3,6-DCPA AND 3,6-DCPA MIXTURES FOR SELECTIVE BRUSHWEED CONTROL IN RADIATA PINE

G.R. RUTHERFORD

Ivon Watkins-Dow Limited, Christchurch

SUMMARY

3,6-DCPA (3,6-dichloropicolinic acid) was assessed alone and in mixture was either 2,4,5-T ester or triclopyr ester for control of gorse *(Ulex europeaus)*, broom *(Cytisus scoparius)* and silver wattle *(Acacia dealbata)* in establishing radiata pine *(Pinus radiata)* plantations. Brushweed control with these mixtures was superior to 2,4,5-T ester or the mixture of picloram/2,4,5-T at rates which could be applied with safety to active growing radiata pine *(Pinus radiata)*.

INTRODUCTION

The control of brushweeds especially gorse and broom in exotic pine plantations has been a continuing problem. Preest (1966) and Johns *et al* (1971) demonstrated the tolerance of radiata pine to low dosages of 2,4,5-T and picloram/2,4,5-T. While these herbicides have been standard treatments in forest establishment they provide only temporary suppression of regenerating brushweeds at rates tolerated by radiata pine. To achieve satisfactory pine establishment the forester has had to rely on complex site preparation programmes aimed at virtual elimination of brush weeds before planting. In the case of gorse this has seldom been achieved and release spraying post-planting has continued to be necessary.

The activity on gorse of the herbicide 3,6-DCPA has been described elsewhere (Haagsma 1975; Naish 1975). In 1978 a series of trials was commenced to identify a herbicide mixture containing 3,6-DCPA which would provide a high level of brushweed control when applied as a broadcast treatment over establishing radiata pine.

This paper reports results from twenty replicated small plot trials and ten large scale aerial trials conducted since 1978.

METHOD

When applied alone 3,6-DCPA was used as the butyl ester; in tank mixtures with either triclopyr butoxyethanol ester or 2,4,5-T butyl ester 3,6-DCPA was in the form of an oil soluble amine or the butyl ester. The picloram/2,4,5-T mixture was a propriety formulation of potassium salt and iso-octyl ester respectively.

Small plot trials were of randomised complete block design with two or three replications in the weed control trials and four replications in the tolerance trials. Plot sizes varied from 20 m^2 to 60 m^2. Broadcast treatments were applied with a precision sprayer and 2 m hand held boom fitted with Teejet fan nozzles 8003 or 730154, operating at 200 kPa applying 400 litres/ha in two passes in opposite directions.

Aerial trials were applied using helicopters calibrated before application. Spray volumes varied between 220 to 520 litres/ha applied in overlapping passes in opposite directions. Plots were 0.4 ha.

Brushweed efficacy trials were established in typical radiata pine afforestation areas where weeds had regenerated both as seedlings and coppicing root-stocks following site preparation and tree planting. In most trials herbicides were applied in the second year after tree planting with the remainder in the first or third years. Applications were made during active growth of the weeds and trees in the period August to December. Weed control was visually assessed at intervals throughout the trials, by two independent observers. The mean data from the final ratings are presented.

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Tree tolerance data was determined in seven trials where all plots were maintained essentially weed free by hand weeding and/or directed application of triazine herbicides. Trees were measured (height and/or diameter) at intervals and relative growths computed from the product of the mean height and square of the mean diameter. Data has been expressed as percentage of untreated for all trials at the assessment times indicated.

RESULTS

Weed control

Data from 11 gorse trials (5 small plot, 6 aerial), 9 broom trials (4 small plot, 5 aerial) and 3 silver wattle trials (2 small plot, 1 aerial) are summarised in Table 1.

A high degree of control of established gorse, broom and wattle was achieved with 3,6-DCPA 6 kg/ha or 3,6-DCPA 2 kg/ha with either 2,4,5-T 0.5 kg/ha or triclopyr 0.25 kg/ha. There was no difference in performance between the oil soluble amine and butyl ester of 3,6-DCPA so the results have been combined. The rating scale used to assess weed control was conservative inasmuch as weeds which regrew (and rated as alive) were generally weak and uncompetitive with the tree crop.

By about 24 months after treatment gorse had broken down allowing access to the 3,6-DCPA plots for follow-up silvicultural operations or grazing. The 2,4,5-T, 2,4,5-T/picloram and untreated plots, however, were essentially impenetrable after 2 years.

Timing of application of 3,6-DCPA or 3,6-DCPA mixtures was important, and trials treated after January in Canterbury gave poor gorse and broom control as was also shown by Balneaves (unpublished). Application in August (pre-flowering) or during flowering provided acceptable control though regrowth tended to be greater with the latter.

Several trials established on seedling and coppicing gorse in spring of the year of tree planting tended to show less advantage in weed control by 3,6-DCPA treatments over the standards 2,4,5-T or picloram/2,4,5-T.

Silver wattle was completely controlled by 3,6-DCPA 6 kg/ha and combinations of 3,6-DCPA 2 kg/ha with either 2,4,5-T 0.5 kg/ha or triclopyr 0.25 kg/ha provided acceptable control for up to 2 years following treatment.

TABLE 1: Control of gorse, broom and silver wattle with 3,6-DCPA and mixtures.

Weed		Gorse	Broom	Silver wattle
No. of trials		11	9	3
Weed height (m)		0.7	1.3	1.6-2
Months after treatment		21	13	21
Treatment	kg/ha	Mean % Control		
3,6-DCPA/triclopyr	4+0.25	83	82	95
	2+0.25	65	69	89
3,6-DCPA/2,4,5-T	4+0.5	77	81	97
	2+0.5	67	67	83
3,6-DCPA ester	6	83	63	100
picloram/2,4,5-T	0.15+0.6	33	68	50
2,4,5-T ester	1.0	21	51	60

Tree tolerance

Data on tolerance of radiata pine to 3,6-DCPA and mixtures with 2,4,5-T or triclopyr in seven trials on weed free sites is presented in Table 2. No significant differences in tree growth due to any herbicide treatment relative to untreated were observed, even though treatments were applied during active tree growth (October —

February) when 2,4,5-T ester and picloram/2,4,5-T have been reported as damaging to radiata pine (Balneaves unpublished).

Growth response of radiata pine on gorse or silver wattle infested sites following treatment with 3,6-DCPA and mixtures are also shown in Table 2.

By control of competing brushweeds large increases in tree growth resulted in the majority of trials and most 3,6-DCPA treatments in trial 1-485 were significantly higher ($P < 0.05$) than untreated and the standard herbicides. Trials 1-457 and 1-462 applied in late summer resulted in poor weed control with all treatments and this is reflected in the lower tree growth responses.

Having regard to both brushweed control and tree tolerance mixtures of 3,6-DCPA 2 kg/ha plus either 2,4,5-T 0.5 kg/ha or triclopyr 0.25 kg/ha appear to be the most cost effective. A slightly higher kill of brushweeds was given by 3,6-DCPA 6 kg/ha alone and the 3,6-DCPA 4 kg/ha plus either 2,4,5-T or triclopyr, but control by the lower rates was sufficient to optimise tree growth and to provide access for subsequent silvicultural operations.

TABLE 2: Tree growth as a percentage of untreated. Herbicide rates kg/ha.

Trial No.†	Month applied	Months after treatment	3,6-DCPA + triclopyr		3,6-DCPA + 2,4,5-T		3,6-DCPA alone	picloram +2,4,5-T	2,4,5-T ester	untreated
			4+0.25	4+0.5	4+0.5	4+1	6	0.15+0.6	1 . 0	
Weed free sites										
4-226	NOV	14	-	-	103	100	103	87	-	100 NS
4-228	JAN	12	-	-	113	96	90	90	-	100 NS
2-610	NOV	30	135	-	100	-	82	84	92	100 NA
0-876	DEC	21	103	96	105	103	114	94	90	100[1]NS
1-531	JAN	28	93	-	96	-	86	100		100 NS
1-532	JAN	28	113	-	115	-	107	91		100 NS
0-886	FEB	20	104	105	-	-	117	103		100[1]NS
MEAN			110	100	105	100	100	93	91	100
Weedy sites										
1-457[2]	FEB	39		↓	117	↓	85	95	78	100 NS
1-462[2]	MAR	38			202		249	118	167	100 NS
1-485[2]	AUG	33	264*	253*	289*	103	267*	132	179	100
1-504[2]	OCT	31	235	168	232	318	231	209	171	100 NS
1-507[2]	NOV	30	202		169					100 NA
1-565[3]	OCT	19	231	189	151	139				100 NA
1-571[3]	OCT	19		152		153				100 NA
MEAN			233	191	193	178	208	139	149	100

* Significantly different than untreated ($P = 0.05$).

NA Not analysed

[1] Data based on tree height only. [2] = Trial on gorse, [3] = Trial on wattle

† Prefix No. gives site location; 0 = Taranaki, 1 = Canterbury, 2 = Central North Island, 4 = Otago

↓ 3,6-DCPA + tricolpyr/2,4,5-T applied at 2 + 0.25 and 2 + 0.5 kg/ha respectively.

CONCLUSIONS

The activity of 3,6-DCPA alone and in mixture with either 2,4,5-T or triclopyr on gorse, broom and silver wattle was better than the present herbicides, 2,4,5-T or picloram/2,4,5-T and radiata pine tolerance was good. This increased tolerance of radiata pine to 3,6-DCPA mixtures over the commercial standard herbicides would provide increased flexibility by allowing timing of release sprays for optimum brushweed control.

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