to 0.03/1.0 kg/ha compared to the standard phenoxy herbicides in both the replicated small plot and large scale field trials. The use of this herbicide has enabled an extension of the season of application into the August to September period. It provided more reliable control of thistles with large root-crowns not adequately controlled by conventional herbicides. As with the phenoxyacetic herbicides, there has been some clover suppression. At rates of up to 0.022/0.75 kg/ha 3,6-DCPA/MCPB showed a similar degree of white clover suppression to the standard herbicides with recovery to normal production within 4-5 months. Further evaluation of white clover suppression in relation to timing of herbicide applications is required.

Subterranean and other annual clovers were more sensitive to 3,6-DCPA/MCPB at 0.022/0.75 to 0.03/1.0 kg/ha than they were to the reference herbicides. However, applications of 3,6-DCPA/MCPB at 0.015/0.5 kg/ha provided similar tolerance to MCPA and 2,4-D and satisfactory thistle control in pastures containing these clover species.

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